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(2) Date of repair _____

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE.

Y.S. **Government of Madras.**

Public works **DEPARTMENT.**

G.O. No. 3740	Press ~~Mis.~~
7-8	
Dated 1. 12	1868.

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*Proceedings of the Madras Government, Public Works Department,
1st December 1868.*

No. 7. Read the following letter from the Superintending Engineer, 5th Division, to the Secretary to Government, Public Works Department, dated Salem, 5th October 1868, No. 114 :—

1. With reference to the Order of Government of the 21st of April, No. 1,201,

- 1 Plan.
- 1 Estimate.
- 1 Letter from Executive Engineer.
- 1 Detailed list of articles
- 1 Memorandum on the proposed drainage.

I have the honor to forward a revised estimate of Rupees 69,000, accompanied by plan and report, for the drainage of the Race Course Barracks at Bangalore.

2. The original estimate, forwarded with my letter of the 11th of February, No. 224, was returned with a view to alterations being made to provide "a better flushing of the drains, improved ventilation of the shafts, and an extension of the outfalls." The estimate now forwarded has been revised to meet the above requirements, and the system of drainage has also been modified, as far as possible, in accordance with the views of the Sanitary Commissioner, and medical authorities at Bangalore.

3. The first scheme was for the removal of liquid refuse from the buildings entirely by the glazed pipes. It is now proposed that the drainage should, in the first instance, be collected in open V shaped granite channels, and conducted by them into pipes laid under ground. The open drains are to be provided with covering planks where necessary. The number of traps will in consequence be considerably reduced, and there will be no difficulty in keeping the open drains clean in the immediate vicinity of the buildings, where alone they will be laid. The flushing and ventilation will be simpler and more effectual than in the original scheme.

4. The two main drains are to follow the course laid down in the first plan, but they will be carried to a greater distance. Egg shaped pipes are to be substituted for circular. This will ensure a quicker flow for the sewage, and the sizes of the pipes are to be increased to avoid danger of choking. The smallest size now proposed to be used is four by five and a half inches.

5. It is intended to effect the drainage of one set of the buildings, viz., the Artillery Married Quarters, entirely by open channels. In the event of the estimate being approved, I would recommend that part of the scheme being first carried out, and by the time the pipes are received from England it will be seen whether the open system of drainage should be adopted to a greater extent than provided in this estimate.

6. The plan and estimate have been detained up to this time in my office, as I wished to go over the ground again before forwarding them.

From Captain J. O. MAYNE, R. E., Executive Engineer, Bangalore, to the Superintending Engineer, 5th Division, dated Bangalore, 9th June 1868, No. 242 A.

- 1 Original plan.
- 1 Estimate.
- 1 Specification.
- 1 Modified Plan.
- 1 Revised Estimate.
- 1 Copy of Dr. Barclay's Memorandum.
- 1 Copy of Executive Engineer's letter, No. 246, dated 9th June 1868, to the Deputy Assistant Quarter Master General.
- 1 Indent.

1. I have the honor to re-submit the project for drainage of Race Course Bangalore, with a modified plan, and to offer the following remarks on the subject.

2. The subject of drainage is new to this country, and any system of covered drainage at all defective in principle would be almost worse

than none at all, and a little further discussion will do no harm.

*Proceedings of the Madras Government, Public Works Department,
1st December 1868.*

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3. The Government in returning the plan, &c., submitted by Lieutenant Pennycuik, call in G. O., No. 1,291, of 21st April, for a revised estimate for, first, a better system of flushing; second, improved ventilation to shafts; and, third, an extension of the outfalls.

4. The third item is a simple matter. The first two require some consideration, and I venture to suggest a modification of the plan proposed by Lieutenant Pennycuik and recommended by you, which will in great measure meet the requirements of Government, and, in my opinion, be more applicable to this country and to the nature of the drainage required.

5. I have gone through Lieutenant Pennycuik's plan and report, and also carefully read the Sanitary Commissioner's report thereon.

6. The general scheme, as far as the proposed line of main drainage and the outfalls (with the modifications proposed by the Sanitary Commissioner) I fully approve of, but I would simplify the minor drains, and combine some surface drainage with the underground sewerage, though I by no means advocate a general system of surface drainage, as recommended by the Sanitary Commissioner, the natural drainage being excellent, and when the barracks are all completed and a few inequalities levelled off, and roads and paths gravelled, will be all that could be wished.

7. In this country the greater the simplicity in the arrangements for drainage of barracks as a rule, the greater the efficiency and the less chance of nuisances.

8. The sub-soil drainage, so strongly urged by the Sanitary Commissioner, I do not advocate for Bangalore. I cannot call to mind a single place in the station where it would in any way be advantageous. I can fully understand it being desirable in some soils, but if ever introduced into Bangalore, it will be repented of. The wells in the station render but very precarious supplies, and I feel convinced if sub-soil drainage is introduced, they will fail entirely, to say nothing of withdrawing all moisture from the trees, and probably seriously affecting their growth.

9. Reverting to the recommendations of the Sanitary Commissioner, as noted at the conclusion of his report—

1st.—The collection and storage of rain-water from the roofs I have always allowed, and strongly recommended.

2nd.—The supply of water from Ulsoor Tank, for common purposes, may be carried out eventually, but will not be available for some time.

3rd.—The paving round all the buildings is not, I think, essential. I have never observed any ill effects from the want of it, and it would, in my opinion, be a useless expense.

4th.—The natural drainage may be improved as suggested in paragraph 6.

5th.—The tubular system of sewage I would modify, as hereafter recommended.

6th.—The sub-soil drainage I do not approve of.

7th.—The extension of the out falls will not be very expensive, and is desirable.

10. The modifications I would propose are as follows:—

1st.—Doing away with the minor covered drains and traps leading up to each house, and substituting open drains round the portions of the buildings from which any sewage is to be removed.

2nd.—Altering the shape of the pipes, from circular to egg shaped.

3rd.—Enlarging the size of the pipes, from circular to egg shaped.

4th.—Re-adjusting the man-holes and ventilating shafts.

11. The advantages I claim are, more effective means of flushing, and assisted, in many months in the year, by the rain-falls; more perfect ventilation; less risk of nuisances—I believe more economical in construction, and lastly, but not least, that the work would be put in hand at once, and large quantities of materials prepared ready to be laid down when the pipes from England arrive.

12. I thus meet the two most important requirements of Government.

13. The plan now proposed provides solely for house sewerage, necessitating a great many traps and numerous small branch drains, and especially to the married quarters and stables. There, I fear, will prove sources of endless trouble. When exposed, as they will be, to so many chances of solid matter and sand washings entering them, they will be constantly choking. Then again, if not constantly in use, in this country the water in the lead evaporates, and, instead of traps

they become escapes for the foul gases from the drain. The fewer number of these traps, the more efficient will be the flushing of the drain, and the more easily will the great desideratum of proper flushing be effected. As now proposed, it will be endless and expensive work flushing every trap.

