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**80/100/120 CUBIC FOOT**

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NOTICE

Information in this manual is subject to change. Updates will be provided when safety issues arise, or when information becomes outdated. The Besser Company drawings and prints provided with your equipment and machinery are current to the date of manufacture.

Illustrations in this manual are provided to help you understand the instructions. The illustrations have not been drawn to scale. Please read and understand this manual and the Operation/Maintenance Manual before operating this machinery. Observe all safety signs and OSHA-approved lockout and tagout procedures. If you have questions about these safety procedures, please contact your Besser Sales and Service Representative before start-up of the machine.
# 80/100/120 Cubic Foot Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>80 CU FT</th>
<th>100 CU FT</th>
<th>120 CU FT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shipping Weight (Approximate)</strong></td>
<td>22,000 lb [9979 kg]</td>
<td>22,500 lb [10,206 kg]</td>
<td>23,500 lb [10,660 kg]</td>
</tr>
<tr>
<td></td>
<td>L: 14 ft 2 in. [4.32 m]</td>
<td>L: 14 ft 2 in. [4.32 m]</td>
<td>L: 14 ft 2 in. [4.32 m]</td>
</tr>
<tr>
<td></td>
<td>H: 6 ft 8 in. [2.03 m]</td>
<td>H: 6 ft 8 in. [2.03 m]</td>
<td>H: 6 ft 8 in. [2.03 m]</td>
</tr>
<tr>
<td><strong>Production Capacity</strong></td>
<td>Max volume 80 cu ft [2.27 m³]</td>
<td>100 cu ft [2.8 m³]</td>
<td>120 cu ft [3.4 m³]</td>
</tr>
<tr>
<td></td>
<td>Max weight 8000 lb [3628.8 kg]</td>
<td>10,000 lb [4536 kg]</td>
<td>12,000 lb [5443 kg]</td>
</tr>
<tr>
<td><strong>Mixer Electrical Motor Rating</strong></td>
<td>75 hp [56 kW]</td>
<td>100 hp [74.57 kW]</td>
<td>125 hp [93.13 kW]</td>
</tr>
<tr>
<td><strong>Blade Shaft Speed (RPM)</strong></td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td><strong>Mixer Air Requirements</strong></td>
<td>1/2 in. NPT 1/4 cu ft [0.035 m³] at 40 to 45 psi</td>
<td>1/2 in. NPT 1/4 cu ft [0.035 m³] at 45 to 50 psi</td>
<td>1/2 in. NPT 1/4 cu ft [0.035 m³] at 50 to 55 psi</td>
</tr>
<tr>
<td>Air inlet supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air clutch, each actuation,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge gate, each open/close cycle,</td>
<td>1 3/5 cu ft [0.045 m³] (23.2 SCFM)</td>
<td>1 3/5 cu ft [0.045 m³] (23.2 SCFM)</td>
<td>1 3/5 cu ft [0.045 m³] (23.2 SCFM)</td>
</tr>
<tr>
<td>at 120 psi [827.4 kPa]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mixer Water Requirements</strong></td>
<td>1 1/2 in. [38 mm] ID</td>
<td>1 1/2 in. [38 mm] ID</td>
<td>1 1/2 in. [38 mm] ID</td>
</tr>
<tr>
<td>Water supply inlet</td>
<td>58 [220]</td>
<td>72 [272.5]</td>
<td>86 [326]</td>
</tr>
<tr>
<td>Gallons [liters] per batch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensor and Control Panel Operating Ranges</strong></td>
<td>32° to 131°F [0° – 55°C]</td>
<td>32° to 131°F [0° – 55°C]</td>
<td>32° to 131°F [0° – 55°C]</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity range</td>
<td>5 to 95 percent, noncondensing</td>
<td>5 to 95 percent, noncondensing</td>
<td>5 to 95 percent, noncondensing</td>
</tr>
<tr>
<td>Line voltage</td>
<td>85 to 132 VAC, 50/60 Hz</td>
<td>85 to 132 VAC, 50/60 Hz</td>
<td>85 to 132 VAC, 50/60 Hz</td>
</tr>
<tr>
<td><strong>Operating Conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
SCFM means standard cubic feet per minute.

---

Table A 80/100/120 Cubic Foot Mixer Specifications
Figure A Primary Mixer Dimensions
The caution below applies to the 80, 100, and 120 cubic foot mixer electrical data.

CAUTION:

To Comply with Articles 110-9 110-10 of the National Electrical Code:

• The customer shall supply a branch circuit protective device to protect the control panel. The protective device shall have a short circuit interrupting rating of no less than the available short circuit current. Failure to do so could result in a rupture of the protective device while personnel are attempting to clear a fault.

• Besser Company recommends the use of protective devices with interrupting ratings of no less than 200,000 amps RMS symmetrical.
# 80 CUBIC FOOT ELECTRICAL DATA

<table>
<thead>
<tr>
<th>PLANT POWER SUPPLY (VOLTS)</th>
<th>BRANCH CIRCUIT DISTRIBUTION SWITCH (AMPS)</th>
<th>BRANCH CIRCUIT FUSE FRS-R (AMPS)</th>
<th>BRANCH CIRCUIT FEEDER THHN</th>
<th>BRANCH CIRCUIT FEEDER CONDUIT</th>
<th>SHORT CIRCUIT INTERRUPTING CAPACITY (AIC)</th>
<th>MOTOR AMPS</th>
<th>TOTAL AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>208V 60HZ</td>
<td>400</td>
<td>350</td>
<td>350 KCMIL</td>
<td>2.5 IN 64 MM</td>
<td>200,000</td>
<td>203.80</td>
<td>206.20</td>
</tr>
<tr>
<td>220V 50HZ</td>
<td>400</td>
<td>300</td>
<td>350 KCMIL</td>
<td>2.5 IN 64 MM</td>
<td>200,000</td>
<td>193.80</td>
<td>195.27</td>
</tr>
<tr>
<td>230V 60HZ</td>
<td>400</td>
<td>300</td>
<td>350 KCMIL</td>
<td>2.5 IN 64 MM</td>
<td>200,000</td>
<td>184.80</td>
<td>186.17</td>
</tr>
<tr>
<td>380V 50 Hz</td>
<td>200</td>
<td>200</td>
<td>3/0 AWG 85 MM²</td>
<td>1.5 IN 38 MM</td>
<td>200,000</td>
<td>112.00</td>
<td>113.32</td>
</tr>
<tr>
<td>415V 50 Hz</td>
<td>200</td>
<td>175</td>
<td>2/0 AWG 67.5 MM²</td>
<td>1.5 IN 38 MM</td>
<td>200,000</td>
<td>103.00</td>
<td>104.20</td>
</tr>
<tr>
<td>440V 50 Hz</td>
<td>200</td>
<td>125</td>
<td>1 AWG 42.4 MM²</td>
<td>1.25 IN 32 MM</td>
<td>200,000</td>
<td>101.2</td>
<td>102.2</td>
</tr>
<tr>
<td>460V 60 Hz</td>
<td>200</td>
<td>150</td>
<td>1 AWG 42.4 MM²</td>
<td>1.25 IN 32 MM</td>
<td>200,000</td>
<td>92</td>
<td>93</td>
</tr>
<tr>
<td>575V 60 Hz</td>
<td>200</td>
<td>125</td>
<td>2 AWG 33.6 MM²</td>
<td>1.0 IN 25 MM</td>
<td>200,000</td>
<td>73.5</td>
<td>74.4</td>
</tr>
</tbody>
</table>

Table B 80 Cubic Foot Mixer Electrical Data

This information is the same for all 80 Cubic Foot Mixers.

**TOTAL HORSEPOWER:** 75

**NUMBER OF MOTORS/HORSEPOWER:** 1/75

**TOTAL KILOWATTS:** 55.93

**NUMBER OF MOTORS/KILOWATTS:** 1/55.93

**CONTROL PANEL TRANSFORMER:** 500 volt-amps (If Used)

Please consult the table above to find the appropriate electrical data for your 80 cubic foot Mixer. First, find your corresponding plant power supply in the left column. Then find the corresponding electrical data on the same row as your power plant supply.

**NOTE:**
Fuses and wire and conduit are sized for 125% of motor full load amperes. Full load amperes may vary from one motor to another.
Example: Your power plant supply is 460V at 60 Hz. According to the table, you will then get these values:

**PLANT POWER SUPPLY:**
460 volt – 3-phase – 60 hertz

**BRANCH CIRCUIT**
- Distribution Switch Recommended: 200 amp
- Fuse Recommended [FRS–R]: 150 amp
- Feeder Recommended [THHN]: No. 1 AWG – [42.4 sq. mm]
- Feeder Conduit Recommended: 1.25 in – [32 mm]
- Short Circuit Interrupting Capacity: 200,000 AIC

**TOTAL AMPERE LOAD:**
93

**MIXER MOTOR**
- Total Horsepower: 75
- Number of Motors/Horsepower: 1/75
- Total Kilowatts: 55.93
- Number of Motors/Kilowatts: 1/55.93
- Amperes: 92

**CONTROL PANEL TRANSFORMER:**
500 volt-amps (If Used)

**ELECTRICAL DATA NOTES**
For safety purposes, Besser Company requires that this equipment be connected to a lockable electrical disconnect.
### 100 Cubic Foot

#### Electrical Data

<table>
<thead>
<tr>
<th>Plant Power Supply (Volts)</th>
<th>Branch Circuit Distribution Switch (AMPS)</th>
<th>Branch Circuit Fuse FR-S-R (AMPS)</th>
<th>Branch Circuit Feeder THHN</th>
<th>Branch Circuit Feeder Conduit</th>
<th>Short Circuit Interrupting Capacity (AIC)</th>
<th>Motor Amps</th>
<th>Total Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>208V 60Hz</td>
<td>600</td>
<td>450</td>
<td>4/0 AWG* 107 MM²</td>
<td>2 IN* 51 MM</td>
<td>200,000</td>
<td>275.00</td>
<td>277.40</td>
</tr>
<tr>
<td>220V 50Hz</td>
<td>400</td>
<td>400</td>
<td>3/0 AWG* 85 MM²</td>
<td>1.5 IN* 38 MM</td>
<td>200,000</td>
<td>250.00</td>
<td>252.27</td>
</tr>
<tr>
<td>230V 60Hz</td>
<td>400</td>
<td>400</td>
<td>3/0 AWG* 85 MM²</td>
<td>1.5 IN* 38 MM</td>
<td>200,000</td>
<td>239.00</td>
<td>241.17</td>
</tr>
<tr>
<td>380V 60Hz</td>
<td>400</td>
<td>250</td>
<td>250 KCMIL</td>
<td>2 IN 51 MM</td>
<td>200,000</td>
<td>160.00</td>
<td>161.32</td>
</tr>
<tr>
<td>415V 60Hz</td>
<td>400</td>
<td>225</td>
<td>4/0 AWG 107.2 MM²</td>
<td>2 IN 51 MM</td>
<td>200,000</td>
<td>145.00</td>
<td>146.20</td>
</tr>
<tr>
<td>440V 50Hz</td>
<td>200</td>
<td>175</td>
<td>2/0 AWG 67.5 MM²</td>
<td>1.5 IN 38 MM</td>
<td>200,000</td>
<td>131.45</td>
<td>132.45</td>
</tr>
<tr>
<td>460V 60Hz</td>
<td>200</td>
<td>200</td>
<td>3/0 AWG 95 MM²</td>
<td>1.5 IN 38 MM</td>
<td>200,000</td>
<td>120.00</td>
<td>121.08</td>
</tr>
<tr>
<td>575V 60Hz</td>
<td>200</td>
<td>150</td>
<td>1/0 AWG 53.5 MM²</td>
<td>1.25 IN 32 MM</td>
<td>200,000</td>
<td>96.0</td>
<td>96.87</td>
</tr>
</tbody>
</table>

**Table C** 100 Cubic Foot Mixer Electrical Data

This information is the same for all 100 Cubic Foot Mixers.

**TOTAL HORSEPOWER:** 100

**NUMBER OF MOTORS/HORSEPOWER:** 1/100

**TOTAL KILOWATTS:** 74.57

**NUMBER OF MOTORS/KILOWATTS:** 1/74.57

**CONTROL PANEL TRANSFORMER:** 500 volt-amps (If Used)

Please consult the table above to find the appropriate electrical data for your 100 cubic foot Mixer. First, find your corresponding plant power supply in the left column. Then find the corresponding electrical data on the same row as your power plant supply.

