ENHANCEMENT OF INDIGENOUS PRODUCTION CAPACITY THROUGH AN ASSESSMENT OF MASONRY UNITS PRODUCED IN MAMELODI, SOUTH AFRICA

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Abstract: There is a dearth of housing units for the teeming population in developing countries: similar challenge is noticeable in South African's townships such as Mamelodi among others. Records showed that Mamelodi is a large, historically designated black township in Pretoria that is situated on the north eastern outskirts of Pretoria, in the Guateng Province of South Africa with a population of about one million people. The research sought to assess masonry units commonly used for housing from indigenous producers in the township with a view to determining its strength and quality in order to enhance their output capacity. Fourty three masonry units made up of bricks and sandcrete blocks were collected from five indigenous producers in Mamelodi east; and the laboratory of the Department of Civil Engineering, Tshwane University of Technology, Pretoria. Materials used include different types of cement, aggregates, hardener and water with manual as well as mechanical equipments. Sieve analyses of the different types of sand used were undertaken in line with SABS Method 829:1994. The sizes and compressive strengths of the samples were determined according to South African standards, SANS 1215:2008 and SABS EN 197-1; and compared to specified values. In addition, materials, mix proportions and production techniques were appropriately assessed. It was observed that the types of cement used by the producers were CEM 42,5N, CEM 32.5R, CEM IV/B [V] 32.5R and CEM 32,5R. The different types of sand used as aggregates were crusher sand, plaster sand and dag sand. The water used was clean devoid of any deleterious material. Though the compressive strengths were found to be less than those specified in the standards, the sizes of the samples showed variation from the specification. However, the compressive strength of the masonry units from the laboratory of the Department of Civil Engineering, Tshwane University of Technology, Pretoria complied with the specified standard. The observed deviation of the results from the approved specification may be as a result of unfamiliarity with the standard by indigenous producers, the properties of the material ingredients, proportion of the mix, the method of compaction and other controls during placing, compaction and curing. It was also observed that the materials used by the producers were found to be from different sources, while there were variable mix proportions as well as production techniques. The knowledge available to the indigenous producers from the research on the quality of the masonry units would enhance the productive capacity of the indigenous producers in the townships.

Keywords: Bricks; Compressive strength; Indigenous producers; Production capacity; and Sandcrete blocks.

INTRODUCTION

Mamelodi is a large, historically designated black township in Pretoria that is situated on the north eastern outskirts of Pretoria, in the Guateng Province of South Africa with a population of about one million people [1]. It is similar to other townships on the peripheries of all South African cities planned by the apartheid authorities as temporary dormitory zones for black labour. Its problems are typical of other townships that are mono-functional residential areas with poor quality housing and a large component of informal settlements [2].

It is divided into two sectors by the Pienaars Rivier, Mamelodi West and Mamelodi East as illustrated in Figure 1. Mamelodi West shares a distinct border with the established township of Eersterust to the West and the industrialized area of Silverton to the South-West. The Magaliesberg mountain range defines the northern perimeter of the greater township. Mamelodi East is bound by the North-South lying branch of the Magaliesberg mountains and new commercial and residential development to the South in the Willows. Mamelodi East contains a great deal of informal dwellings, particularly in the extreme East where there is significantly less formal housing and limited infrastructure [1].

Mamelodi shows traces of its numerous growth patterns, both from its pre-apartheid and post-apartheid eras. It displays evidence of the diverse urban planning typologies practiced during the changing years of government and the fusion of incongruent road grids baring testimony to the many contrasting forms of housing typologies implemented within the township. There is also much unconstrained growth in the form of informal housing shacks depicted by the smaller informal grid patterns.

Much of the current formalized township of Mamelodi East is composed of consolidated informal settlements, in which land previously subdivided without approval is usually sold or leased to the informal residents and has overtime been recognized as part of the township. Improved infrastructural networks are provided and these informal settlements are merged within the recognized township. In contrast, squatters have been relocated and the land been developed for new Reconstruction Development and Plan (RDP) houses subsidized by the government. Besides, these areas have seen the rise of new typologies of low cost buildings, most of them made of bricks or sandcrete blocks. Nowadays bricks turned on edge, patterning, alternating of materials and orientation of bricks are all used in various ways. Wet works construction typically represents a more permanent and thus settled solution to housing. It is widely used for additions and alterations by land owners in the more established wards. The result is a diverse, complex and local brick tectonic for the area [4].

In order to satisfy the huge request of housing, lots of local producers opened manufacturing activity throughout the township. The consequence is a production of different sandcrete blocks and bricks for building housing units. The latter development informed the necessity for the research which was conducted under the supervision of Tshwane University of Technology, Pretoria, South Africa with the collaboration of University of Trento, Italy. It involved the study of the manufacture of concrete masonry units in the township of Mamelodi with a view to assessing the masonry units commonly used for housing from indigenous producers in the township in order to determine the strength and quality of the units so as to enhance their output capacity.

MATERIALS AND METHODS

In view of the peculiar nature of the research which dealt with the assessment of masonry units to enhance the production capacity in the township of Mamelodi, the section highlights the following research strategies involved in data acquisition to conceptualize relevant principles and patterns.

Selection of production units

Five producers of masonry units who have established sites in Mamelodi east that showed willingness and readiness to allow the assessment of the sites in line with the objectives of the research were selected. The selection of the producers was based on extensive discussions facilitated by contacts that had earlier being made during earlier visits to the township. It formed the basis for the collection of crucial information on the operation of the masonry sites; and enhanced the collection of the materials needed for the research. In line with the ethics of research, the producers will simply be referred to as Producers 1 to 5. Some of the sites for the production of masonry units are shown in Figure 2.

