OBJECTIVE SHEET

TROWEL MACHINES 7

INTRODUCTION

Marvin Whiteman Sr., invented the first power trowel in 1939. Since that time power floats and trowels have been widely used to finish large areas of concrete flatwork. There are many advantages to power troweling. While a cement mason using hand tools can finish approximately 300 to 600 square feet a day, a walk-behind power trowel can finish approximately 700 to 1500 square feet per day. The amount of area covered depends on numerous factors, such as the nature of the job, weather conditions, and the efficient use of the trowel machine.

FOCUS ASSIGNMENTS

FOCUS ASSIGNMENTS

1. Your instructor will provide you with magazines or catalogs that feature trowel machines.

2. Compile a list of features found on these machines. Your instructor will lead a discussion about the importance of those features.

UNIT OBJECTIVE

After completing this unit, you will show the following competencies by mastering the activities on the Assignment Sheet and Job Sheets and by scoring at least 85% on the Written Test.

SPECIFIC OBJECTIVES

1. State the purpose of power floating.
2. State the purpose of power troweling.
3. Identify types of power trowels.
4. Describe types of walk-behind machines.
5. Describe features of ride-on machines
6. Describe the different types of blades used on a power trowel.
7. Describe the functions of different power trowel blades. (Assignment Sheet)

8. List guidelines for maintenance of power trowels.

9. List spare power trowel equipment to always have on hand.

10. List key safety measures for working with power trowels.

11. Name safety features found on power trowels.

12. Perform maintenance on a walk-behind trowel machine. (Job Sheet 1)

13. Perform blade maintenance on a walk-behind trowel machine. (Job Sheet 2)

14. Finish a slab with a power trowel. (Job Sheet 3)

TROWEL MACHINES

OBJECTIVE 1

State the purpose of power floating.

Floating allows the concrete to cure from the bottom up by opening the concrete surface. Floating helps eliminate imperfections on the surface of the slab, embeds aggregates and brings mortar to the top, solidifying the concrete. Floating involves these procedures:

- The cement mason can begin floating when the concrete has set to the point that it can support the weight of the machine (Figure 1).

FIGURE 1

- The concrete is ready when a footprint on the slab surface leaves only a slight indentation of about ⅛ inch or less.
- The slab surface should be free of bleed water.
- The cement mason should operate the machine at low speed, raising the rpm as the slab begins to harden.

  ✔ **NOTE:** Never float wet concrete at high rpms.

- Blades should be flat or slightly elevated at no more than ⅛ inch.

OBJECTIVE 2

State the purpose of power troweling.

WORDS YOU SHOULD KNOW	
pitching	Tilting the trowel blade.

After floating, the surface is troweled in order to seal it. Guidelines for finishing are as follows:

- Cement masons choose a floor finish appropriate for the type of traffic supported by the slab.

  EXAMPLE: For forklift traffic, a warehouse floor may require a smooth burnished finish.

- Pitching the blades of the machine places more pressure on the trailing edge of the blade.

- Multiple passes may be necessary to accomplish the desired effect.

- The machine operates at various speeds while finishing the floor.

  ✔ **NOTE:** Raising the pitch of the blades will be necessary as the concrete hardens.

- Power trowels can perform both floating and finishing.

OBJECTIVE 3

Identify types of power trowels.

Walk-Behind (Figure 2)

FIGURE 2

- Size ranges from 24-54 inches with one set of rotating blades
- Fits areas where ride-on trowels aren't practical

  EXAMPLE: An area where multiple protrusions are present.
- Cost less than ride-on models
- Does not finish as much area as a ride-on trowel

Ride-On

- The extra weight of a ride-on trowel compresses the concrete making it denser
- Can finish large areas of floor with one cement mason (Figure 3)

FIGURE 3

- Makes a flatter floor than walk-behind or hand troweling.
- Sizes range from 30-60 inches; a double-rider trowel has two vertical rotating shafts while a triple-rider has three vertical rotating shafts; Each shaft has its own set of blades; comes in a wide variety of sizes.
- Ride-on trowels have a forward, backward, and side-to-side motion.

