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B.M. 76457 6/3/88

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I also pointed out that plan No. 2 (which in my opinion was the necessary modification of No. 1 in order to remedy its defects) was open to the undoubted objection of throwing vessels, entering the harbour, further into shoal water than was desirable, and I suggested for consideration the alternative plan of extending one of the faces so as to cover the existing entrance as shown in No. IV.

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In No. III the extension of the face is carried out with a slight change of direction, whereas, in the plan I suggested, the extension was in a straight line, on the prolongation of the face.

Mr. Thorowgood, however, in putting forward plan No. III, accorded the preference to No. IV, which also found most favour with the Harbour Board for the following reasons :—

"*1st.*—That only a very small portion of the old ruined wall and rubble have to be cleared away.

"*2nd.*—That during the construction there will never be more openings than the proposed entrance through which the sea can come.

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I may add that I prefer my original suggestion as it stands in plan No. IV to its modified form as plan No. III, because, in addition to the above-mentioned advantages, No. IV allows more sea room and involves less disturbance at the mouth of the Harbour from the action of confluent waves. The relative estimates of plans Nos. III and IV are Rs. 61,00,000 and Rs. 62,45,000, respectively.

The ends of the covering arm should, in my opinion, be turned inwards instead of outwards as shown on the drawings.

If No. III is to be carried out, I would strongly recommend a slight modification of it, as shown by the blue lines which I have drawn on the plan No. III that accompanies the report of the Committee.

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BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of {1888} Madras.

PUBLIC WORKS.

Dated August, 1st.

Recd. *Encl.*

G.O., 1st Aug. 1888, Nos. 2335, 2336 W.

AUGUST.

Madras Harbour

Forwarding copy of Proceedings on the report of the Home committee regarding the best position for an entrance to the Madras Harbour; and requesting early intimation of the final adoption of the committee's plan.

Note by G. L. MOLESWORTH, Esq., *Consulting Engineer to the Government of India for State Railways, on the subject of the Madras Harbour.*

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

READ—the following papers :—

G.O., dated 25th April 1888, No. 151, Marine.

Read—the following letter from R. W. BARLOW, Esq., C.S., Chairman, Harbour Trust Board, to the Chief Secretary to Government, dated Madras, 6th April 1888, No. 69 :—

I have the honor to acknowledge the receipt of G.O. No. 153 W., dated 16th January 1888, forwarding a letter from Mr. Parkes addressed to the Under-Secretary of State for India, dated 25th November 1887, and to submit, for the information of Government, an extract of the Proceedings of the Harbour Trust Board at their meeting of 2nd March, confirmed at the meeting of the 8th idem.

2. The question of the position of the entrance has been most carefully considered and very fully discussed; and while the trustees "adhere to their former resolution as to the necessity of a north-east entrance, and (with one dissentient) prefer plan No. III, approved by the London committee, subject to any modifications that may be proved necessary hereafter," they are unanimously of opinion that *smooth* water is absolutely necessary to make the harbour a success, as without it very little practical progress can be made in the improvement of means for conducting landing and shipping operations, inasmuch as with an eastern entrance all improvements effected, in the way of providing large iron lighters, low level wharfage, &c., are liable to be wrecked by the free entrance of the heavy rollers accompanying each succeeding cyclone, or very heavy weather.

3. The Board do not think the harbour can be looked upon as a harbour of refuge from a cyclone, until experience has proved it such, and, at present, are of opinion that no ship would attempt to enter the harbour for shelter or, if inside, remain on the approach of or during a cyclone, if it should be at all practicable to put to sea beforehand; that, during the prevalence of such a storm, it may be taken for granted all shipping operations would be suspended; and that on its approach all vessels would put to sea and return when the weather had moderated.

4. It is absolutely essential, in the opinion of the trust, to the future prosperity of this port, that ships so returning should find lighters and machinery for loading or landing cargo, ready to go to work at once; and lighters and jetties, with cranes erected thereon, must depend for safety upon the smoothness of the water in the harbour. An eastern entrance will never give *smooth* water during at all heavy weather, and though a boat harbour, as proposed by Mr. Parkes, would secure the lighters, it would leave jetties and wharves in the harbour, with the cranes thereon, unprotected and exposed to certain destruction.