14. The removal of these minor drains and traps would also render ventilation more easy. The great essentials in ventilating drains is to reduce the number of openings to a minimum, and make those necessary as perfect as possible, that no gas may escape, except through the purifiers. Now, it would be impossible to ventilate each of these small drains, and being on the higher levels and trapped, they would always be charged. And I would point out that it is not only liquid sewage that escapes from the pipes, and contaminates the soil, but bad gases have almost equally deleterious effect (instance gas pipes, and the state of the soil around them), and in matter of time the soil in the immediate neighbourhood of the houses would be seriously affected.

15. In fact, these traps are meant and suited for regular house sewage, such as in towns in Europe, where regular water supplies are laid on to the houses, and they are constantly being used.

16. I propose, therefore, laying only main pipes to carry away the sewerage from the barracks, and laying open drains made of granite slabs, set in cement, V shaped (with the base of the V built up with cement thus ∇), to every building where water is used for bathing and such purpose, leading into trapped pipes. Where the V drains cross open ground, they should be provided with covering planks, one and a half inches or two inches thick.

17. These can always be kept clean, and will afford a paving round many of the basements, which is advocated by several.

18. These arrangements will reduce the number of traps very considerably, and will also diminish the risks of escapes of gas in proportion. There will only be one trap at each junction of open drain with sewer, and the flushing will be much easier carried out, at less expense, and when the water is laid on to the barracks, which will probably be about the same time as the drainage is completed, the flushing will be an easy matter.

19. The next consideration is the shape of the pipes. I am convinced the nine-inch circular pipes would soon choke. The egg shaped pipes is everywhere acknowledged to be the most suitable for sewers, and they are made especially for the purpose. They are seldom known to choke with any great fall, which these would have here.

20. The size also, I am of opinion, is too small, and I quite agree with the recommendation of the Sanitary Commissioner that they should be larger. I would recommend nothing less than four inches leading into seven inches and ten inches breadths, the corresponding depths of which would be about five and a half inches, nine and a half inches, and thirteen and a half inches, respectively.

21. As regards the man-holes and ventilation, I think in lieu of the plan recommended by the Sanitary Commissioner, as the pipes will never in this case be laid any great depth, (fifteen feet is the extreme depth mentioned by Lieutenant Pennycuik,) a simple shaft, with a charcoal (animal) basket at top, would suffice. The basket removed opens a man-hole. The sketch B on the plan will show what I propose.

22. I would never place one of these nearer than fifty feet to any dwelling room, and if the trap is near a room, the first fifty feet of piping must be laid nearly level, so that the gas can escape from it into the shaft.

23. I would place one at high level end of every drain, one at every junction, and, in long runs, if fall is slight, one at every five hundred feet, but if the fall is great, at every one thousand feet will not be too great a distance.

24. With these arrangements, I do not anticipate any difficulty in either flushing or securing proper ventilation.

25. The accompanying plan shows the line of drains, &c., proposed, and position of the ventilator shafts, and the estimate shows the length of the various portions. I have estimated the rates at an approximation, having no data for the pipes of the kind proposed.

26. The blue lines on plan show open drains, the red the sewers. The double blue lines show the portions covered with planks.

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28. The drains are put
wash and other out-houses.

30. being carried into the sewer, for it will choke the gallery, instead of being carried into the sewer.
31. Owing to the large quantity of water, it is not possible to pump out the water from the gallery.

31. Owing to the low level of the Artillery marriage camp, it will make the difficulty of being carried down by so few families, I think, and much less for carrying them to the main sewer.

The estimate, amounting to \$100,000, was approved by Lieutenant Pennycuik. The estimate was also approved by the board of directors.

From Captain J. O. MAYNE, B. F. M.

1. I have the

2. Previous to receiving the memorandum from Dr. Barclay, dated 23 January, on the drainage of the Race Course, forwarded for my consideration a letter to the Honorable the President, dated 14 January, 1878, No. 215.

3. Dr. Barendse, in a letter to the Superintendent, dated 1911, stated that he had already communicated to the Major General, in a copy of his report, the views of the Government on the project, and reported that the project had been approved by the Government.

4. He suggests that no one is hurt by the kind, and that there is no harm done.

be no difficulty under these heads. They are not to be carried over to the next year.

5. He also raises the question of the engineering and design of the bridge.

6. Dr. Burchard

That all solid matter of every kind which may be collected, as well as

7. Now, no one, I think, can doubt that the condition of the body laid out in the

8. As stated in paragraph 7, I have no objection to the release of the information provided by me.

9. The drains, if any, are laid with pipes.

establishment and large quantities of clothing and cleansing done repeatedly and efficiently done, means that the work is not vitiated.

... failure in the quantity of water would have to be provided; and if the water
laid line of pipe

From excavations on the part of the ... and not less than three feet from ...

11. The sub-soil drainage, I observe, Dr. Barclay considers unnecessary in Bangalore. In conclusion, first, as before stated, I do not deny that if Dr. Barclay's proposal were carried out, and the daily flushing efficiently performed, the sanitary condition of the barracks should be perfect. But

Memorandum on the Drainage of the Race Course Barracks, Bangalore.

In submitting the following observations on the proposed plan of drainage, I have the honor to

state that my acquaintance with its details is derived, solely, from the published "Precis of subjects in the Proceedings of the Sanitary Commissioner for Madras for the month of March 1868." No reference has ever been made to me on the subject. I do not, however, feel justified in withholding

I. Except for the stables, which are completely detached

tance from them, on their southern side, and which can be drained separately at a comparatively small cost, the establishment of a system of under-ground drainage, tubular or otherwise, is unnecessary. The introduction of the dry earth system of conservancy, and the removal by it of all

solid and fluid excreta being intended, there only remain to constitute the "sewage," the contents of the plunge baths, the water from the lavatories, and the refuse from the kitchens. The latter is rather dwelt upon by the Sanitary Commissioner, as the ingredient which will chiefly entitle the

contents of the drains to be styled *sewage*; and, in truth, if it be left out, there will be no good reason why the remainder, which will consist entirely of water from baths and ablution rooms, should be allowed to run off at fixed hours in properly constructed surface drains, the aqueous matter

the following general suggestions respecting works of

"sewage and drainage for slaving towns, and districts
"are extended to embody the chief points of experience
"obtained in England, and may be adopted in India so
"far as they may be found applicable under local and
"special peculiarities of surface of contours, subsoil,
"and prevailing atmospheric temperature. Sanitary

prevailing at most Indian Stations, and the heated state of the earth through which the drains must pass. Decomposition of the sewage, contained in such drains in this country, take

place with a rapidity and to an extent to which there is no parallel in temperate climates. The

*Proceedings of the Madras Government, Public Works Department,
1st December 1868.*

high temperature also causes an increased tendency, on the part of the exhaled gases, to rush out through every available aperture; and the possible effluvia so familiar to the inhabitants of Calcutta and Madras, are the result. Whether or not that result could be prevented by an improved system of engineering, may be an open question, but it may certainly be said, that it has not been prevented as yet. The circumstances of a large city may, and probably do, render it necessary to adhere to the system of under-ground drainage, with all the evils inseparable from it, but why introduce that system in such a site, as that on the Race Course, where it is not necessary.