**NOTE:**
Fuses and wire and conduit are sized for 125% of motor full load amperes. Full load amperes may vary from one motor to another.
**Example:** Your power plant supply is 460V at 60 Hz. According to the table, you will then get these values:

**PLANT POWER SUPPLY:** 460 volt – 3-phase – 60 hertz

**BRANCH CIRCUIT**
- Distribution Switch Recommended: 200 amp
- Fuse Recommended [FRS–R]: 200 amp
- Feeder Recommended [THHN]: No. 3/0 AWG – [85 sq. mm]
- Feeder Conduit Recommended: 1.5 in – [38 mm]
- Short Circuit Interrupting Capacity: 200,000 AIC

**TOTAL AMPERE LOAD:** 121.08

**MIXER MOTOR**
- Total Horsepower: 100
- Number of Motors/Horsepower: 1/100
- Total Kilowatts: 74.57
- Number of Motors/Kilowatts: 1/74.57
- Amperes: 120

**CONTROL PANEL TRANSFORMER:** 500 volt-amps (If Used)

**ELECTRICAL DATA NOTES**
- For safety purposes, Besser Company requires that this equipment be connected to a lockable electrical disconnect.
### 120 Cubic Foot

#### Electrical Data

<table>
<thead>
<tr>
<th>Plant Power Supply (Volts)</th>
<th>Branch Circuit Distribution Switch (Amps)</th>
<th>Branch Circuit Fuse FRS-R (Amps)</th>
<th>Branch Circuit Feeder THHN (KCMIL)</th>
<th>Branch Circuit Feeder Conduit (In 51 MM)</th>
<th>Short Circuit Interrupting Capacity (AIC)</th>
<th>Motor Amps</th>
<th>Total Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>380V 50 HZ</td>
<td>400</td>
<td>300</td>
<td>300 KCMIL</td>
<td>2 IN 51 MM</td>
<td>200,000</td>
<td>199.66</td>
<td>200.98</td>
</tr>
<tr>
<td>415V 50 HZ</td>
<td>400</td>
<td>250</td>
<td>250 KCMIL</td>
<td>2 IN 51 MM</td>
<td>200,000</td>
<td>181.66</td>
<td>182.86</td>
</tr>
<tr>
<td>440V 50 HZ</td>
<td>400</td>
<td>225</td>
<td>4/0 AWG 107.2 MM²</td>
<td>2 IN 51 MM</td>
<td>200,000</td>
<td>164</td>
<td>165</td>
</tr>
<tr>
<td>460V 60 HZ</td>
<td>400</td>
<td>250</td>
<td>250 KCMIL</td>
<td>2 IN 51 MM</td>
<td>200,000</td>
<td>149</td>
<td>150</td>
</tr>
<tr>
<td>575V 60 HZ</td>
<td>200</td>
<td>200</td>
<td>3/0 AWG 85 MM²</td>
<td>1.5 IN 38 MM</td>
<td>200,000</td>
<td>119.2</td>
<td>120</td>
</tr>
</tbody>
</table>

**Table D 120 Cubic Foot Mixer Electrical Data**

This Information is the same for all 120 Cubic Foot Mixers.

**Total Horsepower:** 125

**Number of Motors/Horsepower:** 1/125

**Total Kilowatts:** 93.21

**Number of Motors/Kilowatts:** 1/93.21

**Control Panel Transformer:** 500 volt-amps (If Used)

Please consult the table above to find the appropriate electrical data for your 120 cubic foot Mixer. First, find your corresponding plant power supply in the left column. Then find the corresponding electrical data on the same row as your power plant supply.

**Note:**
Fuses and wire and conduit are sized for 125% of motor full load amperes. Full load amperes may vary from one motor to another.
Example: Your power plant supply is 460V at 60 Hz. According to the table, you will then get these values:

**PLANT POWER SUPPLY:** 460 volt – 3-phase – 60 hertz

**BRANCH CIRCUIT**
- Distribution Switch Recommended: 400 amp
- Fuse Recommended [FRS–R]: 250 amp
- Feeder Recommended [THHN]: No. 250 kcmil
- Feeder Conduit Recommended: 2 in – [51 mm]
- Short Circuit Interrupting Capacity: 200,000 AIC

**TOTAL AMPERE LOAD:** 150

**MIXER MOTOR**
- Total Horsepower: 125
- Number of Motors/Horsepower: 1/125
- Total Kilowatts: 93.21
- Number of Motors/Kilowatts: 1/93.21
- Amperes: 149

**CONTROL PANEL TRANSFORMER:** 500 volt-amps (If Used)

**ELECTRICAL DATA NOTES**
For safety purposes, Besser Company requires that this equipment be connected to a lockable electrical disconnect.

Due to the high current required, use of 230 VAC or less is not recommended.
SAFETY BULLETIN

This notice is issued to advise you that some previously accepted shop practices may not be keeping up with changing Federal and State Safety and Health Standards. Your current shop practices may not emphasize the need for proper precautions to insure safe operation and use of machines, tools, automatic loaders and allied equipment and/or warn against the use of certain solvents or other cleaning substances that are now considered unsafe or prohibited by law. Since many of your shop practices may not reflect current safety practices and procedures, particularly with regard to the safe operation of equipment, it is important that you review your practices to ensure compliance with Federal and State Safety and Health Standards.

IMPORTANT

The operation of any machine or power-operated device can be extremely hazardous unless proper safety precautions are strictly observed. Observe the following safety precautions:

- Always be sure proper guarding is in place for all pinch, catch, shear, crush and nip points.
- Always make sure that all personnel are clear of the equipment before starting it.
- Always be sure the equipment is properly grounded.
- Always turn the main electrical panel off and lock it out in accordance with published lockout/tag-out procedures prior to making adjustments, repairs, and maintenance.
- Always wear appropriate protective equipment like safety glasses, safety shoes, hearing protection and hard hats.
- Always keep chemical and flammable material away from electrical or operating equipment.
- Always maintain a safe work area that is free from slipping and tripping hazards.
- Always be sure appropriate safety devices are used when providing maintenance and repairs to all equipment.
- Never exceed the rated capacity of a machine or tool.
- Never modify machinery in any way without prior written approval of the Besser Engineering Department.
- Never operate equipment unless proper maintenance has been regularly performed.
- Never operate any equipment if unusual or excessive noise or vibration occurs.
- Never operate any equipment while any part of the body is in the proximity of potentially hazardous areas.
- Never use any toxic flammable substance as a solvent cleaner.
- Never allow the operation or repair of equipment by untrained personnel.
- Never climb or stand on equipment when it is operational.

It is important that you review Federal and State Safety and Health Standards on a continual basis. All shop supervisors, maintenance personnel, machine operators, tool operators, and any other person involved in the setup, operation, maintenance, repair or adjustment of Besser-built equipment should read and understand this bulletin and Federal and State Safety and Health Standards on which this bulletin is based.
<table>
<thead>
<tr>
<th>Sign</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All Panels</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Mixer</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Concrete Products Machine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Depalleter</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Mixer</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Skiploader</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Skiploader/Mixer Platforms</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>Skiploader/Mixer Platforms</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>Vertical: Pallet Transport System</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Horizontal: LSC-40A/LSC-100</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Pallet Transport System</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Besser-Matic</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Besser-Matic</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Skiploader</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>All Panels</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Overhead Block Transfer</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Block Pusher</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pallet Transfer System</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>Concrete Products Machine</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Conveyors</td>
<td>12</td>
</tr>
<tr>
<td>17</td>
<td>Cuber</td>
<td>8</td>
</tr>
<tr>
<td>18</td>
<td>Cuber</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Block Turnovers</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Slat Conveyors</td>
<td>2</td>
</tr>
</tbody>
</table>

To order safety decals, contact your local Besser representative or the Besser Central Order Department. Thank you!
<table>
<thead>
<tr>
<th>No.</th>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1   | ![Image](https://example.com/image1.png) | **DANGER**
High voltage. Follow lockout procedure before servicing panel or machine. |
| 2   | ![Image](https://example.com/image2.png) | **DANGER**
Mixer blade hazard. Close front panel and stay clear during operation. Follow lockout procedure before servicing. |
| 3   | ![Image](https://example.com/image3.png) | **DANGER**
Crush hazards. Stay clear of machine. Follow lockout procedure before servicing. |
| 4   | ![Image](https://example.com/image4.png) | **DANGER**
Nip points. Stay clear. Follow lockout procedure before servicing. |
| 5   | ![Image](https://example.com/image5.png) | **DANGER**
Crush hazard. Stay clear. Follow lockout procedure before servicing. |
| 6   | ![Image](https://example.com/image6.png) | **WARNING**
Fall hazard. Stay clear. |

1. **Large:** 113236F0409
   - High Voltage
   - Width: 4 1/2 inch
   - Height: 9 5/8 inch

2. **Small:** 113236F0204
   - High Voltage
   - Width: 2 inch
   - Height: 4 1/8 inch

3. **Vertical:** 113240F0307
   - Crush Hazard
   - Width: 3 1/2 inch
   - Height: 7 1/2 inch

4. **Horizontal:** 113239F0604
   - Crush Hazard
   - Width: 6 5/8 inch
   - Height: 4 inch

5. **Nip Points:** 114692F1006
   - Width: 5 3/4 inch
   - Height: 9 1/2 inch

6. **Crush Hazard:** 114688F0906
   - Width: 6 1/4 inch
   - Height: 9 1/2 inch

7. **Fall Hazard:** 114689F0804
   - Width: 4 1/2 inch
   - Height: 7 3/4 inch
114690F0805
Falling Objects
Width 4 3/4 inch
Height 8 inch

113244F0410
Crush Hazard
Vertical: Width 4 1/2 inch
Height 10 inch
Horizontal: 113245F1005
Crush Hazard
Width 10 inch
Height 5 3/4 inch

113242F0409
Crush Hazard
Width 4 1/2 inch
Height 9 5/8 inch

113243F0410
Falling Objects
Width 4 1/2 inch
Height 10 inch

114691F1006
Shear and Fall Hazards
Width 5 3/4 inch
Height 9 3/4 inch

113249F0410
Safety Instructions Decal – Suggested Lock-out Procedure
Width 4 inch
Height 10 inch

SUGGESTED LOCKOUT PROCEDURE
1. Announce lockout to other employees.
2. Turn power off at main panel.
3. Lockout power in off position.
4. Put key in pocket.
5. Clear machine of all personnel.
6. Test lockout by hitting run button.
7. Block, chain or release stored energy sources.
8. Clear machine of personnel before restarting machine.
13 113238F1005
Crush Hazard
Width 10 inch
Height 5 3/4 inch
Crush hazard. Stay clear of machine. Follow lockout procedure before servicing.

14 113248F1006
Crush Hazard
Width 10 inch
Height 6 inch
Crush hazard. Stay clear of transfer area. Follow lockout procedure before servicing.

15 113241F0605
Crush and Pinch Points
Width 6 5/8 inch
Height 4 inch
Crush and pinch points. Stay clear of machine. Follow lockout procedure before servicing.

16 113246F0704
Nip Hazard
Width 7 inch
Height 4 1/2 inch
Nip hazard. Stay clear of conveyor. Follow lockout procedure before servicing.

17 113247F1006
Crush Hazard
Width 10 inch
Height 6 inch
Crush hazard. Follow lockout procedure and secure elevator before servicing.

18 113250F1006
Crush and Pinch Hazard
Width 10 inch
Height 6 inch
Crush and pinch points. Stay off conveyor. Follow lockout procedure before servicing.
LIFTING POINTS

Besser Company recommends that the customer use a professional rigging crew to hoist the heavy Mixer components. The method used to hoist this equipment may vary, depending upon available rigging equipment and the plant layout.

To ensure the safety of plant personnel during Mixer installation, the rigging system must have a lifting capacity that meets or exceeds the shipping weight of the Mixer as listed in Mixer Specifications at the front of this manual.

Figure B  Mixer Lifting Points
Figure C Decals
1.1 INFORMATION ABOUT THIS MANUAL

WARNING:
This manual contains instructions and guidelines for the correct operation and maintenance of the Mixer. Operating the Mixer without fully understanding and following the material in this manual may result in serious injury to personnel or damage to machinery. If you have questions about any instructions, procedures or guidelines, contact your Besser Sales and Service Representative for assistance.

This manual covers operation and maintenance of a Mixer. The manual will help you operate and maintain the Mixer safely and correctly. Refer to the Installation Manual to determine the drive position.

Refer to Mixer Specifications and Mixer Electrical Data at the front of this manual to identify certain requirements of your Mixer. The Mixer model number is on the name and lubrication plate on the Mixer. For details about operating and maintaining the Mixer that might not be in this manual, refer to Besser Company drawings and information provided with the equipment.

1.2 ORGANIZATION OF THIS GUIDE

This guide includes procedures for properly operating and maintaining the Mixer. It’s divided into the following major Sections:

- Overview: Provides an overview of the Mixer, identifying its major components.
- Operation: Describes the Mixer’s sequence of operation, as well as its functional modes.
- Maintenance: Provides the recommended schedule for routine service, as well as lubrication, adjustment and repair procedures.

1.3 TERMS AND ABBREVIATIONS

The following terms and abbreviations are used throughout this manual.

- ACR Auto Control Relay
- bar Unit of Pressure
- CB Circuit Breaker
- gpm Gallons Per Minute
- lpm Liters Per Minute
- LS Limit Switch
- MCR Master Control Relay
- Fu Fuse
- PER Photoelectric Cell
- PRS Proximity Sensor
- psi Pounds Per Square Inch
- UC Unloading Conveyor
- vac Volts, Alternating Current

WARNING:
This manual contains instructions and guidelines for the correct operation and maintenance of the Mixer. Operating the Mixer without fully understanding and following the material in this manual may result in serious injury to personnel or damage to machinery. If you have questions about any instructions, procedures or guidelines, contact your Besser Sales and Service Representative for assistance.
1.4 SAFETY INFORMATION

Review the Safety Bulletin at the front of this manual before operating or working on the Mixer. Observe safe shop practices during all Mixer operation, troubleshooting and maintenance.

IMPORTANT:
Make sure any welding equipment is properly grounded.

IMPORTANT:
Wear the required protective gear and clothing when performing Mixer maintenance, welding, cleaning, etc.

IMPORTANT:
When possible, work in teams when doing Mixer maintenance.

IMPORTANT:
Observe the Confined Space Work Rules and Regulations of your company, locality, city and state, when doing maintenance within the Mixer drum.

Follow your plants lockout procedure before beginning any Mixer maintenance and troubleshooting. The following procedure is suggested for locking out the Mixer.

1.4.1 General Lockout for all Batch Controls

1. Announce lockout to other employees.
2. Turn power off at main panel.
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear equipment of all personnel.
7. Test lockout by hitting run button.

1.4.2 Lockout and Tag Equipment which Presents a Hazard to Personnel Working on the Mixer

1. Announce lockout to other employees.
2. Turn power off at main panel and motor starters.
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear equipment of all personnel.
7. Test lockout by hitting run button.
8. Block, chain, or release and lockout all stored energy sources.
9. Visually inspect equipment to make sure it is properly locked out and tagged.