5. Referring to the three points dealt with by Mr. Parkes in his letter, the trustees would remark, with regard (*a*) to the question of the advance of the sand to the south of the harbour, that had the committee been in possession of the information referred to by Mr. Parkes in para. 22, they would probably never have alluded to the subject. The advance of sand to the south of the southern arm of the harbour is, the Board consider, a matter of no present practical importance, and has nothing whatever to do with the question, whether the best position for the entrance is east or north-east.

6. In reference (*b*) to the second point raised by Mr. Parkes, the Board unanimously approve the decision of Admirals Salmon and Nares and of Sir John Coode, and, as there are "two co-existing but conflicting judgments based upon the same evidence," would strongly urge their right to act upon the one which coincides with

their own unanimous views. It is in their opinion a most difficult task for gentlemen at a distance, who may never have seen this port in a cyclone, and are totally unacquainted with its business, routine, and requirements, to form a judgment. The Board would most emphatically urge that they are in every way best qualified to *know* what is wanted, altogether independent of a mass of conflicting testimony, which is all the gentlemen forming the various committees at a distance have to guide them.

7. Referring (*c*) to Mr. Parkes's third point, the Board agree with him in para. 29 that he had perhaps "rather enhanced than otherwise the difficulties of the situation;" they *prefer* plan No. III, but what they *want* is *smooth water*, ensuring safety to landing and shipping appliances in heavy weather. Any modification of plan III or IV or any plan which will give them *this*, within a reasonable time, at a cost which the port can afford to pay, is all they have contended for as being absolutely necessary, and upon the absolute necessity of *smooth water* they do most strongly insist.

8. The Board do not approve of Mr. Parkes's modification "A," which presents the objectionable re-entering curve to the full force of a cyclone swell, immediately to seaward of a proposed entrance, and they understand that this is an objection previously insisted upon by all engineers who have been consulted.

9. The question of an alternative scheme brings me to the financial position and revised estimates.

10. Mr. Parkes estimates the extra cost of his new proposal, above sanctioned estimate, with 600 feet overlap, at Rs. 18½ lakhs, and with 800 feet, Rs. 21¼ lakhs (para. 33).

On referring the question to their Engineer, Mr. Thorowgood, he estimates the probable extra cost *for Mr. Parkes's plan A*, at Rs. 24,75,976 and Rs. 27,14,236, respectively.

11. *For plan III* Mr. Thorowgood estimates the extra cost to be Rs. 27,70,103 and Rs. 30,08,363 for 600 and 800 feet overlap, respectively.

12. In estimating their financial position the trustees prefer to take their own engineer's estimate made on the spot, and, in round figures, the result would be as follows, upon the date when it is anticipated that the works will be complete:—

600 *feet Overlap.*		Rs.
Sanctioned estimate ...		46,55,000
Add extra for plan III		27,70,000
		74,25,000
Deduct—		
Advances refunded—		
1886-87, 1887-88 ...	2	
1889, 1894 ...	6	
		8,00,000
Capital advances outstanding, 1894-95		66,25,000
Interest thereon, at 4½ per cent.		*2,98,125
Annual refund of loan		1,00,000
Amount payable to Government		3,98,125
Income—		
Revenue account		3,00,000
Port dues levied under Acts XII of 1875 and IV of 1881		1,20,000
Surplus of pilotage fees		12,000
Warehouse charges		20,000
		4,52,000
Deduct amount payable to Government as above		3,98,000
Balance to credit of trust		54,000

* Decreasing annually by Rs. 4,500, the interest at 4½ per cent. upon one lakh of rupees.

