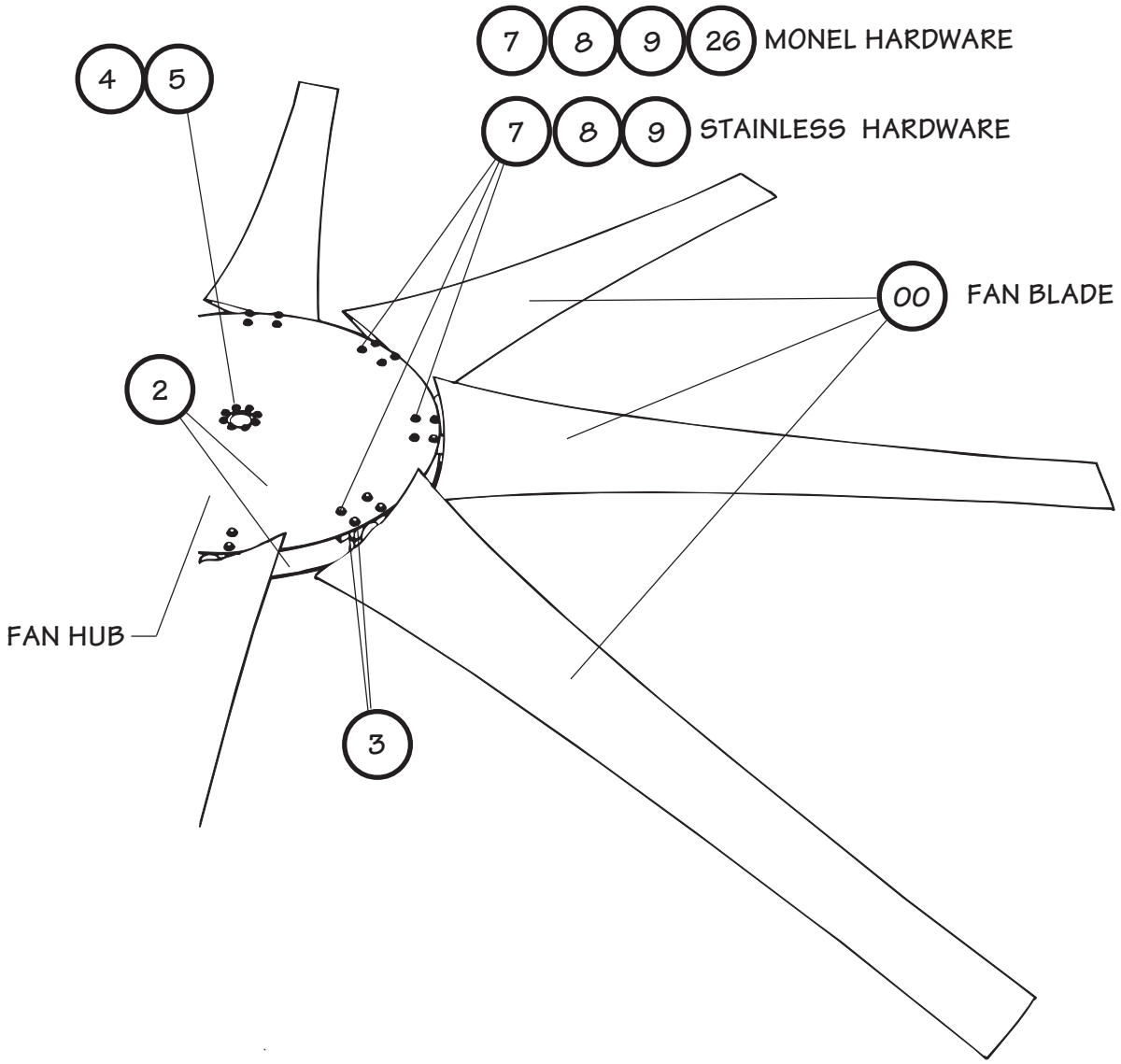
DuraCore™ Fan

Owners Manual

SM-HP8-264-360A
SM-HP8-10 Meter

Marley

Manual 92-1473D



Fan Components

Marley Order No. _____

Trial Pitch Angle _____

Final Pitch Angle _____

Speed-rpm _____

Contract hp _____

Fan Hub Assembly and Installation

The following instructions detail the process for installing a Marley DuraCore fan on a Marley Geareducer® with tapered shaft and bolted fan hub retention hardware. Installation on other gear reduction units may be different. The fan hub is normally factory assembled but if the fan hub requires assembly, start with **Item 1** in the following section— otherwise start with **Item 2**.