1.4.3 Lockout and Tag Mixer

1. Announce lockout to other employees.
2. Turn power off at main panel, manual control station and Mixer motor starter(s).
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear Mixer of all personnel.
7. Test lockout by hitting run button.
8. Block, chain, or release and lockout all stored energy sources, including but not limited to:
   • Discharge Gate – Block open with safety stop
   • Air Supply – Release pressure, lockout, and tag
   • Water Supply – Release pressure, lockout, and tag
   • Blades, blade arms, and drive train (bull gear, pulley, etc.) – Block and/or chain

9. Visually inspect Mixer to make sure it is properly locked out and tagged.

WARNING:
This lockout procedure is a minimum precaution for the safety of servicing personnel. Do not attempt to avoid or shortcut these procedures.
1.5 DESCRIPTION OF MAJOR COMPONENTS

The following lists the major components of the Mixer. Component names followed by an asterisk (*) are items that may not be on the Mixer due to customer build specifications. Numbers before the component name indicate where in this manual the component is described. Refer to Figure 1.1 for relative locations of the major components, and check your Mixer so you know which components are on it.

- 1.5.1 Air-operated discharge gate
- 1.5.2 Circuit for switching contact protection (Inductive loads)
- 1.5.3 Drive shaft-with clutch*
- 1.5.4 Gear guard
- 1.5.5 Pulley guard
- 1.5.6 Removable head section
- 1.5.7 Enclosed drum
- 1.5.8 Cleaning rings*
- 1.5.9 Head scrapers*
- 1.5.10 Blade shaft covers*
- 1.5.11 Trough liners
- 1.5.12 LeSueur moisture system*
- 1.5.13 Ramsey moisture system*
- 1.5.14 ARC Moisture System – Ground probe liners*
- 1.5.15 ARC Moisture System – Microwave probe liners*
- 1.5.16 Blades with wear liners*
- 1.5.17 Bottom clean-out gate*

Figure 1.1 Major Components of the Mixer
1.5.1 Air-Operated Discharge Gate

A gate, operated by a pneumatic cylinder, enables discharge of mixed concrete from the Mixer. See Figure 1.2. The cylinder rod extends to open the gate, and retracts to close it. Most batching control systems require signals to indicate the open and closed gate positions. A magnet on the cylinder piston closes the contacts of proximity reed switches located on the cylinder to provide the signals. Table 1.1 lists the electrical characteristics of the reed switches and Section 1.5.2 gives switch circuit recommendations.

As the cylinder extends to open the gate, the piston magnet aligns with a reed switch at the top of the cylinder and its contacts close. When the contacts close, a signal is sent to the control system to indicate the gate is open. When the cylinder starts to retract to close the gate, the magnet moves away from the switch and its contacts open. As the cylinder fully retracts and closes the gate, the rod magnet now aligns with a switch at the bottom of the cylinder and its contacts close. When these contacts close, a signal is sent to the control system to indicate the gate is closed.

![Discharge Gate Assembly]

**Figure 1.2** Air-Operated Discharge Gate
<table>
<thead>
<tr>
<th><strong>Switching Logic</strong></th>
<th>Normally Open, SPST (Form A)</th>
</tr>
</thead>
</table>
| **Supply Voltage Range** | 85 – 125 VAC or 5 – 30 VDC  
Polarity is restricted to DC operation, (+) to brown, (-) to blue. If these connections are reversed, the contacts will close, but the LED will not light. |
| **On-State Voltage Drop** | 1.7 V Maximum |
| **Power Rating** | 10 Watts (Resistive)  
5 Watts (Inductive) |
| **Switching Current Range** | 30 – 200 mA (Resistive)  
30 – 100 mA (Inductive) |
| **Leakage Current** | 0 |
| **LED Function** | Red, Target Present |
| **LED Turn-On Current, Minimum** | 18 mA |
| **Operating Temperature** | 14° – 140° F (-10° – 60° C) |
| **Storage Temperature** | -4° – 140° F (-20° – 60° C) |
| **Switching Response** | 300 Hz Maximum |
| **Shock Resistance** | 30 g |
| **Vibration Resistance** | 10 – 55 Hz 1.5 mm, Double Amplitude |
| **Enclosure Protection** | Meets IEC IP67 |
| **Lead Wire** | 2 conductor, 22 gauge, 39 in long |

Table 1.1 Reed Switch Electrical Characteristics
1.5.2 Circuit for Switching Contact Protection (Inductive Loads)

Required for proper operation 24V DC

1. Put Diode parallel to loads following polarity. See Figure 1.3.

2. Select a Diode with the breakdown voltage and current rating according to the load.

3. Typical example
   • 100 Volt, 1 Amp Diode
   • CR: Relay coil (under 0.5 W coil rating)

Recommended for longer life 125 VAC

The operation for some 120VAC PLC’s can overload the reed switch. The switch may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the switch and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.

1. Put a resistor and capacitor in parallel with the load.

2. Select the resistor and capacitor according to the load. See Figure 1.4.

3. Typical example:
   • CR: Relay coil (under 2 W coil rating)
   • R: Resistor under 1 KΩ
   • C: Capacitor 0.1 µF

Figure 1.3 Loads Following Polarity

Figure 1.4 Resistor and Capacitor
1.5.3 Drive Shaft with Clutch*
When fitted, the Mixer utilizes an air-operated clutch for drive operation. See Figure 1.5. The clutch requires the following air pressure for operation:

- 80 Cubic Foot – 8,000 lbs – 40 – 45 psi
- 100 Cubic Foot – 10,000 lbs – 45 – 50 psi
- 120 Cubic Foot – 12,000 lbs – 50 – 55 psi

The vendor’s manual for the clutch is provided to assist in clutch installation, operation and maintenance.

*Figure 1.5 Typical Air-Operated Drive Clutch
1.5.4 Gear Guard

An oil retaining gear guard helps ensure proper Mixer operation. See Figure 1.1. The gear guard provides a continuous oil bath for the gears and minimizes gear contamination. In addition, the gear guard protects personnel from the moving gears and the crush and pinch points associated with the gears. The gear guard includes an oil fill pipe and dip stick and can hold about 12 qt [11.4 L] of oil. Refer to the name and lubrication plate on the Mixer or Section 3.12 for the type and grade of oil required.

DANGER:
Crush and pinch points. Stay clear of machine. Follow lockout procedure before servicing.

1.5.5 Pulley Guard

The pulley guard protects personnel from the moving drive belts and clutch components and the crush and pinch points associated with these moving parts. See Figure 1.6. The pulley guard can be disassembled in sections, as needed, to check and service the belts and clutch components. Two grease fittings can be reached by removing a section of the clutch guard. Replace guard section after lubricating bushings.

DANGER:
Crush and pinch points. Stay clear of machine. Follow lockout procedure before servicing.

Figure 1.6 Pulley Guard
1.5.6 Removable Head Section
A removable section in each head plate enables service and maintenance for the Mixer blade shaft.

1.5.7 Enclosed Drum
The Mixer drum is fully enclosed to protect personnel and provide dust control.

**DANGER:**
Do not modify fully enclosed drum (front panel, shroud, drum etc.) in any manner. Modifications can create crush points, shear points, and other hazards. Modifications to the shroud are allowed to provide for sand, aggregates, and cement charging. The shroud modifications, which allow for charging sand, aggregate, and cement, must be designed to eliminate all hazards. Customer to provide additional guarding as needed.

1.5.8 Cleaning Rings*
Blade shaft cleaning rings help reduce the build-up of concrete on the blade shaft assembly and blade arms. See Figure 1.7. Cleaning rings are made from two metal rods that are shaped and welded together around the blade arms or shaft.

1.5.9 Head Scrapers*
Head scrapers help remove concrete buildup on the head liner at the end of the Mixer drum. See Figure 1.8.

**Figure 1.7 Blade Shaft Cleaning Ring Assembly**

**Figure 1.8 Head Scraper Subassembly**
1.5.10 Blade Shaft Covers*

Blade shaft covers are replaceable wear components which help prolong the life of the blade shaft. Covers are made specifically for individual Mixers and are installed by welding the two halves of the blade shaft cover together around the blade shaft.

1.5.11 Trough Liners

Mixer trough liners are wear components that can be replaced and are available with or without moisture probes, depending upon customer specifications. See Sections 1.5.13 – 1.5.16. Because moisture probes help improve the efficiency and quality of mixing operations, they are often factory-installed.

**NOTE:**
If your Mixer does not have moisture probes and you wish to install them, refer to Section 3.16 for installation information.
1.5.12 LeSueur Moisture System*
LeSueur moisture probes determine the amount of water added to a batch of concrete and, thus, help improve the quality of the mix. When this system is fitted, a special liner with the moisture probes replaces a standard 12 inch [304.8 mm] liner. Besser Company drawing number 332752 shows the liners, along with the locations of the moisture probes and their liner. Usually, the moisture probes are installed at the factory per customer order specifications. If they are added after factory-build of the Mixer, or if they need to be replaced, refer to Figure 1.10, and the procedure in Section 3.2.7.

1.5.13 Ramsey Moisture System*
The Ramsey Moisture System includes one moisture probe located on either side of a standard liner. See Figure 1.11. If a Ramsey system is to be added after factory-build of the Mixer, refer to print number 323999.

1.5.14 ARC Moisture System – Ground Probe Liners*
The ARC Moisture System with ground probe liners are located on the outsides of the liners. See Figure 1.12. If an ARC ground moisture probe system is to be added after factory-build of the Mixer, refer to print number 467490.

1.5.15 ARC Moisture System – Microwave Probe Liners*
The ARC microwave moisture probe liner is similar to the ARC ground moisture probe liner except that it uses only one liner. The liner can be placed on either of the outside positions. If an ARC microwave moisture probe system is to be added after factory build of the Mixer, refer to print number 481202.
1.5.16 Blades with Wear Liners*
Figure 1.14 illustrates blades with wear liners. Liners are replaceable wear components that help protect the back-up blade from excessive wear. They help improve the cost-efficiency of Mixer operations by reducing the frequency of blade replacement. Even so, a common practice is to keep a right- and left-hand blade in stock for times when a blade does require replacement due to wear or damage. Such stocking can save costs associated with down time when blades need replacing.

1.5.17 Bottom Clean-Out Gate*
An optional bottom clean-out gate helps during Mixer cleaning and enables dumping the waste directly from the bottom of the Mixer instead of from the discharge gate.

**WARNING:**
When a bottom clean-out gate is on the Mixer, the gate must be closed before starting the Mixer. If it is open, aggregate may injure personnel who might be below the Mixer.

**DANGER:**
Crush and pinch points. Stay clear of machine. Follow lockout procedure before servicing.

**WARNING:**
Falling objects. Hard hat area.

**DANGER:**
Shear hazard. Fall hazard. Stay clear. Follow lockout procedure before servicing.

**DANGER:**
Crush hazard. Stay clear. Follow lockout procedure before servicing.
Figure 1.14  Blades with Wear Liners
SECTION 2
OPERATION

2.1 SAFETY INFORMATION
Review the Safety Bulletin at the front of this manual before operating or working on the Mixer. Observe safe shop practices during all Mixer operation, troubleshooting and maintenance.

IMPORTANT:
Make sure any welding equipment is properly grounded.

IMPORTANT:
Wear the required protective gear and clothing when performing Mixer maintenance, welding, cleaning, etc.

IMPORTANT:
When possible, work in teams when doing Mixer maintenance.

IMPORTANT:
Observe the Confined Space Work Rules and Regulations of your company, locality, city and state, when doing maintenance within the Mixer drum.

Follow your plants lockout procedure before beginning any Mixer maintenance and troubleshooting. The following procedure is suggested for locking out the Mixer.

2.1.1 General Lockout for all Batching Controls
1. Announce lockout to other employees.
2. Turn power off at main panel.
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear equipment of all personnel.
7. Test lockout by hitting run button.

2.1.2 Lockout and Tag Equipment which Presents a Hazard to Personnel Working on the Mixer
1. Announce lockout to other employees.
2. Turn power off at main panel and motor starters.
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear equipment of all personnel.
7. Test lockout by hitting run button.
8. Block, chain, or release and lockout all stored energy sources.
9. Visually inspect equipment to make sure it is properly locked out and tagged.
2.1.3 Lockout and Tag Mixer

1. Announce lockout to other employees.
2. Turn power off at main panel, manual control station and Mixer motor starter(s).
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear Mixer of all personnel.
7. Test lockout by hitting run button.
8. Block, chain, or release and lockout, all stored energy sources, including but not limited to:
   - Discharge Gate – Block open with safety stop
   - Air Supply – Release pressure, lockout, and tag
   - Water Supply – Release pressure, lockout, and tag
   - Blades, blade arms, and drive train (bull gear, pulley, etc.) – Block and/or chain
9. Visually inspect Mixer to make sure it is properly locked out and tagged.

**WARNING:**
This lockout procedure is a minimum precaution for the safety of servicing personnel. Do not attempt to avoid or shortcut these procedures.

2.2 BATCHING CONTROL SYSTEM INFORMATION

Besser Company ships each Mixer fully assembled, except for a batching control system. A crucial part of the overall production unit, the batching control system helps regulate the operation and interaction of associated machinery, and increase production efficiency and levels. For information on operation and maintenance of the batching control system, contact the vendor of the system, or if purchased through Besser Company, contact your Besser Sales and Service Representative.

2.3 PRELIMINARY ADJUSTMENTS (BEFORE START-UP)

When a safety interlock (zero-speed) switch and an underspeed function relay are fitted on the Mixer, refer to Electrical Adjustments and adjust, as necessary, before initial start-up. See Section 3.2.

2.4 MIXER OPERATION

**IMPORTANT:**
The start-up of the Mixer depends upon its batching control system. See Section 2.3. Usually, Besser Company does not supply the control system and cannot predetermine how yours will function with the Mixer. Please contact the vendor of your system to perform initial start-up of the Mixer.

The following gives a manual operating procedure, along with descriptions of circuit functions. Be sure you are familiar with the procedural sequence. Use the procedure and electrical instruction drawings listed on Mixer documentation as a guide for operating the Mixer.