Figure 1: Subdivision of Mamelodi : West and East [3]

Figure 2: Different sites of Mamelodi East.

Figure 3: Different samples of masonry units collected

Table 1: Sampled Masonry Units

(a) PRODUCER 1

No. of items	Type
3	full block for RDP House
3	full block
3	block with 2 holes
3	full block for Foundations

(b) PRODUCER 2

No. of items	Type
3	block with 2 holes
3	block with 2 holes
3	full block

(c) PRODUCER 3

N°of items	Type
3	brick

(d) PRODUCER 4

No. of items	Type
1	full block
9	full block
1	block with 3 cylindrical holes
1	paving stone

(e) PRODUCER 5

No. of items	Type
2	block with 2 holes
2	block with 2 holes
2	full block
2	block with 2 holes
4	full block

Selection of samples

Masonry units

However in the world market, and in the special case of Mamelodi, there are lots of different sizes of units, as many as the number of producers. During the research, different production units were visited and 48 samples were collected as shown in Table 1 (a) to (e) and the different types of masonry units are shown in Figure 3. Out of the samples, 39 were subjected to laboratory test with an additional 4 samples from the laboratory of the Department of Civil Engineering, Tshwane University of Technology. In all, 43 samples of masonry units were tested.

Fine aggregates

All the producers selected used different types of sand as fine aggregates. The three main types were crusher sand, plaster sand and dag sand. Crusher sand is an excellent fine aggregate. Dolomites crushed in the Gauteng are hard and have a close grained crystalline texture. Plaster sand is special sand with a medium coarseness. Dag sand is obtained directly from the crusher sand. All the sands collected were from Mamelodi. The producers obtained the aggregates from different sources as indicated below. Producer 1: Crusher Sand : Delf Sand Ltd., Farm Pienaard, Pretoria. Plaster Sand : Delf Sand Ltd., Farm Pienaard, Pretoria. Dag Sand: Far East Mamelodi. Producer 2: Crusher Sand : Far East Mamelodi Plaster Sand : Delf Sand Ltd., Farm Pienaard, Pretoria. Producer 3: Crusher Sand : Ferro Deposit, Mamelodi East. Producer 4: Crusher Sand : Mamelodi Quarries Ltd., Portions 72 & 79, The Farms, Franspoort, Pretoria. Plaster Sand : Mamelodi Quarries Ltd., Portions 72 & 79, The Farms, Franspoort, Pretoria.

Samples of crusher sand, dag sand and plaster sand respectively are shown in Figure 3.

Cement

Cement is the standard binder with aggregates for the production of concrete masonry units. Masonry cement is made of Portland cement with other fine material, for example builder's lime (calcium hydroxide) or ground limestone; and may contain an air entraining agent. The cements are used to improve the plasticity of mortars and plasters and thus make working with the materials easier [5]. The quality of cement, particularly with regard to the rate of strength and sensitivity of curing (or lack of curing in many cases) is of vital consideration. The types of cement used by the selected producers were CEM 42,5N; CEM 32,5R; CEM IV/B [V] 32.5R; and CEM 32,5R

Water

In line with [6], the water used was inspected to be clean and acceptably free from impurities that may impair the strength or durability (or both) of the masonry units. However, no chemical analyses were done on the water used for the masonry units.

Admixture

Chemical admixtures are materials that are added to the concrete at the mixing stage to modify the properties of concrete. Only one producer used an admixture for his bricks. It is a cement accelerator and hardener diluted 1:9 with clean water.

Laboratory tests

Laboratory tests on the compliance of the sizes of the masonry units to the specified standards as well the squareness of units were carried out. In addition, sieve analysis using [7] of the sampled fine aggregates collected for the production of masonry units was conducted. Also, the compressive strengths using [8] of the collected samples of the masonry units were determined. The laboratories used were the laboratories of SOILLAB (PTY) Ltd located in Lynnwood Ridge, Pretoria and Department of Civil Engineering, Tshwane University of Technology, Pretoria.

Other investigation

Other investigation conducted were identification of the equipment used, mix proportions, curing and storage techniques adopted by the producers.

Analytical and presentation technique

The results of the investigation as well as the laboratory tests conducted during the research were reported in the form of tables, charts and plates; and analysis using [9]. The relevant calculations were carried out using established equations as specified in the relevant sections of the South African Bureau of Standatds.

RESULTS AND DISCUSSION

Masonry Units

Masonry units were observed to be widely used in the construction of residential, commercial, industrial, community and other types of buildings. The research showed that the units of brick and sandcrete blocks (solid or hollow), were manufactured with materials and equipment which are readily available. The observation agreed with existing research [10]. Another important definition is the difference between a brick and sandcrete block that consisted in the size of the unit. According to [11], a masonry unit is referred to as a block if its dimensions satisfy any of the following conditions: length between 300 mm and 650 mm; width between 130 mm and 300 mm; or height between 120 mm and 300 mm.

On the hand, a brick has all dimensions smaller than those ones [10]. According to [6], the recommended nominal dimensions of bricks are given in the Table 2.

It is worthy of note that the dimensions of the sampled masonry units are not wholly in agreement with the specified standards. Thus, there is a proliferation of different sizes of masonry units in the market place that are generally driven by the producers of masonry units. The situation may generally be attributed to commercial purposes.

Grading analysis

The sieve analysis on the different types of sand (fine aggregates) sampled according to [7] are shown in Figures 5 to 13.

Figure 4: Crusher Sand, Dag Sand and Plaster Sand (from left to right).

