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MANUFACTURE OF BRICK BY USING PARTIAL REPLACEMENT OF SOIL WITH SAW DUST

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Abstract: Soil is a very serious problem to construct the building and industrial establishment and seeks due to soil deficiency in environmental condition. Management of soil is a burning issue due to soil deficiency. The Project emphasizes the sawdust brick is the composition of clay and sawdust .The main objective of this research work was to study the suitability of utilizing sawdust in the manufacture of bricks. The sawdust low cost construction material to the public. The characteristics of sawdust were analyses to study its feasibility in achieving the objective .Brick earth and sawdust in different proportions . The manufactured brick were then tested for crushing strength, water absorption, soundness, drop test, presence of soluble salts, etc. And results were compared with those of ordinary brick.

Keywords Saw dust, Soil, Brick

I. INTRODUCTION

Bricks are masonry units composed of inorganic non-metallic material and are widely used as building components all over the world. The bricks could be sun-dried or burnt. Burnt are usually stronger than sun-dried bricks, especially if they are made of clay material. This is because the burnt bricks, as a result of the heat to which they are usually subjected (about 800-1180oc), become homogeneous, harder and stronger from the ceramic bond produced through the fusion of the silica and alumina clay constituent. It has been ascertained that soils having a clay fraction of between 30 to 40% are considered satisfactory for brick production, with the absence of processing defects after drying and firing such as cracks, fracture, deformation and volume change. The organic matter of admixture such as sawdust, which burnt out when the bricks undergo firing. This category of admixture serves the purposes as they burn out they leaven pores in the product. This permits the control of the bulk density of brick products and help in producing lighter and more porous bricks.

II. MATERIAL USED

Red soil
Saw dust
Water
Weight balance5. Brick mould

III. EXPERIMENTAL INVESTIGATION

1. SPECIFIC GRAVITYOF SOIL

SAM PLE-1

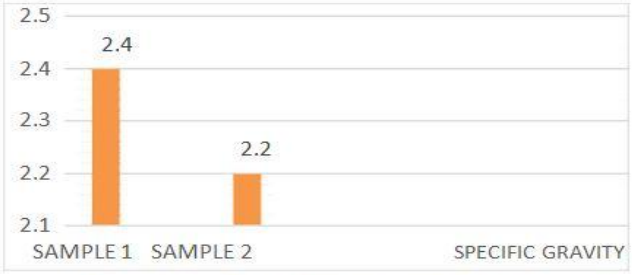
DESCRIPTION	TRAIL-1	TRAIL2	TRAIL3
Mass of pycnometer (M1) gm	688	655	667
Mass of pycnometer and soil (M2) gm	1617	1492	1610
Mass of pycnometer with soil and water (M3) gm	2029	1975	2079
Mass of pycnometer and water (M4) gm	1492	1507	1511
specific gravity G	2.36	2.26	2.51

Result :Average specific gravity, G = 2.4

SAM PLE-2

DESCRIPTION	TRAIL-1	TRAIL-2	TRAIL-3
Mass of pycnometer (M1) gm	688	655	667
Mass of pycnometer and soil (M2) gm	1498	1492	1495
Mass of pycnometer with soil and water (M3) gm	1954	1950	1979
Mass of pycnometer and water (M4) gm	1502	1512	1511
specific gravity G	2.26	2.09	2.30

Result :Average specific gravity, G = 2.2



SPECIFIC GRAVITY BAR CHART

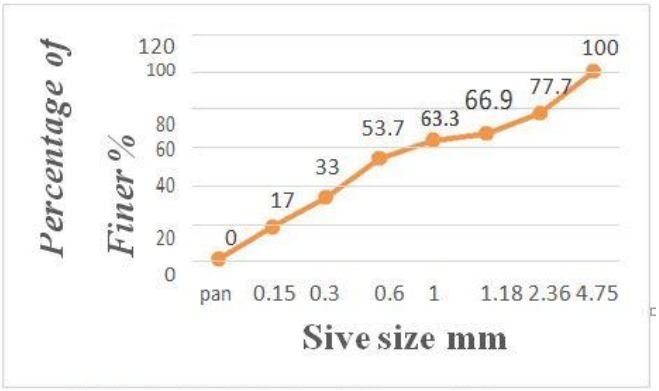
2. GRAIN SIZE ANALYSIS

SAM PLE-1

Sl. No	Sieve size in mm	Weight of soil retained (gm)	Percentage Weight Retained (%)	Cumulative Percentage Retained (%)	Percentage of Finer (%)
1	4.75mm	0.103	10.3	-	100