1—The hub plates and center hub are match-marked for assembly orientation. Locate and line up the keyway on the center hub **1** with the match-marks on the hub plates **2** . Attach hub plates to center hub using 5/8" x 1 1/2" bolts **4**, and 5/8" flat washers **5**. Lubricate this hardware before torquing the 5/8" cap screws to 150 ft·lb$_f$ (204 N·m). Thread lube is shipped with fan assembly. See **Figure 1**.

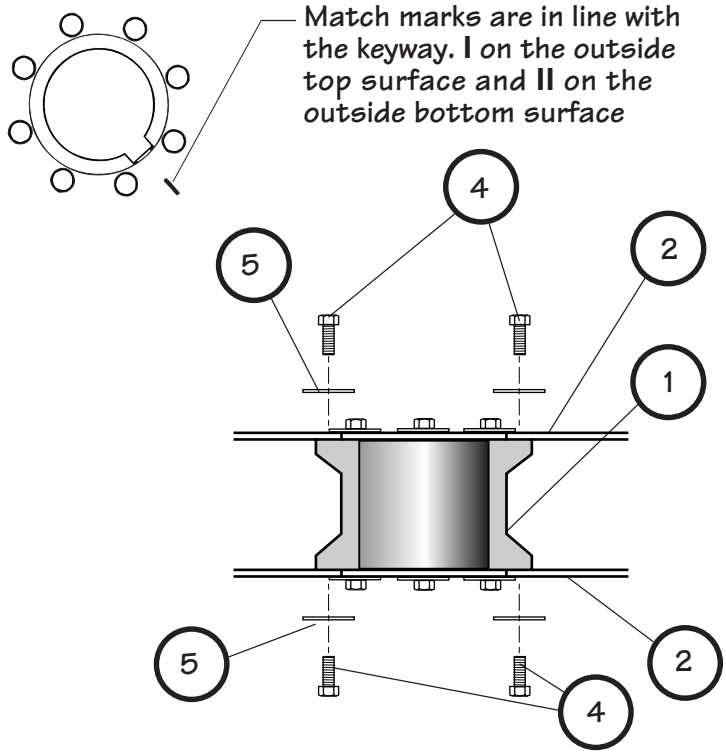


Figure 1

2—Remove the retention hardware from the top of the Geareducer fan shaft. Thoroughly clean the Geareducer fan shaft, fan shaft key and the fan center hub bore to remove any debris and/or protective coating. After cleaning, apply a coat of anti-seize compound to the top 7" of the Geareducer fan shaft.

△ **Note**

If the hub is to be installed on a Series 36 or 38 Geareducer refer to additional instructions on page 4.

Fan Hub Installation

3—Prior to hub installation, position the key in the fan shaft keyseat. Be sure the key is fully seated in the keyway depth. The key is a tight fit across the width of the fan shaft keyseat and must never be altered to fit loose.

4—Hoist the fan hub above the shaft for installation. Slowly lower the hub onto the fan shaft with the keyway properly aligned. Make certain that the key does not slide down during installation. It may be helpful to stake the key in the keyway with a center punch at the bottom of the key.

5—The fan shaft key should be approximately centered in the fan center hub when the hub is fully engaged on the shaft. Unless the key is longer than the fan center hub, it should not extend out of the center hub.

6—Visually inspect the fan center hub to be certain that it is fully seated against the shaft at the top and bottom of the hub.

7—Install the fan hub retention hardware and torque bolts to 70 ft·lb$_f$. (95 N·m).

36 and 38 Geareducer

Series 36 and 38 Geareducers utilize a unique tapered key on the fan shaft of the Geareducer. The following instructions detail the proper installation procedure for these Geareducers.

1—Prior to fan hub installation the key must be positioned in the fan shaft keyseat as shown in **Figure 3**. The key is a tight fit across the width of the fan shaft keyseat and must never be altered to fit loose.