800 *feet Overlap.*		Rs.
Sanctioned estimate ...		46,55,000
Add extra for plan III		30,08,000
		76,63,000
Deduct—		
Advances refunded as above		8,00,000
Capital advances outstanding, 1894-95		68,63,000
Interest thereon, at 4½ per cent.		*3,08,800
Sinking fund ...		1,00,000
		4,08,800
Income as above		4,52,000
Balance to credit of the trust		43,200

13. In framing the above estimate the calculations have been based on actuals of previous years; the revenue from port dues is shown at Rs. 1,20,000 only, that being the amount shown in para. 11 of G.O. No. 15, dated 17th January 1888, after allowing for the reduction of Annas 1-6 per ton on liners, recommended by the Board in my letter No. 6974, dated 5th March 1888. The surplus of pilotage fees is taken from the actuals of 1886-87, Rs. 12,467. With regard to the item, Rs. 20,000 warehouse charges, the Board propose to supply, as soon as possible, a want very much felt in Madras by erecting warehouses and storing goods therein under warrant, in the same manner as is done in Bombay, where the Port Trust received in 1880-81, when the system was first introduced, *Rs. 30,716-6-1*, which in 1884-85 had risen to Rs. 97,280-15-3, or deducting cooly-hire, to about Rs. 85,000 net. The Board are of opinion that at least Rs. 20,000 might be raised from this source increasing annually.

14. Another source from which a large income might be derived is by saving in *boat-hire*, provided smooth water can be relied on in the harbour; this is now fully Re. 1 per ton all round, the total tonnage handled yearly being between 2½ and 3 lakhs of tons. Taking the lower figure to allow for timber floated on shore, and calculating a saving of 12 annas per ton in boat-hire charges as practicable with smooth water, an additional revenue of Rs. 1,87,000 could be levied, as enhanced harbour dues, without imposing any additional tax on the trade of the port; and this sum, with the surplus shown above, is more than sufficient to meet all current charges, including petty construction. The reason why boat-hire is so excessively high at Madras is the insecurity of the investment in lighters, which are liable to be smashed to pieces at any moment, and which, under ordinary circumstances, soon become unserviceable, through constantly beating up against each other, against ships' sides, and against the piles of the pier. Iron lighters carrying 100 tons each could, with smooth water, be safely maintained in the harbour, and loaded beforehand against the arrival of a steamer, thereby economising time. A charge for boat-hire of only 4 annas a ton, yielding Rs. 25 per trip, would be, if anything, too high, and more than would be needed to pay a handsome return upon a comparatively secure investment. But the Board do not wish, if it can be avoided, to enhance harbour dues, when smooth water renders a reduction in boat-hire practicable, one of the chief objects of the harbour being not only to facilitate but to cheapen landing and shipping operations, and they would prefer to allow the trade of the port to benefit, as much as circumstances will permit, by any reduction which may be found practicable hereafter. It would probably be sufficient at first to divide the saving effected between the Board and the merchants concerned.

15. I am further requested by the Board to ask that Government will suggest to the Right Honorable the Secretary of State that the rate of interest upon capital advances might be reduced from 4½ to 4 per cent. per annum, which would be of material assistance to the trade of the port.

* Decreasing annually by Rs. 4,500, the interest at 4½ per cent. upon one lakh of rupees.

16. In conclusion, I am desired by the Board to urge upon Government that the Board consider that Mr. Parkes is not sufficiently acquainted with this port to enable him to form a correct opinion of its requirements, and the result of carrying his theories into practice has already been far from satisfactory.

17. The Board have on the spot a staff of engineers who for many years have had the advantage of an intimate practical acquaintance with the harbour which, in its present condition, admits of completion within only very narrow limits of design, and the Board would earnestly represent that all details in reference thereto should be settled on the spot by themselves, subject to the control of the Madras Government, who can instruct their engineers to inquire into and examine any deviation from the sanctioned plan which it might be considered, in the interests of the port, to adopt. This would obviate the delays which have occurred hitherto through constant references to England.

18. The Board are quite willing to subordinate their wishes to engineering control, but would most strongly urge that this control should be in the hands of the Madras Government, and if any proposals which might be made were approved by Government, the Board respectfully submit that the Right Honorable the Secretary of State might rest assured that the matter had been carefully inquired into by competent engineering authority.

Enclosures.

Extract of Proceedings of the Trustees of the Harbour of Madras, at a meeting held at the offices of the Board on Friday the 2nd day of March 1888.