Table 2: Nominal dimensions of masonry units

Work Size, mm		
Length	**Width**	**Height**
190	90	90
290	90	90
390	90	190
390	190	190

Source: [6]

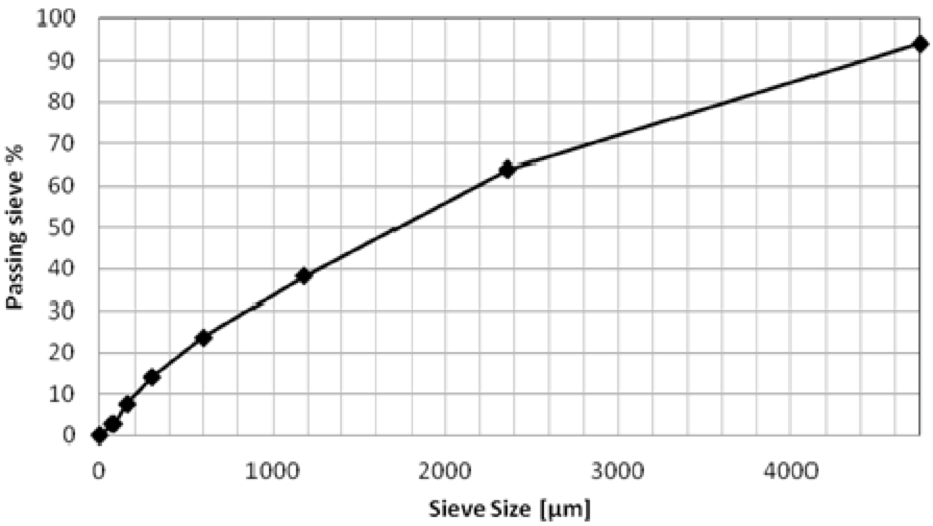

Figure 5: Sieve analysis – Crusher Sand (Producer 1) - 17/11/20

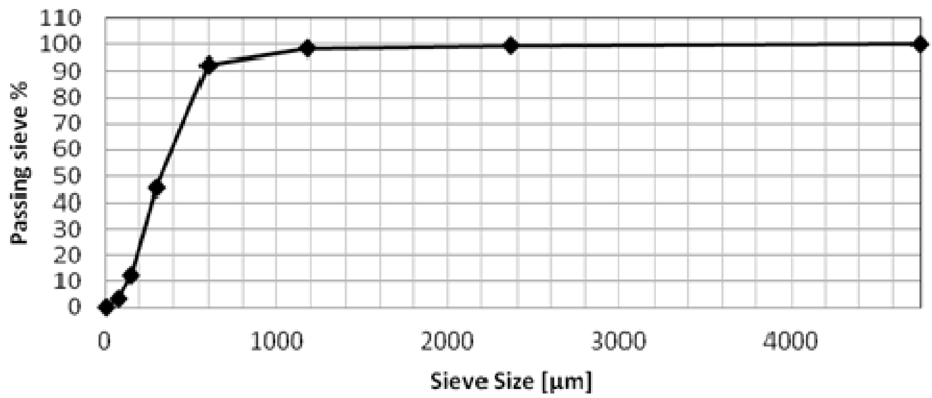

Figure 6: Sieve analysis – Plaster Sand (Producer 1) - 17/11/20

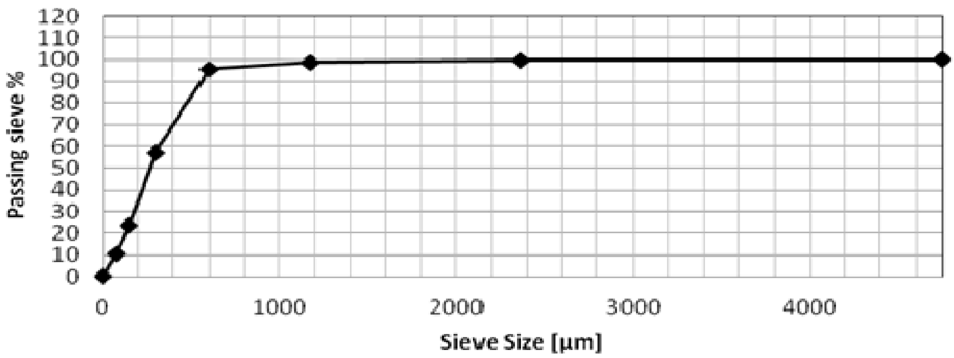

Figure 7: Sieve analysis – Dag Sand (Producer 1) - 17/11/20

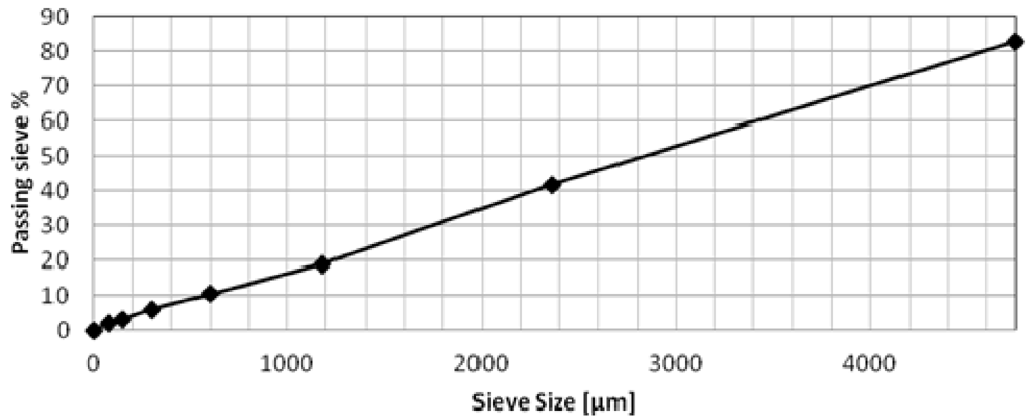

Figure 8: Sieve analysis – Crusher Sand (Producer 2) - 17/11/2011

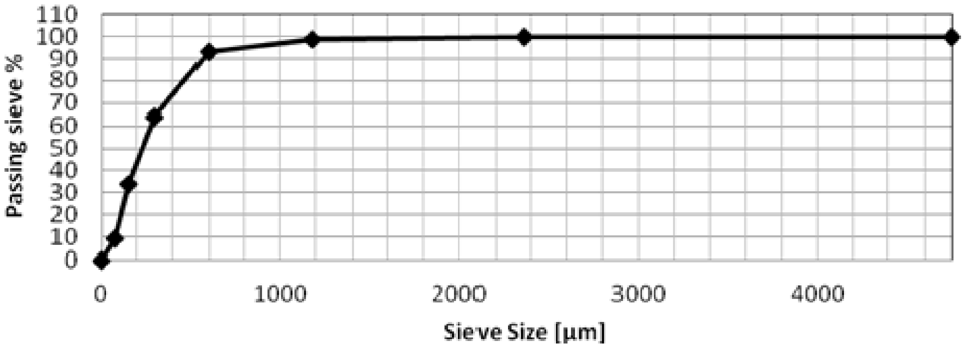

Figure 9: Sieve analysis – Dag Sand (Producer 2) - 17/11/2011

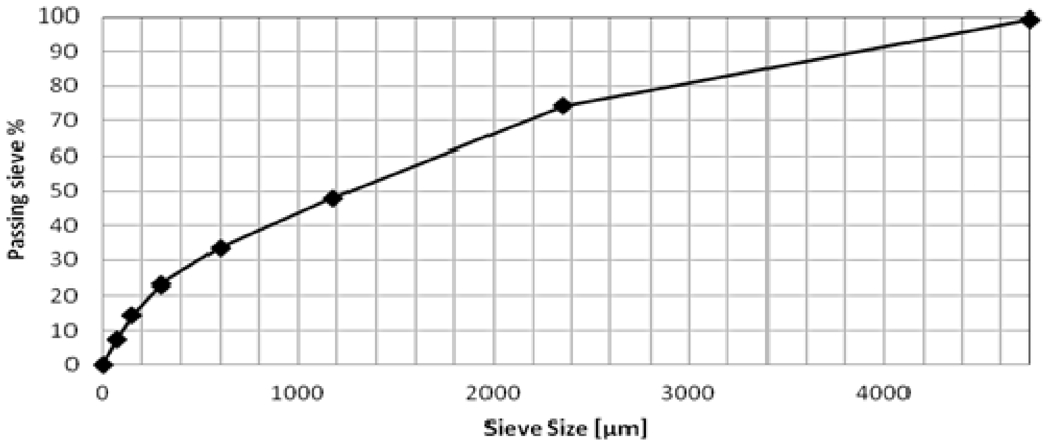

Figure 10: Sieve analysis – Crusher Sand (Producer 3) - 17/11/2011

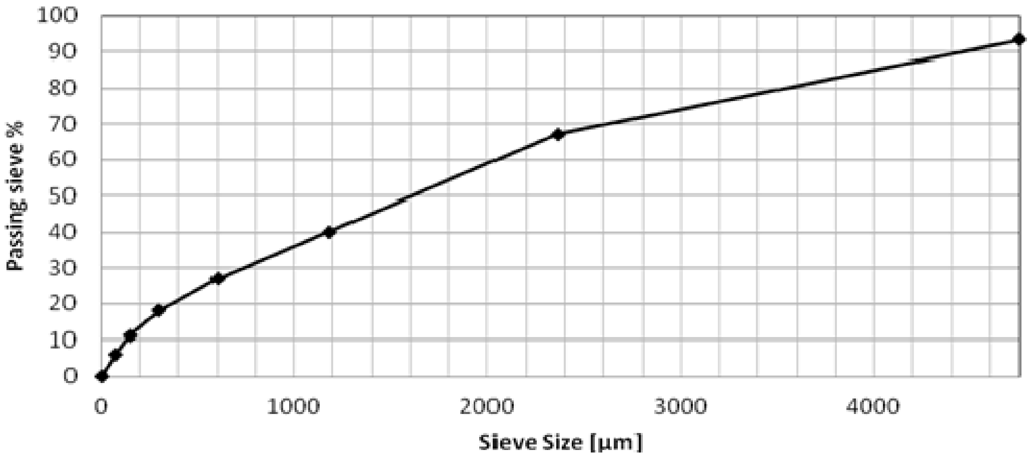

Figure 11: Sieve analysis – Crusher Sand 1 (Producer 5) - 17/11/2011

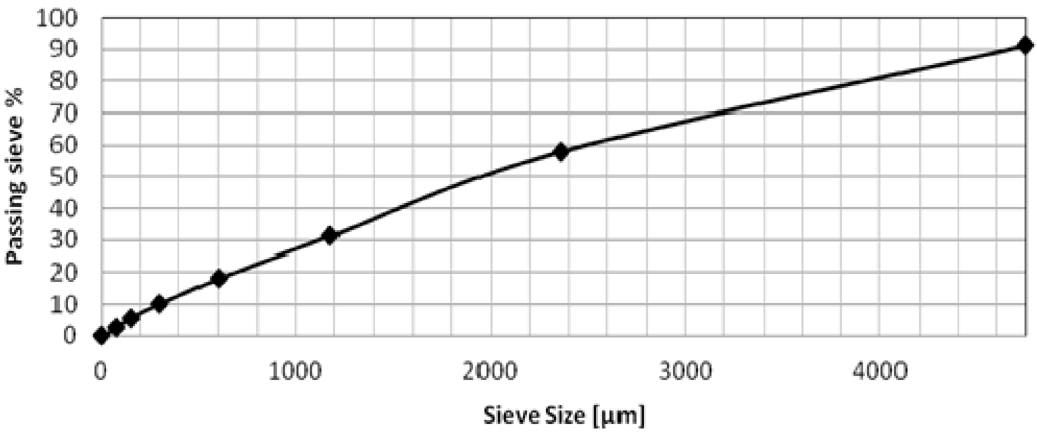

Figure 12: Sieve analysis – Crusher Sand 2 (Producer 5) - 17/11/2011

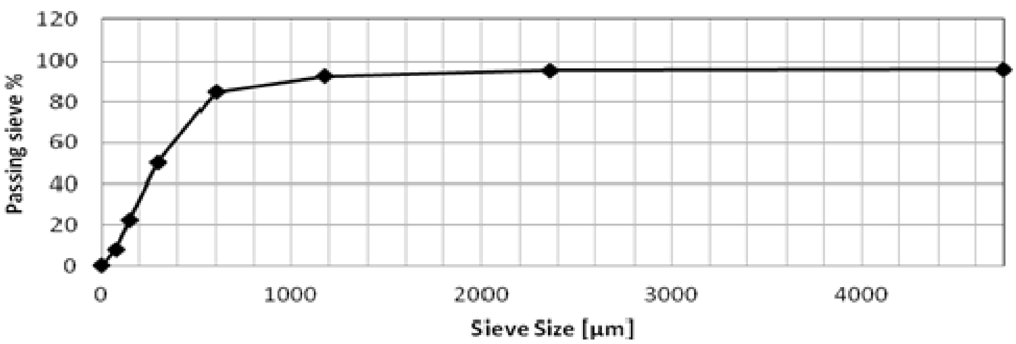

Figure 13: Sieve analysis – Plaster Sand (Producer 5) - 17/11/2011

Mixing

All the producers used different mixes for the production of bricks and blocks as presented in Table 3. The combination of aggregates, the proportion of blended aggregate to cement, the quantitative use of water, the use of admixture, the mixing time and the type of machine all affect the final quality of the units. In the case under consideration, it is not possible to determine the standard mix for the masonry blocks and bricks. Each producer tends to use the mix that meets individual production capacity and profitability. The best mix may only be achieved through the setting of appropriate standard by the relevant governmental agencies in collaboration with the producers for sustainability