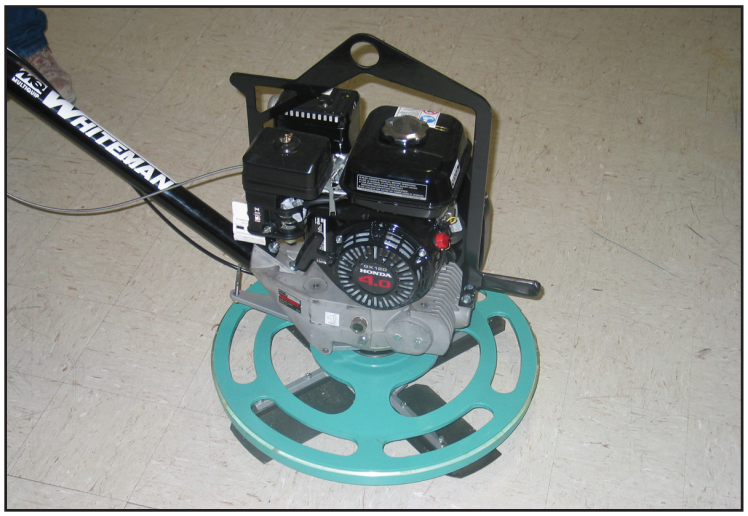
OBJECTIVE 4

Describe types of walk-behind machines.

Walk-behind machines can be powered by propane, gas, or electricity. Heavy-duty machines are always gas or propane-powered.

- **Edging Machine**—compact and lightweight and used for small areas such as basements or narrow doorways. The blades are designed for work around obstructions such as mechanical or electrical (Figure 4).

FIGURE 4



- **Epoxy troweling machine** — uses lower rpms and lower weight to embed material.

  ✔ **NOTE:** Non-metal blades are sometimes used.

- **Standard troweling machine** — used in normal operations such as slabs, parking lots, etc.

OBJECTIVE 5

Describe features of ride-on machines.

- Hydrostatic or conventional steering
- Double and triple rider—two or three rotors (Figure 5)

FIGURE 5

- Overlapping and non-overlapping designs

  ✔ **NOTE:** Non-overlapping riders can be equipped with pan floats.

- Spray systems for retardants

- Lighting

- Transport accessories (Figure 6)

FIGURE 6

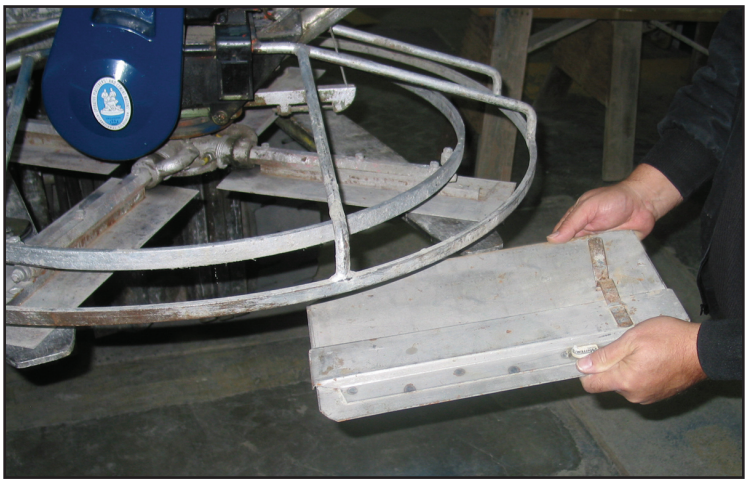
OBJECTIVE 6

Describe the different types of blades used on a power trowel.

Trowel machines may use four types of blades: float, finish, pan float or a combination blade.

