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 (FOUNDRY)

1.0 OBJECTIVE:

a. To determine the sand grain size and
b. Calculates the Grain Fineness Number (GFN) for moulding material of sand casting.

2.0 THEORY:

A system has been developed to rapidly express the average grain size of a given sand sample. The Grain Fineness Number (GFN) is the quantitative indication of the grain distribution of the sand sample by carrying out a sand sieve analysis.

3.0 MATERIALS:

Silica Sand, 1 set of 9 sieves (63,90,125,150,180,212,250,355,500,710,1000) plus the sieve pan, Sieve Shaker, Digital Scale Balance, Brush.

4.0 PROCEDURE:

No.	**Standard Test Specimen Preparation:**
1.	Clean the screens on the sieves carefully by turning the sieve face down and striking the rim evenly on the table. Do not touch the screen with your fingers. Do not beat them hard so as not to damage the rim.
2.	Weight the sand sample 100 grams to an accuracy of 0.01 grams.
3.	Place the stack of sieves on the Sieve Shaker Octagon 2000 machine.
4.	The top sieve of the sieve shaker should contain the biggest mesh size.
5.	Put silica sand into the sieve
6.	The sieves are shaken continuously for a period of 15 minutes.
7.	After the shaking operation, the sieves are taken apart and left over sand of each sieve is carefully weighed. Record the weight in column (C) of Table 1.
8.	To calculate the Grain Fineness Number (GFN), use the formula as given.

5.0 DATA COLLECTION

Table 1. Sieve Analysis Data and Calculations

	A	B	C	D	E	F
NO	**Sieve No**	**Opening (Mic)**	**Sand mass (g)**	**Sample %**	**AFS Multiplier**	**AFS Product (C X E)**
1	18	1000			10	
2	25	710			20	
3	35	500			30	
4	45	355			40	
5	60	250			50	
6	70	212			70	
7	80	180			100	
8	100	150			145	
9	120	125			200	
10	170	90			300	
11	230	63			400	
12	PAN					
Total accumulated sand mass (g)			$\sum C$	100 %		$\sum F$
Original Mass of Sample before Sieving (g)						

$$\text{GFN} = \frac{\sum F}{\sum C} 100\%$$

Typical Sand Size:

Coarse GFN 40-100
Fine GFN 100-220

Ferrous Cast

- Typically GFN 70
- GFN < 50 too coarse – poor surface quality in casting
- GFN >100 too fine – low permeability, large surface area

6.0 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 Explain briefly what is GFN.

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.

Plot the following graphs :
i. Between sieve numbers and percentage of mass retained on each sieve.
ii. Between sieve numbers and cumulative percentages of mass left in the the sieve.

d. Identifies and corrects any related issues.

i. Need for improvement/modification in the system.
ii. Based on the GFN value and the distribution obtained, suggest the suitability of the sand for castings.

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. Analyse the relationship of GFN to the wall surface of wall cavity.
Discuss what results mean and what conclusions may be drawn from them.

ii. Recommendation

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