1. To the argument that the sewage in the drains there would be comparatively free from offensive impurities, it is only necessary to reply that, in practice, it would be impossible to prevent the drains from being used as receptacles for every species of filth, and that a large part of excreta from native followers from the married quarters, would certainly find their way into them. Of this the condition of the drain in Fort St. George affords ample proof. The proposed number of openings is so great that, judging from experience elsewhere, it must be expected that some of the traps will very frequently be out of order, and offensive effluvia permitted to escape from them.

2. No one in India has any experience in the construction of drains on the plan proposed, and there is no certainty that the pipes can be every way so constructed as to prevent the escape of their contents and the consequent contamination of the sub-soil. On the contrary, this appears to be contemplated by the Sanitary Commissioner as unavoidable, and in his recommendation, as to the sub-soil drainage, he suggests means for the mitigation of the resulting evil.

3. The rain-fall, which I believe is correctly estimated by the Sanitary Commissioner at an annual average of 35 inches, is by no means equally distributed over the several months of the year, and occasionally six or eight inches have been known to fall in a few hours. I remember one such fall when I was stationed here twelve or thirteen years ago, what chance there would be of pipes of the proposed dimensions with standing a sudden pressure like that to which, under such circumstances, they would be exposed, the Engineers are best qualified to judge. Should the pipes not stand the strain however, the result would be serious in a sanitary point of view.

4. The contamination of the sub-soil water, resulting from such an event, and (inevitably as believed by the Sanitary Commissioner) from leakage through the joints of the pipes, or fracture of some of them, would, without doubt, gradually render the water in wells in the neighbourhood of the barracks unfit for use, and this I conceive to be a most serious objection to the plan. There is at present, a good prospect of a sufficient supply of drinking water, of good quality, being obtained from wells at the edge of the plateau, or on the slope extending outwards from it, and if these wells be contaminated by the drains, I know not where else an equally good supply is to be obtained. The plan of storing, for drinking and cooking purposes, the rain which falls on the roof of the barrack-rooms involves, for its success, the construction of absolutely impervious tanks, and the provision of means of letting the best part of every shower escape. The latter, I believe, would be found in practice to be a matter of no little difficulty. The necessity for it might perhaps be obviated by leading the rain water from the roofs of the barracks into a filter, similar to that figured at page 16 of the Suggestions of the Barrack Hospital Commission, (and which I saw in beneficial operation at Fort Pella, in South Africa, upwards of twenty years ago). But should the supply from that source fail, I know of no other that could be resorted to, for I do not believe they is the slightest probability that any amount of filtering, which is practicable on a large scale, will ever render the water of the Upper tank fit for drinking.

5. The main sewer, as I understand, is proposed to be led close past the hospital, so as to contaminate the air in that neighbourhood by the effluvia from its ventilating shafts and the water in the wells (now in use by the patients) by percolation. The point selected for its outfall also in during several months, almost directly to windward of the hospital.

For the reasons above stated, I have the honor respectfully to submit that it is, on sanitary grounds, extremely desirable that the plan as proposed should undergo the following modifications—

(1.) That the drainage of the stables, lying as they do at a considerable distance from most of the barracks, on the southern edge of the plateau be entirely separated from that of the barracks and be carried out, as proposed, by tubular drains, the number of openings into them being however reduced as much as possible.

*Proceedings of the Madras Government, Public Works Department,
1st December 1868.*

(2.) That the drainage of the barracks be entirely by open drains, made, as far as possible, impervious to water, as recommended by the Committee assembled under the orders of His Excellency the Commander-in-Chief on the 19th May 1865; a path-way four or five feet in width, flagged with granite, cemented so as to be absolutely impervious to water, passing round each barrack and block of buildings, and a V shaped drain running along its outside, (where necessary from the contour of the ground), the drains might be covered over during part of their course. If it were possible by asphalt, or by any other means, to make the surface, for some distance around each building, impervious to rain, it would be of great advantage to do so, and the further that the impervious coating could be made to extend the greater would the advantage be.

(3.) That the contract for the removal of the poudrette from the latrines be made to include the removal, at least once daily, of all kitchen and other refuse from barracks, hospitals, and married quarters.

(4.) That nothing be permitted to be emptied into the drains, except water from ablution rooms and baths; that each ablution room be provided with a cistern for the reception of the refuse water; that the contents of these cisterns be let off into the drains, at fixed hours daily, so that they may run off at once, and that after the discharge of the foul water the drains be flushed daily by clean water, which should not be discharged in a small stream from a pipe, but in a rush through a sluice in an appropriate cistern.

It will be observed that, in the preceding remarks, I have made no alteration to sub-soil drainage, and my reason for not having done so is, that the question as to the sub-soil drainage is entirely distinct from that as to sewage, except in so far as the establishment of a system of under-ground sewers may render sub-soil drainage the more necessary.

I believe with the Barrack and Hospital Commission, and the Sanitary Commissioner, that an efficient system of sub-soil drainage would add to the healthiness of most barracks in India, while its employment is entirely free from sanitary objection; but, at the same time, I am bound to state that I believe there are few sites where it is so little required as on the Race Course, the contour of the plateau being such that the greater part of the rain-fall runs off from it at once (the ragged gullies on all sides bear witness to the speed with which it does so), the level of the sub-soil water being at all times far from the surface, and the station being singularly free from malarious disease.

No. 8. ORDER THEREON, 1st December 1868, No. 3,740.

MILITARY WORKS, No. 1.

The Government consider it expedient to postpone the consideration of the foregoing papers, pending the return to Madras of Captain Tulloch who, during his recent stay in Europe, has had his attention engaged on the subject of sanitary improvements as practised in large towns.

(True Extract.)

Colonel, R. E.,
Secretary to Government.

To the Superintending Engineer, 5th Division.
Military Department.

Exd. S. T. Augustin.

PUBLIC WORKS.

THE SUPERSTIMULING INNOVATION

Printed by the Government Printer, 1898.

1. 4. 5.

G. O. 1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 84

DECEMBER.

HOE. 7-8

The following is a list of the names of the persons who have been appointed to the various positions in the Department of the Interior, under the act of March 3, 1879, entitled "An Act to provide for the better management of the public lands, and for other purposes."

N^o 242

A

Executive Engineer's Office, Bangalore

9th June 1868

Despatched on the 1st July 1880

From

The Executive Engineer,
Bangalore.

07

The Superintending Engineer,
5th Division.

Sir,

Enclosures 8.

1 Original Plan.

1 Estimate.

1 Specification.

Modified Clav.

Revised Estimate.

1 Copy of Dr. Barclay's
Receipt.

1 Copy of E: Englis.

Letter No. 2467
at June 1888/64

9th June 1861, at
St. Asaph - Dr. Master

General.