Table 3: Mix design of the producers

(a) Producer 1	4 wheelbarrows of Crusher Sand = 1344 kg 1 wheelbarrow of Plaster Sand = 336 kg 1 Bag of Cement = 50 kg 20 L Water w/c = 0,4
(b) Producer 2	5 wheelbarrows of Crusher Sand = 1680 kg 1 wheelbarrow of Plaster Sand = 336 kg 1 Bag of Cement = 50 kg 20÷30 L Water w/c = 0,4 ÷ 0,6
(c) Producer 3	27 shovels of Crusher Sand = 100 kg 3 shovels of cement = 7,5 kg 1,5 L of hardener 5 L Water w/c = 0,66
(d) Producer 5	4 wheelbarrows of Crusher Sand = 1344 kg 2 wheelbarrows of Plaster Sand =336 kg 1 bag of Cement = 50 kg 20 ÷ 30 L Water w/c =0,4 ÷ 0,6

Moulding (Machines)

In Mamelodi East, it was observed that all of the masonry companies used similar devices for making hollow and full blocks. In the case of hollow blocks, the producers adopted a fairly simple procedure without the use of specialized labour. Following the mixing, the fresh mix was deposited in a special container in the form of the shape of a single unit. The worker has to fill the space within the moulding machine (Figure 14) with the material, using a shovel as well as hand, press it with a tubular metal device and remove all the tools. The fresh hollow block was then ready for curing. On the other hand, the process involved in the production of bricks was quite different from the blocks. The machines used were dissimilar and each producer chose the type that suited the production of its units. However, the third producer utilised a special machine (Figure 15), that allowed production of 12 bricks per operation cycle. The most important feature of machine was the speeds of operation as well as its ability to self vibrate the bricks. Though specialized labour was not required, trained labour constituted an essential part of operation.