2.4.1 Initial Conditions

Check the gate and clutch air pressure regulators before start-up. Refer to the specifications and data at the front of this manual. Make sure the regulators are operational and set properly.

For normal operation make sure the clutch is engaged and the blade turning before the drum is charged with aggregate.

Do not overload the Mixer. Do not exceed the maximum weight and volume ratings of the Mixer. Refer to the specifications and data at the front of this manual.

Set the following initial conditions:
1. Confirm the Mixer is clear of personnel, then close and secure the front panel and all gates. See Section 2.1 Safety Information.
2. Turn electrical disconnect to on.
3. Set the clutch switch to off.
4. Pull out emergency stop switch(es).
5. Set the batcher/manual control switch to manual.
6. Press the MCR Reset button and the green power lamp will light.
7. The electrical power will be on.
2.4.2 Start-Up Procedure
1. Check and make sure the initial conditions have been set. See Section 2.4.1.
2. Press and release the Motor Start push-button. This energizes the motor starter to start the motor. When the pushbutton is released, the starter remains energized through the normally open contacts of ACR, and the closed contacts of 1TD and 2TD, parallel to the start button.
3. Set the clutch switch to on.
4. Verify that the motor remains running. If it is not, readjust the underspeed potentiometer, as indicated in Section 3.16. (PRS-5 presents a timed signal to the underspeed relay. When the motor is up to speed, this PRS-5 signal maintains the 1TD contacts closed which keeps the motor running.)

5. In the event that the Mixer slows down below 13.5 RPM, the underspeed relay will disable the 1TD timer, which in turn will disable the ACR Relay, stopping the motor.

CAUTION:
This circuit will not protect the motor if the Mixer is jogged thru any mix cycle.

2.4.4 Mixer Shut-Down
Follow the lockout procedures in Section 2.1.
2.5 MIXER CHARGING GUIDELINES

Centralized introduction of cement will improve mixing efficiency and reduce mixing time.

2.5.1 Optimum Charging Location

The center of the aggregate and cement charging area is located on the center of the Mixer drum and 12 inches [305 mm] in front of the Mixer shaft on the down stroke of the Mixer blade. See Figure 2.1 showing the charging area.

2.5.2 Recommended Charging Area

Introduce aggregate and cement within 30 inches [762 mm] to either side of the center of the Mixer drum and within 28 inches [711 mm] in front of the Mixer shaft on the down stroke of the Mixer blade. See Figure 2.1.

NOTE:
For charging location different than above consult Besser Company Engineering Department.

2.6 GROUTING PROCEDURE

The first batch for a Mixer with blade wear liners, is referred to as a “grouting batch.” The “grouting batch” fills the void between the backup blade and blade liners providing support to blade liners. Often, a Besser Sales and Service Representative runs the grouting batch. For more information about the grouting procedure, refer to Besser Company print number 360464.

To prepare your new Besser Mixer blades for operation, follow this grouting procedure for a good seating of Ni-hard liners to the Mixer blade:

1. Run a throw-away first batch a day or two before the start of actual production.
2. Use a fine grout mix made of:
   • 4,000 lbs very fine sand
   • 1,000 lbs cement
   • Water to make 7 – 9 inch slump.
3. Add cement and water at same time to make cement slurry.
4. Slowly add fine sand to make grout.
5. When mix is consistent, stop one blade in submerged position. Allow enough time for grout to hold in all spaces between backup blade and Ni-hard blade liners.
7. Perform lockout. See Section 2.1.
8. Clean Mixer by hand to allow grout in blades to harden before start of production operation.
Figure 2.1 Charging Area
2.7 OPERATIONAL CONSIDERATIONS
The optimal operation of the Mixer is strongly affected by these additional considerations.
- Mixing Water
- Ratio of Cement to Aggregate
- Mixing Hard Aggregates
- Mixing Lightweight Aggregates

2.7.1 Mixing Water
Both quantity and quality of mixing water affect the making of quality block. Knowledge of the amount of mixing water added is the only means to make batching adjustments.

The quantity of water can be determined only if some sort of water gauging or metering device is used. A good water meter properly trapped and periodically checked for accuracy will assist in a quality control conscious plant. See Figure 2.2.

Water used for making quality concrete should be pure enough for drinking. Water should be added evenly from several discharge points.

Figure 2.2 Water Meter
2.7.2 Ratio of Cement to Aggregate

Table 2.1 shows the range of cement to aggregate ratio for the most widely used aggregates. Hard type aggregates, such as sand and gravel, limestone and slag (air cooled) have a wider and more lean range of cement to aggregate ratio than the lightweight aggregates.

The method of calculating cement to aggregate ratio is as follows:

Example (sand and gravel):

\[
4500 \text{ lbs aggregate} + 500 \text{ lbs cement} = 5000 \text{ lbs total batch.}
\]

\[
\frac{4500}{500} = 9 \text{ parts of aggregate to } 1 \text{ part of cement.}
\]

or

\[
\frac{500}{500} = 5.32 \text{ sacks of cement per batch.}
\]

NOTE:

The cement to aggregate ratio figure is always expressed with the cement first i.e. 1:9.

Assuming the sand and gravel block to weigh 40 lbs, the batch yield would be:

\[
\frac{5000}{40} = 125 \text{ blocks per batch}
\]

or

\[
\frac{125}{5.32} = 23.5 \text{ blocks per sack of cement}
\]

2.7.3 Mixing Hard Aggregates

Correctly mixing hard type aggregate can improve the quality characteristics of the concrete product. Follow this recommended procedure for hard aggregates:

1. Charge Mixer with all aggregate.
2. Add all cementitious materials (like cement, fly ash or lime).
3. Dry mix combined materials for one minute.
4. Add all required mixing water.
5. Continue mixing for an absolute minimum of two to four minutes.
6. When tempering water is required to bring mix to consistency, mix for an additional one minute.

2.7.4 Mixing Lightweight Aggregates

Mixing lightweight aggregate is similar to the procedure for hard type aggregate, however the water is added more gradually to keep consistency. Follow this recommended procedure for lightweight aggregate, various highly absorbent limestones and other similar type aggregates:

1. Charge Mixer with all lightweight aggregate.
2. Add 1/2 to 2/3 total mixing water.
3. Mix 30 seconds.
4. Add all cementitious material (like cement, fly ash or lime).
5. Add balance of required mixing water.
6. Continue mixing for an absolute minimum of two to four minutes.
7. When tempering required to bring mix to right consistency, mix for an additional one minute.
3.1 OVERVIEW
This Section of the manual highlights important service and maintenance procedures required to maximize the Mixer operating life and ensure optimum performance.

Major topics include:
- Safety Information
- Maintenance Tools
- Maintenance Schedule
- General Lubrication
- Pneumatic Guidelines
- Electrical Adjustments
- Pump Maintenance
- Bearing Maintenance
- Discharge Gate Safety Stop
- Standard Gate Adjustment
- Seal Alignment to Drive Shaft
- Pinion and Gear Alignment
- Cleaning Rings Replacement
- Blades with Wear Liners
- LeSueur Trough Liners Replacement
- Maintenance Reference Drawings and Notes

3.2 SAFETY INFORMATION
Review the Safety Bulletin at the front of this manual before operating or working on the Mixer. Observe safe shop practices during all Mixer operation, troubleshooting and maintenance.

IMPORTANT:
Make sure any welding equipment is properly grounded.

IMPORTANT:
Wear the required protective gear and clothing when performing Mixer maintenance, welding, cleaning, etc.

IMPORTANT:
When possible, work in teams when doing Mixer maintenance.

IMPORTANT:
Observe the Confined Space Work Rules and Regulations of your company, locality, city and state, when doing maintenance within the Mixer drum.

Follow your plants lockout procedure before beginning any Mixer maintenance and troubleshooting. The following procedure is suggested for locking out the Mixer.
3.2.1 General Lockout for all Batching Controls
1. Announce lockout to other employees.
2. Turn power off at main panel.
3. Using your shop's authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear equipment of all personnel.
7. Test lockout by hitting run button.

3.2.2 Lockout and Tag Equipment which Presents a Hazard to Personnel Working on the Mixer
1. Announce lockout to other employees.
2. Turn power off at main panel and motor starters.
3. Using your shop's authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear equipment of all personnel.
7. Test lockout by hitting run button.
8. Block, chain, or release and lockout all stored energy sources, including but not limited to:
   - Discharge Gate – Block open with safety stop
   - Air Supply – Release pressure, lockout, and tag
   - Water Supply – Release pressure, lockout, and tag
   - Blades, blade arms, and drive train (bull gear, pulley, etc.) – Block and/or chain
9. Visually inspect Mixer to make sure it is properly locked out and tagged.

3.2.3 Lockout and Tag Mixer
1. Announce lockout to other employees.
2. Turn power off at main panel, manual control station and Mixer motor starter(s).
3. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
4. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
5. Tag lockout.
6. Clear Mixer of all personnel.
7. Test lockout by hitting run button.
8. Block, chain, or release and lockout, all stored energy sources, including but not limited to:
   - Discharge Gate – Block open with safety stop
   - Air Supply – Release pressure, lockout, and tag
   - Water Supply – Release pressure, lockout, and tag
   - Blades, blade arms, and drive train (bull gear, pulley, etc.) – Block and/or chain
9. Visually inspect Mixer to make sure it is properly locked out and tagged.

3.2.4 Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belt and sheave gauge</td>
<td>#112541</td>
</tr>
<tr>
<td>Belt tension gauge</td>
<td>#106666</td>
</tr>
<tr>
<td>Multiple lockout device</td>
<td>#111140</td>
</tr>
<tr>
<td>Padlock</td>
<td>#111139</td>
</tr>
</tbody>
</table>

*Table 3.1 Tools*
### 3.3 TWO HOUR MAINTENANCE

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade Shaft – General</td>
<td>Manual lubrication dust seals</td>
<td>Lubricate dust seals.</td>
</tr>
</tbody>
</table>

*Table 3.2 Two Hour Maintenance*

### 3.4 EACH USE MAINTENANCE

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlocks</td>
<td>Mixer disconnect interlock</td>
<td>Test Mixer disconnect interlock.</td>
</tr>
<tr>
<td>Electric Motor and Power – General</td>
<td>Input power disconnect switch and lockout</td>
<td>Test input power disconnect switch and lockout</td>
</tr>
<tr>
<td>Air System</td>
<td>Lockout valve</td>
<td>Test lockout valve.</td>
</tr>
</tbody>
</table>

*Table 3.3 Each Use Maintenance*

### 3.5 DAILY MAINTENANCE (8 HOURS)

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixer Drum – General</td>
<td></td>
<td>Clean.</td>
</tr>
<tr>
<td>Trough liners and bolts</td>
<td></td>
<td>Clean trough liners. Inspect liners for cracks and wear.</td>
</tr>
<tr>
<td>Head liners and bolts</td>
<td></td>
<td>Clean head liners. Inspect liners for cracks and wear.</td>
</tr>
<tr>
<td>Blade liners and bolts*</td>
<td></td>
<td>Clean blade liners and bolts. Inspect liners for wear, cracks and fastener tightness.</td>
</tr>
<tr>
<td>Blades and bolts</td>
<td></td>
<td>Clean blades and bolts. Inspect blades for cracks, wear, distortion and fastener tightness.</td>
</tr>
<tr>
<td>Head scrapers and bolts</td>
<td></td>
<td>Clean head scrapers and bolts. Inspect parts for cracks, wear, distortion and fastener tightness.</td>
</tr>
<tr>
<td>Blade arms and bolts</td>
<td></td>
<td>Clean blade arms and bolts. Inspect parts for cracks, wear, distortion and fastener tightness.</td>
</tr>
<tr>
<td>Blade arm covers</td>
<td></td>
<td>Clean blade arm covers. Inspect cover and welds for cracks, wear and distortion.</td>
</tr>
<tr>
<td>Tension strap and liner*</td>
<td></td>
<td>Clean tension strap and liner. Inspect parts for cracks, wear, distortion and welds for wear and cracks.</td>
</tr>
<tr>
<td>Blade shaft</td>
<td></td>
<td>Clean blade shaft. Inspect parts for cracks, wear and distortion.</td>
</tr>
<tr>
<td>Blade shaft covers</td>
<td></td>
<td>Clean blade shaft covers. Inspect cover and weld for cracks, corrosion, wear and distortion.</td>
</tr>
</tbody>
</table>

*Table 3.4 Daily Maintenance (8 Hours)*
<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Arm cleaning rings</td>
<td>Clean arm cleaning rings. Inspect rings and weld for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Shaft cleaning rings</td>
<td>Clean shaft cleaning rings. Inspect rings and weld for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Cleaning ring retainer</td>
<td>Clean cleaning ring retainer. Inspect rings and weld for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Moisture probes*</td>
<td>Clean moisture probes. Inspect for wear.</td>
</tr>
<tr>
<td></td>
<td>Shell, shroud and components</td>
<td>Clean shell, shroud and surrounding components. Inspect for cracks, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Front panel</td>
<td>Clean front panel. Inspect for cracks, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Water Pipe</td>
<td>Clean water pipe. Inspect for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Discharge Gate Assembly – General</td>
<td></td>
<td>Clean discharge gate assembly. Inspect parts for cracks, corrosion, wear, distortion and welds for wear and cracks. Test discharge gate assembly.</td>
</tr>
<tr>
<td></td>
<td>Discharge gate and cylinder assembly</td>
<td>Clean discharge gate and cylinder assembly. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Gate shafts and bearings</td>
<td>Clean gate shafts and bearings. Inspect parts for cracks, corrosion, wear, distortion and welds for wear and cracks.</td>
</tr>
<tr>
<td></td>
<td>Gate links</td>
<td>Clean gate links. Inspect welds for wear and cracks.</td>
</tr>
<tr>
<td></td>
<td>Cylinder arm</td>
<td>Clean cylinder arm. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Cylinder bracket</td>
<td>Clean cylinder bracket. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Gate safety stop</td>
<td>Clean gate safety stop. Inspect parts for cracks, corrosion, wear and distortion. Test gate safety stop.</td>
</tr>
<tr>
<td></td>
<td>Discharge chute</td>
<td>Clean discharge chute. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
</tbody>
</table>