Indents

I have the honor to resubmit the project for drainage of Race Course Bangalore, with a modified Plan, and to offer the following remarks on the subject:

2. The subject of drainage is new to this country, and any system of covered drainage at all defective in principle would be almost worse than none at all, and a little further discussion will do no harm.

3. The Government in returning the Plan ~~for~~ submitted by Lieut^t Pennington call, in G. O. No 1281 of 21st April, for a revised estimate, for 1st a better system of flushing, 2nd Improved ventilation to shafts, and 3rd an extension of the outfalls.

4. The third Item is a simple matter. The first two require some

consideration, and I venture to suggest a modification of the plan proposed by Lieutenant Pennycook and recommended by you, which will in great measure meet the requirements of Government, and, in my opinion, be more applicable to this country and to the nature of the drainage required.

5. I have gone through Lieutenant Pennycook's plan and report, and also carefully read the Sanitary Commissioner's report thereon.

6. The general scheme, as far as the proposed line of main drainage and the out falls (with the modifications proposed by the Sanitary Commissioner) I fully approve of, but I would simplify the minor drains, and combine some surface drainage with the underground sewerage, though I by no means advocate a general system of surface drainage, as recommended by the Sanitary Commissioner. The natural drainage being excellent, when the barracks are all completed, and a few inequalities levelled off, and roads and paths gravelled, will be all that could be wished.

7. In this country, the greater the simplicity in the arrangements for drainage of barracks, as a rule, the greater efficiency and the less chance of nuisances.

8. The sub soil drainage so strongly urged by the Sanitary Commissioner I deprecate entirely for Bangalore. I cannot call to mind a single place in the station, where it would in any way be advantageous. I can fully understand it being desirable in some soils, but if ever introduced into Bangalore, it will be repented of. The wells in the station render but very precarious supplies, and I feel convinced, if sub soil drainage is introduced, they will fail entirely, to say nothing of with drawing all moisture from the trees, and probably seriously affecting their growth.

9. Reverting to the recommendations of the Sanitary Commissioner, as noted at the conclusion of his report.

1st. The collection and storage of rain water from the roofs, I have always advocated, and strongly recommended.
2nd. The supply of water from Elsser Tank, for common purposes, may be carried out eventually but will not be available for some time.
3rd. The paving round all the buildings is not I think essential. I have never observed any ill effects from the want of it, and it would in my opinion be a useless expense.
4th. The natural drainage may be improved as suggested in para. 5th.
5th. The tubular system of sewage I would modify, as hereafter recommended.
6th. The sub soil drainage I do not approve of.
7th. The extension of the out falls will not be very expensive & is desirable.
8th. The modifications I would propose are as follows:-
1st. Doing away with the minor covered drains, and traps leading up to each house, & substituting open drains round the portions of the buildings

buildings from which any sewage is to be conveyed.
2nd. Altering the shape of the pipes from circular to egg shaped.
3rd. Enlarging the size of the pipes.
4th. Re-adjusting the man holes and ventilating shafts.
5th. The advantages I claim are more effective means of flushing and assisted, in many months in the year, by the rain falls - more perfect ventilation - less risks of nuisance - I believe more economical in construction & lastly but not least, that the work would be put in hand at once and large quantities of materials prepared ready to be laid down when the pipes from England arrive.
6th. I thus meet the two most important requirements of Government.
7th. The plan now proposed provides solely for house sewerage necessitating a great many traps & numerous small branch drains & especially to the married quarters and stables. These

These I fear will prove sources of endless trouble. When exposed, as they will be, to so many chances of solid matter and sand washings entering them, they will be constantly choking. Then again, if not constantly in use, in this country, the water in the bend evaporates, and instead of traps, they become escapes for the foul gases from the drain. The fewer number of these traps, the more efficient will be the flushing of the drain, and the more easily will the great desideratum of proper flushing be effected. It is now proposed it will be endless and expensive work flushing every trap.

13. The removal of these minor drains and traps would also render ventilation more easy. The great desideratum in ventilating drains is to reduce the number of openings to a minimum, and make those necessary as perfect as possible, that no gas may escape, except through the purifiers. Now, it would be impossible to ventilate each of these small drains, and being on the higher levels and trapped, they would always be charged with

would point out that it is not only liquid sewage that escapes from the pipes, and contaminates the soil, but bad gases have almost equally deleterious effect (instance gas pipes and the state of the soil around them) & in matter of time, the soil in the immediate neighbourhood of the houses would be seriously affected.

14. In fact, these traps are meant and suited for regular house sewage, such as in towns in Europe, where regular water supplies are laid on to the houses, and they are constantly being used.

15. I propose therefore laying only main pipe to carry away the sewerage from the Barracks, and laying open drains made of granite slabs, set in cement & shaped (with the base of the V built up with cement thus V) to every building where water is used for bathing and such purposes, leading into trapped pipes. Where the V drains cross open ground, they should be provided with covering planks 1 1/2 inch or 2 inches thick.

16. These can always be kept clean, and will afford a paving round many of the basements, which is advocated by several.

17. This arrangement will reduce the number of traps very considerably, and will also diminish the risks of escapes of gas in proportion.

There will only be one trap at each junction of open drain with sewer, and the flushing will be much easier carried out, at less expense, and when the water is laid on to the Barracks, which will probably be about the same time as the drainage is completed, the flushing will be a very easy matter.

18. The next consideration is the shape of the pipes. I am convinced that the 10 inch circular pipes would in very few cases be the most suitable for the purpose. They are seldom known to choke, and I am of opinion that the 10 inch circular pipes would be the best for the purpose. I am of opinion that the 10 inch circular pipes would be the best for the purpose. I am of opinion that the 10 inch circular pipes would be the best for the purpose.

the recommendation of the Sanitary Commissioner that they should be larger. I would recommend nothing less than 4' leading ^{into} and 10' breadth, the corresponding depths of which would be about 5½', 9½' and 13½' respectively.

20. As regards the manholes and ventilation, I think, in lieu of the plan recommended by the Sanitary Commissioner, as the pipes will never in this case be laid any great depth (15 feet is the extreme depth mentioned by Lieutenant Pirnywick), a simple shaft, with a charcoal (animal) Basket at top, would suffice. The Basket removed opens a manhole. The sketch B on the plan will shew what I propose.

21. I would never place one of these nearer than 50 feet to any dwelling room, and if the trap is near a room, the first 50 feet of piping must be laid nearly level so that the gas can escape from it into the shaft.

22. I would place one at high level end of every drain - one at every junction, and, in long runs, if fall is slight,

one

one at every five hundred feet, but if the fall is great, at every 1000 feet will not be too great a distance.

23. With these arrangements, I do not anticipate any difficulty in either flushing or securing proper ventilation.

24. The accompanying plan shows the line of drains & the proposed position of the ventilator shafts, and the estimate shows the length of the various portions. I have estimated the rates at an approximation, having no data for the pipes of the kind proposed.

25. The blue lines on plan show open drains, the red the sewers. The double blue lines show the portions covered with planks.

