



Government of Bombay

Report
on the
Working of the Development
Directorate

For the Year ending 31st March 1925

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BOMBAY

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APPENDIX A.

Copy of the report of the Chairman, Sanitary Committee, Bombay Development Directorate, on the sanitary condition of the Reclamation for the period from the 1st April 1924 to 31st March 1925.

During the year nine meetings of the Sanitary Committee were held and the reclamation works were inspected on each occasion.

The arrangements previously made by the Municipal Commissioner for the City of Bombay about paying Rs. 100 to Captain Chalam to cover the wages of the two coolies engaged for work in Colaba in the municipal areas and the cost of supervising their work through the Reclamation Malaria Inspectors were terminated from 1st June 1924, as the Corporation disapproved of this proposal. Instead, one Sub-Inspector and two coolies from the Municipal Malaria Department were placed under Captain Chalam for this work and their wages were paid by the Municipality.

A great deal of consideration was given to the question of the new site for the coolies, when after inspection and discussion the following resolution was passed :—

- (a) On general principles and on grounds of public health the Committee considers that the presence of a cooly camp either in its present position or on the new one proposed is objectionable and think that every attempt should be made to find a site elsewhere.
- (b) If it is impossible to find a new site, it has considered the objections raised by the General Officer Commanding to the new site or newly reclaimed land which is proposed.
- (c) The Chief Engineer assures us that the water carriage system of sewage disposal in the proposed camp can be satisfactorily arranged and that the nuisance which has been suggested is not likely to arise.

If his expectations are correct, this part of the objections falls to the ground.

To meet the æsthetic objections brought forward, he states that he is prepared to erect a twelve foot barricade of galvanised iron on the land side of the camp, so that all but the top rooms of the new flats will not look into the camp and he will build in addition a lattice on which quickly growing creepers will grow and so hide the unsightly iron fencing.

- (d) The new camp he says is to be closed completely from the land side and further by policing and other disciplinary measures some of the objections to the presence of coolies will be obviated.
- (e) We consider that, even if it is found necessary to place the camp on the site suggested, such location should be considered as purely temporary and that as soon as it is possible another area should be

reclaimed further away from residential sites and the cooly camp should be moved thereto, where its presence will give rise to the minimum objection to residents.

- (f) We are of opinion that, if these measures are taken, the danger to health and the æsthetic objection to the new site will not be greater than they are to the camp as at present situated.
- (g) Further we are strongly of opinion that in no case should the population in the camps be increased by fresh drafts from outside.

The cooly camp has now been removed from the proposed site.

Lt.-Col. R. M. Carter, C.B., F.R.C.S., I.M.S., resigned the Chairmanship of the Committee when the following resolutions were passed :—

1. We are of opinion that the resignation of Lt.-Col. R. M. Carter, C.B., F.R.C.S., I.M.S., be sent to the Secretary to Government, Development Department, with an expression of regret. The Committee place on record the very valuable help and assistance given by him as Chairman of the Committee and they regret his separation owing to pressure of work.
2. The Committee is of opinion that the name of Lt.-Col. F. P. Mackie, O.B.E., M.D., M.Sc., F.R.C.P., F.R.C.S., I.M.S., be recommended to the Secretary to Government, Development Department, as permanent Chairman of the Committee. He has already acted as Chairman from 14th April 1923 and has shown a deal of energy and activity in the disposal of business. His wide experience and knowledge have been of great assistance in solving the difficult problems on the Reclamation Scheme.

Lt.-Col. F. P. Mackie, O.B.E., M.D., M.Sc., F.R.C.P., F.R.C.S., was appointed Chairman under Government Resolution No. S.D.-1354, dated the 3rd September 1924.

Captain Chalam's quarterly report for the quarter ending 30th September 1924 was discussed and it was resolved that all hollows that are now existing as well as new pits that may be formed hereafter at the junction of the pipes should be filled before the next rainy season.

The following observations in Captain Chalam's report are worth noting :—

There were a large number of surface pools immediately after the commencement of the rains which required constant care. These pools were accessible and the reclaimed area did not present any unusual difficulties for the men to walk upon for purposes of search or treating with a larvacide. A fair amount of breeding was noticed during the months of July and August, but there was a sudden increase in breeding places in the reclamation area during the later part of September. A large number of pools both in the reclaimed and unreclaimed portions showed signs of mosquito life and were effectively dealt with. Complete absence of larvæ was not expected as ova were continually hatching out, but the comparative absence of full grown larvæ and the almost

entire absence of pupae in these pools was satisfactory to show that few of them were allowed to reach maturity.

Reclamation pools being comparatively clean, collections of water showed 95 per cent. of anophelines. Outside the reclamation the Military Officer made a conjoint inspection with Captain Chalam, the Medical and Sanitary Officer of the Development Department, twice a week, house to house, for breeding places.