2—After the fan hub is installed, the bottom end of the key must extend through the bottom of the fan center hub, and the top end of the key must be more than 5/8" above the top of the fan shaft. Do not force the key down once these criteria are met. The key may extend above the top of the fan center hub.

3—**Figure 2** illustrates the proper installation of the retention plate and hardware. The retention plate is designed to allow clearance for the fan shaft key and when properly installed will not extend over or interfere with the key in any way. Torque the retention bolts to 70 ft·lb$_f$ (95 N·m), then turn the corners of the locking straps up to capture the flats on the bolt heads to prevent bolts from loosening.

Fan Hub Installation

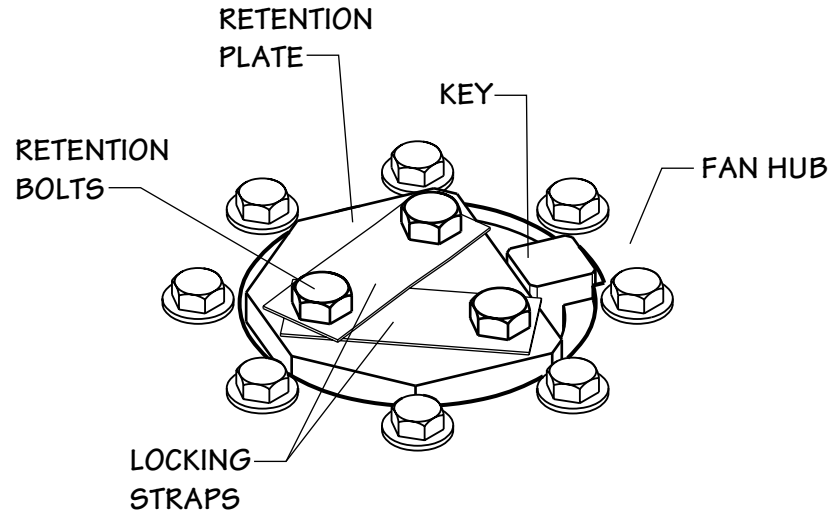


Figure 2
36 and 38 Geareducer

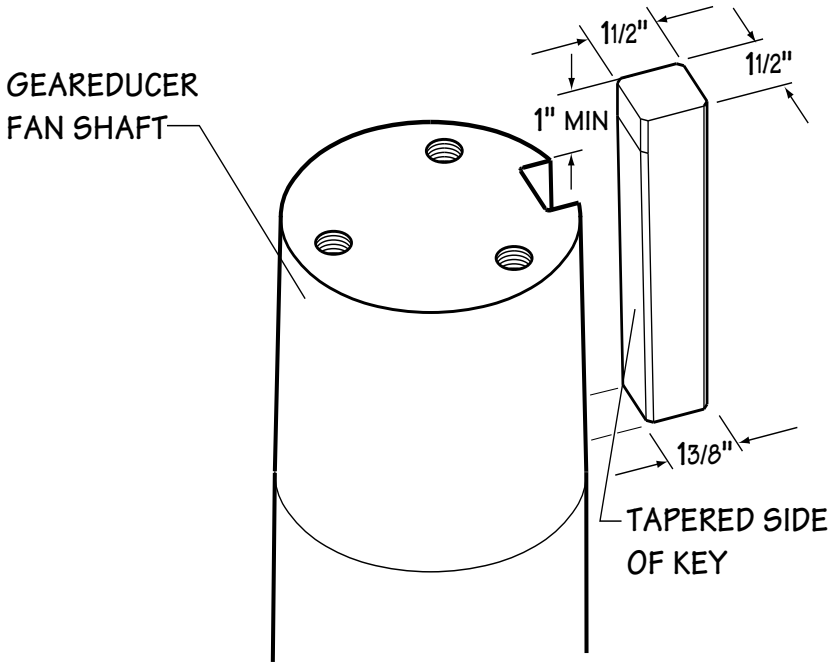


Figure 3
36 and 38 Geareducer

Fan Assembly

Marley DuraCore fan blades and blade clamps are match-weighed at the factory. The fan blades and blade clamps can be installed in any sequence without affecting fan balance.

△ **Note**

The blades are inscribed on the end of the shank with a letter code (i.e. "A" or "B" etc.). When assembling or replacing blades be sure to install only blades of the same letter code within a hub assembly.

