Building and Assembly Instructions for the

TOMMY SHREDDER

Jeffrey P. Weiss

University of St. Thomas
St. Paul, Minnesota
June 2006
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Breadfruit Shredder Exploded Layout

Note: Numbers in Balloons Refer to the Item Number in the Bill of Materials
### Bill of Materials – Breadfruit Shredder

#### Bill of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Drawing Number</th>
<th>Qty:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FRAME PLATE</td>
<td>001</td>
<td>1</td>
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<tr>
<td></td>
<td>0.25&quot; X 6.0&quot; X 8.0&quot; MILD STEEL PLATE</td>
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<tr>
<td></td>
<td>1.50&quot; INSIDE DIAMETER X 0.13&quot; WALL X 4.50&quot; LONG STEEL TUBING</td>
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<td>DRIVE SHAFT</td>
<td>002</td>
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<td>0.50&quot; DIAMETER X 44.0&quot; LONG HOT ROLLED STEEL SHAFT</td>
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<td>FLAT WASHER FOR 1/2&quot; BOLT, SAE STANDARD</td>
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<td>3</td>
<td>FEEDER TUBE</td>
<td>003</td>
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<td>5</td>
<td>HANDLE</td>
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<td>6</td>
<td>BLADE MOUNT</td>
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<td></td>
<td>MACHINE SCREW, #10-32 FINE THREAD, PAN HEAD</td>
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<td>7</td>
<td>CENTER DIVIDER</td>
<td>007</td>
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<td>8.50&quot; X 8.75&quot; X 20 GAUGE (0.036&quot; THICK) SHEET STEEL</td>
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<td>CENTER DIVIDER SPACER TUBE</td>
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<td>WING NUT, 3/8-16&quot; COURSE THREAD</td>
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<td>LINCH PIN, ¼&quot; DIA X 1-3/4&quot; LONG WITH RETAINING RING</td>
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<td>14</td>
<td>(HILLMAN INC., #4259-H)</td>
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<td>15</td>
<td>LANYARD, STAINLESS STEEL WIRE, 1FT LONG (REID #CBL-17)</td>
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<td>SHREDDER BLADE (PURCHASED), STAINLESS STEEL, 1/2&quot;</td>
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<tr>
<td>16</td>
<td>DIAMETER HOLES (HOBART #VS12SD12)</td>
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OPTIONAL COMPONENTS FOR FABRICATING A SHREDDER BLADE:

17  SHREDDER BLADE (FABRICATED)  010  1
    24 GAUGE (0.024" THICK) X 9.50" X 9.50" STAINLESS STEEL SHEET  1

18  BLADE HOLE TEMPLATE  011  1
    0.25" X 4.50" X 10.00" MILD STEEL PLATE  1

19  BLADE PROFILE DIE  012  1

20  BLADE PROFILE PUNCH  013  1
Frame Plate Fabrication

Frame Plate Components:

Reference Drawing #001 (FRAME PLATE) for fabrication specifications.

Fabrication Procedures:
1). Cut Base material to size and drill mounting holes as shown on fabrication print.
2). Cut Bushing Supports and Hoop Spacer tubing to length shown on fabrication print.
3). Cut Hoop material to size as shown on fabrication print.
4). Drill holes in Bushing Supports as shown on fabrication print (Figure B).
5). Cut slot in Bushing Supports with a saw to the depth shown on the fabrication print (Figure B).
6). Bend Hoop to the dimensions shown on the fabrication print using a sheet metal roller or round forming die (See Figure C.)
7). Weld the Bushing Supports onto the Base by placing in the locations shown on the fabrication print. Ensure that the holes in the Bushing Supports are lined up by inserting a rod through both sets of holes as shown in Figure D. Weld to the Base using a ‘Skip Weld’ as shown in Figure E. Too much heat to the Base will warp it.
8). Weld the Hoop Spacer to the Base using the location shown on the fabrication print using a ‘Skip Weld’ (See Figure F).
9). Center the Hoop on the Hoop Spacer and weld. The Hoop must be lined up with the centerline of the part as shown in the ‘top view’ of the fabrication print.
Figure B: Bushing Support

