ATTRITION TEST FOR DELETERIOUS MATERIAL IN ICE CONTROL SAND

1. SCOPE

1.1 This method covers the laboratory determination of the percentage of deleterious material in ice control sands by carrying out the Attrition test.

2. RELEVANT DOCUMENTS

2.1 MTO Method LS-602

2.2 MTO Report EM - 26, An Attrition Test for Evaluating Dirt Content of Winter Ice Control Sand, February 1979.

3. APPARATUS

3.1 DRYING OVEN: A thermostatically controlled drying oven capable of being maintained continuously at a temperature of 110 ± 5°C.

3.2 BALANCE: Sensitive to 0.1 g and having a capacity of 1000 g.

3.3 SIEVE: 75 µm.

3.4 CONTAINERS: Suitable for drying test samples.

3.5 ATTRITION MACHINE: Conforming in all its essential characteristics to the design shown in Figure 1 to 5. The machine shall consist of a vertical shaft with paddles attached at one end. The other end shall be attached to an electric motor capable of rotating the shaft at a speed of 390 ± 10 rpm under load.

4. TEST SAMPLE

4.1 Samples for attrition are to be obtained from materials to be tested by use of a sample splitter or the method of quartering. The test sample shall be the end result of the sampling method and, when dry, should weigh between 490 and 520 g. Under no circumstances should an attempt be made to select samples of an exact predetermined mass.

5. PROCEDURE

5.1 Oven dry the test sample to constant mass. Weigh to the nearest 0.1 g and record the mass as the original mass.

5.2 Set the Attrition test sample tank so that there is a clearance of 5 mm between the bottom of the attrition shaft and the bottom of the tank.

5.3 Place the test sample in the tank and add 175 mL of water and cover with the lid. Run the attrition machine at 390 rpm for 10 min.

5.4 Lower the tank, wash the material on the lid and paddles into the tank with a wash bottle, and wash the sample onto a 75 µm sieve.

5.5 Wash the sample over the 75 µm sieve as described in MTO Test Method LS-602 and oven dry the material retained to constant mass.

5.6 Weigh the oven-dry sample to the nearest 0.1 g.

5.7 Record data on Attrition Test Data Card (Figure 6).

6. CALCULATION

6.1 Calculate the percentage of deleterious material (loss by attrition and washing) as follows:

$$A = \frac{\text{mass of pass 75 µm sieve}}{\text{mass of original sample}} \times 100 = \frac{W_1 - W_2}{W_1} \times 100$$

where: A = loss by attrition and washing, percent

W_1 = original mass of sample, g

W_2 = mass of retained 75 µm sieve after washing, g

7. REPORTING OF RESULTS

7.1 Report the percentage of deleterious material to the nearest 0.1 percent.

8. GENERAL NOTES

8.1 Care should be taken to ensure that there is no loss of material or water by splashing in the Attrition machine and that all material is washed from the attrition paddles into the sample tank.

8.2 Tap water at room temperature may be used in the test. It is important that exactly 175 mL of water is used since smaller or greater values may have a significant affect on the test result.

8.3 This test includes the pass 75 µm material in the original sample as deleterious material.

8.4 Since a 500 g sample is used, the washing procedure after test may not remove all the pass 75 µm material from very fine sands. If this is suspected, the oven dry sample, after test, should be re-sieved. Any additional pass 75 µm material should be discarded, and the oven dry sample mass (retained) used for calculation purposes. A note should be made on the data card.

9. PRECISION

9.1 Two test results on a sample of sand should not have a difference of greater than one percent. If a greater difference than one percent is obtained, the sample should be re-tested.