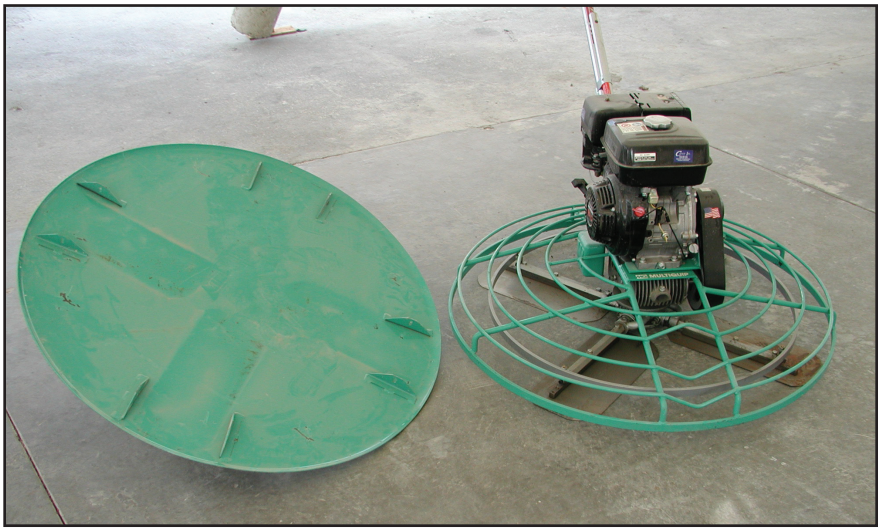
- **Float blades**—This is a blade attachment used after concrete has been poured and screeded. Its purpose is to push the aggregate down below the surface and bring fines to the top. These blades are about 10" wide. They flatten the surface better than the other blades by bringing more blade surface on the slab. Blades are run as flat as possible (Figure 7).

FIGURE 7



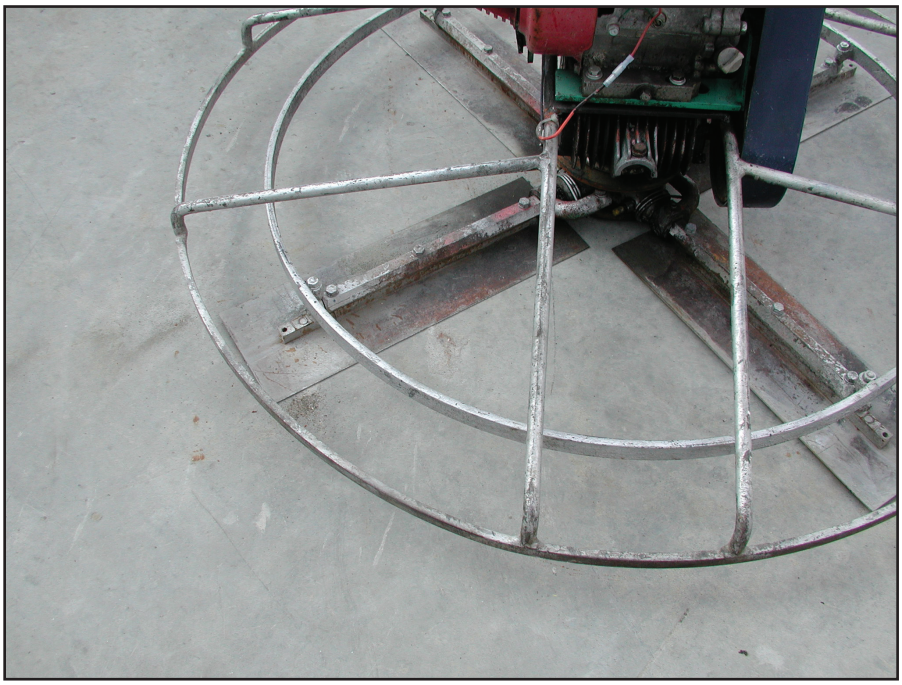
- **Pans**—A float pan, may be substituted for float blades. It is a circular blade designed to allow more surface to contact the slab leaving a flatter floor than floats or combination. Float pans are often used in attaining high FF numbers (Figure 8).