The following species of anophelines were detected as adults in an adult catch initiated in the barracks and the reclamation camp at Colaba in the last week of September :—

A. rossi	..	..	..	14
A. stephensi	..	..	..	1
A. culicifacies	..	..	..	1
A. fuliginosus	..	..	..	2

The spleen rate of the children in the reclamation camp was 3·3 per cent. and the parasite rate was 10·8 per cent.

Considerable breeding was noticed in trees in the military area. On examination of 1,675 trees, 97 were found breeding profusely culex and stegomyia larvæ. All these holes were filled in.

It is believed by some people that the increase in the incidence of malaria in the City of Bombay in 1924 was due to the breeding in the reclamation area, but as shown above, although larvæ were found, effective steps were taken by the Medical Officer to destroy them by a larvacide.

The pumping operations commenced also at Marine Lines in January 1925. The material dredged is ideal from an anti-malarial point of view, being practically all sand and it settles down smoothly and evenly without holding any collections of water and without any fissures or cracks in the surface. The material is dredged from Back Bay and not from the harbour as is the case at Colaba end. This exactly coincides with the Committee's anticipation from the experimental pits which were put up in the early stage of the Reclamation.

Temporary breeding places which were created during the rainy season in Colaba rapidly vanished with the stoppage of the rains. As for permanent breeding places steps were taken to render mosquito proof the few remaining insufficiently covered wells and water cisterns in Colaba.

The bi-weekly examination of all municipal and military areas in Colaba was continued in conjunction with the Military Malaria Officer and the Municipal Health Department staff.

The five cooly camps were supervised carefully by the Medical and Sanitary Officer. The average total strength of labour in these camps was approximately 1,620.

There was no epidemic of any disease in any of the camps during the period. Two cases of small-pox in the Marine Lines area were found concealed but they were detected and removed to the Arthur

Road Hospital. In all 994 persons were either vaccinated or re-vaccinated.

The Committee have very great pleasure in putting on record the excellent work done by the Medical and Sanitary Officer, Captain Chalam, during the period under report. Very recently he has been recommended for extension of his services for a further period of three years and the Committee hope that this recommendation will be accepted by Government.

APPENDIX B.

Members of the Sanitary Committee, Development Directorate for 1924-25.

- (1) Lieut.-Colonel F. P. Mackie, O.B.E., M.D., M.Sc., F.R.C.P., F.R.C.S., I.M.S., Chairman, Sanitary Committee.
- (2) The Director, Bacteriological Laboratory, Parel, Bombay.
- (3) Lieut.-Colonel W. M. Houston, M.B., B.Ch., D.P.H., D.T.M., I.M.S.
- (4) Dr. J. E. Sandilands, M.C., M.D., D.P.H.
- (5) Captain E. F. W. Mackenzie, O.B.E., M.C., R.A.M.C.
- (6) Khan Bahadur Dr. Nusarwanji Hormusji Choksey, O.I.E., M.D., L.M.& S., F.C.P.S.
- (7) Dr. Hormusji Manekji Masina, F.R.C.S. (Eng.), L.M.&S.
- (8) Lieut.-Colonel Raghavendra Rao, O.B.E., M.D. (Lond.).
- (9) Dr. Phiroz Ardeshir Dalal, L.M.& S., D.T.M.& H. (Camb.).
- (10) Dr. Kavasji Byramji Shroff, L.M.& S., D.P.H., D.T.M.

APPENDIX C.

Report from Messrs. J. A. Mitchell and Company, dated the 5th June 1925, on Mumbra sand and shingle.

With reference to the Deputy Director's letter no. B-1-28 D. B. of the 17th November 1923, requesting us to proceed with the above investigation, the tests were duly put in hand and have now been completed, and we beg to report as follows.

2. Practically the only material available in the Bombay district for the preparation of concrete is trap rock, either freshly broken or as water-worn shingle and sand dredged from the creeks and rivers. Analyses of these materials show that they contain iron minerals capable of further oxidation, with consequent expansion, and in view of the nature and importance of ferro-concrete construction, it was deemed advisable to determine by experiment whether under normal conditions of working this action is likely to operate to an extent sufficient to jeopardise the stability of structures.

3. Further, the bulk of the trap used in ferro-concrete in this district is the dredged sand and shingle. From the nature of its deposition the sand contains a varying quantity of "clay" or silt, and one section of the tests was designed to ascertain to what extent the presence of this material is permissible.

4. In order to make the conditions as comparable as possible the materials used in the investigation were taken from the bulks lying at the chawls at Worli. They consisted of Mumbra sand. Sieved through 1/4 inch mesh. Mumbra shingle. Sieved through 1 1/8 inch mesh, and retained on 1/4 inch mesh.

Jubblepore cement (Previously inspected by us).—In utilising these for the tests all shingle failing to pass 1 inch mesh was eliminated, but the sand was used as received; it contained approximately 4 per cent. of silt.

5. The tests were divided into two main sections:

1. *Concrete cubes* for crushing strength and determination of ferrous iron (Feo).
2. *Mortar briquettes* to determine the effect of the presence of clay.