* * * *

2. Read again all papers in connection with the question of the position of the entrance to the harbour, and minutes by the Chairman, Messrs. G. L. Chambers, J. R. Hunter, Captain W. L. C. Baddeley, R.E., Captain H. A. Street and Mr. J. McLintock, and examined plans in reference thereto. Mr. Thorowgood was asked to attend, and explained to the trustees various points upon which they desired information and then withdrew.

Resolved that the trust adhere to their former resolution as to the necessity of a north-east entrance and prefer the plan No. III approved of by the London committee subject to any modifications that may be proved necessary hereafter. The Chairman is invited to submit to Government the views of the Board in regard to the despatch from the Secretary of State, dated India Office, 15th December 1888, communicated under endorsement order No. 153 W., dated 16th January 1888.

* * * *

Extract of Proceedings of the Trustees of the Harbour of Madras, at a meeting held at the offices of the Board on Friday the 23rd day of March 1888.

* * * *

2. Read draft letter from the Chairman, Harbour Trust Board, addressed to the Chief Secretary to Government, Marine Department, in reply to G.O. No. 153 W., dated 16th January 1888, communicating a despatch from the Right Honorable the Secretary of State, No. 11, dated 15th December 1887, forwarding a letter from Mr. Parkes, dated 25th November 1887, in reference to the question of the position of the entrance to the harbour.

Read minutes by Captain Street, Indian Marine, Captain W. L. C. Baddeley, R.E., Mr. Hunter, Mr Chambers and the Chairman.

Resolved that this letter, as now amended, be redrafted and circulated for further consideration.

* * * *

Extract of Proceedings of the Trustees of the Harbour of Madras, at a meeting held at the offices of the Board on Thursday the 29th day of March 1888.

* * * *

2. Read again drafted letter addressed to the Chief Secretary to Government, Marine Department, in reply to G.O. No. 153 W., dated 16th January 1888, communicating a despatch from the Right Honorable the Secretary of State, No. 11, dated 15th December 1887, forwarding

a letter from Mr. Parkes, dated 25th November 1887, in reference to the question of the position of the entrance to the harbour.

Resolved that this letter, as now amended, be approved.

* * * *

Order—dated 25th April 1888, No. 151, Marine.

Transferred to the Public Works Department with the following remarks :—

(1) According to the budget of the current year, reviewed in G.O., dated 7th March 1888, No. 215, Financial, the Board's total revenue receipts amount to Rs. 3,03,000. But this sum includes Rs. 20,000, interest on investments, which will probably have disappeared before the completion of the harbour, as the current revenue expenditure is at present considerably in excess of the receipts.* Again, the establishment and contingency charges amount, in round numbers, to Rupees 1,14,000, and the normal charges for petty construction and repair cannot be taken as less than Rs. 40,000 annually. (The amount provided under this head in the present year's budget is Rs. 95,000). The Board's surplus under harbour revenue in years to come cannot therefore, on the present sources of income, be estimated at more than Rs. 1,29,000 (Rs. 2,83,000 — Rs. 1,54,000) per annum.

* *Revenue Account.*

	Rs.
Budget-estimate for 1888-89—	
Receipts	3,03,000
Charges	4,13,000

(2) The Board have now been appointed conservators of the port under Section 8, Act XII of 1875, and this will enable them to apply the surplus port revenues under that Act to the improvement of the harbour. But it must be remembered that the Government can at any time by an executive order remove them from this position.

(3) Even assuming, however, that their position as conservators will be a permanent one, they have largely over-estimated their surplus from port dues, which they put down at Rs. 1,20,000 per annum. The total receipts of the Madras Port in 1886-87, inclusive of pilotage fees, amounted, according to the Port Officer's administration report for that year, to Rs. 1,83,527, while the charges aggregated Rs. 1,45,601. The Board will doubtless be able to effect a considerable reduction in the port establishment, and the revision of port fund accounts ordered in G.O., 17th January 1888, No. 15, will probably be favorable to Madras. But, on the other hand, the port dues on sea-going ships other than coasting steamers have just been reduced from 6 to $4\frac{1}{2}$ annas a ton, and the Board estimate that this will reduce the receipts under this head by some Rs. 25,000. Allowing for all these changes, the port surplus available for harbour purposes cannot be reckoned at more than Rs. 40,000 per annum in addition to the Rs. 12,000 which the Board have taken credit for under Pilotage fees.