Figure C: Partially Rolled Hoop

Figure D: Alignment of Bushing Supports before welding

Figure E: Skip-Welding of Bushing Supports

Figure F: Weld on Spacer and Hoop
Drive Shaft Fabrication

Reference Drawing #002 (DRIVE SHAFT) for fabrication specifications

Fabrication Procedures
1). Cut Drive Shaft Rod to length as shown in the fabrication print.
2). Mark bend distances from fabrication print onto Drive Shaft rod.
3). Clamp Drive Shaft Rod into a sturdy shop vise with first bend line slightly above top of vise.
4). Heat bend area of Drive Shaft Rod near the first bend line with a torch until red hot.
5). Bend Drive Shaft Rod to a 90 degree angle (Figure B).
6). Remove from vise and re-clamp so that the second bend line is slightly above top of vise.
7). Heat bend area of Drive Shaft Rod near second bend line with a torch until red hot.
8). Bend Drive Shaft Rod to a 90 degree angle (Figure B).
9). Lay bent Drive Shaft Rod on a flat surface to check for alignment of bends. Fix alignment with a large mallet or by re-heating and bending shaft.
10). Mark locations of Support Washers from fabrication print on bent Drive Shaft Rod.
11). Secure Support Washers to Drive Shaft Rod by welding on inside only (away from where washer contacts other parts) (Figure C)
12). Drill hole in bottom of Drive Shaft Rod as shown on the fabrication print.
13). Put chamfer on bottom of Drive Shaft Rod as shown on the fabrication print.
Feeder Tube Fabrication

Reference Drawing #003 (FEEDER TUBE) for fabrication specifications.

Fabrication Procedures
1) Cut Polyvinyl Chloride (PVC) tube to length as shown on fabrication print.
2) Mark center axis line across top of feeder tube.
3) Mark center axis line across bottom of feeder tube. The top axis and bottom axis must be in the same radial position on the tube.
4) Cut slot in top of tube as shown in the drawing using a saw. The slot will be offset to one side as shown on the print (Figure A).
5) Mark hole positions in bottom of tube as shown in fabrication print. The holes will be off to one side and should be in-line with the slots on the top of the tube.
6) Drill the four holes through the PVC tube using a 3/16” (.187”) diameter drill bit.
7) Press 3/16” dowel pins (Item #13) into the holes in the tube. Pins will be pushed through and extend to the inside of the tube (Figure B). Pins should fit tightly into holes.
8) Slide the Center Divider (Drawing # 007) into the center of the Feeder Tube. The extended sections of the Center Divider will slide into the slots on the top of the Feeder Tube and the lower part of the Center Divider will fit between the dowel pins (Figure C). Ensure that Center Divider fits into the Feeder Tube.

Figure A: Slots in top
Figure B: Dowel Pin Locations
Figure C: Feeder Tube with Center Divider
Blade Mount Fabrication

Reference Drawing #006 (BLADE MOUNT) for fabrication specifications.

Fabrication Procedures
1). Cut the Support Arm material as shown in the fabrication print.
2). Cut the Support Ring material to the dimensions shown on the fabrication print. A hand-operated Jig Saw works well for cutting the inside diameter.
3). Cut the Support Hub material as shown on the fabrication print.
4). Drill holes in the Support Hub as shown on the fabrication print.
5). Lay the Support Hub on a flat surface with the large hole facing up and the small cross-hole on top.
6). Position the Support Arms around the Support Hub as shown on the fabrication print.
7). Weld the Support Arms to the Support Hub.
8). Center the welded Support Hub/Support Arms on top of the Support Ring with the Support Hub facing up.
9). Weld the Support Arms onto the Support Ring.
10). Mark the four holes onto the Support Ring as shown on the fabrication print. The center point of the four holes will be the large hole in the Support Hub. Lay the Shredder Blade (Item #16) over top of Support Ring and ensure that the four holes marked on the Support Ring line up with the mounting holes and center hole of the shredder.
11). Drill the four holes into the Support Ring.
12). Tap the four holes as shown on the fabrication print.
13). Screw four pan head screws into the top of the Support Ring. Leave a space of 0.06 inches between the bottom of the screw head and the top of the Support Ring.
14). Check to see that the Shredder Blade fits easily over screw heads and locks into place. Adjust screw head distance if needed.
15). Weld pan head screws in place from the bottom of the Support Ring with a small amount of weld. This is to keep the screws from turning out.