Each section extended over one complete year. The results obtained are set forth on the attached sheets "A"—"G".

6. Before discussing the results in detail it may be stated here that they show :—

That the iron minerals do oxidise.

That within the period of testing, the 1 : 2 : 4 cubes (the mixture normal in ferro-concrete construction) exposed to the weather, have "matured" better than those kept inside.

That whilst the sand as received and containing 4 per cent. (approx. of "clay" gives the highest strength, the addition of 5 per cent. "clay"

is not seriously detrimental at the longer dates, but that with any higher percentage the strength of the mortar is materially affected.

7. *Concrete Cubes*.—Two sets were prepared.

A. In the proportions of 1 cement : 2 sand : 4 shingle.

B. Do. 1 cement : 3 sand : 6 shingle.

These proportions were taken as illustrating, "A" that used normally in the construction of the chawls, and "B" that giving a porous concrete usually.

8. All cubes were made 6"×6"×6" and kept in a moist atmosphere for 14 days after gauging. The percentage of water used in gauging, calculated on the volume of solid materials, was

Series "A" 12.2 per cent. Series "B" 7.6 per cent.

Series "A" had a normal consistency, but series "B" was kept somewhat stiff in order to ensure its porosity.

Twenty-eight days after gauging 3 cubes of series "A" and 6 of series "B" were tested with the results given on sheet "A". Six of "B" were taken in case the somewhat dry gauging had caused irregularity of mixture. It will be seen that one cube gives an appreciably higher result than the rest. Eliminating it, the average strength of the mix is 94 tons. The results are normal.

9. At this date (28 days after gauging) the remaining cubes were dealt with as follows:—

Series "A".

1. 12 cubes exposed to the weather.

2. 12 cubes left exposed to the atmosphere of the testing room. These were tested; 6 of each at 6 months, 3 at 9 months and 3 at 12 months.

Series "B".

1. 12 cubes exposed to the weather.

2. 12 cubes left exposed in the testing room and kept alternately wet and dry.

These were tested; 3 of each at 6 months, 3 at 9 months and 6 at 12 months.

10. *Series "B" 2*.—In order to obtain an indication of the weathering effect over a period of years on porous concrete, these cubes were subjected to "intensified weathering" conditions by being alternately saturated with water and dried out. In carrying out the test distilled water was used, tap water being discarded because of its content of mineral matter, some of which would possibly be deposited in the cubes. The distilled water was allowed to drip from suitable apparatus on to each block until it was saturated, then the drip was discontinued and the block allowed to dry. When this occurred the process was repeated, and so on throughout the test.

11. The three cubes crushed at 12 months, and marked with an asterisk on sheet "B", were gauged somewhat drier than the rest and were very porous.

12. *Crushing Strengths.* See sheet "B".—An examination of the figures of series "A" shows that at each of the three periods the cubes exposed to the weather attained a higher strength than those left in the testing room. The relative results are:—

		Tons per square foot.		
		Months.		
		6.	9.	12.
No. 1.	Weather	239·2	288·7	344·6
No. 2.	Testing room	225·5	244·9	249·2
	Superiority of 1	13·7	43·8	95·4

13. Again with series "B" similar results have been obtained; those cubes subjected to "intensified weather" conditions have proved more resistant to crushing than those lying in the weather.

		Tons per square foot.		
		Months.		
		6.	9.	12.
No. 1.	Weather	117·2	172·3	158·0
No. 2.	Intensified weather	172·0	190·4	224·9
	Superiority of 2	54·8	18·1	66·9

(Omitting the last three cubes of No. 2 which were gauged "dry", the difference at 12 months is 85·9 tons.)

14. It will be noticed that at 9 months No. 2 shows only a slight superiority over No. 1, while at both 6 and 12 months they are substantially stronger. As stated above those cubes which had been subjected to the "intensified weather" conditions gave the higher results, and in looking for a cause for the relatively small difference at 9 months, it was noted that the 6 months cubes of No. 1 series were tested in the early part of the monsoon, while those tested at 9 months were exposed throughout the rains. The last 3 months of the 12 months cubes were dry. With the exception of No. 1 series "B", all the cubes have shown a steady increase in strength.

15. *Alteration in state of Iron Minerals.* See sheet "C".

Series "A".—The results obtained with this mixture (1×2×4) are regular and show that the bulk of the loss in ferrous iron (FeO) takes place within 6 months.

Series "B". (1×3×6).—The ferrous iron figures in section No. 1 are so erratic, that it is possible an error has occurred in sampling the material. They cannot be considered of any value, but have been included in the report as obtained.

16. The results of section No. 2 ("intensified weather") show a great increase in the loss of ferrous iron at 12 months over that at 6 months. The figure of 17 per cent. is from the three cubes gauged "dry" and marked with an asterisk on sheet "B".