FIGURE 8



- **Finishing blades**—These are used after the floating procedure. They are pitched in a way to apply more pressure than float blades in order to compact the surface and seal the surface with a high-grade steel much like hand troweling after hand floating the surface. Increasing the angles of the blade puts greater pressure on the concrete surface as it hardens, just as in handwork. The blade angles must be increased as the concrete hardens to create pressure on the concrete surface. If the blades are pitched too much, however, a washboard effect may result. In such an occurrence, the operator should reduce the blade's pitch and go over the surface again (Figure 9).

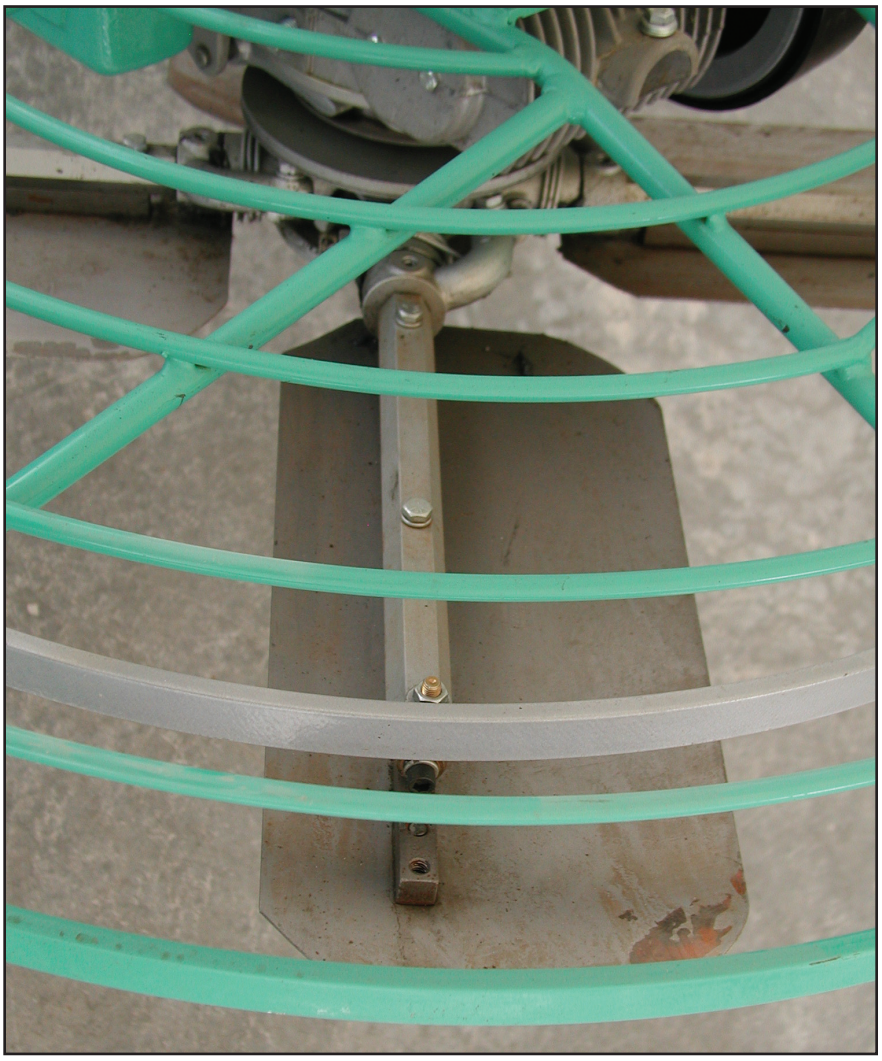
FIGURE 9



✔ **NOTE:** A trowel blade pitched at too great an angle will produce an unsmooth surface called a “washboard” or “chatter” effect. To smooth the surface, reduce the tilt and trowel the area again.

- **Combination blades**—These blades both float and finish a surface. They are more expensive than purchasing the finishing or floating blades, but the operator does not have to stop the troweling process to change blades. One edge of the blade is flat allowing it to both float and finish a surface (Figure 10).