*Table 3.4 Daily Maintenance (8 Hours) – Continued*
<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Out Gate – General*</td>
<td>Clean out gate assembly</td>
<td>Clean clean out gate. Inspect parts for cracks, corrosion, wear and distortion. Test clean out gate.</td>
</tr>
<tr>
<td>Clean out gate cylinder</td>
<td>Clean clean out gate cylinder. Inspect parts for cracks, corrosion, wear and distortion.</td>
<td></td>
</tr>
<tr>
<td>Blade Shaft – General</td>
<td>Roller and thrust bearing housings</td>
<td>Clean roller and thrust bearing housings. Inspect parts for cracks, corrosion and distortion.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Dust seals</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Belt tension</td>
<td>Clean drive shaft. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Roller and Spherical Bearing Housings</td>
<td>Clean bearing housings. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td></td>
<td>NOTE: Daily First Week then Weekly. Inspect parts for cracks and wear. Adjust belt tension. See specific manual section for more information.</td>
</tr>
<tr>
<td>Air System</td>
<td>Filter</td>
<td>Drain water from filter. Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Air System – Gate</td>
<td>Pressure setting</td>
<td>Inspect for correct setting.</td>
</tr>
<tr>
<td>Air System – Clean Out Gate</td>
<td>Pressure setting</td>
<td>Inspect fastener for tightness.</td>
</tr>
<tr>
<td>Air System – Clutch – Pressure Switch</td>
<td>Pressure setting</td>
<td>Inspect fastener for tightness.</td>
</tr>
<tr>
<td>Guards</td>
<td>Pulley</td>
<td>Check that guards are properly assembled with no modifications (holes or cracks)</td>
</tr>
</tbody>
</table>

Table 3.4 Daily Maintenance (8 Hours) – Continued
### Assembled Component Special Instructions

<table>
<thead>
<tr>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Front panel</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Shroud</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Trabon System*</td>
<td>Clean trabon system.</td>
</tr>
<tr>
<td>(See Section 3.17)</td>
<td>Inspect parts for cracks, corrosion and damage.</td>
</tr>
<tr>
<td></td>
<td>Test trabon system.</td>
</tr>
<tr>
<td>Electric Motor and Power – General</td>
<td>Clean electric motor. Inspect parts for cracks, corrosion, wear and damage.</td>
</tr>
<tr>
<td>Electric motor</td>
<td>Clean electric motor.</td>
</tr>
<tr>
<td></td>
<td>See Section 3.16.</td>
</tr>
<tr>
<td>Switches</td>
<td>Gate open and close</td>
</tr>
<tr>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Confirm switch functions properly.</td>
</tr>
<tr>
<td></td>
<td>Under speed</td>
</tr>
<tr>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Confirm switch functions properly.</td>
</tr>
<tr>
<td></td>
<td>Zero speed</td>
</tr>
<tr>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Confirm switch functions properly.</td>
</tr>
</tbody>
</table>

*Table 3.4 Daily Maintenance (8 Hours) – Continued*

### 3.6 WEEKLY MAINTENANCE (40 HOURS)

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Shaft – General</td>
<td>Gears</td>
<td>Check oil level.</td>
</tr>
<tr>
<td></td>
<td>Roller bearing</td>
<td>Lubricate roller bearing. See Section 3.12.4.</td>
</tr>
<tr>
<td></td>
<td>Spherical bearing</td>
<td>Lubricate spherical bearing. See Section 3.12.4.</td>
</tr>
<tr>
<td></td>
<td>Plain bearings</td>
<td>Lubricate plain bearings. See Section 3.12.4.</td>
</tr>
<tr>
<td>Air System – Discharge Gate</td>
<td>Regulator</td>
<td>Clean regulator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion and damage.</td>
</tr>
<tr>
<td></td>
<td>Directional valve</td>
<td>Clean directional valve.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion and damage.</td>
</tr>
<tr>
<td></td>
<td>Flow control valve</td>
<td>Clean flow control valve.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion and damage. Confirm valve is properly adjusted and locked.</td>
</tr>
</tbody>
</table>

*Table 3.5 Weekly Maintenance (40 Hours)*
<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Motor and Power – General</td>
<td>Electric motor base</td>
<td>Clean electric motor base. Inspect parts for cracks, corrosion wear and distortion.</td>
</tr>
<tr>
<td>Air System – Clean Out Gate</td>
<td>Flow control valve</td>
<td>Clean flow control valve. Inspect parts for cracks, corrosion and damage. Confirm valve is properly adjusted and locked.</td>
</tr>
<tr>
<td></td>
<td>Directional valve</td>
<td>Clean directional valve. Inspect parts for cracks, corrosion and damage.</td>
</tr>
<tr>
<td>Air System – Clutch</td>
<td>Directional valve</td>
<td>Clean directional valve. Inspect parts for cracks, corrosion and damage.</td>
</tr>
<tr>
<td></td>
<td>Regulator</td>
<td>Clean regulator. Inspect parts for cracks, corrosion and damage.</td>
</tr>
<tr>
<td>Air System Clutch – Pressure Switch</td>
<td>Clutch pressure switch</td>
<td>Inspect parts for cracks, corrosion and damage. Confirm switch functions properly.</td>
</tr>
<tr>
<td>Mixer Drum – General</td>
<td>Blade liners to trough liner space*</td>
<td>Inspect blade liner to trough liner space. Adjust blade liner and blades as necessary.</td>
</tr>
<tr>
<td></td>
<td>Blade to trough liner space</td>
<td>Inspect blade to trough liner space. Adjust blade to trough liner.</td>
</tr>
<tr>
<td></td>
<td>Blade to head liner space</td>
<td>Inspect blade to head liner space. Adjust blade to head liner.</td>
</tr>
<tr>
<td></td>
<td>Head scraper to head liner space</td>
<td>Inspect head scraper to head liner space. Adjust head scraper to head liner.</td>
</tr>
<tr>
<td>Interlock</td>
<td>Pressure switch interlock</td>
<td>Confirm pressure switch interlock works properly.</td>
</tr>
<tr>
<td>Discharge Gate Assembly – General</td>
<td>Gate shaft bearings</td>
<td>Lubricate gate shaft bearings. See Section 3.12.</td>
</tr>
<tr>
<td></td>
<td>Bushings – link end bushings</td>
<td>Lubricate bushings and link end bushings. See Section 3.12.</td>
</tr>
<tr>
<td></td>
<td>Cylinder and gate arm pin</td>
<td>Lubricate cylinder and gate arm pin. See Section 3.12.</td>
</tr>
<tr>
<td>Blade Shaft – General</td>
<td>Gears</td>
<td>Check oil level. See Section 3.12.</td>
</tr>
<tr>
<td></td>
<td>Roller and thrust bearings</td>
<td>Lubricate the roller and thrust bearings.</td>
</tr>
</tbody>
</table>

*Table 3.5 Weekly Maintenance (40 Hours) – Continued*
## 3.7 MONTHLY MAINTENANCE (160 HOURS)

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade Shaft – General</td>
<td>Thrust bearing end play</td>
<td>Inspect part for cracks, corrosion, wear, distortion and welds for wear and cracks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Test thrust bearing end play.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjust thrust bearing end play.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Section 3.18.</td>
</tr>
<tr>
<td></td>
<td>Bull gear</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Pinion gear</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Electric Motor and Power – General</td>
<td>Electric motor starter</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Input power disconnect switch and lockout</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Conduit and wire</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
</tbody>
</table>

**Table 3.6 Monthly Maintenance (160 Hours)**

## 3.8 QUARTERLY MAINTENANCE (480 HOURS)

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air System – Discharge Gate</td>
<td>Air lines</td>
<td>Clean air lines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Air System – Clean Out Gate</td>
<td>Air lines</td>
<td>Clean air lines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Air System – Clutch</td>
<td>Air lines</td>
<td>Clean air lines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Rotary union</td>
<td>Clean rotary union.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Pulley</td>
<td>Clean pulley.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Sheave</td>
<td>Clean sheave.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Belts</td>
<td>Inspect parts for cracks and wear</td>
</tr>
</tbody>
</table>

**Table 3.7 Quarterly Maintenance (480 Hours)**
### 3.9 YEARLY MAINTENANCE (1920 HOURS)

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixer Structure</td>
<td></td>
<td>Inspect for loose fasteners. Inspect parts for cracks, corrosion, wear, distortion and welds for wear and cracks.</td>
</tr>
<tr>
<td>Blade Shaft – General</td>
<td>Roller bearing</td>
<td>Inspect part for cracks, corrosion, wear, distortion and welds for wear and cracks. See Section 3.18.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Roller bearing</td>
<td>Inspect part for cracks, corrosion, wear and distortion. See Section 3.18.</td>
</tr>
<tr>
<td></td>
<td>Spherical bearing</td>
<td>Inspect part for cracks, corrosion, wear and distortion. See Section 3.18.</td>
</tr>
</tbody>
</table>

*Table 3.8 Yearly Maintenance (1920 Hours)*

### 3.10 SEE MANUAL SECTION FOR MAINTENANCE

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade Shaft – General</td>
<td>Gears</td>
<td>Change and flush oil in the blade shaft gears. See Section 3.12.3.</td>
</tr>
<tr>
<td>Drive Shaft – General</td>
<td>Gears</td>
<td>Change and flush oil in the blade shaft gears. See Section 3.12.3.</td>
</tr>
</tbody>
</table>

*Table 3.9 See Manual Section for Maintenance*

### 3.11 MAINTENANCE AT DISASSEMBLY

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Component</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Shaft – General</td>
<td>Clutch</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
<tr>
<td></td>
<td>Drive shaft</td>
<td>Inspect parts for cracks, corrosion, wear and distortion.</td>
</tr>
</tbody>
</table>

*Table 3.10 Maintenance at Disassembly*
3.12 GENERAL LUBRICATION

Regularly lubricating the Mixer's moving parts is vital to ensure optimum performance and a long operating life. Table 3.12 lists the recommended frequency of lubrication as well as lubricant specifications. Note that the numbers in the "Item" column correspond to the item number in Figure 3.1.

Bearings are factory-lubricated with a lubricant which is suitable for most applications. Extra protection may be required if the bearing is subject to excessive moisture, dust or corrosive vapor. In these cases, the bearing should contain as much grease as operating speed permits. (A full bearing with consequent slight leakage through the seal is the best protection against contaminants.)

In extremely dirty environments, the bearing should be purged daily to flush out contaminants. For added protection, shroud the bearing from falling material.

Figure 3.1 Mixer Lubrication Points
<table>
<thead>
<tr>
<th>Item</th>
<th>Equipment/Component</th>
<th>Lubricant Type</th>
<th>Scheduled Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Discharge Gate Assembly</td>
<td>Gate Shaft Bearings</td>
<td>Purge with EP#1 grease as needed Weekly</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Link End Bushings</td>
<td>Purge with EP#1 grease as needed Weekly</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Cylinder and Gate Arm Pin</td>
<td>Purge with EP#1 grease as needed Weekly</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Thrust Bearing</td>
<td>EP#1 Grease – See Section 3.12.2 Weekly</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Gear Oil</td>
<td>Check oil level and top off as needed Weekly</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>Gear Oil</td>
<td>Change and flush oil at regular intervals See Section 3.12.3 for recommended frequency. Weekly</td>
</tr>
<tr>
<td>8.</td>
<td>Dust Seals</td>
<td></td>
<td>EP#1 Grease – See Section 3.12.2 Every 2 Hours</td>
</tr>
<tr>
<td>9.</td>
<td>Drive Shaft – Assembly</td>
<td>Gear Oil</td>
<td>Check oil level and top off as needed. See Section 3.12.3. Weekly</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>Gear Oil</td>
<td>Change and flush oil at regular intervals See Section 3.12.3 for recommended frequency. Weekly</td>
</tr>
</tbody>
</table>

*Table 3.12  Mixer Lubrication Points and Schedule*
3.12.1 Discharge Gate Assembly
Use EP#1 grease to lubricate the following parts weekly:
• Gate shaft bearings
• Link end bushings
• Cylinder and gate arm pin
  1. Clean grease fitting.
  2. Slowly pump grease into bearing until clean grease appears at seal or pin. The viscosity of the oil in the grease should be 3,400 to 3,500 SUS at operating temperature (ambient temperature plus 50° F).

3.12.2 Blade Shaft Assembly
Use EP#1 grease to lubricate the following parts weekly:
• Roller bearings
• Thrust bearings
  1. Clean grease fitting.
  2. Slowly pump grease into bearing until clean grease appears at seal or pin. The viscosity of the oil in the grease should be 3,400 – 3,500 SUS at operating temperature (ambient temperature plus 50° F).
  3. Pack the bearing full and the cavity half full when assembling.

Use EP#1 grease to lubricate the following every two hours:
• Dust seal
  1. Clean grease fitting.
  2. Slowly pump grease into bearing until clean grease appears at seal or pin. The viscosity of the oil in the grease should be 3,400 – 3,500 SUS at operating temperature (ambient temperature plus 50° F).
  3. Pack the dust seal full when assembling.

3.12.3 Gear Oil
1. Check the oil level weekly on the dip stick for the blade shaft and the drive shaft.
2. Change and flush the oil after 500 hours of operation or 4 weeks, whichever comes first. After the first time, change the oil after 2,500 hours of use or 6 months, whichever comes first.
3. Use approximately 3 gallons of oil to fill the gear case. Choose the appropriate gear oil for the temperature of your operation:
   • AGMA grade #6 for 50° F to 125° F (ISO Grade 320, Shell Omala 320 or equivalent)
   • AGMA grade #5 for 15° F to 50° F (ISO grade 220, Shell Omala 220 or equivalent)

3.12.4 Drive Shaft Assembly
Use EP#1 grease to lubricate the following parts weekly:
• Roller bearing
• Spherical bearing
• Plain bearings
  1. Reach grease fittings for the plain bearings by removing one section of the pulley guard. See Section 1.5.6.
  2. Clean grease fitting.
  3. Slowly pump grease into bearing until clean grease appears at seal or pin. The viscosity of the oil in the grease should be 1,650 – 1,750 SUS at operating temperature (ambient temperature plus 50° F).
  4. After lubrication is complete, reassemble the pulley guard.