2	2.36mm	0.120	12	22.3	77.7
3	1.18mm	0.108	10.8	33.1	66.9
4	1mm	0.036	3.6	36.70	63.3
5	0.600mm	0.096	9.6	46.3	53.70
6	0.300mm	0.207	20.7	67	33
7	0.150mm	0.160	16	83	17
8	pan	0.170	17	100	0

Result: Fineness modulus = 3.885

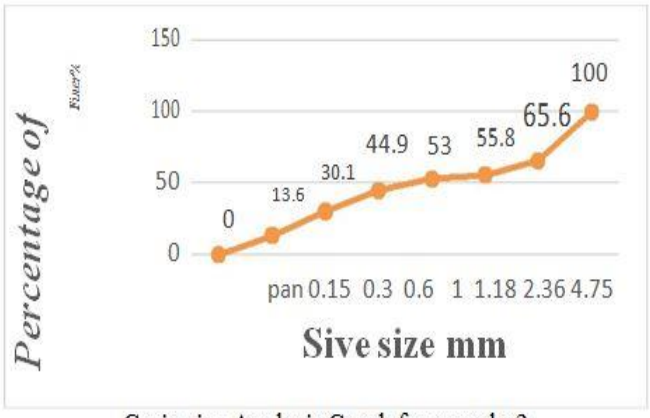


Grain size Analysis Graph for sample-1

SAMPLE-2

Sl. No	Sieve size in mm	Weight of soil retained (gm)	Percentage Weight Retaine %	Cumulative Percentage%	Percentage of Finer (%)
1	4.75mm	0.213	21.3	-	100
2	2.36mm	0.131	13.1	34.4	65.6
3	1.18mm	0.098	9.8	44.2	55.80
4	1mm	0.028	2.8	47	53
5	0.600mm	0.081	8.1	55.1	44.9
6	0.300mm	0.148	14.8	69.9	30.1
7	0.150mm	0.165	16.5	86.4	13.6
8	Pan	0.136	13.6	100	0

Result: Fineness modulus = 4.37



Grain size Analysis Graph for sample-2

3. LIQUID LIMIT OF SOIL:

SAMPLE-1

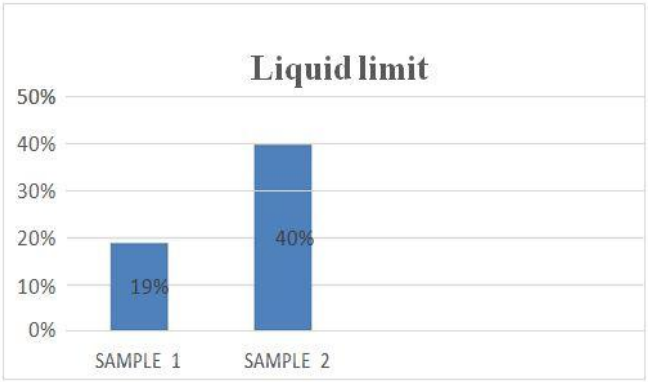
SI. NO	No.of blows	Empty Container Weight (M1)gm	Empty Container Weight+Wet Soil(M2)gm	Empty Container Weight+dry Soil(M3)gm	Water Content %
1	75	0.016	0.029	0.027	19
2	56	0.015	0.032	0.030	13
3	35	0.015	0.033	0.030	20
4	29	0.016	0.031	0.029	15.38
5	16	0.015	0.034	0.030	27

