CENTER FOR MECHANICAL ENGINEERING STUDIES, UNIVERSITI TEKNOLOGI MARA, PULAU PINANG

Program	**:**	**Diploma in Mechanical Engineering**
Course	**:**	**Workshop Practice II**
Code	**:**	**MEM 261**

WORKSHOP PRACTICE II LABORATORY SHEET (SAND TESTING PREPARATION (GREEN SAND)

1.0 OBJECTIVE:

a. To measures the green compression strength and permeability of moulding material of sand casting.
b. To analyze the relationship between green compression strength and permeability of molding material.
c. To predict the potential defect which may occur from improper strength and permeability of mold material.

2.0 THEORY:

2.1 Green Compression Strength

Green compression strength refers to the stress required to rupture the sand specimen under compressive loading. The sand specimen required to rupture the sand specimen under compressive loading. The sand specimen is then taken out of the specimen tube and is immediate (any delay causes the drying of the sample which increases the strength) put on the strength testing machine and the force required to cause the compression failure is determined. The green strength of sand is generally in the range of 0.03 to 0.16 MPa.

2.2 Permeability

The rate in cc/min at which air will pass through the standard compression specimen is used as an index of permeability Standard permeability is determined by measuring the time necessary for 2000 cm^3 of air to pass through the standard specimen while it is confined in the specimen tube and under a pressure of 10 gm/cm^2 if the time is determined the permeability number can be calculated from the formula:

$$P = (V. H) / (p. A. T)$$

where; V: volume of air = 2000 cm^3

H: height of sand specimen = 2 inches

P: pressure = 10 gm/cm^2

A: cross sectional area of the sand specimen =1in^2

T: time, sec, for 2000 cm^3 air to pass through

The formula reduces to AFS Permeability:

$$P = \frac{3000.7}{T(sec)}$$ for old machine working with Hg

The formula reduces to AFS Permeability For Rıdsdale-Dieter:

$$P = \frac{30557}{\text{air pressure in cm of water x time in (sec)}}.$$

$$= \frac{30557}{pxt}$$

3.0 MATERIALS:

Silica sand	Coal dust	Water	Bentonite
			

4.0 APPARATUS/ EQUIPMENT:

		
i. Sand Rammer	**ii.** Permeability Machine,	**iii.** Universal Sand Strength Testing Machine

5.0 HAND TOOLS:

	
i. Specimen Tube	**ii.** Ruler.

6.0 PROCEDURE:

No.	**Standard Test Specimen Preparation:**
1.	Since the strength of a moulding sand depends greatly on its degree of ramming, the condition of moulding the standard test sample must be carefully controlled.
2.	In laboratory work, reproducing ramming conditions are achieved by the use of a standard sand rammer and specimen tube accessories.
3.	The sand (6.375 to 7.25 kg) is placed in the specimen tube and rammed by impact with three blows of a standard weight.

4.	The ramming device is manually operated and the weight is dropped from a height of 50.8 ± 0.125 mm. Three rams should produce a specimen 50.8 ± 0.8 mm in height and to produce this size of specimen this size of specimen usually sand of 145 to 175 g would be required.
5.	To obtain this height, the weight of the sand should be adjusted. Specimen weight in grams, multiplied by 0.97 x 10^{-2} gives the bulk of the sand in gm/cm^3.
6.	Then, the specimen is removed from the tube by means of a stripping post.

7.0 RESULT AND DISCUSSION:

Perform all the task as an individual and team work.
Students are required to document the working procedure by taking photos during the workshop session (work as an individual and team members).

a. Theoretical Background
   i. Briefly explains the Green Compression Strength.
   ii. Briefly explains the permeability.

b. Describe material selection-material standards, selecting appropriate tools and sizes, performing machining operations, SOP and adhering to working procedures.

c. Present any measurement/ standard calculations/ measurement data/ result/ graph/ sketching, tolerance, or machining parameter etc.
   i. Tabulate the result using table
   ii. Use graph to show the relationship between strength and permeability

d. Identifies and corrects any related issues.

e. Snap, record and describe all the safety procedures, regulations, and personal protective equipment (PPE) relevant to each workshop activities.
based on established standards and codes of practice.
ISO standards or environmental regulations

f. Conclusion and recommendation

i. Describe the relationship between strength and permeability
ii. Discuss possible defect which may occur from improper setting of strength and permeability.
iii. Recognize a need for improvement/modification in the system. Recommend and incorporate innovative ideas in the experimental work or set-up

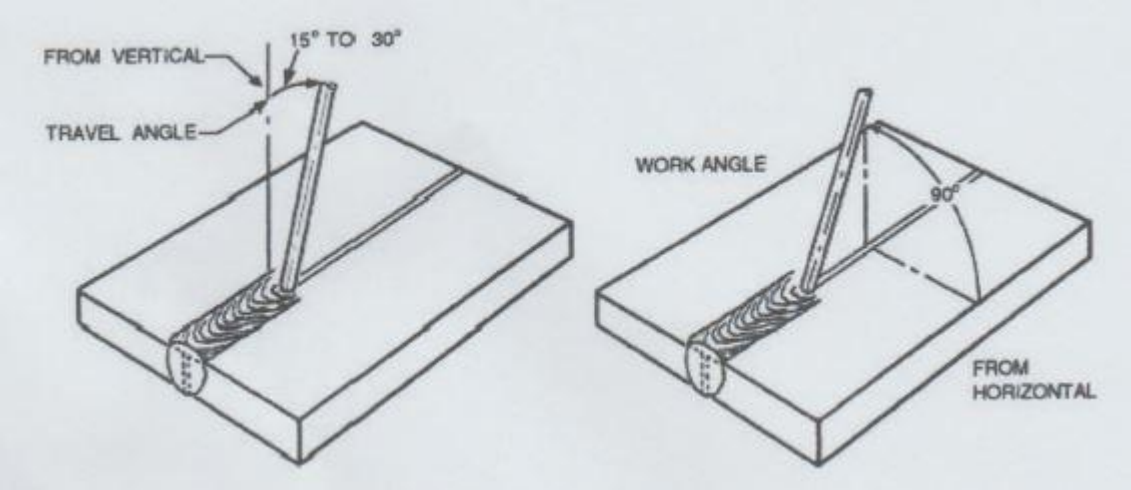
g. References

State all the references that you have been used in order to complete this report.

For technical report:

Prepare the report according to the Technical Report & Rubric Requirements

Appendix A: Drawing



Appendix B: Description of complete project/Welding imperfection defect

Welding Imperfection/Defect (refer appendix A)	**40**	Two (2) defect
		Three (3) defect
		Four (4) defect
		Five (5) defect and above

WELDING IMPERFECTION/DEFECT

1. **Uniformity-(linear and angular misalignment)**
2. **Gas Cavities – (Porosity,blow hole and gas pore)**
3. **Slag Inclusion**
4. **Incomplete Penetration & incomplete filled groove**
5. **Excess Weld Metal**
6. **Undercut**
7. **Spatter**
8. **Poor Stop and Start**

Appendix C: Description of complete project

Complete Project	**10**	Able to complete SMAW and oxy-acetylene welding project.
		Able to complete only SMAW or oxy-acetylene welding project.