FIGURE 10



OBJECTIVE 7

Complete the Assignment Sheet.

OBJECTIVE 8

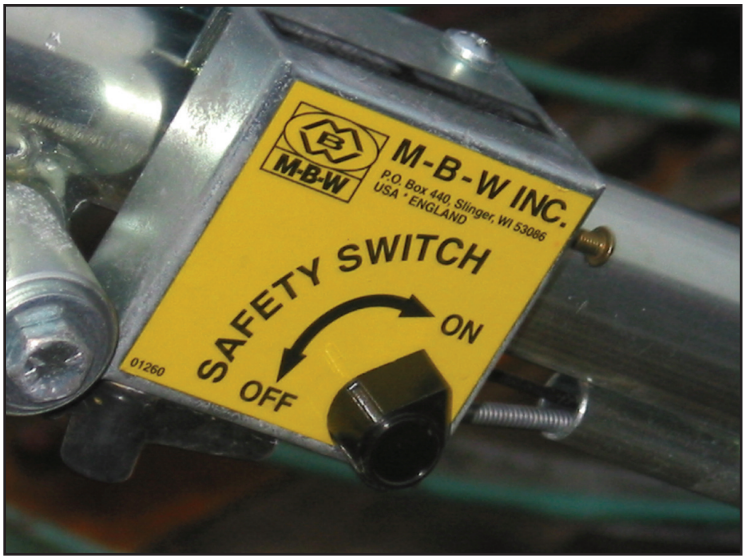
List guidelines for maintenance of power trowels.

To keep power trowels at top efficiency, certain maintenance procedures need to be followed. A poorly maintained machine can result in uneven floors. If the engine is not regularly maintained, it may not start or may shut down during the job.

Maintenance guidelines:

- Check the safety or kill switch (Figure 11).

FIGURE 11



- Check spark plugs regularly to ensure good performance.
- Weekly, clean battery tops and hold-downs, and check acid levels.
- Check oil level of gearbox and maintain levels at manufacturer's recommendations.
- Check the gas (Figure 12).

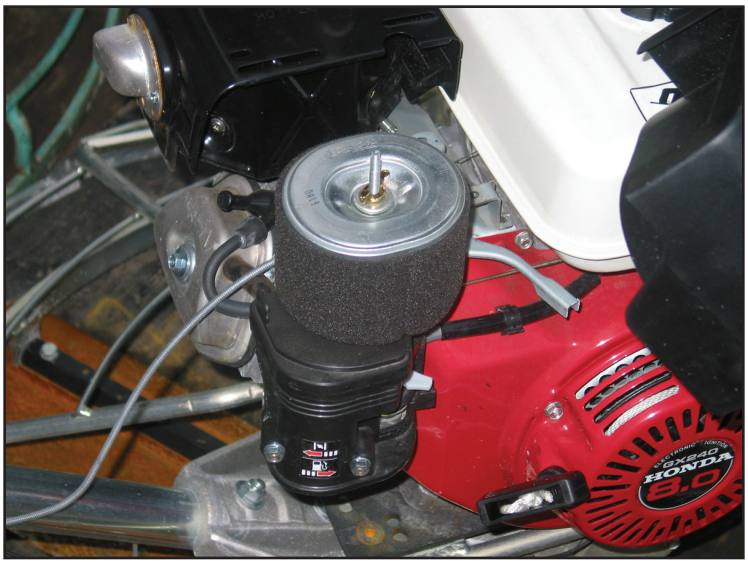
FIGURE 12

- Check engine oil level daily and add oil if needed and clean or replace oil filter if needed (use non-solvent oil base for cleaning) (Figure 13).

FIGURE 13

- Clean air filter daily (Figure 14).

FIGURE 14



- Grease all fittings (Figure 15).