Result; Liquid limit of soil Sample, W_L =19%

Sample: 2

SI. NO	No.of blows	Empty Container Weight (M1)gm	Empty Container Weight+Wet Soil(M2)gm	Empty Container Weight+Dry Soil(M3)gm	Water Content %
1	63	0.014	0.024	0.023	11.11
2	55	0.014	0.024	0.023	11.11
3	35	0.015	0.033	0.030	20
4	29	0.016	0.091	0.029	15.38
5	16	0.015	0.036	0.032	23.52

Result: Liquid limit of soil Sample, W_L =11.11%



LIQUID LIMIT BAR CHART

4. PLASTIC LIMIT OF SOIL

SAMPLE-1

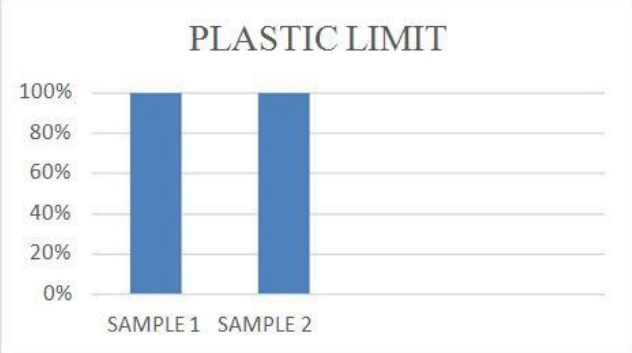
SI. NO	EMPTY CONTAINER WEIGH M1	EMPTY CONTAINER WEIGHT+WET SOIL(M2)	EMPTY CONTAINER WEIGHT+DRY SOIL(M3)	WATER CONT %
1	0.015	0.019	0.017	50
2	0.014	0.018	0.017	25
3	0.016	0.021	0.019	40
4	0.015	0.019	0.017	50
5	0.013	0.017	0.017	33.33

Result: Plastic limit of soil Sample, W_p=50%

SAMPLE-2

SI. NO	EMPTY CONTAINER WEIGHT (M1)	EMPTY CONTAINER WEIGHT+WET SOIL(M2)	EMPTY CONTAINER WEIGHT+DRY SOIL(M3)	WATER CONT %
1	0.016	0.203	0.021	97
2	0.015	0.018	0.016	67
3	0.013	0.017	0.014	75
4	0.015	0.202	0.020	97
5	0.014	0.019	0.016	60

Result: Plastic limit of soil Sample, W_p= 60%



PLASTIC LIMIT BAR CHART

IV. SOIL CLASSIFICATION

SAMPLE-1: (IS: 1498-1970)
Plasticity index Ip = WL ~ WP
= 19 ~ 50
Ip= 31%
Liquid limit= 19% (above A-line)
So, Liquid limit value less than 35%
Sample-1 (Type of soil) = CL (gravel clays, sandy clays, silt clays)

SAMPLE-2: (IS: 1498-1970)
Plasticity index Ip = WL ~ WP = 12.4 ~ 60Ip
=47.6 % Liquid limit
= 12.4% (above A-line) So, Liquid limit value less than 35%
Sample-2
(Type of soil) = CL (gravel clays, sandy clays,silt clays)

V. DESIGN OF BRIKS

1. WEIGHT OF BRICKS:

Mode of brick	Weight ofbric kg) Trail-1	Weight of brick(Kg) Trail-2	Weight of brick Kg Trail-3	Average weight of brick Kg
10% sawdust Added brick	2.892	2.902	2.890	2.891
20% sawdust Added brick	2.506	2.512	2.507	2.508

2. COMPRESSIVE STRENGTH TEST ON BRICK:

Mode of brick	Maxu loade of brick (KN) Trail-1	Max loade of brick (kN) Trail-2	Max loade of brick (KN) Trail-3	AveragMax load of brick	CompStrength of brick N/mm2
10% sawdust	85	78	80	81	3.16
20% sawdust	63	57	65	61.667	2.41