17. From these results it would appear that prolonged wetting or exposure to moist atmosphere, is beneficial to the strength of the concrete, and that a *well-made* mixture in the proportions of 1 : 2 : 4 "makes up" and becomes practically impervious; any slight oxidation of the materials tending towards this effect. But that with a concrete not sufficiently dense to "make up", the materials may continue to oxidise beyond the strengthening stage to such an extent as to materially aid the disrupting tendency of reinforcement corroding owing to the porosity of the concrete.

18. We send herewith one bottle containing freshly broken Mumbra gravel. Before breaking, each piece appeared solid, but examination of the fractured surfaces will show in some cases that the iron minerals in the interior are undergoing oxidation. There is no reason to assume that the process will not continue if moisture obtains access to the interior of the concrete.

19. *Effect of clay.*—In carrying out the experiments to determine to what extent it is necessary to free the Mumbra sand from clay or silt some 276 briquettes were prepared and tested. They consisted of the following series:—

"A". Mumbra sand as received and gauged with 7 per cent. and 9 per cent. of water:—

"B". Mumbra sand as received *plus* 5 per cent. of trap clay.

"C". Do. do. 10 per cent. do.

"D". Do. do. 15 per cent. do.

"E". Do. do. 20 per cent. do.

All gauged in the proportions of 3 parts : 1 cement.

20. In gauging the briquettes containing the added clay, the sand and cement were mixed together dry, allowance being made for the clay in the quantity of sand used. The requisite proportion of dried clay was thoroughly mixed with the gauging water, and the emulsion added to the dry material. Twenty-four hours after gauging the briquettes were placed in water, which was changed every 7 days throughout the period of test.

21. The two "A" series were broken at 7 and 28 days, and at 3, 6, 9 and 12 months, and the remaining series at 2 months in addition.

For comparison a series ("O") of briquettes composed of 3 British standard sand : 1 cement was prepared and tested at the same periods.

The detailed results of the tests are set forth on sheets "D", "E" and "F", and a summary on sheet "G".

22. The two series "A1" and "A2" are of the same composition, *viz.*, 3 Mumbra sand : 1 cement, but gauged with 7 per cent. and 9 per cent. of water, respectively. 7 per cent. gave a somewhat dry mix, and the effect of not making mortar sufficiently wet is shown in the much lower strength attained as against that reached by the briquettes gauged with 9 per cent.—the correct proportion.

23. The addition of 5 per cent. of clay (series "B") necessitated a higher percentage of water in gauging, and 12 per cent. was found to give the correct consistency. The strength of the briquettes is substantially lower than series "A" at the earlier dates, but the deficiency at the end of a year is not serious.

24. Any quantity of clay above 5 per cent. is shown by the results to seriously lower the strength of the mortar.

25. The results demonstrate however, that for first class work the sand should be as free as possible from clay or silt. The sand used in these tests had been washed, and the 4 per cent. (approx.) of "clay" which it contained, was the result of "dusting" through subsequent exposure and handling.

Conclusions.

26. From the results of the above investigation we are of opinion :

1. That unless concrete prepared from Mumbra sand and shingle prepared practically impervious to moisture at the time of its placing, or is of such proportions as to become so within a short period, there is a possibility that the iron minerals will oxidise to a substantial extent, and aid the disrupting effect of corroding reinforcement.

2. That a well-made mixture of 1 cement : 2 sand : 4 shingle becomes practically impervious within a short time.

3. That should the impermeability of the concrete be doubted, the surfaces should be well cement washed.

4. That from the point of view of strength, the sand and shingle are suitable.

5. That the sand should contain no more than 5 per cent. of "clay" for the most important work, but that where the maximum strength is not essential, some 4 per cent. to 5 per cent. more may be permitted.

"A"

Cubes.

6"×6"×6".

Series "A" 1 cement : 2 sand : 4 shingle.

Do. "B" 1 Do. : 3 Do. : 6 Do.

Cubes kept in moist atmosphere for 14 days and then exposed to atmosphere of testing room.

Tested at 28 days.

Crushing strength in lbs.

Area 36 square inches.

	A.	B.
	74,260	52,670
	75,310	63,820
	74,310	54,580
		51,150
		52,130
		52,700
Average ..	74,613	54,520
Tons per square foot ..	133.2	97.3

At the end of 28 days each series of cubes was sub-divided as follows:
Series "A".

1. Cubes exposed to weather.
2. Cubes left exposed to atmosphere of testing room.

Series "B".

1. Cubes exposed to weather.
2. Cubes left exposed in testing room and kept alternately wet and dry.

"B"

Crushing strength in Lbs.

Area 36 square inches.