26. It will be observed that I have placed open drains around one end only of each block of barracks. This arrangement will admit the bath rooms, provided in the verandahs, being used, and the married sergeants could always be located at those ends.

27. The drains are placed in the rear of

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of all the buildings, so as to communicate with several wash and other out houses.

28. The sketch A shows the trapped gulley, for connecting the open drains with the sewer, which, it will be observed, if kept supplied with water, prevents any escape of gas, and also any solid matter being carried into the sewer, for it will choke the gulley, instead of being carried into it.

29. Sketch B shows the arrangements for ventilation, and manholes for examining the sewers.

30. Owing to the low level of the Artillery married Quarters, and the fact of their being occupied by so few families, I think, rather than go to the expense of carrying another branch to the main sewer, I would allow their sewage to be carried away by open drains, to the low ground below them, the fall being very great.

The estimate amounting to Rupees 69,000, being Rupees 16,000 less than that submitted

submitted by Lieut. Pennycook.

The estimate and plans received with your letter under reply are returned for reference.

I have the honor to be
Yours faithfully,
/s/ J. D. Mayne Captain R.E.
Executive Engineer Bangalore.
(True Copy)

E. A. Ford Lt. Col. R.E.
Superintg. Engineer
5th Division.

N^o 246

From

Executive Eng'g. Office
Bangalore, 9th June 1868.

The Executive Engineer,
Bangalore.

The Dy. Assist. Dir. Genl.
Mysore Division.

I have the honor to return
you from Mr. Barclay, dated 3rd
to, on the Drainage of the Race
forwarded for my consideration
following remarks:-
Prior to receiving it, I had
communicated to the Major
Genl., in a copy of a letter to the
Attending Engineer, my own views
on the Project, submitted to Government
by Lieut. Pennycook, and reported on
by the Sanitary Commissioner.

3. Dr. Barclay considers a System
of drainage by pipes as unnecessary,
and that it will be injurious to the
Sanitary condition of the Station.

4. He suggests that no one in India has had any experience, in the construction of drains of the kind, and that there will be difficulty, in laying them, so as to prevent escape of sewage. There should be no difficulty under these heads. They are purely Engineering questions, and very simple ones, that only require care, without any great amount of science, and no doubt many are competent to carry them out.

5. He also raises the question of an undue strain on the pipes from Rainfall. This also is an Engineering question, and I cannot anticipate any such serious consequences, as Dr Barclay suggests.

6. Dr Barclay proposes that the drainage of the Barracks be entirely by open drains, and that the ground around each building be surrounded by a flagged pavement, and a drain on outside of it. That all solid matter

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of every kind be removed in carts - that the water of the wash houses be collected, and let off suddenly, at fixed hours during the day, and that also the drains be flushed daily with a body of water.

7. Now, no one I think can deny that, if Dr Barclay's suggestions were carried out, the Sanitary Condition of the Barracks would be every thing that could be desired, but if the pipes are properly laid (which as I before observed is no such difficult matter) I certainly do not think that they would prove as objectionable as Dr Barclay appears to anticipate.

8. As stated in my letter alluded to in para 2, I also object to the numerous outlets provided by Lieut Pennycook, but, if these were modified, I see no objection to the main sewers only laid with pipes.

9. The drains, if all open, should not be carried any less distance than

than now proposed, and the amount of flushing and cleansing down, required every day, would be enormous, and a very heavy establishment, and large quantity of water, would have to be provided; and if this was not efficiently done, more bad smells would be emanated, and a more extended range of atmosphere vitiated, than would ever arise from the pipes. From carelessness on the part of the sweepers, or a failure in the quantity of water, these nuisances would arise at once; whereas, once in a well laid line of pipes, and not less than 3 feet from the surface, the sewage is perfectly harmless.

10. The expense of paving round the Buildings, laying the open drains, and bridging across them ~~yes~~ would be quite as much as the plan now proposed.

11. The sub-soil drainage I observe Dr. Barclay considers unnecessary in Bangalore.

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Bangalore. In conclusion 1st, as before stated, I do not deny that if Dr. Barclay's proposal were carried out, and the daily flushing efficiently performed, the sanitary condition of the Barracks should be perfect. But 2nd, I am of opinion that a combination of the two systems, viz:— all minor drains to be open, and discharge into traps communicating with a main line of pipes, would, in no way, prove injurious to the sanitary condition of the Barracks, and would be more economical in working, and, on the whole, preferable.

I have &c.

/sgd/ J. O. Mayne Captain R.E.,
Executive Engineer, Bangalore.

/ True Copy /

/sgd/ J. O. Mayne Captain R.E.,
Executive Engineer, Bangalore.

14

Memo on the Drainage of the Race Course
Barracks Bangalore.

In submitting the following observations on the proposed plan of drainage, I have the honor to state that my acquaintance with its details is derived, solely, from the published "Precis of subjects in the Proceedings" of the Sanitary Commissioner for Madras for the month of March 1888. No reference has ever been made to me on the subject. I do not however feel justified in withholding my opinion concerning it, as I believe that the plan, if carried out as proposed, instead of improving the Sanitary Condition of the Barracks, will have a directly opposite effect, and will lead, in various ways, to inconvenience and embarrassment. To avoid unduly lengthening this memo I shall not repeat here any of the details. They are given in full in the Sanitary Commissioners' Precis, and to that I beg to refer for them.

The following are my objections to the proposed plan:—

I

1 Except for the stables, which are completely detached from the Barracks, and at some distance from them, on their Southern side, and which can be drained separately at a comparatively small cost, the establishment of a system of under ground drainage, tubular or otherwise, is unnecessary. The introduction of ^{the} dry earth system of conservancy, and the removal by it of all solid and fluid excreta being intended, there only remain to constitute the "sewage" the contents of the plunge baths, the water from the lavatories, and the refuse from the kitchens. The latter is rather dwelt upon, by the Sanitary Commissioner, as the ingredient which will chiefly entitle the contents of the drains to be styled sewage; and, in truth, if it be left out, there will be no good reason why the remainder, which will consist entirely of water from baths and ablution rooms, should not be allowed to run off, at fixed hours, in properly constructed surface drains, the requisite means

5
means being provided for flushing these drains, daily, with pure water, after the discharge of the "ablution" water. Now the removal of the kitchen refuse, by carts specially constructed for the purpose, is a very small matter. The removal, in that way, of the refuse from the kitchen of the Horse Artillery Barracks became necessary lately, from circumstances which it is unnecessary to detail here, and I then ascertained that the whole amount of refuse - solid and fluid, requiring removal daily, amounted only to ^{the} of a tubful, the tub being the half of a porter cask. A very few carts would suffice for the removal of the refuse from the whole of the Barracks, kitchens, and the married soldiers' quarters; and the demand for manure, in the neighbourhood of Bangalore, is so great that a very small expenditure would doubtless suffice for its removal, to a distance from the station.
II But in addition to being unnecessary.

necessary, a system of under ground drainage would, I believe, be injurious to the Sanitary condition of the Station.