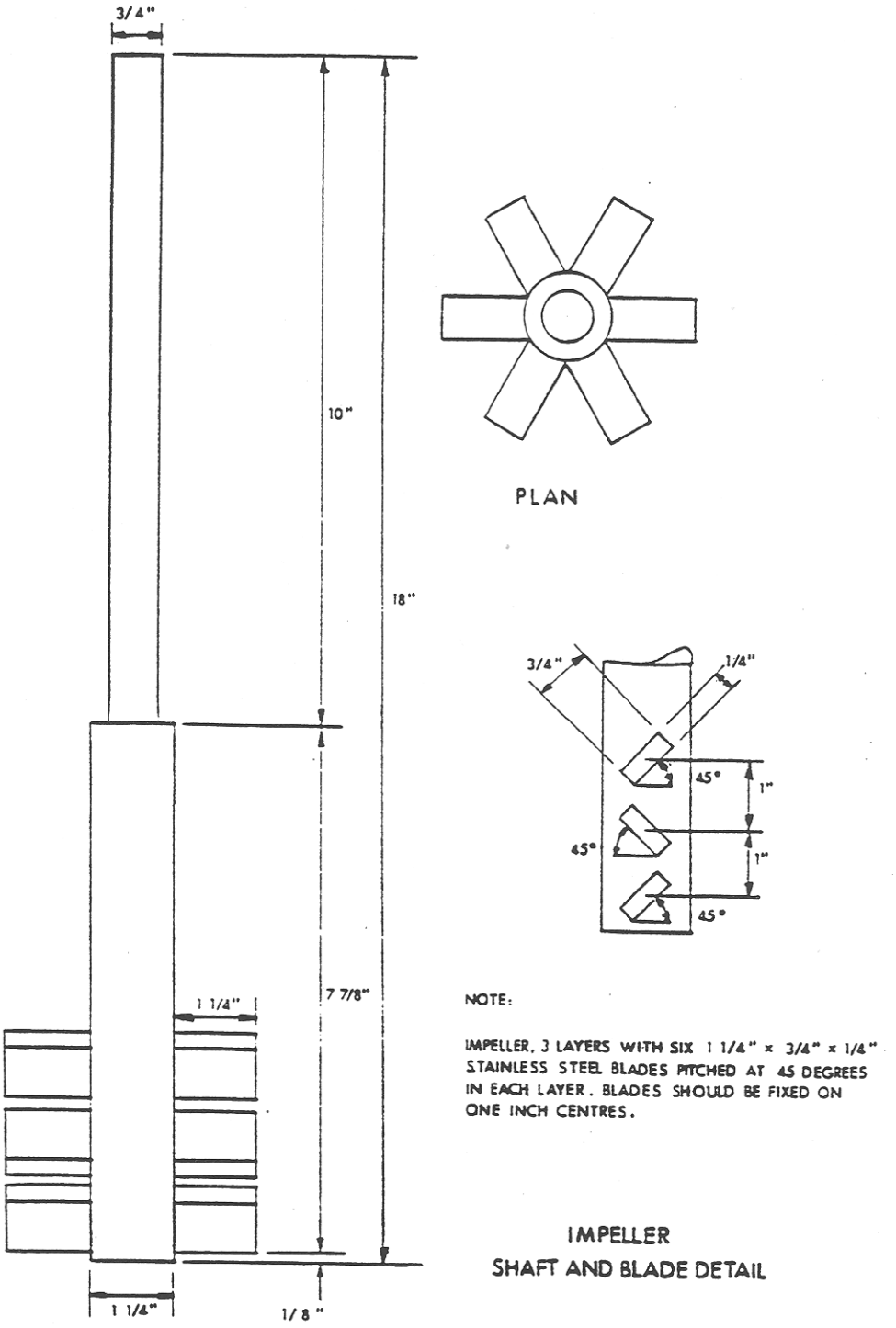

Figure 1 Shaft And Blade Detail

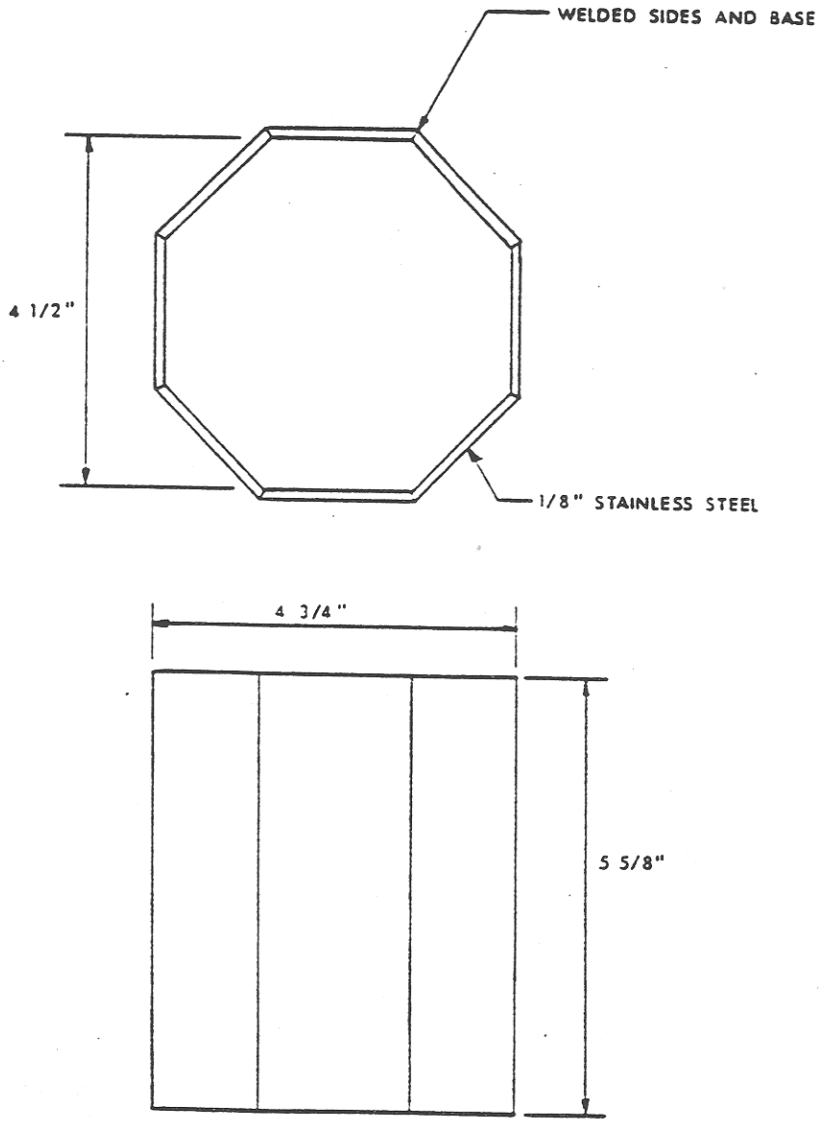

Figure 2 Octagonal Tank

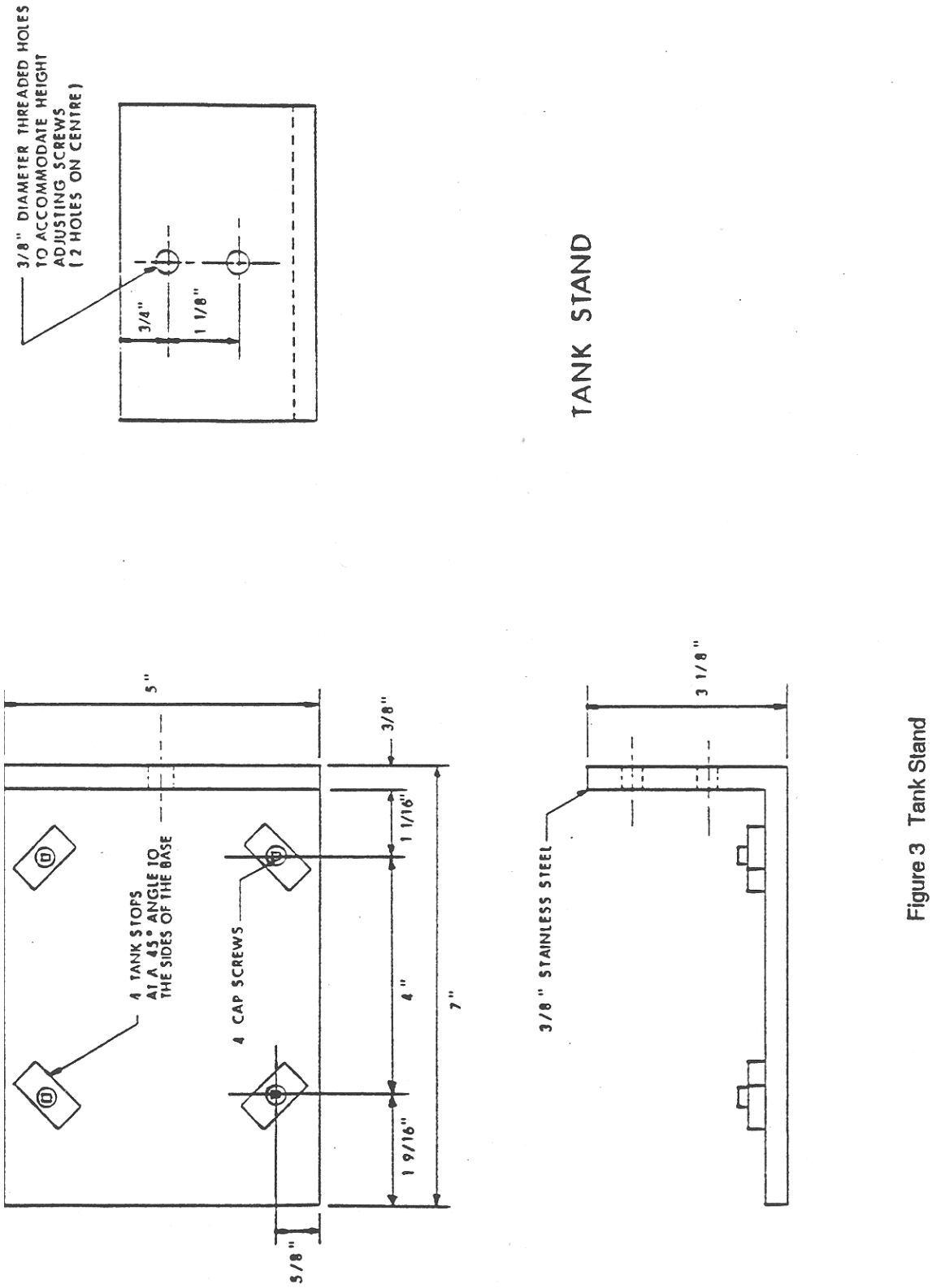