	A.		B.	
	1	2	1	2
<i>Six Months</i> ..	120,460	122,790	....	....
	131,070	127,330	....	....
	135,640	113,640	....	....
	135,620	129,860	64,100	95,280
	140,370	132,770	64,620	85,420
	142,120	124,680	68,110	108,500
Average ..	134,213	125,178	65,610	96,420
Tons per square foot ..	239·2	225·5	117·2	172·0
<i>Nine Months</i> ..	164,010	132,840	104,750	121,340
	174,590	133,840	91,930	102,830
	146,500	144,660	92,540	95,680
Average ..	161,700	137,113	96,506	106,617
Tons per square foot ..	288·7	244·9	172·3	190·4
<i>Twelve Months</i> ..	....	....	87,070	132,640
	....	....	87,470	134,460
	....	....	89,160	142,630
	188,490	137,710	86,370	114,590
	193,690	144,010	84,720	105,630
	196,780	137,030	96,240	125,960
	Average ..	192,987	139,583	88,505	125,984
Tons per square foot ..	344·6	249·2	158·0	224·9

"C"

ALTERATION OF STATE OF IRON MINERALS
IN THE CONCRETE.

Indicated by loss of ferrous iron (Fe O).

Series "A". 1 cement : 2 sand : 4 shingle.

1. Cubes exposed to weather.
2. Cubes exposed in testing room.

Series "B". 1 cement : 3 sand : 6 shingle.

1. Cubes exposed to weather.
2. Cubes exposed in testing room and kept alternately wet and dry.

—	Percentage of ferrous iron (Fe O).				
	In dry Mix.	After 6 Mos.	After 12 Mos.	Per cent. Loss at 6 Mos.	Per cent. Loss at 12 Mos.
Series "A"—					
1	5·980	5·386	5·320	9·94	11·04
2	5·980	5·345	5·214	10·62	12·81
Series "B"—					
1	6·220	5·140	5·725	17·36	7·80
2	6·220	5·669	5·270 5·160	8·86	15·27 17·00

"D"
BRIQUETTES.

1" × 1" in section. lbs per square inch.

"A" series.

3 Mumbra sand as received : 1 cement.

Per cent. Water.	Temp. F.		Days.			Months.				
	Air.	Water.	7	23	3	0	9	12		
7	{ 75·0 80·0	{ 73·0 76·0	280	370	585	620	615	580		
			305	410	470	460	500	455		
			200	415	505	400	420	530		
			200	420	545	460	480	470		
			255	340	635	465	465	485		
			200	375	475	385	470	460		
			Average ..		280	398	551	407	485	493
					325	425	545	610	700	670
					380	490	640	580	650	660
					350	490	625	500	510	575
9	{ 75·0 80·0	{ 73·0 76·0	360	485	595	535	620	600		
			370	425	575	620	700	570		
			350	445	585	575	660	605		
			Average ..		350	450	578	570	673	613

" E "
BRIQUETTES.

1" × 1" in section. lbs. per square inch.

" B " series.

3 Mumbra sand containing 5 per cent. added clay : 1 cement.

Per cent. Water.	Temp. F.		Days.		Months.						
	Alr.	Water.	7	28	2	3	6	9	12		
12			260	355	405	455	575	590	590		
			320	380	400	440	550	565	640		
			87.0	87.0	280	360	430	480	530	605	675
					270	375	430	480	498	535	585
			89.5	89.0	310	320	440	480	515	530	570
					290	370	420	490	555	560	580
			Average ..		288	360	421	471	536	564	587

" C " series.

3 Mumbra sand containing 10 per cent. added clay : 1 cement.

14.0			170	260	345	340	410	440	480		
			180	230	320	335	435	495	505		
			86.5	85.0	175	275	320	315	410	465	470
					185	265	325	350	455	470	510
			88.5	87.0	180	250	350	330	475	400	400
					200	200	340	350	480	550	520
			Average ..		182	237	333	337	444	485	496

"F"

BRIQUETTES.

1" × 1" in section, lbs. per square inch.

"D" series

3 Mumbra sand containing 5 per cent. added clay : 1 cement.

Per cent. Water.	Temp. F.		Days.		Months.					
	Air.	Water.	7	28	2	3	6	9	12	
14.5	{ 80.5 89.0 }	{ 85.0 88.0 }	100	245	340	340	460	410	425	
			155	245	320	340	445	460	500	
			185	245	310	345	460	400	440	
			100	210	320	330	435	415	385	
			195	230	300	345	400	460	430	
			185	235	320	340	430	460	545	
			Average ..	183	235	318	340	438	434	481

"E" series.

3 Mumbra sand containing 20 per cent. added clay : 1 cement.

15.0	{ 80.5 90.0 }	{ 85.0 88.0 }	200	300	325	330	450	410	375	
			180	310	325	350	415	440	425	
			210	245	330	340	410	435	420	
			180	295	310	350	420	435	380	
			190	295	330	335	400	425	465	
			170	200	335	345	425	475	385	
			Average ..	188	280	326	342	423	437	408

" G "
BRIQUETTES.

SUMMARY OF RESULTS.