Great caution was observed, by the Barrack Hospital Commission, in their suggestions as to the adoption of that system at Indian Stations generally; and it appears to me, that those who urge its general adoption do not generally attach sufficient importance to the high temperature prevailing at most Indian Stations, and the heated state of the earth, through which the drains must pass. Decomposition of the sewage, contained in such drains in this country, takes place, with a rapidity, and to an extent, to which there is no parallel in temperate climates. The high temperature also causes an increased tendency, on the part of the evolved gases, to rush out through every available aperture; and the

The following general suggestions respecting works of sewage & drains for Stations, Towns and Districts are intended to embody the chief points of experience obtained in England and may be adopted in India so far as they may be found applicable under local surface of contours, subsoil, rainfall, droughts, suggestions in regard to Sanitary works required for improving Indian Stations. Page 3.

15
the possible effluvia, so familiar to the inhabitants of Calcutta and Madras are the result. Whether or not that result could be prevented, by an improved system of Engineering, may be an open question, but it may certainly be said, that it has not been prevented as yet. The circumstances of a large city may, and probably do, render it necessary to adhere to the system of under ground drainage, with all the evils inseparable from it, but why introduce that system in such a site, as that on the Race Course, where it is not necessary.

To the argument that the sewage in the drains there, would be comparatively free from offensive impurities, it is only necessary to reply, that in practice, it would be impossible to prevent the drains from being used, as receptacles for every species of filth, and that a large part of excreta, from native followers, from the married quarters, would certainly find their way into them. Of this the condition of the drain, in Fort St. George, affords ample proof. The proposed number of

of openings is so great that, judging from experience elsewhere, it must be expected that some of the traps will very frequently be out of order, and offensive effluvia permitted to escape from them.

2. No one in India has any experience in the construction of drains, on the plan proposed; and there is no certainty that the pipes can be every way so cemented, as to prevent the escape of their contents, and the consequent contamination of the sub soil. On the contrary, this appears to be contemplated by the Sanitary Commissioner as unavoidable, and in his recommendation, as to the sub soil drainage, he suggests means for the mitigation of the resulting evil.

3. The rainfall, which I believe is correctly estimated by the Sanitary Commissioner at an annual average of 35 inches, is by no means equally distributed over the several months of the year & occasionally, 6 or 8 inches have been known to fall, in a few hours. I remember

one

one such fall, when I was stationed here 12 or 13 years ago, what chance there would be, of pipes of the proposed dimensions with standing a sudden pressure like that to which, under such circumstances they would be exposed, the engineers are best qualified to judge. Should the pipes not stand the strain, however, the result would be serious, in a sanitary point of view.

4. The contamination of the sub soil water, resulting from such accidents, and (inevitably as believed by the Sanitary Commissioner) from soakage through the joints of the pipes, or fracture of some of them, would, without doubt, gradually render the water in wells in the neighbourhood of the Barracks unfit for use, and this I conceive to be a most serious objection to the plan. There is, at present, a good prospect of a sufficient supply of drinking water, of good quality, being obtained from wells at the edge of the plateau

1. plateau; or on the slope extending
outwards from it, and if these wells
be contaminated by the drains,
I know not where else an equally
good supply is to be obtained. The
plan of storing, for drinking and
cooking purposes, the rain which falls
on the roof of the Barracks, seems in-
volved, for its success, the construction
of absolutely impervious tanks, and
the provision of means of letting the
best part of every shower escape. The
latter I believe would be found in
practice to be a matter of no little
difficulty. The necessity for it might
perhaps be obviated, by leading the
rain water from the roofs of the Barracks
into a filter, similar to that figured
at page 16 of the suggestions of the
Barrack Hospital Commission (and
which I saw in beneficial opera-
tion at Fort Coddin in 2 or 3
years upwards of 20 years ago).
But should the supply from that
source ^{fail}, I know of no other that could
be resorted to, for I do not believe
there is the slightest probability that any
amount

18 ✓
amount of filtering, which is practicable
on a large scale, will ever render the
water of the Ulloor Tank fit for drinking.
5. The main sewer, as I understand,
is proposed to be led close past the
hospital, so as to contaminate the air
in that neighbourhood by the effluvia
from its ventilating shaft, and the water
in the wells (now in use by the patients)
by percolation. The point selected for
its outfall, also, is, during several
months, almost directly to windward
of the Hospital.

For the reasons above stated;
I have the honor respectfully to submit
that it is, on sanitary grounds, extremely
desirable that the plan as proposed
should undergo the following modi-
fications:—

1. That the drainage of the stables,
lying as they do at a considerable dis-
tance from most of the barracks, on
the southern edge of the plateau, be
entirely separated from that of the barracks
and

and be carried out, as proposed, by tubular drains, the number of openings into them being however reduced as much as possible.

2. That the drainage of the Barracks be entirely by open drains, made, as far as possible, impervious to water, as recommended by the Committee, assembled under the orders of His Excellency the Commander-in-Chief on the 19th May 1855; a path way 4 or 5 feet wide flagged with granite cemented, as to be absolutely impervious to water, passing round each Barrack and Block of Buildings, and a V shaped drain running along its outside, (where necessary from the contour of the ground) the drains might be covered over, during part of their course. If it were possible by asphalt, or by any other means, to make the surface, for some distance around each building, impervious to rain, it would be of great advantage

19
to do so, and the further that the impervious coating could be made to extend, the greater ^{would} the advantage be.

3. That the Contract for the removal of the pondrette from the latrines, be made to include the removal, at least once daily, of all kitchen and other refuse from Barracks, Hospitals and Married quarters.

4. That nothing be permitted to be emptied into the drains, except water from ablution rooms and baths; that each ablution room be provided with a cistern, for the reception of the refuse water; that the contents of these cisterns be let off into the drains, at fixed hours daily, so that they may run off at once, and that after the discharge of the foul water, the drains be flushed daily, by clean water, which should not be discharged in a small stream from a pipe, but, in a rush, through a sluice in an appropriate cistern.

It will be observed that, in the preceding remarks, I have made no

no alteration to sub soil drainage,
and my reason for not having done
so is, that the question as to the sub
soil drainage, is entirely distinct from
that as to sewage, except in so far
as the establishment of a system
of under ground sewers may render
sub soil drainage the more necessary.

I believe with the Barrack
and Hospital Commission, and
the Sanitary Commissioner, that an
efficient system of sub soil drainage
would add to the healthiness of
most Barracks in India, while
its employment is entirely free
from sanitary objection, but, at
the same time, I am bound to
state that I believe there are few
sites, where it is so little required,
as on the Race Course, the contour of
the plateau being such that the greater
part of the rain-fall runs off from
it at once (the ragged gullies on all
sides bear witness to the speed with which
it

20
it does so) the level of the sub soil —
water being at all times far from
the surface, and the station being
singularly free from malarious disease.

Bangalore
31st June 1888

/Sgd/ A. Barclay M.D.
Dy. Inspector Gt. of Hospitals
B. M. Service, Mysore
Circle.