16). Attach the Lanyard (Item 15) to the bottom of the Blade Mount (Figure B). The lanyard attachment method may vary depending upon the type of lanyard purchased. Ensure that the lanyard does not interfere with the operation of the shredder and allows the blade to be easily put onto the Blade Mount.

17). Attach the Linch Pin (Item 14) to the Lanyard (Figure B). Make sure that the Linch Pin will fit easily into the hole on the side of the Hub Support block.

Figure B: Blade Mount with Lanyard and Linch Pin
Shredder Press Weight Fabrication

Reference Drawing #009 (SHREDDER PRESS WEIGHT) for fabrication specifications.

Fabrication Procedures

1). Cut Press Feet, Press Legs, Top Plate, and Handle to dimensions shown on fabrication print.

2). Position individual Press Legs onto Press Feet as shown in the fabrication print and Figure B. Weld in place.

3). Space Press Feet apart as shown in the fabrication print (Figure B).

4). Position Top Plate onto Press Legs as shown in the fabrication print and Figure C.

5). Weld one of the Press Legs onto the Top Plate.

6). Check the distance between Press Feet and ensure that they are straight.

7). Weld on the second Press Leg to the Top Plate.

8). Position Handle onto top of Top Plate as shown in the fabrication print and Figure D.

9). Weld Handle onto Top Plate.

Figure A: Shredder Press Weight Components

Figure B: Press Feet and Legs

Figure C: Weld area on Washers

Figure D: Press Handle
1) Mount the Frame Plate (Item #1) to a secure post.

2) Slide the Drive Shaft Bearings (Item #4) into the tubes on the Frame Plate and secure with a screw and wing nut. Insert the screw for the Frame Plate hoop into the clamp holes on the hoop.

3) Insert the Center Divider (Item #7) into the Feeder Tube (Item #3). Slide the Feeder Tube Assembly into the hoop on the Frame Plate (the slots on the Feeder Tube will be on top). Tighten the screw on the Frame Plate hoop to hold the Feeder Tube in place.
4) Slide the Drive Shaft (Item #2) through the holes in the Drive Shaft Bearings from the top. Insert the Center Divider Spacer tube (Item #8) over the Drive Shaft. Continue to slide the Drive Shaft down until its stop washer rests on the top of the Drive Shaft Bearing. Slide the Handle (Item #5) over the top of the Drive Shaft. Slide the Feeder Tube Assembly up until the Center Divider spacer contacts the bottom of the lower Drive Shaft Bearing.

5) Position the Hobart Blade or the fabricated Shredder Blade (Item #16) over the top of the Blade Mount (Item #6). The teeth of the blade should be facing up. Align the keyhole slots of the blade over the extended screws on the Blade Mount. Lock the blade into place.
6) Slide the Blade Mount with Shredder Blade over the lower end of the Drive Shaft. The teeth on the blade should be toward the Feeder Tube. Line up the lower mounting hole on the Blade Mount with the hole on the end of the Drive Shaft. Slide the pin (Item #14) through Blade Mount and Drive Shaft holes to the other side. Lock pin in place.

7) Assembled Shredder
Shredder Assembly Instructions – Pictorial
**Drawing #001 – Frame Plate**

**Material and Dimensions**

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Quantity</th>
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<tr>
<td>0.25&quot; x 6.0&quot; x 8.0&quot; Mild Steel Plate</td>
<td>1</td>
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<tr>
<td>1.50&quot; Inside Diameter x 0.125&quot; Wall x 4.50&quot; Long Steel Tubing</td>
<td>2</td>
</tr>
<tr>
<td>1.50&quot; Inside Diameter x 0.125&quot; Wall x 1.00&quot; Long Steel Tubing</td>
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</tr>
<tr>
<td>0.13&quot; x 1.75&quot; x 31.0&quot; Mild Steel</td>
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</tbody>
</table>