Column "O"	3 British standard sand : 1 cement.
„ "A 1"	3 Mumbra sand : 1 cement gauged with 7 per cent. water.
„ "A 2"	3 Mumbra sand : 1 cement gauged with 9 per cent. water.
„ "B"	3 Mumbra sand containing 5 per cent. added clay : 1 cement.
„ "C"	3 Mumbra sand containing 10 per cent. added clay : 1 cement.
„ "D"	3 Mumbra sand containing 15 per cent. added clay : 1 cement.
„ "E"	3 Mumbra sand containing 20 per cent. added clay : 1 cement.

	Pounds per square inch.						
	O	A1	A2	B	C	D	E
7 Days ..	278	280	356	288	182	183	188
28 Days ..	310	388	450	300	257	235	280
2 Months ..	..	..	..	421	333	318	326
3 Months ..	337	551	578	471	337	340	342
6 months ..	328	467	570	536	444	438	423
9 Months ..	304	485	673	504	485	434	437
12 Months ..	316	493	613	587	406	481	408

APPENDIX D.

*Members of the Advisory Committees for Bombay City and Suburbs
for 1924-25.*

BOMBAY.

Name of Member.	Constituency.
1. Dr. Nadirshaw H. E. Sukhia, L.M.&S., L.V.Sc. (Spl.), F.R.S.I. (Lond.)	Bombay Municipality.
2. Fazal Ibrahim Rahimtoola, Esq., B. A.	Do. do.
3. R. H. A. Delves, Esq., F.S.I.	.. City of Bombay Improvement Trust.
4. E. C. Reid, Esq.	.. Bombay Chamber of Commerce.
5. Jehangir Bomanji Petit, Esq.	.. Bombay Millowners' Associa- tion.
6. Manu Subedar, Esq.*	.. Indian Merchants' Chamber.
7. F. G. Scowen, Esq.	.. Bombay Presidency Trades' Association.
8. S. K. Bole, Esq., M.L.C.	.. Working Classes.
9. Joseph Baptista, Esq., L.C.E. (Bom.), B.A. LL.B. (Cant.), Bar.-at- law, M.L.C.	Do.

BOMBAY SUBURBAN REVENUE DIVISION.

1. Ig. D'Monte, Esq.†	.. Bandra Municipality.
2. D. D. Rodrigues, Esq.	.. Kurla Municipality.
3. P. J. Vakil, Esq., B.A., LL.B.	.. Ghatkopar-Kirol Municipality.
4. Janmejy Chhabildas, Esq., M.A. (Cant.).	.. Notified Area Committees.

* Mr. Manu Subedar was elected by the Indian Merchants' Chamber in place of Mr. Manmohandas Ramji who resigned his seat on the Committee in November 1924.

† Mr. Ig. D'Monte was elected by the Bandra Municipality in place of Mr. Augustus Pereira who resigned his seat on the committee in October 1924.

APPENDIX E.

DEVELOPMENT DIRECTORATE.

Designation.	Name.
1. Director of Development	.. Sir Lawless Hepper, Kt., J.P.
2. Deputy Director of Development ; Secretary to Government, Develop- ment Department ; Commissioner, Bombay Suburban Division and Settlement Commissioner, and Director of Land Records, Bombay Suburban Division.	<i>J. R. Martin, C.I.E., I.C.S., J.P. (on leave).</i> R. D. Bell, C.I.E., I.C.S., J.P. (acting).
3. Deputy Secretary to Government, Development Department ; Secre- tary to the Development Directorate and Assistant Commissioner, Bom- bay Suburban Division.	H. St. C. Smith, J.P.
4. Assistant Secretary to Government, Development Department.	R. B. Vachha, M.A., J.P.
<i>Reclamation Branch.</i>	
5. Chief Engineer, Reclamation .. Branch.	H. A. Elgee, M.I.C.E.
6. Deputy Chief Engineer, Reclama-.. tion Branch, Marine Lines Section.	G. M. O'Rorke, C.I.E., M.B.E. B.A.I., A.M.I.C.E. (also super- vising the Quarry Section).
7. Deputy Chief Engineer, Reclama-.. tion Branch, Colaba Section.	P. Billinton.
8. Deputy Chief Engineer, Dredging.. Section.	C. R. Brims.
9. Executive Engineer, Projects ..	W. H. Thomas, A.C.G.I., A.M.I.C.E.
10. Executive Engineer, Reclamation.. Branch.	W. F. Anderson, A.M.I.C.E.
11. Marine Surveyor	G. D. Kundaji, M.R.San.I. (Lond.), A.M.I.E.S. (Glas.)
12. Executive Engineer-in-charge .. Quarry Section.	C. G. Croudace.
13. Assistant Engineer	S. M. Abdullah, A.M.I.E., (Ind.), M.R.San.I. (Lond.)
14. Do. do.	A. N. Seal, B.Sc. (Lond.)
15. Do. do.	Badrinath Sadanand.
16. Do. Dredging Section ..	F. M. Surveyor.