Curing and Storage

Curing is the process to maintain satisfactory moisture content and a favorable temperature in concrete during the hydration of the cement. The natural curing method as shown in Figure 16 is the most common in Mamelodi where the ambient temperature allowed the blocks to be stored without heating in an artificial atmosphere. The advantage of natural curing is that the initial capital outlay is low but because of the blocks' slow rate of gaining strength; they have to be stored for a longer period before dispatch from the site [12].

Figure 14: Machine for the production of hollow blocks

Figure 15: Machine for the production of bricks.

Figure 16: Curing and storage in different sites visited.

Figure 17: Capping.

Table 4: Standard Compressive Strength

Column 1	Column 2	Column 3
Nominal Compressive Strength [Mpa]	Compressive Strength [MPa]	
	Average (for 5* units)	Individual units
3,5	4	3
7	8	5.5
10.5	11.5	8.5
14	15.5	11
21	23.5	17

* In the case of units having an overall length of 290mm or less, an average for 12 units is taken

Source: [8]

Table 5: Recommended nominal compressive strength for durability

Exposure zone	Recommended nominal compressive strength [MPa]	
	Solid units	Hollow units
Protected	7.0 – 10.5	3.5 – 7.0
Moderate	10.5 – 14.0	7.0 – 14.0
Severe	21.0	14.0
Very severe	Manufacturer’s guidance required	

Source: [11]

Table 6: Compressive strength of the samples collected.