3.12.5 Electric Motor
Refer to motor manufacturer information. Do not over lubricate bearings; bearings may overheat with too much grease. Many manufacturers lubricate bearings for life at assembly.
3.13 GENERAL PNEUMATIC MAINTENANCE GUIDELINES

3.13.1 Pneumatic Maintenance Precautions

Follow the lockout procedure in Section 3.2. Before removing any air line component, be sure to lockout and tag the air supply source.

3.13.2 Periodic Pneumatic Maintenance

Pneumatic components on the Mixer require little periodic maintenance other than the following items. Be sure to follow lock out procedures before doing maintenance on the Mixer.

- Drain water at the air compressor, air filters, and regulators at the beginning of each day.
- Change the air filters regularly. A shop maintenance schedule should be developed by considering run times, air supply quality, and environmental factors.
- Clean out the air lines of foreign matter and water build-up. Cleaning can be done during normal Mixer down times.

WARNING:
Never check for air leaks with your hand, or get your face close to a suspected leak. High pressure air can cause serious injury.

Check for an air leak by visually looking at and around the air line from a distance. Look for blowing dust and listen for the hiss of a leak from a distance.

Once an air line has been verified to have a leak, be sure to lock out the Mixer and air supply before replacing the line or component.

3.13.3 Air Supply System

Check the pressure settings at each regulator to see that they are in the acceptable range. Make sure gauges are working properly. Be sure the air supply system maintains the required pressure for correct Mixer operation. Refer to the Mixer Specifications at the front of this manual for air supply requirements.

3.13.4 Checking for Air Leaks

Remember the following when you suspect an air leak and need to check for its location.
3.14 ELECTRICAL ADJUSTMENTS

Before doing any electrical maintenance on the Mixer, follow the lockout procedure in Section 3.2.

Use a batching control panel electrical disconnect that is lockable and visible from the Mixer location. If other types of controls are used in place of the batching control panel, a lockable electrical disconnect must be used to enable locking out Mixer operation. Observe all local, state and federal regulations regarding lockouts.

When the optional safety interlock (zero-speed) switch and underspeed function relay are fitted on the Mixer, do the following procedures to adjust, as necessary, before initial start-up and as noted in the adjustment procedures.

3.14.1 Zero-Speed Interlock Safety Switch

**WARNING:**
To prevent serious injury, do not open the front panel or enter the Mixer drum before shutting off and locking out all electrical power to the unit. Do not open the front panel or enter the drum until the blade shaft has completely stopped moving. See Section 3.2 General Lockout Procedure.

When fitted, the zero-speed interlock safety switch will not let the front panel be opened until the blade shaft assembly has slowed to a speed of less than 0.25 rpm. See Figure 3.1. Before the Mixer can start, the front panel must be closed with the switch actuator blade inserted into the switch. A zero-speed proximity sensor controls the electrical release of the actuator blade via the zero-speed relay. With the Emergency Stop switches open (pulled out) and the MCR circuit de-energized, when the sensor senses a blade shaft speed of less than 0.25 rpm, the zero-speed switch releases and the front panel can be opened.

**WARNING:**
For personnel safety, the zero-speed switch must not be bypassed.
3.14.2 Zero-Speed Switch Adjustment

Check and adjust, as needed, the zero-speed interlock safety switch before initial start-up of the Mixer, and any time the motor off-time required for front panel opening is incorrect for your operation. See Figure 3.2.

Do the following to adjust the switch.
1. With the Mixer not running, set the zero-speed relay control to speed range x1.
2. Adjust the underspeed potentiometer of the zero-speed relay to minimum.
3. Adjust the Delay Set potentiometer to “A”.
4. With the Emergency Stop switches open (pulled out), and MCR de-energized, check that the front panel opens. This indicates that the switch has released the actuator blade.
5. Close and secure the front panel.
7. With the Mixer running, check to make sure the actuator blade is locked in place.
8. Turn off the Mixer.
9. Check the motor off-time that occurs before the front panel can be opened. Adjust the underspeed pot to ensure the blade shaft speed is 0.25 rpm or less before the front panel can be opened.

Figure 3.2 Zero-Speed Switch and Actuator
3.14.3 Underspeed Relay Function

The underspeed relay function automatically stops the Mixer motor if the Mixer speed drops to less than a preset value, or if the Mixer stalls. This action helps prevent damage to the clutch if foreign matter becomes lodged beneath the blades, or the Mixer is accidentally charged with an overload. If the motor speed decreases below the set point of the underspeed relay, the relay de-energizes the 1TD coil and, in turn, de-energizes the ACR. This drops out the starter and removes power from the motor.

3.14.4 Underspeed Adjustment

Adjust the underspeed setting before initial start-up of the Mixer, and any time the motor speed is insufficient for correct operation.

1. With the Mixer not running, set the underspeed range to x10.
2. Adjust the underspeed adjust potentiometer to between 10 and 15.
3. Adjust the Delay Set potentiometer to “C”.
4. Set 1TD for about 1 – 3 seconds delay.
5. Set 2TD on the delay timer for 0.2 second delay.
7. While the Mixer is running, slowly turn the underspeed adjust potentiometer clockwise (CW) until the Mixer motor starter drops out.
8. Back off the underspeed adjust potentiometer by turning it 1/8 turn counterclockwise (CCW).
9. Start the motor.
10. Check that the motor stays running. If it drops out, repeat Steps 6 thru 10.

3.15 ELECTRICAL INTERLOCKS TO BATCH CONTROLS

3.15.1 Mixer Disconnect Function

All batch controls are to be disabled with the use of the Mixer Disconnect Interlock. This interlock will be electrically open when the Mixer disconnect is in the “off” and “lockout” position.

3.15.2 Pressure Switch Interlock (Clutch) Function

All air operated clutch Mixers require a Pressure Switch Interlock. This interlock will be electrically open when the clutch is not engaged to prevent loading of the Mixer. See print number 384561.
3.16 ELECTRIC MOTOR
The electric motor is designed for a reliable, low-maintenance service life. Refer to the motor manufacturer's service information and the name and data plate on the motor for specific maintenance that may be required. Table 3.13 lists general maintenance guidelines.

3.16.1 Electric Motor
An electric motor drives the Mixer using a sheave and pulley belted drive configuration. See Figure 3.3. Refer to the electrical data at the front of this manual, and to the name and data plate(s) on the motor for motor specifications, requirements, maintenance information, and safe operating instructions.

**DANGER:**
For safety reasons, Besser Company requires that the power source for the motor is routed through a lockable electrical disconnect.

**DANGER:**
High voltage. Follow lockout procedure before servicing panel or machine.

<table>
<thead>
<tr>
<th>Type of Maintenance</th>
<th>Special Instructions</th>
<th>Scheduled Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
<td>• Use moderate air pressure to blow out dirt from the windings. Clean slip rings.</td>
<td>Every six months</td>
</tr>
<tr>
<td>Inspect connector</td>
<td>• Inspect and tighten all connections on motor and controls.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Repair or replace any damaged connections and wiring.</td>
<td></td>
</tr>
<tr>
<td>Check current</td>
<td>• Check current draw and compare with normal load rating.</td>
<td></td>
</tr>
<tr>
<td>Check mounting</td>
<td>• Inspect the mounting bolts and hardware for damage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Retighten all mounting bolts. With motor running, verify that motor operation is smooth and vibration-free.</td>
<td></td>
</tr>
</tbody>
</table>

*Table 3.13 Electric Motor Maintenance*
### 3.16.2 Electric Motor Troubleshooting

Table 3.14 lists possible motor operating problems along with probable causes and corrective actions.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Indication/Cause</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor fails to start</td>
<td>• Blown fuse or open circuit breaker</td>
<td>• Replace fuse or reset circuit breaker.</td>
</tr>
<tr>
<td></td>
<td>• Overload tripped</td>
<td>• Check and reset overload.</td>
</tr>
<tr>
<td></td>
<td>• Improper line connection</td>
<td>• Check connection against prints.</td>
</tr>
<tr>
<td></td>
<td>• Open circuit in winding or starting switch</td>
<td>• Evidenced by a humming sound from motor when switch is closed. Check inside motor to determine if switch is closed. Check for loose connections.</td>
</tr>
<tr>
<td></td>
<td>• Improper current supply</td>
<td>• Check to determine that power supply matches motor name plate specifications.</td>
</tr>
<tr>
<td></td>
<td>• Mechanical failure</td>
<td>• Determine that motor and drive turn freely. Check bearings.</td>
</tr>
<tr>
<td></td>
<td>• Short circuited stator</td>
<td>• Indicated by blown fuses. Motor must be rewound.</td>
</tr>
<tr>
<td></td>
<td>• Poor stator coil connection</td>
<td>• Remove end bells and locate with a test lamp.</td>
</tr>
<tr>
<td></td>
<td>• Defective rotor</td>
<td>• Look for broken bars or end rings. Replace rotor.</td>
</tr>
<tr>
<td></td>
<td>• With 3-phase power source, one phase may be open</td>
<td>• Check line for open phase. Locate and repair.</td>
</tr>
<tr>
<td></td>
<td>• Defective capacitor</td>
<td>• Replace capacitor.</td>
</tr>
<tr>
<td>Motor stalls</td>
<td>• Low line voltage</td>
<td>• Check across AC line and correct if possible.</td>
</tr>
<tr>
<td>Motor runs and then stops</td>
<td>• Partial loss of line voltage</td>
<td>• Check for loose connections. Check for proper main power supply. Replace rotor.</td>
</tr>
<tr>
<td></td>
<td>• Stator shorts when motor warms up</td>
<td>• Check across AC line and correct if possible.</td>
</tr>
<tr>
<td>Motor does not come up to speed</td>
<td>• Voltage too low at motor terminals</td>
<td>• Check connections and tighten where necessary.</td>
</tr>
<tr>
<td></td>
<td>• Broken rotor bars</td>
<td>• Look for broken bars or end rings. Replace rotor.</td>
</tr>
<tr>
<td>Motor takes too long to accelerate</td>
<td>• Loose connections</td>
<td>• Check across AC line and correct if possible.</td>
</tr>
</tbody>
</table>

*Table 3.14 Electric Motor Troubleshooting*
<table>
<thead>
<tr>
<th>Problem</th>
<th>Indication/Cause</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| Motor overheats above nameplate specification    | • Motor fan may be clogged with dirt preventing proper ventilation
  • With 3-phase power source, one phase may be open
  • Partially shorted stator coil
  • Line voltage too high
  • Line voltage too low
  • Rotor rubs stator bore
  • Worn bearings                                    | • Remove fan cover and clean.
  • Check to insure that all connections are tight.
  • Rewind motor.
  • Check across AC line and correct. Consult power company. Step-down transformer may be required.
  • Check across AC line. Consult power company. Step-up transformer may be required.
  • Replace bearings and seals.
  • Replace bearings and seals.                      |
| Motor vibrates                                    | • Motor mounting bolts are loose
  • Drive equipment is unbalanced or worn
  • Worn motor bearings
  • 3-phase motor bearings
  • 3-phase motor is running on single phase
  • Bent motor shaft                                   | • Tighten mounting bolts.
  • Check balance, repair or replace drive equipment.
  • Replace bearings and seals.
  • Check for open circuit and correct.
  • Replace shaft or rotor.                           |
3.17 TRABON PUMP MAINTENANCE

The adjustments covered in this section are:
- Pump in-feed pressure.
- Pump stroke
- Flow control
- Filling the grease pump.

For more complete instructions on the Trabon pump, refer to Trabon Pump Owner's Service Manual (Part Number 437629F913).

WARNING:
Be very careful while adjusting or troubleshooting the lube system that the machine is not turning, and the main drive motor is off.

3.17.1 Trabon In-Feed Pressure Adjustment

The Trabon pneumatic pump has an air-to-lube ratio of 30 to 1. The Trabon in-feed air pressure on many Besser Vibrapacs is supplied from the Bescodyne main drive brake air regulator. In this case when the brake regulator adjustment is changed, it also affects the Trabon pump. The Trabon pump pressure ideally should be 60 – 80 psi [4.1 – 5.5 bar], which can develop at least 1800 psi [124 bar] pumping pressure.

Note:
It may be advantageous to connect your Trabon pump to the Bescodyne main drive clutch rather than to the brake. The clutch air pressure adjustment is higher than the brake. Starting in 1991, Besser block machines have a separate air regulator supplied to the Trabon pumps. The plastic air solenoids on double acting pumps may not operate with less than 70 psi [4.8 bar].

3.17.2 Trabon Piston Stroke Adjustment

AL-5M Pump stroke adjustment for Besser block machines:

On AL-5M pumps, we recommended in the past a setting of .020 which would be 20 thousandths cubic inches of grease per stroke or .328 cubic centimeters. .020 is the middle of three calibration marks.

On the right side of the pump, remove the calibrated silver cap. Put the open end of the cap up against the locknut. The stroke is how far the screw sticks out and matches the calibrations on the cap. To adjust the stroke, loosen the locknut on the adjustment screw. Turn the screw inward or clockwise to reduce the stroke. Turn the screw outward or counterclockwise to increase the stroke. The locknut has to be retightened and the cap placed up against it again to recheck the settings after you change them. After final adjustment, tighten locknut, then tighten silver cap onto the adjustment screw.

L-25M Pump stroke adjustment:

On AL-25M pumps used on block machines, set the pump stroke on the mark between the 30 line and the .075 line. This will be a setting of approximately .052 cubic inches which is equal to .853 cubic centimeters. The method of adjustment is described and shown in the Pump owner's manual on page 4-2 and 4-3.