**Note:** Refer to assembly instructions in Breadfruit Shredder Project paper.

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**University of St. Thomas**

**Frame Plate**

**Dimensional Notes:**

- All dimensions are in inches.
- Tolerances: ±0.001

**Drawing Information:**

- **Drawn by:** [Name]
- **Date:** [Date]
- **Checked by:** [Name]
- **Date:** [Date]

**Comments:**

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Drawing #002 – Drive Shaft

Material

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<th>Description</th>
<th>Quantity</th>
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<td>0.50&quot; Diameter x 44.0&quot; Long Hot Rolled Steel Shaft</td>
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<td>Flat Washer for 1/2&quot; Bolt, SAE Standard</td>
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</table>

Note: Refer to assembly instructions in Breadfruit Shredder Project Paper

Dimensions in Inches

- 35.75
- 28.0
- 27.3
- 23.9
- 0.31
- 9/32" (0.281)
- 0.06 (1/16) x 45° Chamfer
- MIN BEND RAD (2)
- 30°
- 90°
- 8.0

University of St. Thomas

Drawn: MJE
Checked: JPW
Date: 12/12/05
Rev.: 002

Drive Shaft
MATERIAL: 8.0" I.D. × 8.8" O.D. × 9.0" LONG PVC (POLYVINYL CHLORIDE) TUBE

NOTE: REFER TO ASSEMBLY INSTRUCTIONS IN BREADFRUIT SHREDDER PROJECT PAPER
Drawing #004 – Drive Shaft Bearing

Material: Nylon (or hard plastic or hard wood)

Dimensions (in inches):
- Diameter: 1/2" (0.50)
- Length: 4.0
- Diameter: 1.50
- Dimensions of holes: (0.13 (2))

Tolerances:
- Width: ±0.1
- Height: ±0.01

Drawing and Checking:
- Drawn by: MJE 12/10/05
- Checked by: JFW 5/15/05
MATERIAL: 0.63" INSIDE DIAMETER X 1.0" OUTSIDE DIAMETER X 6.0" LONG PVC [POLYVINYL CHLORIDE] TUBE
Drawing #006 – Blade Mount

---

**MATERIAL**

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<th>Material Description</th>
<th>Quantity</th>
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<td>0.25&quot; X 0.5&quot; X 4.0&quot; LONG MILD STEEL</td>
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<tr>
<td>0.13&quot; X 9.5&quot; X 9.5&quot; MILD STEEL SHEET</td>
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</tr>
<tr>
<td>MACHINE SCREW, #10-32 FINE THREAD X 1/2&quot; LONG, PAN HEAD</td>
<td>4</td>
</tr>
</tbody>
</table>

**Note:** Refer to Assembly Instructions in Breadfruit Shredder Project Paper

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**Dimensions:**

- Ø9/32" (Ø0.281) THRU
- (4.0)
- (0.13)
- (0.5)
- 1.0
- 45° (4)
- 0.25 (4)
- 1.0
- Ø9.25 O.D.
- Ø8.25 I.D.
- Ø1/2" (Ø0.50) THRU
- (Ø8.70 BOLT CIRCLE)
- 90°
- (4.35)
- (0.25)
- 10-32 UNF - 2B THRU ALL (4 ON Ø8.70 B.C.)
MATERIAL: 0.63" INSIDE DIAMETER X 1.0" OUTSIDE DIAMETER X 3.0" LONG PVC (POLYVINYL CHLORIDE) TUBE
NOTE: REFER TO ASSEMBLY INSTRUCTIONS IN BREADFRUIT SHREDDER PROJECT PAPER
0.90 TYPICAL DIST BETWEEN SLOTS

MATERIAL: 24 GAUGE (0.024") STAINLESS STEEL SHEET

NOTE: REFER TO ASSEMBLY INSTRUCTIONS IN THE BREADFRUIT SHREDDER PROJECT PAPER

DETAIL A
SCALE 1 : 1

DETAIL B
SCALE 2 : 1.5
(DRILL TO A 7/16" DIA ROUND HOLE)
Drawing #011 – Blade Hole Template

MATERIAL: 0.25" X 4.5" X 10.0
MILD STEEL PLATE