(4) The total surplus upon which the Board can now reckon will therefore be—

	Rs.
From Harbour revenue account	1,29,000
„ Port fund	40,000
„ Pilotage fees	12,000
„ Warehouse fees	20,000
Total ...	2,01,000

or in all about 2 lakhs of rupees, to meet payments to Government which will amount to Rs. 3,98,000 if the 600 feet overlap is adopted, or Rs. 4,08,000 upon the 800 feet overlap, leaving a deficit of Rs. 1,97,000 or Rs. 2,07,000.

(5) The Board, however, consider that the saving in boat-hire will enable the trade to pay increased harbour dues without additional burthen, and hope to realise not less than Rs. 1,87,000 per annum under this head. That amount will more than cover the ordinary charges of the Harbour Trust Board, which have been omitted in the Board's calculations, but are included above, and will nearly meet the deficit above shown. The balance remaining may jointly be met by additional warehouse fees, of which the Board have adopted a minimum estimate; or must be provided for by increasing harbour or port dues beyond the amount of the estimated saving in boat-hire. The Government are at present unable to test the correctness of these estimates,

but they note that the anticipated saving in boat-hire depends on the certainty of smooth water, and this cannot be secured until the harbour approaches completion.

(6) It is evident then that, making full allowance for the fact that the interest on the accumulated sinking fund will, as time goes on, materially diminish the net charges, the Board will sooner or latter be obliged to raise the harbour dues, or port dues, or both, in order to meet the increased liabilities which they propose to incur. Such increase, and more especially under port dues which have just been reduced, is, however, perfectly feasible, and may possibly not entail more than a temporary increased burthen on the trade. There is also a considerable, though not as yet ascertained, surplus to the credit of the Madras Port Fund, which will now be at the disposal of the Board as Conservator. On the whole, from a financial point of view, the Board's ability to repay the further advance now in question seems sufficiently established.

(7) Of course, if the Board's prayer for a reduction of the interest on capital advances from $4\frac{1}{2}$ to 4 per cent. is complied with, the necessity for imposing fresh rates will be *pro tanto* diminished. The Government, in this department, consider that the request is a reasonable one, and deserves the favorable consideration of the Secretary of State.

(True Extract.)

(Signed) W. L. C. BADDELY, Capt., R.E.,
Under-Secy. to Govt., P.W.D.,
for Chief Secretary.

G.O., dated 6th March 1888, No. 764 W., Public Works.

Read—the following paper:—

From R. B. BUCKLEY, Esq., Under-Secretary to the Government of India, Public Works Department (Civil Works—Miscellaneous), to the Secretary to the Government of Madras, Public Works Department, dated Calcutta, 28th February 1888, No. 106 M.

With reference to the Secretary of State's despatches, noted in the margin, on the subject of the best position for the entrance to the Madras harbour, I am directed to forward, for His Excellency the Governor's information, copy of a Note on the subject, by Mr. Molesworth, the Consulting Engineer to the Government of India for State Railways.

Nos. 10 and 11 P.W., dated respectively the 24th November and 15th December 1887, to the address of His Excellency the Governor of Madras.

Enclosure.

Note by G. L. Molesworth, Esq., *Consulting Engineer to the Government of India for State Railways, on the subject of the Madras Harbour.*

The committee, composed of Admiral Salmon, Sir John Coode, and Sir George Nares, has now pronounced in favour of an entrance at the north-east corner of the Madras harbour, closing the present entrance to the east.

Of the four plans proposed and marked Nos. I, II, III and IV, respectively, the committee accords its preference to No. III on nautical grounds, but it does not state the nature of those grounds.