Designation.	Name.
17. Quarry Master	E. O. Roberts.
18. Mechanical Engineer, Quarry ..	A. Bellefontaine.
19. Dredging Master	W. S. Speirs.
20. Sanitary and Medical Officer, Back Bay Reclamation Scheme.	B. S. Chalam.

No. 1 Housing and Materials Division.

21. Superintending Engineer, No. I Housing and Materials Division ..	T. Harvey, M.Sc., M.I.C.E., J.P.
22. Executive Engineer, Bombay Housing District No. I.	J. R. Colabawalla, M.S.E. (Lond.), M.I.E. (India), Assoc. M.Am.Soc.C.E., Assoc. A.I.E.E.
23. Executive Engineer, Bombay Housing District No. II.	A. Hamid, F.Sc.
24. Executive Engineer, Bombay Housing Sanitary District.	Rao Saheb P. S. Krishnasami Ayyar.
25. Executive Engineer, Mechanical and Materials District.	W. K. Caldwell.
26. Assistant Engineer ..	M. A. Dhoria, B.A., B.E.
27. Do. do. ..	S. S. Rajadhyaksha, B.A., B.E.
28. Assistant Engineer ..	<i>Sardar Kala Singh (on leave).</i>
29. Do. do. ..	Mahomed Hashim, B.E., M.R. San.I., A.M.I.E.
30. Do. do. ..	<i>Vacant.</i>
31. Do. do. ..	<i>Vacant.</i>
32. Do. do ..	J. D. Daruwala.
33. Do. do. ..	K. L. Mahindru.
34. Do. do. ..	Nand Kishor Agrawal.

No. 2 Suburban Division.

35. Superintending Engineer, No. 2 Suburban Division.	A. F. Macdonald Clark, M.A. B.Sc., M.I.C.E., J.P. (<i>on leave</i>).
	Colonel R. St. J. Gillespie, C.I.E., O.B.E., J.P. (<i>acting in addition to his own duties</i>).

	Designation.	Name.
36.	Electrical and Mechanical Engineer	A. Lennox Stanton, M.I.M.E., M.I.E.E., M.Am.S.M.E., M.I.E. (India).
37.	Executive Engineer, Andheri District.	D. K. Bhawe, L.C.E., M.A., B.A.C. A. M. Inst. C.E., A.M.I. Mech.E. (on leave). T. S. Soorma, B.E. (acting in addition to his own duties).
38.	Executive Engineer, Suburban Sanitary District.	T. S. Soorma, B.E. (Vide entry No. 37).
39.	Executive Engineer, Kurla-Trombay District.	T. A. Pereira.
40.	Assistant Engineer	Rao Saheb K. C. Advani, L.C.E., A.M.I.E. (works also as Personal Assistant to the Superintending Engineer, No. 2 Suburban Division).
41.	Do. do.	H. K. Vacha, B.A., B.E., A.M.I.E.
42.	Do. do.	F. J. Campos, B.E.
43.	Do. do.	Ramlal Suri.
44.	Do. do.	R. S. Borker.
45.	Do. do.	T. V. Sunderasan, B.A., B.E. (on leave).

Suburban Survey.

46. Superintendent, Bombay Suburban Survey. W. J. Newland, J.P.

Land Acquisition, Bombay.

47. Land Acquisition Officer for the City of Bombay. G. C. Rowe, F.S.I., J.P.
48. Personal Assistant to the Land Acquisition Officer for the City of Bombay. S. D. Nariman, B.A.

Land Manager, Development Directorate.

49. Land Manager, Development Directorate. E. M. Gilbert-Lodge, F.S.I. F.I.A., F.A.I., J.P.
50. Personal Assistant to the Land Manager, Development Directorate. K. R. Doctor, F.S.I., L.C.E., A.M.I.E.

Designation.

Name.

Sulsette Development.

51. Collector, Bombay Suburban.. E. W. Perry, I.C.S., J.P.
District and Salsette Develop-
ment Officer.
52. Personal Assistant to the Salsette.. D. G. Sowani, B. Sc., B.E.
Development Officer.
53. Deputy Colloctor and Assistant.. P. H. Dowan, B.A.
Development Officer, Bandra
Ambernath.
54. Assistant Development Officer,.. *Vacant.*
Trombay.
55. Assistant Development Officer,.. D. M. Ranadive, B.A.
Kurla.
56. Special Assistant to the Collector,.. E. de B. Jewell.
Bombay Suburban District.

Audit and Finance.

57. Financial Adviser to Government.. A. V. V. Aiyar, C.I.E.
58. Deputy Financial Adviser to.. S. M. L. Bean.
Government and Audit and Ac-
counts Officer, Bombay Develop-
ment Scheme.
59. Assistant Audit and Accounts.. R. Hogan (on deputation
Officer, Bombay Development K. M. Elijah (acting).
Scheme.
60. Special Officer, Development Direc.. R. Hogan.
torate chawls.

Military Lands Scheme.