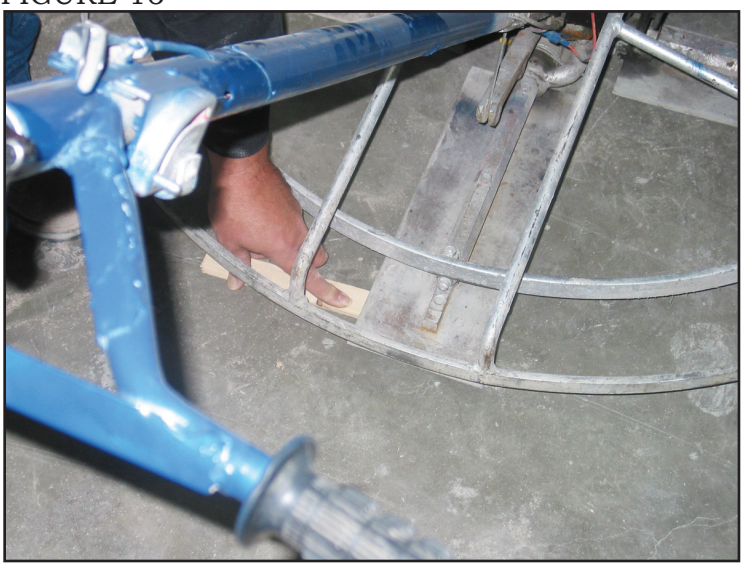
FIGURE 15

- Engine should be properly tuned.

✔ **NOTE:** Improperly tuned engines can cause elevated levels of carbon monoxide emissions.

- Check blades daily. Adjust pitch or shim as needed (Figure 16).

FIGURE 16



OBJECTIVE 9

List spare power trowel equipment to always have on hand.

Power troweling equipment has made it possible for small crews to complete much larger jobs than can be completed by crews using hand tools. However, if completion of the job depends on the use of power equipment, spare parts must be available in case of a breakdown.

- Spark plugs
- Starting cord
- Spare parts
- Spare machine

OBJECTIVE 10

List key safety measures for working with power trowels.

When using a power trowel, certain precautions must be followed to prevent injury. Because of the sharp blades, the operator must maintain control of the handle to prevent the trowel from spinning out of control. Due to the hazards in operating power trowels, OSHA requires that power trowels have dead man or kill switches. These switches automatically shut off the trowel if the operator loses control.

Power trowel operators should follow these safety precautions:

- Wear safety shoes and earplugs.
- Maintain a firm footing to prevent slipping or loss of control.
- Always turn off the engine and disconnect spark plugs before doing maintenance work.
- If a gasoline engine powers the trowel make sure that the area being finished is well ventilated to prevent the accumulation of carbon monoxide fumes.
- Keep a safe distance from other workers.

OBJECTIVE 11

Name safety features found on power trowels.

All modern walk-behind and ride-on power trowels contain ergonomic features to protect the cement mason such as adjustable seats, handles, etc.

- **Centrifugal kill switch** — kills engine on walk-behind trowel within one rotation if operator loses control or grip on handle.

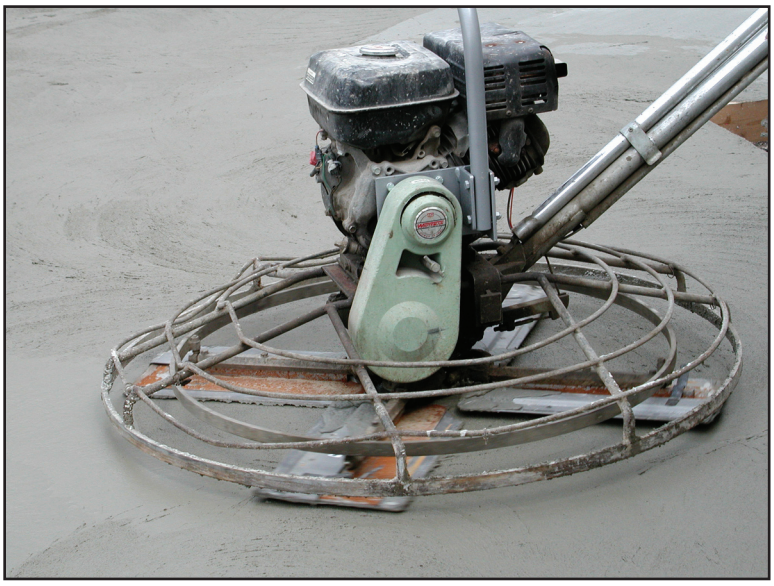
  ✔ **NOTE:** Ride-on trowel machines also have kill switches that will instantly stop the engine when activated by the cement masons.