1—Locate blade clamps **3** and position blade clamps around the shank of the fan blades with chamfered end of blade clamp against the blade safety shoulder. See **Figure 4**. Large nylon cable ties can be used to hold the clamps to the blade for easier assembly into the hub. There are spacers assembled with the blade clamps for shipping purposes only. Remove and discard these spacers prior to assembly of fan.

2—Slide the blade, with the clamps around the shank, between the plates, lining up the 4 bolt holes in the clamp and both plates. Install four 3/4" diameter bolts **7**, eight 3/4" flat washers **8** (four 3/4" lock washers **26** if hardware is monel) and four 3/4" nuts **9** with the nut on the top side as shown. Lubricate hardware before tightening nuts finger tight. See **Figure 4.**

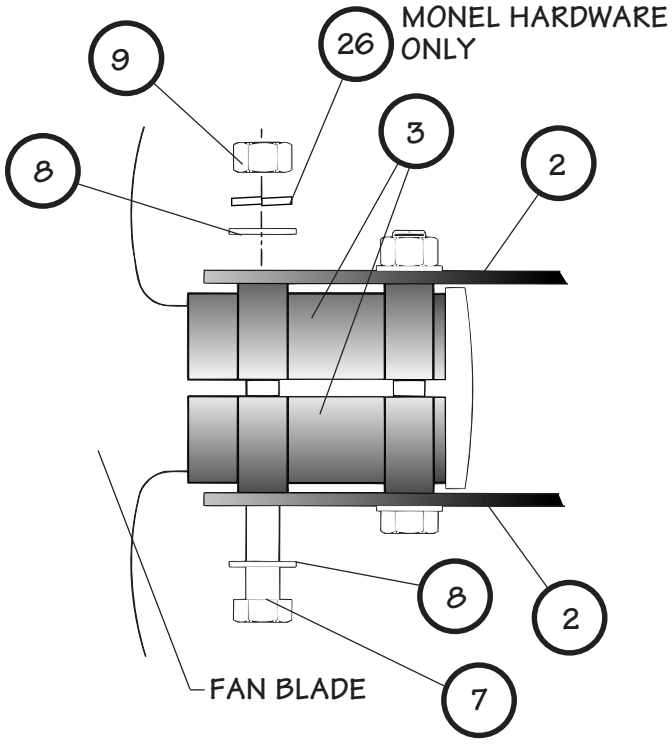


Figure 4

Fan Assembly

4—Do not tighten blade clamp hardware until all the blades are installed. Repeat steps 3 and 4 until all blades are installed in the hub.

5—Position the fan blades so that arrow showing direction of rotation is on the air discharge (top) side of the fan.

6—Pull each blade as far from the center of the fan as the blade clamp bolts and safety shoulder will allow.

7—Select a position on the fan circumference and rotate each blade to this location when setting or checking blade pitch. The blade pitch is set within 2" of the blade tip. Place a bevel protractor on top of a parallel sided straight edge that extends the full width of the blade to measure the fan blade pitch. See **Figure 5**.

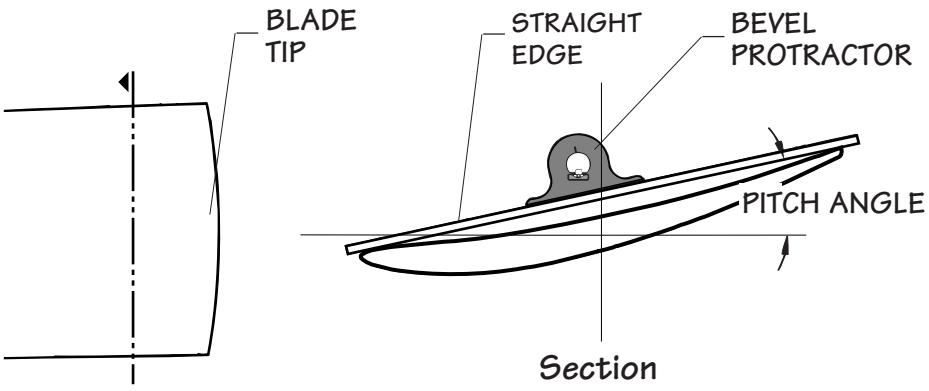


Figure 5

8—Set the bevel protractor at the specified trial pitch angle supplied by The Marley Cooling Tower Company for your fan (see page 2). The trial blade pitch angle is the calculated setting for rated design conditions. Water rate, heat load and/or air density other than rated design conditions can vary the brake horsepower of the fan.