/True Copy/

/Sgd/ J. O. Mayne Captain R.E.,
Executive Engineer, Bangalore.

(True Copy)

Edmond Lt. Col. R.E.

Superintg. Engineer
5th Division.

N^o 114.

Superinty Engrs Office 5th Div.
Salem 5th October 1868-
21✓

From The Superintending Engineer
5th Division.

To The Secretary to
Government S. P. W.

Sir,
With reference to the order of
Government of the 21st of April N^o 1201, I
have the honor to forward a revised estimate
of Rupees 10,000, accompanied by plan and
report, for the drainage of the Race course
Baracks at Bangalore.

- Enclosures 5
- 1 Plan
 - 1 Estimate
 - 1 Letter from Executive Eng^r
 - 1 Detailed list of articles
 - 1 Memo on the proposed drainage.

2. The original estimate, forwarded
with my letter of the 11th of February N^o 224, was
returned, with a view to alterations being made
to provide "a better flushing of the drains, im-
proved ventilation of the shafts, and an
extension of the outfalls". The estimate now
forwarded has been revised to meet the
above requirements, and the system of drain-
age has also been modified, as far as
possible in accordance with the views of

the

P. W. 38/9/68

Enclosure to 3 in letter
N^o 114, dated 5th Oct 68
from the Deputy Engineer
S. P. W. to the Secretary
S. P. W.

Sanitary Commissioner, and Medical Authorities
at Bangalore.

3 The first Scheme was for the removal
of liquid refuse from the buildings, entirely
by the glazed pipes. It is now proposed that
the drainage should, in the first instance,
be collected in open V shaped granite
channels, and conducted by them into
pipes laid under ground. The open drains
are to be provided with covering plates
where necessary. The number of traps will
in consequence be considerably reduced,
and there will be no difficulty in keeping
the open drains clean, in the immediate
vicinity of the buildings, where alone they
will be laid. The flushing and ventilation
will be simpler and more effectual, than
in the original Scheme.

4 The two main drains are to follow
the course laid down in the first plan, but
they will be carried to a greater distance.

Egg shaped pipes are to be substituted for
circular. This will ensure a quicker flow
for the sewage, and the sizes of the pipes
are to be increased to avoid danger of
choking. The smallest size now proposed
to be used is 14 by 5 1/2 inches.

5 It is intended to effect the drainage
of one set of the buildings, vizt the Artillery
married quarters, entirely by open channels.
In the event of the estimate being approved,
I would recommend that part of the scheme
being first carried out, and by the time the
pipes are received from England it will be
seen whether the open system of drainage
should be adopted to a greater extent, than
provided in this estimate.

6 The plan and Estimate have been
detained up to this time in my office,
as I wished to go over the grounds again
before forwarding them.

I have the honor to be,
Sir,
Your most obedient Servant.
E A Ford Esq R.E.
Superintg Eng^r 5th Division.

Public Works Dept.
 No 3740
 Readings of the Madras Government
 Under date the 1st December 1868
 Read the following
 From the Supy Engineer
 of the 5th Div.
 (Here enter No 114 of 5th October 1868)

The Govt consider it expedient to postpone the consideration of the foregoing papers, pending the return to Madras of Captain Tulloch who, during his recent stay in Europe, has had his attention engaged on the subject of Sanitary improvements as practised in

2. 260666/1868-5th Div.

1868

Forward a Revised Estimate of the 5th Div. accompanied by plan and report for the drainage of the 5th Div. at Bangalore.

For the 5th Div. at Bangalore
 Recd 4th Dec 1868
 The Secy to Govt
 A.P.W.
 Enclosure 5/114.

2.260641/68 M. S. 11/11/11

in large towns.

Wb

To
6 The Supty of
1 " Military

31
B

Memorandum

Vide G.O. dated 21st April/68
N 1201

With his letter of the
11th February/68 No. 224,
the Superintending Engrs
of the Sth Div submitted
a plan, with an estimate
of Rs. 85,000, for the drain-
age of the Race Course

I do not feel myself
competent to determine
in a matter in which
such conflicting opinions
have been offered by such
competent authorities.
In the question, one of
an extremely high
character. We may
reach a little longer
the view of acting
on a small basis at
last where such
important interests
and so large a sum of
money are at stake.

Baracks at Banga-
lore, by means of drains
formed of glazed
stoneware pipes to
carry off liquid re-
fuse of all kinds
from the hospitals,
baths,

2. 260661. 16502. 5th Aug

"baths, washhouses,
cook-rooms, family
quarters and stables,
and to discharge
it in two directions

at points 700 yards
to the east and 300
yards to the south
of the plateau.

respectively. Col. Lord
proposed to connect
the drains by branches
with each building
and to provide them
with grates and
trapped openings,
ventilating

Col. Lord's
plan
was
definitely
to make a special
study of sanitary
drainage.
The
plan
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along
the
plateau
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branches.
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by
branches.

London mail
brought what-
ever I wanted
today 11.0.01

ventilating shafts, and
manholes. The drains were
not however intended
to carry off the refuse
from the privies and
minas (as these were
to be conserved on the

dry-earth system) or
storm-waters which,
owing to the natural

surface slopes of the
slope, flow off rapidly.

The use of glazed stone-
ware pipes, varying
from 3 to 9 inches in
diameter, was prefer-
red on the grounds

that it was impossible
to manufacture
bricks at Bangalore
capable of resisting
the action of sewage,
and that pipes could
be more quickly
and easily laid, would
require a small amount
of excavation, and
admit of a better
discharge of sewage
than masonry drains.
The Lieut. Engr's
report, together with
the plans and esti-
mates, having been
referred

referred, ^{to} the Mil-
itary Dept. to the Com-
mander-in-chief
and the Sanitary Com-
missioner, His Exce-
llency gave it as his
opinion that the scheme
would meet the de-
sired object. The
Sanitary Com^{tee} how-
ever tho' not object-
ing to the plan, con-
sidered that it did
not go far enough.
He approved of the
tubular pipe drai-
nage which he stated,
was

was in general con-
 formity with the prin-
 ciples laid down by
 the Barrack and
 Hospital Committee,
 but pointed out
 certain measures
 which in his opini-
 on, should be
 taken for flushing
 the drains, extending
 the outfalls, and im-
 proving the ventilating
 shafts, and strongly
 urged the necessity
 for adding a carefully
 devised system of
 surface

surface and sub-soil
 drainage. Mr. Ranking
 also submitted re-
 marks on the utili-
 zation of sewage
 and the system of
 water supply at
 Bangalore.

The following
 was a summary
 of the suggestions
 made by the Sani-
 tary Com^{tee}:—

1. The provision of
 special means for
 flushing the drains.

2. The extension of the
 out-fall pipes.

The

2. 260626/03 V.C. 122
3 The construction of ventilating shafts with manholes, and provision of charcoal filters.

4 The paving of the surface surrounding the barracks and hospitals with non-absorbent stone, and improving the natural surface drainage.