Figure 3 Tank Stand

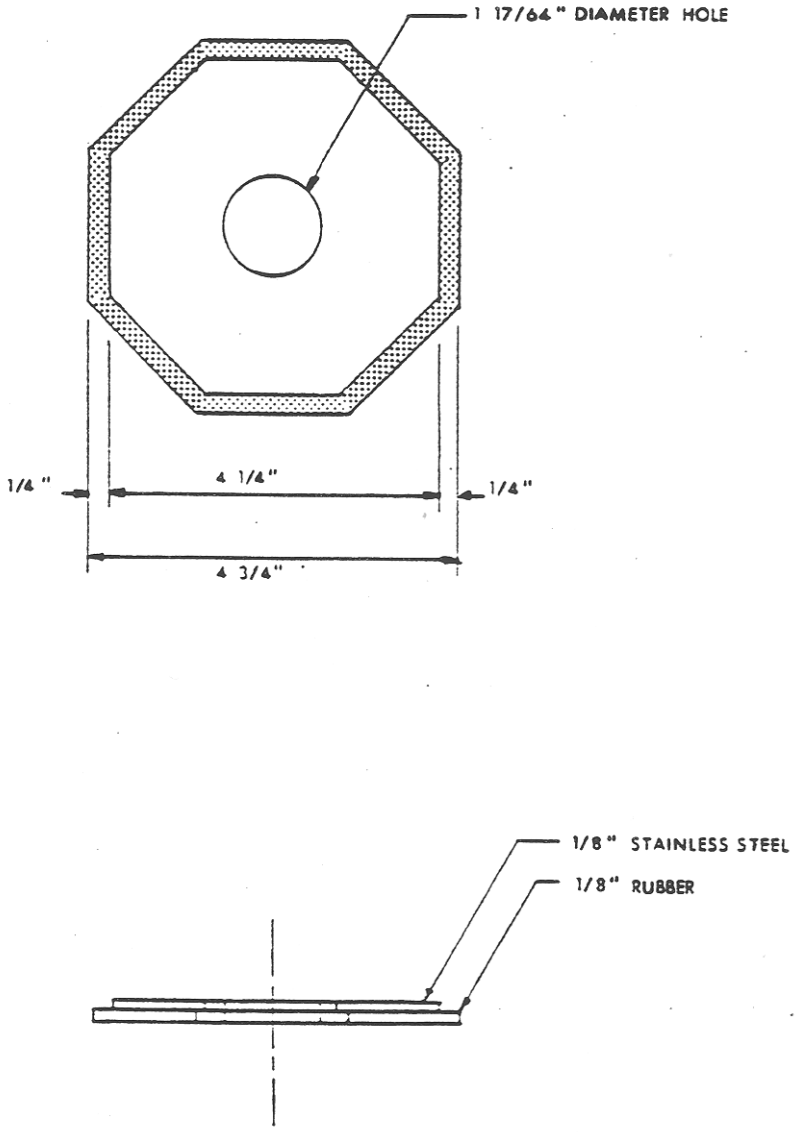

Figure 4 Tank Lid

Figure 5 Attrition Apparatus

Ministry of Transportation Ontario

ATTRITION TEST

LAB. NO.	ORIGINAL MASS g	MASS AFTER TEST g	LOSS g	PERCENT LOSS

DATE _____ OPERATOR _____

REMARKS

PH-CC-408 90-01

Figure 6 Attrition Test Data Card