Result
Average compressive strength of bricks = 2.785 N/mm2

3. WATER ABSOPTION TEST ON BRICKS

BEFORE WATER ABSORPTION OF BRICKS

Samples	Before water absorption weight (Kg) Trail-1	Before water absorption weight kg Trail-2	Before water absorption weight (Kg) Trail-3
10% sawdust Added brick	2.856	2.785	2.756
20% sawdust Added brick	2.580	2.341	2.601

AFTER WATER ABSORPTION OF BRICKS (24hrs)

Samples	After water absorption weight (Kg) Trail-1	After water absorption weight (Kg) Trail-2	After water absorption weight (Kg) Trail-3
10% sawdust Added brick	3.260	3.189	3.160
20% sawdust Added brick	3.051	2.812	3.072

WATER ABSORPTION OF BRICKS:

Samples	After water absorption of brick % Trail-1	After water absorption of brick % Trail-2	After water absorption of Brick Trail-3	Average Water Absorption of bricks%
10% sawdust	14.15	14.51	14.65	14.44
20% sawdust	18.26	20.11	18.11	18.83

Result:

Water absorption of the given bricks =14.95%

4. SOUNDNESS

The bricks were tested for soundness in weight batching by striking with each other. The bricks gave a clear ringing sound up to 20% replacement in weight batching.

5. HARDNESS

No nail impression was made on bricks when scratched up to replacement of 20% sawdust.
It provided to sufficiently hard.

6. DROP TEST

The bricks were dropped flat from a height of 1M on a hard ground. The bricks compared with those of first class bricks.

COMPARISON FIRST CLASS BRICKS:

PARAMETER	**FIRST CLASS BRICK**	**SAWDUST :SOIL**	**VALUES**
Water absorption %	20	10:90 20:80	14.44 18.83
Compressive strength N/mm^2	3.5	10:90 20:80	3.16 2.41

COMPARISON OF SECOND CLASS BRICKS:

PARAMETER	SECOND CLASS BRICK	SAWDUST :SOIL	VALUES
Water absorption %	22	10:90 20:80	14.44 18.83
Compressive strength N/mm^2	2.7	10:90 20:80	3.16 2.41

VI. CONCLUSION

The following conclusion are drawn on the basis of test results and comparison with first with the first class brick and second class brick.

- It is inferred that bricks manufactured on the basis of Weight batching in proportion of 10% sawdust and 90% clay closely resembles the first class bricks in compressive strength and water absorption could be employed for construction activities.
- It is inferred the bricks manufactured on the basis of weight batching in proportion of 20% sawdust and 80% clay closely resembles the second class bricks in compressive strength and water absorption could be employed construction activities.
- Weight of brick is low comparing to conventional bricks.
- So self-weight of wall also reduced.
- Bricks are easy to transport
- Water absorption of brick also reduced comparing to conventional brick.

REFERENCES

[1] Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain., soil mechanics and foundation.
[2] S.K.Khanna, C.E.G.Justo., highway engineering.
[3] S.C.Rangwala highway engineering.
[4] IS: 2720 (Part III/sec-1)1980 Specific gravity of soil.
[5] IS: 2720 (Part 4) -1985 Grain size analysis.
[6] IS: 2720 (Part 5) -1985 Liquid limit and plastic limit of soil.
[7] IS: 1498-1970 -soil classification.
[8] "Limestone dust and wood sawdust as brick material" (Paki Turgut, Halil Murat Algin)
[9] "Masonry concrete block strength compound with sawdust according to residue treatment" (Ana Betania Silva Moreira, AlcebladesNegraoMacedo and Paulo Sergio Lima Souza)
[10] "Production of composite bricks from sawdust using PORTLAND CEMENT as a binder" (A.Zziwa1, S. Kizito, A.Y.Banana, J.R.S.Kaboggoza, R. K. Kambugu and O. E.Sseremba)
[11] Effect of Adding Sawdust on Mechanical-Physical Properties of Ceramic Bricks to Obtain Light weight Building Material"(BachirChemani, and Halima ChemaniA.U.Elinwa, YA Mahmood.)