- **Outer ring or guard ring** — keeps trowel machine blades from coming in contact with obstructions that may be protruding from the slab.

  EXAMPLE: Plumbing or electrical fixtures

- **Cage** — protects worker from stepping or falling into the blade (Figure 17).

  FIGURE 17



- Use lifting bar or pick point for picking up machine (Figures 18 & 19)

FIGURE 18

FIGURE 19

OBJECTIVE 12 **Complete Job Sheet 1.**

OBJECTIVE 13 **Complete Job Sheet 2.**

OBJECTIVE 14 **Complete Job Sheet 3.**

ASSIGNMENT SHEET

TROWEL MACHINES 7

Name _____Score_____

OBJECTIVE 7

Describe the different types of blades used on a power trowel.

BASIC SKILLS


Writing

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

As you have learned in this unit, trowel machines can perform a variety of tasks on a job. Use what you've learned in this unit to answer the questions below.

1. What is the function of a float blade?

_____

_____

_____

2. What is the function of a pan?

_____

_____

_____

3. What is the function of finishing blades?

_____

_____

_____

4. If the finishing blades are pitched too much, what might be the result?

_____

_____

_____

5. What is the function of combination blades?

_____

_____

_____

6. What is the advantage of using combination blades?

_____

_____

_____

JOB SHEET 1

TROWEL MACHINES

7

Name _____Score_____

OBJECTIVE 12

Perform maintenance on a walk-behind trowel machine.

BASIC SKILLS

Employability

EQUIPMENT AND SUPPLIES

- Walk-behind trowel machine
- Basic tool kit including wrenches, screwdriver, spark plug wrench, etc.
- Replacement parts including spark plugs, belts, etc.
- Oil
- Fuel
- Grease gun and grease
- Clean rags
- Personal Protective Equipment

✔ **NOTE:** Refer to CFR (Code of Federal Regulations) 1926 Construction Industry Safety and Health Regulations.

PROCEDURE

Yes No

❑ ❑ 1. Check the oil.

✔ **NOTE:** Refer to the operators manual for the manufacturer recommendations.

❑ ❑ 2. Check the fuel.

❑ ❑ 3. Change the spark plug and set gap.

❑ ❑ 4. Check and clean the air filter.

❑ ❑ 5. Check the kill switch for proper operation.

❑ ❑ 6. Have the instructor check your work.

❑ ❑ 7. Clean the work area and return tool and equipment to proper storage..

SKILL TEST RECORD

PRODUCT EVALUATION

Evaluator note: Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

Safety	4	3	2	1
Use of tools	4	3	2	1
General appearance	4	3	2	1
Overall performance	4	3	2	1

AVERAGE RATING

Evaluator note: To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

KEY

4 **Skilled** — Can perform job with no additional training
3 **Moderately Skilled** — Has performed job during training program; limited additional training may be required
2 **Limited Skill** — Has performed job during training program; additional training is required to develop skill
1 **Unskilled** — Is familiar with process, but is unable to perform job

EVALUATOR'S COMMENTS

JOB SHEET 2

TROWEL MACHINES

7

Name _____Score_____

OBJECTIVE 13

Perform blade maintenance on a walk-behind trowel machine.

BASIC SKILLS

Employability

EQUIPMENT AND SUPPLIES

- Tin Snips
- File
- Appropriate wrenches
- Shims
- Grease gun
- 90 Weight oil
- Personal Protection Equipment

✔ **NOTE:** Refer to CFR (Code of Federal Regulations) 1926 Construction Industry Safety and Health Regulations.

PROCEDURE

Yes No

❑ ❑ 1. Inspect and rotate the blades.