Plan No. I was originally proposed by the Madras committee in its report, dated June 20th, 1883; but when that report was referred to me by the Government of India for opinion, I pointed out in my Note of July 17th, 1883, the very serious objections to which this plan was exposed from its re-entering curve and from the action of confluent waves.

I also pointed out that plan No. II (which, in my opinion, was the necessary modification of No. I in order to remedy its defects) was open to the undoubted objection of throwing vessels, entering the harbour, further into shoal water than was desirable, and I suggested for consideration the alternative plan of extending one of the faces so as to cover the existing entrance as shown in No. IV.

In May 1887, Mr. Thorowgood submitted, for the consideration of the Madras Harbour Trust Board, plans Nos. I, II and IV, and in addition to these plans he also submitted the modification of No. IV, as shown in plan No. III.

In No. III the extension of the face is carried out with a slight change of direction, whereas in the plan I suggested, the extension was in a straight line, on the prolongation of the face.

Mr. Thorowgood, however, in putting forward plan No. III, accorded the preference to No. IV, which also found most favour with the Harbour Board for the following reasons:—

"(1*st*) That only a very small portion of the old ruined wall and rubble have to be cleared away.

"(2*nd*) That during the construction there will never be more openings than the proposed entrance through which the sea can come.

"(3*rd*) That it allows the work to be proceeded with at present at least for 4 months or more."

I may add that I prefer my original suggestion as it stands in plan No. IV to its modified form as plan No. III, because, in addition to the above-mentioned advantages, No. IV allows more sea room and involves less disturbance at the mouth of the harbour from the action of confluent waves. The relative estimates of plans Nos. III and IV are Rs. 61,00,000 and Rs. 62,45,000, respectively.

The ends of the covering arm should, in my opinion, be turned inwards instead of outwards as shown on the drawings.

If No. III is to be carried out, I would strongly recommend a slight modification of it, as shown by the blue lines which I have drawn on the plan No. III that accompanies the report of the committee.

Order—dated 6th March 1888, No. 764 W., Public Works.

Communicated to the Harbour Trust Board for consideration, in continuation of G.O. No. 404 W., dated 4th February 1888.

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Secretary to Govt., P.W.D.

G.O., dated 9th June 1888, No. 1715 W., Public Works.

Read—the following paper:—

From the Secretary to the Government of India, Public Works Department, dated 23rd May 1888, No. 261 M.

In continuation of Public Works Department No. 106 M., dated the 28th February 1888, I am directed to forward, for the information of His Excellency the Governor in Council, the accompanying copy of a further Note, dated the 5th May 1888, by Mr. Molesworth, the Consulting Engineer to the Government of India for State Railways, on the subject of the best position for the entrance to the Madras harbour.

Enclosure.

Note by G. L. Molesworth, Esq., *Consulting Engineer to the Government of India for State Railways, dated 5th May* 1888, *on the subject of the best position for the entrance to the Madras Harbour.*

When I wrote my last Note on the Madras harbour, I had not seen the minutes of evidence which induced the committee to prefer plan No. III on "nautical grounds." I have now had an opportunity of studying that evidence, and I would suggest, for consideration, a slight modification of the plan I originally suggested (marked No. IV). This modification consists simply in prolonging slightly further the eastern arm which I had suggested; and also slightly altering the tangent point from the north-eastern elbow so as to change its position instead of having it in the position in which it was originally built.

I have shown the prolongation of the eastern arm sufficiently long to cover the opening and protect it from seas coming in, even at an angle of 30° from the normal direction.

In my report on the Madras harbour, dated March 1st, 1882, para. 96, I advanced the opinion that "the *waves of a dangerous character must always come in broadside to the shore or nearly so* whatever the position of the storm;" and in paras. 75 and 76 of that report, I gave my reasons for the opinion I advanced. This opinion is confirmed by the experience of nautical men, as given in the evidence. The direction of the waves is stated to be quite

independent of the direction of the wind, and that the heavy swells come in nearly broadside to the shore, even when the wind is blowing off the shore. Others state that the direction of the waves never exceeds an angle of 30° from the normal, but I doubt very much whether any waves, except those of oscillation, which are comparatively harmless, can possibly come in at any angle approaching this.