9—Support the blade at the tip to maintain a proper plane of rotation while holding the pitch angle. Progressively tighten all 3/4" nuts **9** at the blade clamp to 120 ft·lb$_f$ (163 N·m) torque. Recheck the pitch angle. Blades should be within ±1/4° of the desired pitch. Next, check the tip track variation. The vertical tip track variation from a reference plane of rotation is ±1" (25 mm) for 264" through 360" fans and ±1 1/4" (32 mm) for 10 meter fans. If the tip track variation is off, support the blade tip higher when tightening the blade clamp bolts.

10—Repeat step 9 for all blades.

Fan Operation

1—Bump the fan motor and check for correct rotation. Rotation should be clockwise when viewed from the air discharge side. Start and operate the fan until the motor and Geareducer have reached operating temperature (approximately 30 minutes).

2—Measure the operating voltage and amperage for use in calculating motor horsepower by the following equation:

$$HP_A = \frac{VOLTS_A \times AMPS_A}{VOLTS_N \times AMPS_N} \times HP_N$$

HP_A = Actual Horsepower
$VOLTS_A$ = Actual Volts
$AMPS_A$ = Actual Amperage
$VOLTS_N$ = Nameplate Volts
$AMPS_N$ = Nameplate Amperage
HP_N = Nameplate Horsepower

3—The calculated horsepower should be close to the contract horsepower specified by The Marley Cooling Tower Company. Measurements used in these calculations ***must*** be made with the specified rate of hot water flowing through the towers.

△ **Note**

Measurements taken on motors operating with Variable Frequency Drive controls may read up to 15% high from errors in measuring the approximated sine wave. Instruments capable of measuring a squared off wave form accurately should be used for measuring power in this situation.

4—Adjust fan pitch as required to obtain the desired motor load. If blades are repitched, nuts must be retightened to 120 ft·lb$_f$ (163 N·m) torque. Record the final pitch angle on page 2.

△ **Caution**

When checking and/or changing blade pitch or cycling fan in normal operation, do not exceed 30 sec/hour total motor starting time as motor may be overheated.

Routine Maintenance

Preventive maintenance will prolong useful life and assure continued trouble-free operation.

1—Check, and if necessary, retighten blade clamping hardware to the prescribed torque at six-month intervals.

2—Inspect the fan for damage from striking debris or corrosive attack at the same time the torque is checked. Remove any accumulation of scale or dirt if there are indications balance is affected.

3—If it is necessary to disassemble the fan for any reason, blade clamp bolt threads and nut bearing surfaces must be coated with anti-seize thread lubricant before reassembly and tightened to the prescribed torque.

Fan Service

When writing the Marley sales office or representative for repair or replacement parts, please refer to the tower serial number.

Replacement blades can be installed without field rebalancing. The fan diameter and blade letter code (see page 6) are required when ordering replacement blades.

If rebalancing is required, trial and error attachment of balance weights to the fan hub may produce a satisfactory dynamic balance. If this is not satisfactory, return the complete fan hub assembly to The Marley Cooling Tower Company for factory rebalance. Obtain a ***"Customer Return Material"*** tag from your Marley sales office or the representative in your area.

Parts List

300 Series Stainless Steel Hardware

Item	Description
1	Center Hub
2	Hub Plate
3	Blade Clamp
4	Cap Screw 5/8" x 1 1/2" 300s SS
5	Flat Washer 5/8" 300s SS
7	Bolt 3/4" x 8 1/2" 300s SS
8	Flat Washer 3/4" 300s SS
9	Nut 3/4" self-locking 300s SS
00	Fan blade