(a) PRODUCER 1

Date of Test	No of sample	Dimension Length [mm]	Width - Average [mm]	Height [mm]	Area L x W [mm^2]	Volume [mm^3]	Mass [kg]	Crushing Strength Failure Load [KN]	Compressive Strength [MPa]
2011/11/10	1.1	223.79	100.32	79.31	22450.6128	1780558.101	3.212	87.40	3.9 *
2011/11/10	1.2	229.40	100.59	83.83	23075.3460	1934406.255	3.419	24.45	1.1
2011/11/10	1.3	231.49	100.74	79.65	23320.3026	1857462.102	3.501	56.59	2.4
2011/11/11	1.4	295.18	133.74	93.43	39477.3732	3688370.978	6.471	141.41	3.6
2011/11/11	1.5	292.42	128.16	96.08	37476.5472	3600746.655	6.401	40.22	1.1
2011/11/11	1.6	298.39	133.75	98.84	39909.6625	3944671.042	6.605	77.94	2.0
2011/11/11	1.7	410.00	152.18	139.19	62393.8000	8684593.022	14.820	23.78	0.4
2011/11/11	1.8	410.00	143.91	143.69	59003.1000	8478155.439	14.770	16.95	0.3
2011/11/11	1.9	397.00	146.30	197.36	58081.1000	11462885.896	15.410	98.35	1.7
2011/11/11	1.10	449.00	155.35	226.70	69752.1500	15812812.405	19.470	7.83	0.1 *
2011/11/11	1.11	454.00	163.01	224.40	74006.5400	16607067.576	21.430	12.15	0.2 *
2011/11/11	1.12	439.00	157.05	225.05	68944.9500	15516060.998	19.690	34.67	0.5

* **Invalid tests**

(b) PRODUCER 2

Date of Test	No of sample	Dimension Length [mm]	Width - Average [mm]	Height [mm]	Area L x W [mm^2]	Volume [mm^3]	Mass [kg]	Crushing Strength Failure Load [KN]	Compressive Strength [MPa]
2011/11/11	2.1	430.00	169.56	178.80	72910.8000	13036451.040	17.520	74.83	1.0
2011/11/11	2.2	433.00	164.70	176.39	71315.1000	12579270.489	18.410	58.44	0.8
2011/11/11	2.3	430.00	164.80	176.37	70864.0000	12498283.680	17.400	50.96	0.7
2011/11/11	2.4	290.93	141.59	98.18	41192.7787	4044307.013	7.590	94.02	2.3
2011/11/11	2.5	290.33	140.51	95.86	40794.2683	3910538.559	7.660	90.10	2.2
2011/11/11	2.6	290.88	142.95	97.95	41581.2960	4072887.943	7.571	82.28	2.0
2011/11/11	2.7	360.00	167.50	145.96	60300.0000	8801388.000	15.251	61.85	1.0
2011/11/11	2.8	361.00	164.70	150.08	59456.7000	8923261.536	15.517	86.33	1.5
2011/11/11	2.9	353.00	161.85	151.16	57133.0500	8636231.838	15.104	64.56	1.1

(c) PRODUCER 3

Date of Test	No of sample	Dimension Length [mm]	Width - Average [mm]	Height [mm]	Area L x W [mm^2]	Volume [mm^3]	Mass [kg]	Crushing Strength Failure Load [KN]	Compressive Strength [MPa]
2011/11/10	3.1	292.97	154.10	103.00	45146.6770	4650107.731	7.617	66.55	1.5
2011/11/11	3.2	293.80	147.44	96.78	43317.8720	4192303.652	7.290	52.59	1.2
2011/11/11	3.3	296.15	148.45	98.10	43963.4675	4312816.162	7.370	76.16	1.7

(d) PRODUCER 4

		Dimension						Crushing Strength	
Date of Test	No of sample	Length [mm]	Width - Average [mm]	Height [mm]	Area L x W [mm^2]	Volume [mm^3]	Mass [kg]	Failure Load [KN]	Compressive Strength [MPa]
2011/11/10	4.1	226.07	112.69	78.94	25475.8283	2011061.886	3.795	495.88	19.5
2011/11/10	4.2	223.29	111.50	81.11	24896.8350	2019382.287	3.768	434.97	17.5
2011/11/10	4.3	227.17	112.12	81.22	25470.3004	2068697.798	3.819	316.58	12.4
2011/11/10	4.4	223.44	109.70	73.62	24511.3680	1804526.912	3.476	547.05	22.3
2011/11/10	4.5	225.67	110.78	72.51	24999.7226	1812729.886	3.315	412.72	16.5
2011/11/10	4.6	215.12	103.71	72.48	22310.0952	1617035.700	2.986	475.98	21.3
2011/11/10	4.7	223.44	120.65	77.30	26958.0360	2083856.183	3.809	648.69	24.1

(e) PRODUCER 5

		Dimension						Crushing Strength	
Date of Test	No of sample	Length [mm]	Width - Average [mm]	Height [mm]	Area L x W [mm^2]	Volume [mm^3]	Mass [kg]	Failure Load [KN]	Compressive Strength [MPa]
2011/11/11	5.5	354.00	167.90	167.74	59436.6000	9969895.284	19.220	100.28	1.7
2011/11/11	5.6	354.00	164.33	163.44	58172.8200	9507765.701	17.630	55.85	1.0
2011/11/11	5.7	376.00	157.54	170.00	59235.0400	10069956.800	16.070	54.81	0.9
2011/11/11	5.8	380.00	159.00	168.24	60420.0000	10165060.800	16.820	72.03	1.2
2011/11/11	5.9	319.10	174.08	134.00	55548.9280	7443556.352	14.080	67.09	1.2 *****
2011/11/11	5.10	314.50	167.50	136.00	52678.7500	7164310.000	13.940	223.47	4.2
2011/11/11	5.11	461.00	173.95	198.80	80190.9500	15941960.860	23.940	160.93	2.0
2011/11/11	5.12	457.00	179.00	202.30	81803.0000	16548746.900	24.500	96.30	1.2