5 The application of sub-soil drainage either to the whole area of the plateau or along the lines of drainage drains

6 The construction of reservoirs for storing rain

rain falling upon the roofs, for drinking and cooking purposes.

After a careful consideration of the whole subject, the Govt. were of opinion that the drainage of the buildings should be dealt with separately, and they accordingly approved of the adoption of the scheme recommended by the Superintending Eng^r, but before addressing the Govt. of India on the subject, they requested

3. Requested Coll. Ford
of new to submit a report
with estimate providing
of ch. for a better flushing
4. of the drains, improved
surface ventilation of the
kitchen shafts, and an ex-
pansion of the out-falls.
5. As regards the
drain surfaces and sub-soil
drainage the Govt. com-
missioner decided that the pro-
posed sewer might prove the
of the present one, and that
the latter was, and that
6. the latter, which was
of a scarcely requisite
on

on the plateau might
be deferred. They also
stated that the sub-
ject of the storage
of rain water from
the roofs of the barracks
and subsidiary build-
ings would be considered
on the return from
Europe of Captain
Tulloch who was spe-
cially instructed
to study that me-
thod of water storage
on his passage thro'
Malta.

In compliance
with the foregoing
requisition

3 requisition, the Capt.
of Engineer of the 5th En.
now submits a revised
of estimate, together with
4 a plan and a report
to from the Executive Eng.
at Bangalore. Coll.
5 Lord also forwards
a correspondence that
passed between
the latter officer and
the Deputy Inspector
of General of Hospitals,
B. M. Service, Mysore
Circle, on the subject.
The design now
submitted appears
of to have been modified,
as

as far as possible,
in accordance with the
views of the Sanitary
Commissioner and the
Medical Authorities
at Bangalore, and dif-
fers from the original
plan in the following
points:
1. Instead of the
drains being connected
by branches with the
buildings on the Race
Course, it is now pro-
posed to do away
with the branch drains,
and to substitute for
them open shaped
granite channels,
provided

3 provided with covering
of planks where they cross
with open ground. The open
of drains will be built
4 only in the immedi-
ate vicinity of the
buildings where it is
wanted, there will be
no difficulty in keeping
the drains clean. By this
arrangement, the ne-
cessity for a large
5 number of traps will
be obviated, and the
facilities for the escape
of gas proportionately
6 diminished. Moreover
a

a better ventilation
of the shafts will be
secured, and the flush-
ing of the drains which
are now proposed to
be constructed with
glazed earthenware
egg shaped pipes, the
internal dimensions of which will
vary from 4 by 5 1/2 to
10 by 13 1/2 inches, will be
much more easily
effected and at less
cost, and will become
an easy matter when
a supply of water is
laid on to the barracks.
In

In support of the present proposal to use egg shaped instead of circular pipes in the formation of the main drains, it is urged that the former are acknowledged everywhere to be the most suitable for sewers, are so made as to insure a quicker flow for the sewage and are seldom known to choke with any thing like the great fall which will be given to the drains at Bangalore.

In

In lieu of combining ventilating shafts with manholes, and providing the former with charcoal filters, as recommended by the Sanitary Commission, it is now considered sufficient to construct simple shafts covered at top by baskets containing charcoal, and to place them at such points on the drains as will admit of the means of ready flushing and proper ventilation being secured. The extension of the out-falls is provided for as recommended by

by the Sanitary Comm^y,
and some surface drain-
age is proposed to be
combined with the
underground sewage,
leaving the rest to nature.

Taking advantage
of the low level of the ground
on which the Artillery
Manned Quarters are
situated, and consider-
ing the fact of their
being occupied by so
few families, the Sec-
ond Engineer proposes
and the Superintending
Engineer recommends
that, in the event of
the estimate now
submitted

33
submitted being approved,
the sewage of the quarters
be first carried away,
entirely by means of
open channels to the
low land before them,
(the fall being very great)
as from the experience
that may be gained
from the experimental
measures before the
arrival of the pipes
from England, it will
be seen whether the
open system of drain-
age should be adopt-
ed to a greater ex-
tent than at present
contemplated.

contemplated.

The estimated cost of the works amounts to Rs. 69,000, being less than the sum provided in the first estimate by Rs. 11,000.

In this arrangement the Deputy Inspector General of Hospitals, Mysore Circle, took certain objections, which may be summarized thus:

That as only refuse water is to be allowed to run into the drains, the provision of open surface channels is

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is preferable to a system of underground drainage which would prove injurious to the sanitary condition of the station, owing to the rapidity with which decomposition of sewage takes place under a high Indian temperature.

That, in practice, it would be impossible to prevent the drains being used as receptacles for every species of filth.

That it is probable that some of the traps will very frequently get out of order, and

and permit offensive
effluvia to escape.

That there is no
certainty that the pipes
can be put every way
so cemented as to prevent
the escape of them con-
-sistently and the consequent
contamination of the
sub-soil in their neigh-
-bourhood.

That serious results
would follow in the
event of the pipes giving
way under the pressure
to which they might
possibly be subjected
during a sudden fall
of rain.

That the wells
in

in the neighbourhood
of the underground pipes
will be contaminated
by percolation of sewage
from them.

That the air
in the neighbourhood
of the trapped ventila-
-tors will be tainted
by the escape of foul
gases.

Holding these views,
Mr Barclay proposes
the following modifi-
-cations:

That the system
of tubular drainage
should be carried
out only in the case
of

a of the stables. That the barracks
should be drained con-
structively by means of
open non-absorbent
channels. That a path
way, with a V shaped
drain running along
its outside, should
be laid around each
of the buildings.
That the surface
in surrounding each build-
ing should be paved,
if possible, by asphalt
or concrete and be made
impermeable to rain-water.
That the removal
of

of all kitchen and other
refuse from the barracks
should be provided in
the contract that may
be entered into for the
conveyance of the pos-
sible refuse from the latrines
That the refuse
water alone from
ablution rooms and
baths should be allow-
ed to run into the drains,
which should be flush-
ed daily by clean
water.

With the exception
of the alleged liability
of the air in the vicinity
of the buildings to be
tainted by the escape
from

a from the ventilators
of foul gas notwithstanding
all precautions,
c. Mr Barclay's objections
to the project, as now
prepared by Captain
Mayne, do not appear
to the undersigned
to be of much weight.
It is not likely
that any scheme can
be devised that will
be free from objections
in one quarter or
another. The orders
of Government
are requested as to
whether Captain Mayne's
plans

plans and estimates
shall be sanctioned
or not.

W. B.

Govt. of 1868; Madras.

PUBLIC WORKS.

To the *Superintending Engineer*,
5th Division

cc. cc. cc.

Dated

Recd.

Encl. 5

G. O., *1st Dec* 1868, No. *3740*

Nos. 7-8

Drainage of the Race Course Barracks
Consideration of the paper
submitted to the drainage of the
Race Course Barracks at
Mylapore, ordered the post-
office, pending the return to
the Engineer.

22560/18 Q-521