61. Secretary, Board of Control and.. Colonel R. St. J. Gillespie,
Chief Engineer. C.I.E., O.B.E., J.P. (*Vide*
also entry No. 35).
62. Deputy Chief Engineer .. *Vacant.*
63. Executive Engineer, F. Walker.
64. Assistant Engineer I. C. Dare, B.A., F.R.S.A.,
F.S.I., A.M.I.C.E., M.I.S.E.
65. Do. *Vacant.*
66. Do. B. M. Flores, B.A., B.E.
67. Do. *Vacant.*

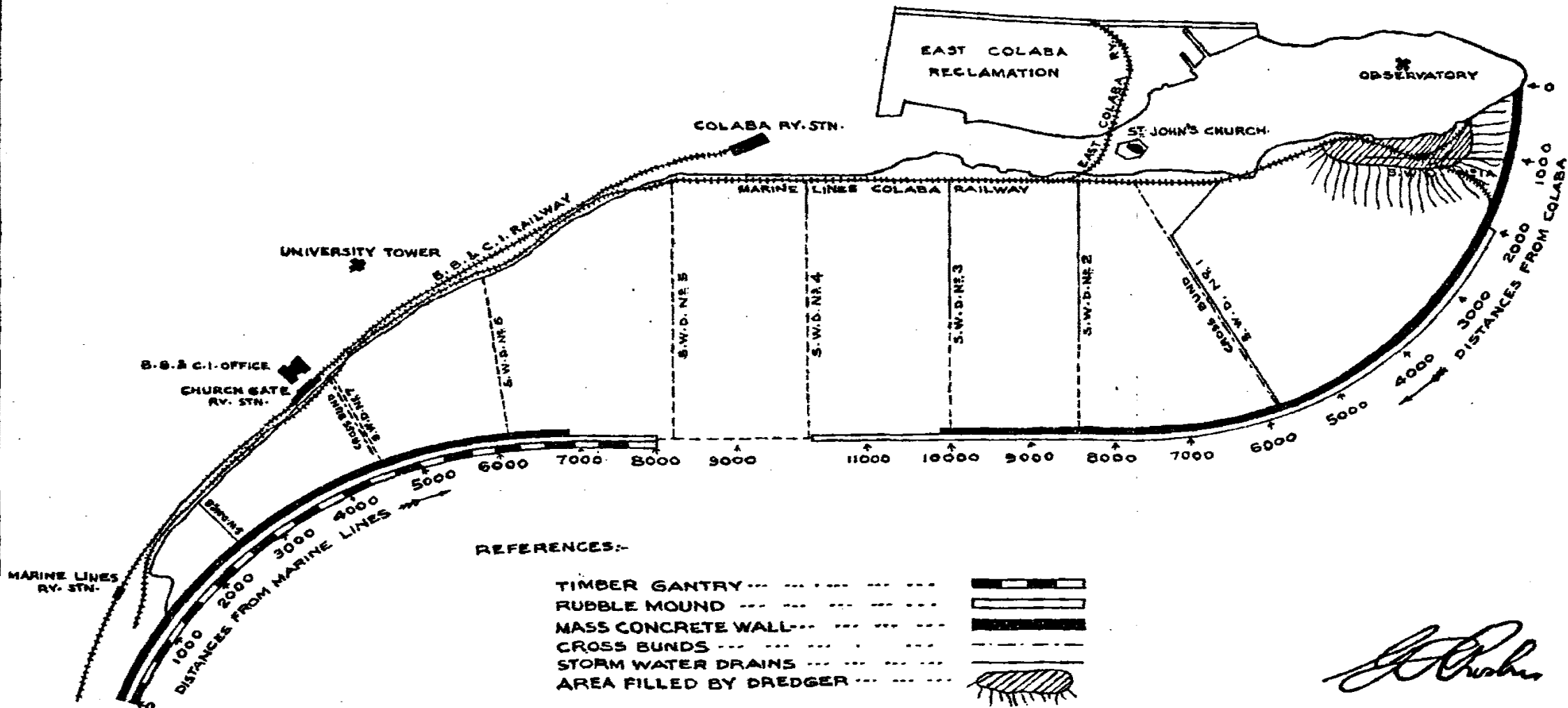
Designation.	Name.
68. Architect	.. J. Fernandez.
69. Financial Adviser to the Board of Control, Military Lands Scheme.	.. S. M. L. Bean.

Consulting Town Planner.

70. Consulting Town Planner	.. W. R. Davidge, F.R.I., B.A., F.S.I., A.M.Inst.C.E.
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BACK BAY RECLAMATION SCHEME

DIAGRAM SHOWING THE PROGRESS OF WORK UPTO 31ST MARCH 1925



REFERENCES:-

- TIMBER GANTRY ---
- RUBBLE MOUND ---
- MASS CONCRETE WALL ---
- CROSS BUNDS ---
- STORM WATER DRAINS ---
- AREA FILLED BY DREDGER ---

J. P. ...

CHIEF ENGINEER
RECLAMATION