Figure 3.4 The Trabon Lube Pump
3.17.5 Filling the Grease Pump

Grease To Use:
We recommend Lithium based EP#1 grease, such as Shell Alvania EP#1, or Mobilux EP#1. In colder climates and/or in colder months, Shell Alvania EP#0, Mobilux EP#0, or grease with equivalent specifications may be used.

Filling the Pump:
The Trabon Pump, on the average, should be filled with grease after 35 hours of operation. It is best if the pump never runs out of grease because excessive air can be introduced into the system. Before filling the pump, turn the filter handle a few times to clean it. Attach a filling pump hose to the fill stud quick disconnect located just ahead of the filter.

Note:
If air does get into the automatic greasing system, refer to the proper sections:
1. To bleed air from the Reservoir, refer to Section 1 in Pump owner's manual.
2. To bleed air from the Pump, refer to Section 6 in Pump owner's manual.
3. To bleed air from the Feeder Blocks and Grease Lines, refer to Section 9 in Pump owner's manual.

Operate the filler pump at a steady speed to allow air-free filling of the reservoir. Filling the pump too fast may form air pockets. Also to avoid inducing air into the pump, make sure there is enough grease in the supply source to fill the reservoir without disconnecting and reconnecting the filler hose. While filling the pump, watch the grease level rise. Stop adding grease when the level reaches the air bleed hole.

Note:
Never fill over the air bleed hole; this will cause a vapor lock in the system. The air bleed hole is found about 2/3, the way up the plastic reservoir on the right. When filling is complete, turn the supply source off and disconnect supply line from the fill stud. Install the plastic dust cap over the fill stud to keep dirt out of the lube system.
3.18 BEARING MAINTENANCE

Remember these Do’s and Don’ts when handling bearings:

<table>
<thead>
<tr>
<th></th>
<th>DO:</th>
<th>DON’T:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remove all outside dirt from housing before exposing bearing.</td>
<td>Work in dirty surroundings.</td>
</tr>
<tr>
<td>2</td>
<td>Treat a used bearing as carefully as you would a new one.</td>
<td>Use dirty, brittle or chipped tools.</td>
</tr>
<tr>
<td>3</td>
<td>Work with clean tools in clean surroundings.</td>
<td>Use wooden pallets or work on wooden bench tops.</td>
</tr>
<tr>
<td>4</td>
<td>Handle with clean, dry hands, or preferably with clean canvas gloves.</td>
<td>Handle with dirty, moist hands.</td>
</tr>
<tr>
<td>5</td>
<td>Use clean solvents and flushing oils.</td>
<td>Use gasoline containing tetraethyl lead, as they may be injurious to health.</td>
</tr>
<tr>
<td>6</td>
<td>Lay bearings out on clean paper.</td>
<td>Spin unclean bearings.</td>
</tr>
<tr>
<td>7</td>
<td>Protect disassembled bearings from rust and dirt.</td>
<td>Spin bearings with compressed air.</td>
</tr>
<tr>
<td>8</td>
<td>Use clean lint-free cloths or rags to wipe bearings.</td>
<td>Use cotton waste or dirty cloths to wipe bearings.</td>
</tr>
<tr>
<td>9</td>
<td>Keep bearings wrapped in oil proof paper when not in use.</td>
<td>Expose bearings to rust or dirt.</td>
</tr>
<tr>
<td>10</td>
<td>Clean inside of housing before replacing bearing.</td>
<td>Nick or scratch bearing surface faces.</td>
</tr>
</tbody>
</table>
3.18.1 Lubrication Tips

Lubrication is essential for the proper operation of bearings. Grease and oil are both used over a considerable range of speeds and operating temperatures. The choice of the type of lubricant should be made only after careful consideration of the several factors involved.

1. Keep lubricants clean. Dirt causes most bearing failures, and one easy way for it to get to bearings is to be put there in the grease. Keep covers tight on all grease cans. Use only clean dishes and clean spatulas with grease. Keep grease stored away from all dust, dirt, and metal chips.

2. Standardize your greasing procedures. Make sure all maintenance personnel understand proper greasing methods. Do not let inexperienced personnel take over greasing; it is too important. Establish precise instructions regarding cleaning of greasing equipment, grease fittings, grease cups (before refilling them). Oil cups and grease fittings can be marked with colored paints to systemize your relubrication.

3. Relubricate on schedule. Do not wait for trouble to signal the need for additional lubrication. Relubrication schedules should be posted on machines.

4. Use only high grade grease in bearings. Low grade grease is a false economy. Its use usually results in shortened bearing life. Also, try to use the grease recommended by the machine manufacturer.

5. Over-greasing is bad. It causes churning of the lubricant and subsequent overheating. If bearing runs hot after relubrication, open the drain plug and let some of the grease run out while the bearing is operating. Never fill end-bells more than 1/3 full when re-greasing.

6. Never start a new machine until the bearings have been lubricated according to directions.

3.18.2 Watch for Dirt

The most important precaution to be observed in handling or using bearings is to keep them clean. Dirt is the greatest enemy of bearings. It causes wear, destroys their accuracy, and shortens their life. To the bearing user, metal chips, grit, abrasive, dust, etc., are all dirt. Avoid them.

3.18.3 Preventive Maintenance

Have a perfectly clean work bench on which to place bearings before and after cleaning. Place the bearing in a degreaser or in a container of appropriate solvent such as standard solvent, kerosene, methyl-chloroform, or similar solvents. “Swirl” the bearing around in the cleaning solvent allowing it to wash through the bearing, carrying away any grit particles and dissolving all oil or grease. Finally, slowly revolve the inner ring so the cleaning solvent reaches all parts of the bearing. Do not allow the bearing to rest on the bottom of the container. Cleaning of a bearing interior around the balls or rollers is often done with a normal paint brush. This is a satisfactory practice although care should be taken to use a good quality brush which does not lose its bristles, and that none of the bristles become lodged between the balls or rollers and separators or rings. A piece of bristle can be as harmful as a steel chip.

Once in, dirt is hard to get out. A clean bearing placed on a dusty bench always becomes contaminated. Dirt, once entrenched in the separator, is exceedingly difficult to remove. Make cleanliness your first rule for working with bearings.

Bearing with closures on both sides should not be cleaned by dipping, spraying and the like, which would wash out the grease. The outer surfaces of such bearings may be carefully wiped with a lint-free cloth and light oil or solvent, after which they can be lightly coated with a protective lubricant, and wrapped to protect against dirt and corrosion.

Throughout the cleaning process, and especially where a bearing has been solvent cleaned, remember that corrosion can be caused by perspiration from hands.

So if a bearing has been solvent cleaned, wipe it carefully before applying a protective oil coat.

CAUTION:

Never use unfiltered air. Make sure all traces of water and dirt in the air line are trapped out. Dirty air can blow dust into the bearing ruining careful cleaning work. Never allow the air blast to spin a bearing. If you must use air, hold bearing and hose carefully.
3.18.4 Relubricate After Cleaning
Always re-lubricate bearings immediately after they have been cleaned. Immerse in light clean oil and rotate the inner ring very slowly until all the solvent has been removed. Oil has a tendency to slip away from metal surfaces already wet with solvents, leaving the bearing surfaces unprotected and in danger of rust and corrosion.

3.18.5 Rewrap After Cleaning
Immediately after re-lubricating the bearing, wrap well in clean polyethylene or oiled paper. Replace in its box, making sure that inside of box is also clean. Reseal the box. A good shop practice is to write on the sealing tape the date of cleaning, the type of lubricant, and the name of the person cleaning the bearing.

3.18.6 Bearing Removal
Bearings may have to be removed as part of an overhaul program to service another part, or to replace the bearing. In any case, even if the bearing is an obvious failure, it should be removed with care to avoid damage to the shaft, housing or other machine parts and to avoid obliterating the cause of failure.

As mentioned before, at least one of the bearing rings is press fitted sometimes to a very tight fit. At this point, we are concerned largely with the proper handling of press fitted parts.

The first basic principle is that no press fit should be broken unless it is essential to the job being done. Many roller bearings are separable and when it is certain the bearing itself has not been damaged, it is best to leave the press fitted member in place. In addition to the time and trouble involved, removal may cause damage to the bearing seat. However, if any failure is evident, the entire bearing should be replaced. The second basic principle is that, in removing a ring, the driving force be directed through the inner or outer ring which is being removed, and not be transmitted through the balls, rollers, separators, closures and the like.

The familiar arbor press is a very good machine for removing (or installing) bearings. If action is rapid, smooth and positive. In addition, it can supply a greater force than most other means. Further, it is a useful shop accessory for many other types of work. Unfortunately, space restrictions prevent its use in many jobs.

![Figure 3.5 Bearings]
The use of a hammer and drift directly in the ring is very bad practice. An auxiliary fixture as shown here should be used.

Large roller bearing inner rings are particularly difficult to remove by any of the methods given here. Usually, these rings are separable and it is necessary to destroy them by heating or splitting. No specific instructions can be given here except that all attempts should be made to prevent damage to the shaft.

3.18.7 Identification Damage and Failure on Bearings

INSPECTION:
When a machine or other piece of equipment is down for repair, the objective of the maintenance personnel is to repair it and get it going as soon as possible. However, some knowledge of bearing failure and damage identification is required to determine:

1. Whether the bearing is suitable for further service.
2. If there is some underlying cause for failure so that corrective measures can be applied before installing a new bearing. Here are some inspection tips and techniques to be used before or during machine dismantling Before removing or replacing a “noisy” bearing, try to determine if the bearing is the cause. To start with, a common complaint is that the bearing is “noisy”. This is a natural reaction of machine users to unusual noise emanating from a machine. Generally, a noisy bearing produces a continuous whine. A pulsating noise is usually the result of a malfunction of some other part. It must be remembered too that all ball and roller bearings have some noise level. Bearings in good condition tend to produce a pleasant sound compared to a harsh sound from one that is not functioning properly.

The least desirable method is removal of inner and outer rings by driving with a hammer. Where machine shop facilities are available, it may be worth the effort to build a simple puller adapted to the job, especially if it is repetitive.
3.19 DISCHARGE GATE SAFETY STOP

3.19.1 Safety Stop Insertion
1. Follow complete lockout procedures. See Section 3.2.
2. Properly lockout automatic gate controls.
3. Clear area around discharge gate of personnel.
5. While keeping hands away from gate arm and cylinder clevis. Refer to print number 466318:
   • Remove quick release pin
   • Position safety stop in locked position
   • Insert quick release pin as shown at “B”
6. Clear area around gate of personnel.
7. Exhaust air to gate valve and gate cylinder using dump valve. Refer to print number 467493. Gate arm should lower against safety stop. If gate does not lower against safety stop, correct the problem.
8. Lockout dump valve.
9. Using your shop’s authorized key and lock system, secure the main power switch in the lockout position.
10. Remove your key from the lock and keep the key with you at all times while performing system maintenance.
11. Test lockout.

3.19.2 Safety Stop Removal
1. Properly lockout automatic gate controls.
2. Clear area around discharge gate of personnel.
3. Remove dump valve lock.
4. Provide air to gate cylinder and cylinder valve by manually positioning dump valve. Refer to print number 467493.
5. Manually open discharge gate using gate valve pushbutton.
6. While keeping hands away from gate arm and cylinder clevis Refer to print number 466318:
   • Remove quick release pin
   • Position safety stop in unlock position and insert quick release pin at “C”
7. Reposition guards, etc.
8. Remove automatic gate control lockout.
3.20 STANDARD GATE ADJUSTMENT
1. Lockout the machinery and observe the safety precautions, making sure the correct lockouts and tags are in place. See Section 3.2.
2. With gate in closed position and cylinder rod bottomed, adjust link rods so gate closes uniformly.
3. Place a straight edge across the top of the gate operating shaft and pin as shown. Dimension between straight edge and pin should be 3/8 inch as shown in Figure 3.6 at point A.
4. If dimension is not 3/8 inch, it is first necessary to estimate adjustment required. A 1/4 inch dimension of the rod end will result in approximately 5/16 inch movement of pin.
5. Operate cylinder to partially open gate.
6. Lockout air supply.
7. Remove cotter pin from pin as shown in Figure 3.6 at point B.
8. Remove pin.
10. Turn rod-end to obtain 3/8 inch dimension.
12. If 3/8 inch cannot be accomplished with above procedure, shim as shown in Figure 3.6 at point C as necessary.

3.21 SEAL ALIGNMENT TO DRIVE SHAFT
1. Lockout the machinery and observe the safety precautions, making sure the correct lockouts and tags are in place. See Section 3.2.
2. Verify the seal alignment on the drive shaft.
3. The seal should be centered on drive shaft within .003 inches TIR.
4. If necessary, correct as required. Refer to Besser drawing #481199.
5. After starting Mixer, check seal for leakage. Correct seal to shaft alignment as needed.
6. Check for seal leakage every hour of first day of operation. Align seal to shaft as necessary.
7. If seal performs properly, check seal for leakage daily.

Figure 3.6 Adjusting Standard Gate
3.22 PINION AND GEAR ALIGNMENT

If the pulley shaft pinion on your Mixer is not in proper alignment with the gear, it will cause excessive wear on one side of the pinion.

The following procedure is a simple method for aligning the pinion and gear.

1. Lockout the machinery and observe the safety precautions, making sure the correct lockouts and tags are in place. See Section 3.2.

2. After the pulley shaft has been assembled in place on the Mixer, leave the bearing holder bolts loose, then check to be sure there is a 0.020 ± 0.005 inch clearance between the pinion and gear as shown in Figure 3.7 at point A. This clearance should be checked at 90° intervals being careful to remain within the tolerances as shown.

3. Place a straight edge horizontally across the face of the pulley and measure the distance from the machined edge of the gear to the straight edge on both sides of the pulley, as shown in Figure 3.8. If these two distances are of equal length, the pinion and gear will be in alignment horizontally.