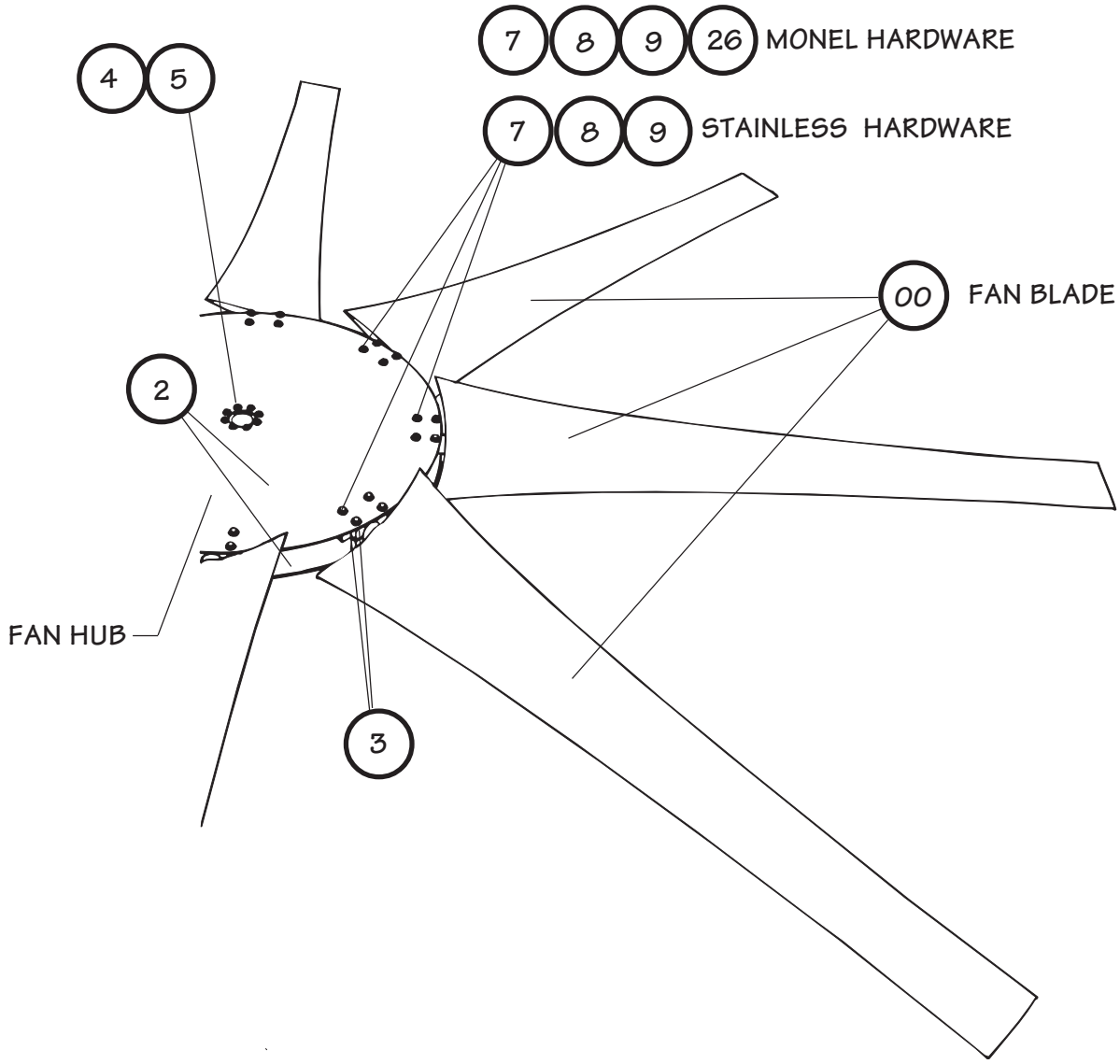
316 Stainless Steel Hardware

1	Center Hub
2	Hub Plate
3	Blade Clamp
4	Cap Screw 5/8" x 1 1/2" 316 SS
5	Flat Washer 5/8" 316 SS
7	Bolt 3/4" x 9" 316 SS
8	Flat Washer 3/4" 316 SS
9	Nut 3/4" self-locking 316 SS
00	Fan blade

Monel Hardware

1	Center Hub
2	Hub Plate
3	Blade Clamp
4	Cap Screw 5/8" x 1 1/2" monel
5	Flat Washer 5/8" monel
7	Bolt 3/4" x 8 1/2" monel
8	Flat Washer 3/4" monel
9	Nut 3/4" monel
26	Lock Washer 3/4" monel
00	Fan blade

Fan Components



Marley Cooling Tower

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