* **Invalid tests**

(f) **TUT**

		Dimension						Crushing Strength	
Date of Test	No of sample	Length [mm]	Width - Average [mm]	Height [mm]	Area L x W [mm^2]	Volume [mm^3]	Mass [kg]	Failure Load [KN]	Compressive Strength [MPa]
2011/11/11	TUT 1	396.00	189.55	188.75	75061.8000	14167914.750	21.760	305.12	4.1
2011/11/11	TUT 2	390.00	190.00	194.00	74100.0000	14375400.000	21.900	455.44	6.1
2011/11/11	TUT 3	390.00	190.00	196.00	74100.0000	14523600.000	22.430	416.42	5.6
2011/11/11	TUT 4	390.00	190.00	196.00	74100.0000	14523600.000	20.080	738.17	10.0

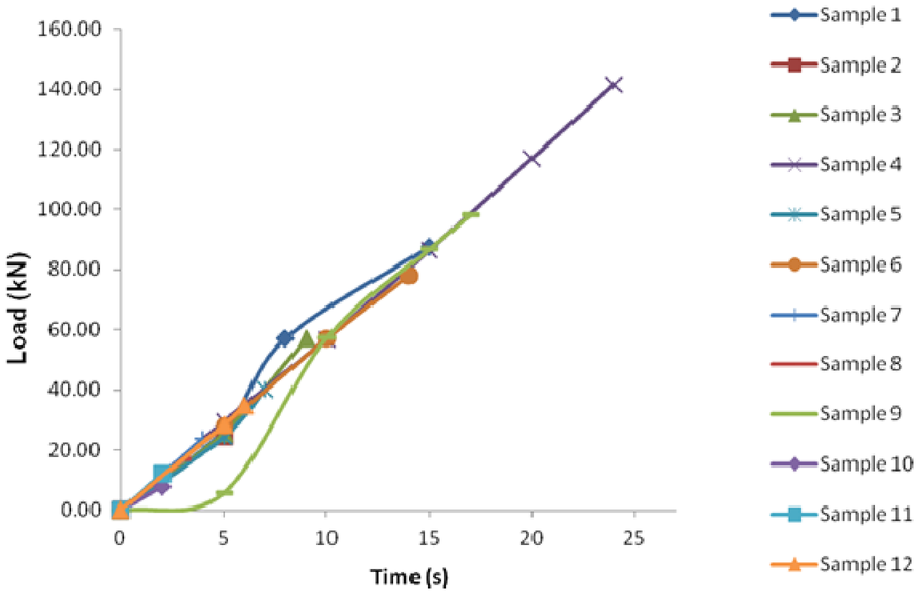

Figure 18: Load versus Time curves for individual samples (Producer 1)

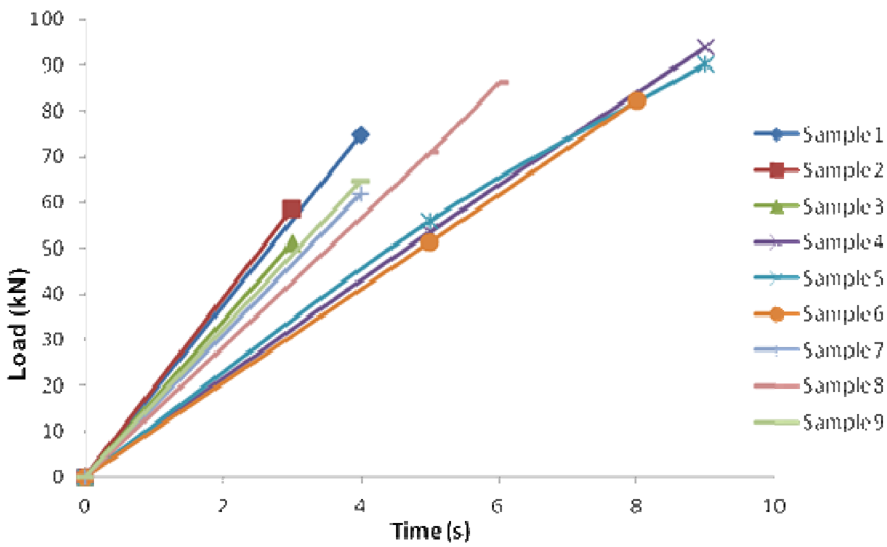

Figure 19: Load versus Time curves for individual samples (Producer 2)

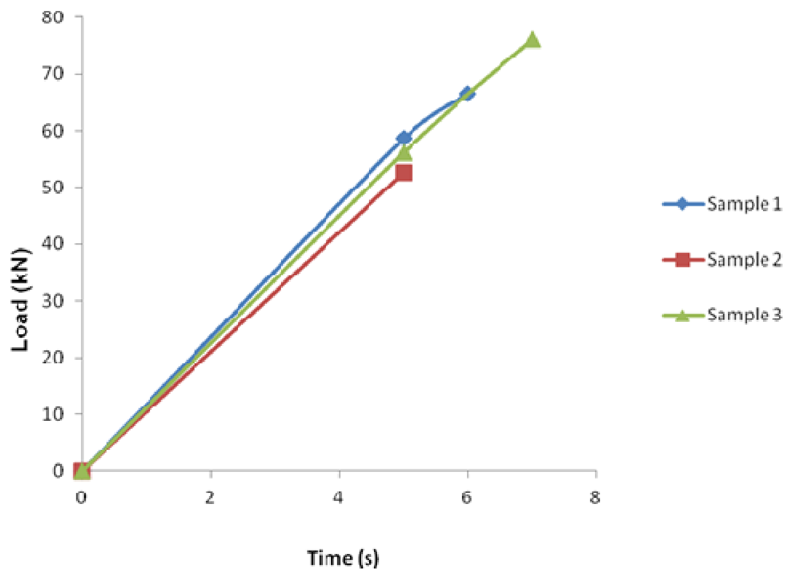

Figure 20: Load versus Time curves for individual samples (Producer 3)