4. To align vertically, follow the same procedure as above using the straight edge in a vertical position as shown in Figure 3.9.

5. After the above alignments have been made, tighten the bearing holder bolts.

Figure 3.7 Mixer Gear and Pinion

Figure 3.8 Positioning Horizontally

Figure 3.9 Positioning Vertically
3.23 CLEANING RINGS REPLACEMENT*

Besser Company drawing number 292016 and Table 3.15 show the ring sizes and their Mixer locations.

Cleaning rings must be replaced when worn to a thickness of 3/4 inch [19.05 mm] at any point on the ring. To replace rings:

1. Lock out the machinery and observe the safety precautions, making sure the correct lock outs and tags are in place. See Section 3.2.
2. Remove the worn cleaning rings
3. Weld the two halves of the new cleaning rings together around the shaft or arm. See Figure 3.10. Refer to print numbers 420979, 420980 and 448328 for welding instructions.
4. Weld plates to blade arms (292016). See Figure 3.10.

---

**Figure 3.10** Blade Shaft Cleaning Ring Assembly

<table>
<thead>
<tr>
<th>Location</th>
<th>Dimensions</th>
<th>Quantity Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade shaft</td>
<td>23 inch [584.2 mm] Dia</td>
<td>4</td>
</tr>
<tr>
<td>Blade shaft</td>
<td>27 inch [685.8 mm] Dia</td>
<td>4</td>
</tr>
<tr>
<td>Blade arm</td>
<td>4.5 inch x 7 inch [114.3 mm x 177.8 mm] Dia</td>
<td>8</td>
</tr>
</tbody>
</table>

*Table 3.15 Cleaning Ring Dimensions and Locations*
3.24 BLADES WITH WEAR LINERS*

The first batch for a Mixer with blade wear liners is referred to as a “grouting batch.” The “grouting batch” fills the void between the backup blade and blade liners providing support to blade liners. Often, a Besser Sales and Service Representative runs the grouting batch. For more information about the grouting procedure, refer to Besser Company print number 360464, and Section 2.6.

3.25 LESUEUR TROUGH LINERS REPLACEMENT*

This procedure is specifically for the LeSueur probe liners. It can be adapted for other liners. Replace liners when cracked or worn down to the bolt head. See Section 3.2.6.

1. Remove and discard the probe liner. This liner measures about 12 inch [304.8 mm] x 15 inch [381 mm] and is located just below the discharge door near the Mixer center. Cut two 4 inch [101.6 mm] diameter holes, as needed, to let the raised portion of the rear of the liner pass through the Mixer shell.

2. Check and clean the Mixer shell where the new LeSueur plate will be installed. The shell must be clean before installing the LeSueur electrode plate.

3. Connect the electrode circuit wires from the LeSueur Moisture Master to the threaded connection in the probe bolt stem on the rear of the electrode plate. This can be done by clamping a piece of #10 gauge stranded copper wire in the connector, and then soldering the #10 wire to the wire from the Moisture Master.

4. Adjust the Mixer blades to the largest diameter aggregate used to minimize wear. Re-adjust the Mixer blades when spacing between the electrode plate and Mixer blade equals two times the diameter of the largest aggregate. If the spacing exceeds this amount due to component wear, moisture error will occur.

IMPORTANT:

Be careful when tightening the liner mounting bolts. Tighten the bolts only to where the lock washers are flat. Do not tighten the bolts past that point. Although the plates are made from very hard material (Ni-Hard), they are fragile and can be easily broken.

5. Tighten the mounting bolts.
3.26 MIXER MAINTENANCE REFERENCE

DRAWINGS AND NOTES

NOTE:
Drawings listed below are current when catalog was produced, check your group part list for the drawings for your Mixer.

<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decals</td>
<td>431251</td>
</tr>
<tr>
<td>1. Decals and Nameplates – Location</td>
<td>431251</td>
</tr>
<tr>
<td>a. Replace when safety sign is damaged or not readable.</td>
<td>431251</td>
</tr>
<tr>
<td>Liners</td>
<td>332752</td>
</tr>
<tr>
<td>2. Trough Liners – All</td>
<td>332752</td>
</tr>
<tr>
<td>a. Do not over-tighten bolts. Torque bolts to just flatten lockwasher.</td>
<td>332752</td>
</tr>
<tr>
<td>b. Replace liners when cracked.</td>
<td>332752</td>
</tr>
<tr>
<td>c. Replace liners when worn down to bolt head.</td>
<td>332752</td>
</tr>
<tr>
<td>3. ARC Moisture Probe Liners – ground (No Probes)</td>
<td>467490</td>
</tr>
<tr>
<td>a. Adjust blade to probe gap to maintain proper moisture probe operation.</td>
<td>467490</td>
</tr>
<tr>
<td>4. ARC Moisture Probe Liners – Microwave (No Probes)</td>
<td>481202</td>
</tr>
<tr>
<td>a. Adjust blade to probe gap to maintain proper moisture probe operation.</td>
<td>481202</td>
</tr>
<tr>
<td>5. Ramsey Probe Liners</td>
<td>—</td>
</tr>
<tr>
<td>a. Adjust blade to probe gap to maintain proper moisture probe operation.</td>
<td>—</td>
</tr>
<tr>
<td>6. Lesueur Probe Liners</td>
<td>—</td>
</tr>
<tr>
<td>a. Adjust blade to probe gap to maintain proper moisture probe operation.</td>
<td>—</td>
</tr>
<tr>
<td>7. Head Liners</td>
<td>—</td>
</tr>
<tr>
<td>a. Replace when thickness is 1/4 inch or less</td>
<td>—</td>
</tr>
<tr>
<td>Blades, Blade Arms, Cleaning Rings, Etc.</td>
<td>245002</td>
</tr>
<tr>
<td>8. Blades – One Piece</td>
<td>245002</td>
</tr>
<tr>
<td>a. Assembly instruction</td>
<td>245002</td>
</tr>
<tr>
<td>b. Adjust blades to maintain blade to trough liner gap to minimize concrete build up and proper moisture probe operation.</td>
<td>245002</td>
</tr>
<tr>
<td>• Blade to trough liner space equals 5/8 inch – 1 inch.</td>
<td>245002</td>
</tr>
<tr>
<td>• Blade to head liner space equals 5/8 inch – 1 1/4 inch.</td>
<td>245002</td>
</tr>
<tr>
<td>c. Besser does not recommend welding blades. Replace blades if cracking or breakage occurs.</td>
<td>245002</td>
</tr>
<tr>
<td>d. Replace blades, head liners and/or trough liners when the specifications (5/8 inch – 1 inch or 5/8 inch – 1 1/4 inch) above cannot be met.</td>
<td>245002</td>
</tr>
<tr>
<td>9. Blades – with Liners</td>
<td>347528</td>
</tr>
<tr>
<td>a. Assembly instruction</td>
<td>347528</td>
</tr>
<tr>
<td>b. Blade grout procedure</td>
<td>347528</td>
</tr>
<tr>
<td>c. Adjust blades to maintain blade to trough liner gap to minimize concrete build up and proper moisture probe operation.</td>
<td>347528</td>
</tr>
<tr>
<td>• Blade to trough liner space equals 5/8 inch – 1 inch.</td>
<td>347528</td>
</tr>
<tr>
<td>• Blade to head liner space equals 5/8 inch – 1.25 inch.</td>
<td>347528</td>
</tr>
</tbody>
</table>

Table 3.16 Mixer Reference Drawings
### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. Besser does not recommend welding blades. Replace blades if cracking or breakage occurs.</td>
<td></td>
</tr>
<tr>
<td>e. If one blade liner breaks, it can be replaced if the new liner can be adjusted even with the other liners.</td>
<td></td>
</tr>
<tr>
<td>f. Replace blades, blade liners, head liners and/or trough liners when the specifications (5/8 inch – 1 inch, or 5/8 inch – 1 1/4 inch) above cannot be met.</td>
<td></td>
</tr>
<tr>
<td>10. Blade Shaft Assembly with Arms</td>
<td>312507</td>
</tr>
<tr>
<td>11. Blade Shaft Bearings</td>
<td></td>
</tr>
<tr>
<td>a. If Mixer is equipped with auto lube system, check if grease is supplied to both bearings.</td>
<td></td>
</tr>
<tr>
<td>b. Listen for bearing rough running noises and look for wobble in blade shaft as it rotates.</td>
<td></td>
</tr>
<tr>
<td>c. Any excess heat in a bearing indicates problems.</td>
<td></td>
</tr>
<tr>
<td>d. The bearings should be removed from housing, cleaned, and visually inspected yearly.</td>
<td></td>
</tr>
<tr>
<td>12. Blade Shaft Subassembly</td>
<td>312506</td>
</tr>
<tr>
<td>13. Cleaning Ring Assembly</td>
<td>292016</td>
</tr>
<tr>
<td>a. Replace rings when welds or ring are cracked.</td>
<td></td>
</tr>
<tr>
<td>b. Replace rings when ring is less than 3/4 inch diameter in any location.</td>
<td></td>
</tr>
<tr>
<td>c. For welding instructions refer to:</td>
<td></td>
</tr>
<tr>
<td>• Blade shaft cleaning rings</td>
<td>420979, 420980</td>
</tr>
<tr>
<td>• Blade arm cleaning rings</td>
<td>448328</td>
</tr>
<tr>
<td>14. Blade Shaft covers</td>
<td>313565</td>
</tr>
<tr>
<td>a. Replace when welds or cover are cracked.</td>
<td></td>
</tr>
<tr>
<td>b. Replace when less than 1/8 inch thick in any location.</td>
<td></td>
</tr>
<tr>
<td>15. Head Scrapers</td>
<td>262742</td>
</tr>
<tr>
<td>a. Adjust scraper to maintain head scraper to head liner gap of 1/4 inch – 1/2 inch to minimize concrete build up.</td>
<td></td>
</tr>
<tr>
<td>b. Inspect for straightness and thickness. Replace scraper when it is 1/2 inch or less thick.</td>
<td></td>
</tr>
<tr>
<td>c. Assemble 90° in back of (following) leading end of Mixer blade.</td>
<td></td>
</tr>
<tr>
<td>16. Dust Hub Seals</td>
<td>312507</td>
</tr>
<tr>
<td>a. Check for leakage at blade shaft</td>
<td></td>
</tr>
<tr>
<td>b. If mixer is equipped with auto lube system, check if air and grease are supplied to dust hub.</td>
<td></td>
</tr>
<tr>
<td>17. Drive</td>
<td></td>
</tr>
<tr>
<td>Drive Shaft Assembly – with Clutch</td>
<td>356462</td>
</tr>
<tr>
<td>a. Oil seal – split – gear case – install</td>
<td>481199</td>
</tr>
<tr>
<td>b. Clutch – See Section 1.5.3</td>
<td>110034</td>
</tr>
<tr>
<td>c. Gear alignment</td>
<td>072975</td>
</tr>
<tr>
<td>d. Pressure switch – air clutch</td>
<td>383834</td>
</tr>
<tr>
<td>e. Solenoid valve assembly – air clutch</td>
<td>467494</td>
</tr>
</tbody>
</table>

Table 3.16 Mixer Reference Drawings – Continued
<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>f. Belts</strong></td>
<td></td>
</tr>
<tr>
<td>• Check belt tension.</td>
<td></td>
</tr>
<tr>
<td>• Replace belts in complete set.</td>
<td></td>
</tr>
<tr>
<td><strong>g. Sheaves</strong></td>
<td></td>
</tr>
</tbody>
</table>

18. Drive Shaft Assembly – without Clutch
a. Oil seal – split – gear case – install 363501
b. Gear alignment 072975
c. Belts
• Check belt tension
• Replace belts in complete sets
d. Sheaves

19. Drive Shaft Bearings (Spherical, Roller, and 2 Plain Bearings)
a. Spherical and roller bearings
• If Mixer is equipped with auto lube system, check if grease is supplied to the bearings.
• Listen for bearing rough running noises and look for wobble in drive shaft as it rotates.
• The bearings should be removed from housing and visually inspected yearly.
b. Plain bearings (inside guard)
• Check to determine if they have been manually lubricated.
• Listen for bearing rough running noises and look for wobble in pulley as it rotates. Pulley wobble should not exceed .093 inch. Check pulley wobble with belts removed every time belts are changed.
c. Any excess heat in a bearing indicates problems.

20. Electric Motor – (See Section 3.16)

21. Safety Stop – Discharge Gate (See Section 3.12) 466318
22. Air Cylinder Subassembly – Discharge Gate 265776
23. Discharge Gate Assembly – Eccentric – with Chute 234088
   a. Make sure the gate is opening and closing properly. Adjust if necessary. See Section 3.19 and 3.20.
24. Solenoid Valve Assembly – Gate 467493

25. Manual Mechanical Cleanout Gate 257212
   a. Make sure the gate is opening and closing properly. Adjust if necessary.
26. Manually Actuated, Air Operated, Cleanout Gate 266644
   a. Make sure the gate is opening and closing properly. Adjust if necessary.

27. Lubrication System (Optional) 437629F9103
   Weekly, make sure the pump is filled with the proper grease and observe the pump to see that it is pumping grease. Inspect the master feeder block, and the lubrication lines to confirm that they are properly supplying grease to all of the lube points. (See Section 3.17).

Table 3.16 Mixer Reference Drawings – Continued
### Table 3.16 Mixer Reference Drawings – Continued

<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical (See Electrical Section)</td>
<td></td>
</tr>
<tr>
<td>28. Check All Switch Settings Daily</td>
<td></td>
</tr>
<tr>
<td>29. Mixer Gate and Clutch Control Circuit</td>
<td>283723</td>
</tr>
<tr>
<td>30. Electric Interlock to Batch Controls</td>
<td>384561</td>
</tr>
<tr>
<td>31. Elementary Wiring Diagram – Zero Speed, Underspeed, etc.</td>
<td>472068</td>
</tr>
</tbody>
</table>