Yes No

❑ ❑ 2. Remove finned or worn out edges (Figure 1).

FIGURE 1

❑ ❑ 3. Trim with tin snips and file edges straight (Figure 2).

FIGURE 2

✔ **NOTE:** Rotate or change blades if necessary.

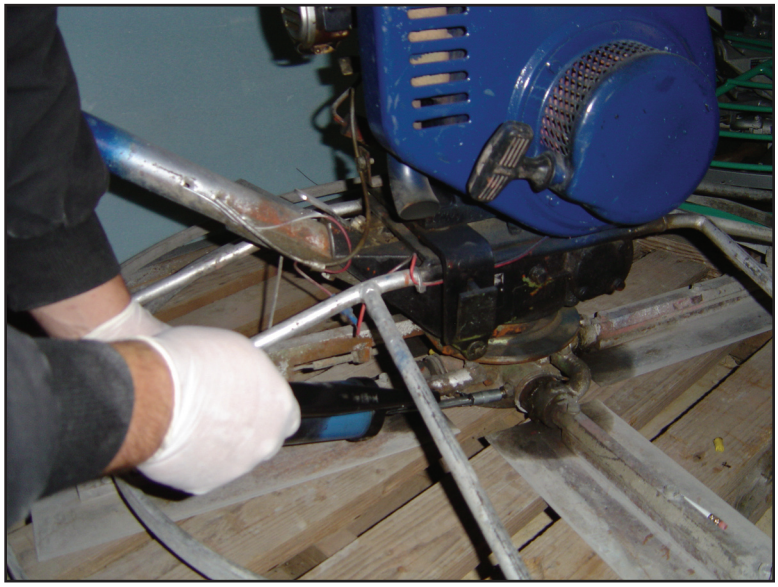
❑ ❑ 4. Inspect the pitch alignment and adjust.

❑ ❑ 5. Shim the blades if necessary.

Yes No

❑ ❑ 6. Grease the fittings (Figure 3).

FIGURE 3



❑ ❑ 7. Check the gear box oil and fill if necessary.

❑ ❑ 8. Have the instructor check your work.

❑ ❑ 9. Clean the work area and return tools and equipment to proper storage.

SKILL TEST RECORD

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EVALUATOR'S COMMENTS

JOB SHEET 3

TROWEL MACHINES

7

Name _____Score_____

OBJECTIVE 14

Finish a slab with a power trowel.

BASIC SKILLS

Employability

EQUIPMENT AND SUPPLIES

- Bucket of water
- Brush
- Margin trowel
- Power trowel
- Slab ready for power troweling
- Personal Protective Equipment

✔ **NOTE:** Refer to CFR (Code of Federal Regulations) 1926 Construction Industry Safety and Health Regulations.

PROCEDURE

Yes	No		
❑	❑	1.	Perform routine maintenance on the trowel machine.
❑	❑	2.	Check the blades and attach the float shoes, if applicable.
❑	❑	3.	Check the slab to determine that it is ready for troweling
❑	❑	4.	Place the machine on the slab.
❑	❑	5.	Start the machine and float the first bay using an appropriate pattern overlapping each pass.
❑	❑	6.	Float a second time repeating the process and changing the direction so that you are moving perpendicular to the first floating.

Yes No

❑ ❑ 7. Remove the float blades and continue the process starting perpendicular to your second float pattern.

✔ **NOTE:** As you reach the final finishing stage, you will need to clean any accumulated material from the blades. Make sure the material is not left on the slab.

❑ ❑ 8. Before restarting the machine, kick the blades to break the bond between the blades and the surface of the slab.

❑ ❑ 9. Restart the machine and continue troweling until you have achieved the desired surface.

❑ ❑ 10. Have your instructor check your work.

❑ ❑ 11. Clean trowel machine blades, ring and hub.

❑ ❑ 12. Perform post maintenance.

❑ ❑ 13. Put away tools and clean the work area.

SKILL TEST RECORD

PRODUCT EVALUATION

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