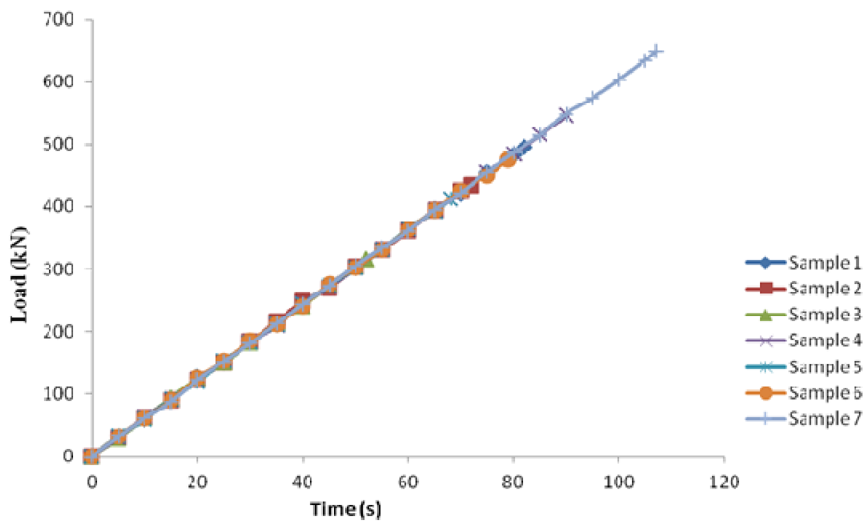

Figure 21: Load versus Time curves for individual samples (Producer 4)

Also, in Mamelodi, the natural curing is the used method, owing to the temperature, the weather and the availability of space for the production sites. Besides a properly drained, paved, storage yards may facilitate the handling of blocks. Blocks ought to be stacked so that the stacks will not settle unevenly as these damages the blocks. There is need for improvement in the aspect of storage of the masonry units as the units showed evidence of "unsquareness'' and defects on the bed faces..

Laboratory tests

Capping

According to [8], a non-absorbent surface (plastic sheet), which was plane within 0.15 mm in 500mm with a metal float, was used for capping the samples of masonry units collected in Mamelodi as illustrated in Figure 17. It was level in two directions at right angles to each other, and it was sufficiently rigid and so supported as to prevent it from being measurably deflected during the capping process. The mix proportion used for the capping consisted of Portland Cement (32,5R) melted with calcined Gypsium in a ratio of 3:1.

Compressive strength

In order to analyze the quality of the masonry units collected, compressive strengths were calculated in laboratory of SOILLAB (PTY) Ltd in line with the provisions of [8]. Thereafter, the compressive strengths were compared with the specified standards shown in Tables 4 and 5. The masonry were crushed as specified in the standard, and the compressive strengths calculated using the established equation provided in the standard as follows: Compressive Strength [MPa] = failure load [N] / area of bed–face [mm^2]

The results of the compressive strengths for the sampled masonry units are shown in Table 6 (a) to (f).

While the compressive strength of the masonry units from producers 1, 2, 3 and 5 do not comply with the standard specification, the samples from producer 4 showed acceptable compliance with the standard. It may be due to the fact that the producer did not make the units for commercial purpose, but rather for personal use. Also, the units from the laboratory of the Department of Civil Engineering, Tshwane University of Technology showed compliance with the standard possibly due to the meticulous adherence to the guidelines in the standard.

A careful look at the load versus time graphs for the individual samples during crushing for producers 1 to 4 are shown in Figures 10 to 13. It is obvious from the figures that the graph for producer 4 showed a more coherent failure path than that of other producers. This may further account for the compliance of the compressive strength of the masonry units from the producer with acceptable standards.

CONCLUSIONS

An assessment of the production of masonry units in Mamelodi was carried out with a view to enhancing the production capacity of the operators. The sites assessed were found to use mix proportions that were unique to individual producers. Hence, adherences to standard specification were found to be not the rule but rather the exception of the rule. The only producer who was found to have masonry units that were acceptable in terms of compressive strength was using the units for personal purposes rather than commercial reasons. The ratio of cement to sand was often 1:9 and 1:10. The sieve analysis showed that sand used comprised of fine parts. Thus, there may be need to enhance the quality of the sand for better masonry units in terms of strength, and, ultimately, output capacity. Results from samples obtained from four of the producers showed that the compressive strength did not exceed the 3.5 MPa minimum provisions in the standard. Other causes of the low compressive strength can be attributed to the type of processing, use of inappropriate devices, issues relating to vibration, and inadequate manpower. The research has shown the current challenges facing the sampled production units. In order to improve the quality and generate increased indigenous production capacity of masonry units prerequisite to quality and affordable housing for the township, it is imperative to use higher quality of sand, manage carefully the ratios of cement to sand, water to cement, and proper quality control for the entire production process coupled with a three pronged relationship, cooperation and collaboration of research, governmental intervention and industry stakeholders.

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