In fact, it is opposed to the laws governing the motion of waves that a *wave of translation* should deviate to any considerable extent from the parallel of the general direction of the contour lines of the bottom of the sea to seaward of the harbour.

An arm covering an angle of 30° will, however, be on the safe side, as protecting the entrance to the harbour, even from waves of oscillation.

I annex a sketch showing the modifications I would propose in my original suggestion; the existing work being shown in black lines, my suggestion of July 1883 in red lines, and the slight modifications I now propose in blue lines.

These modifications will, in my opinion, meet any objections that may be raised on "nautical grounds" to my original suggestions, whilst they will be free from some of the objections to which project No. III is exposed.

Order—dated 9th June 1888, No. 1715 W., Public Works.

Communicated to the Chairman, Harbour Trust Board, for early remarks, in continuation of G.O. No. 764 W., dated 6th March 1888.

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Secretary to Govt., P.W.D.

From R. W. BARLOW, Esq., C.S., Chairman, Harbour Trust Board, to the Chief Secretary to Government, Marine Department, dated Madras, 21st June 1888, No. 1086.

I have the honor to acknowledge G.O. No. 1715 W., dated the 9th instant, forwarding, for the remarks of the Board, a note with plan attached by Sir G. Molesworth regarding the best position for a north-east entrance to this harbour. These were, after circulation, very carefully considered at the meeting of the trustees on the 19th instant, and I submit copy of the resolution then passed, together with copy of a letter from the Board's engineer, No. 368, dated 18th idem, replying to a reference made to him on the subject.

2. Sir G. Molesworth's plan, if carried out, would give the harbour a slightly larger area, but this would be of no practical use for the anchorage of vessels; it would also afford additional protection against waves of translation coming in at a maximum angle of 30° from north of the normal direction; but the trustees note that Sir Guilford gives it also as his opinion that "waves of a dangerous character must always come in broadside to the shore, or nearly so," and in this the trust fully concur, while they also agree with him that "waves of oscillation" are "comparatively harmless," even should they come in at an angle approaching 30°.

3. The Board consider that they would not be justified in incurring the additional heavy expenditure and delay which the adoption of Sir G. Molesworth's design would involve. The junction of the new curves at the north and south arms with the old works, left undamaged by the cyclone of November 1881, proved a most difficult and costly undertaking, and the trust are not disposed to accept any modification that would involve a repetition of this at the north arm. The revised plan would further necessitate the removal of a considerable portion of the *new* work at the northern arm at a heavy outlay, protected, as it is, by a 40-feet wave-breaker screen. The proposed alteration would, besides, carry the south arm into deeper water, as pointed out by our engineer involving still further expenditure. Under a review of the above conditions, the Board are decidedly opposed to the modification suggested by Sir G. Molesworth, and adhere to plan III or IV, as already submitted to Government.

Enclosures.

From F. N. THOROWGOOD, Esq., M. Inst., C.E., Superintendent, Madras Harbour Works, to the Chairman, Harbour Trust Board, dated Madras, 18th June 1888, No. 368.

I have the honor to return, herewith, the papers which accompanied your letter No. 954, of June 13th, with Sir Guilford Molesworth's modified plan for an entrance to the Madras harbour.

It appears to me that nearly the whole of the outer portion of the north pier will have to be taken up to carry out the design proposed, and the greater depth of water into which the south arm is brought will undoubtedly add to the cost of the work and increase the time of construction.

Extract of Proceedings of the Trustees of the Harbour of Madras, at a meeting held at the offices of the Board, on Tuesday the 19th day of June 1888.

* * * *

9. Read letter from the Engineer, Harbour Trust Board, No. 368, dated 18th June 1888, submitting report upon the modified plan for an entrance to the Madras harbour, by Sir Guilford Molesworth, communicated with G.O. No. 1715 W., dated 9th June 1888.

Resolved that the additional protection afforded would not justify the increased expenditure and delay which would be incurred by the necessity for taking up a large portion of the new work recently constructed at the head of the north arm.

* * * *

(True Extract.)

(Signed) C. PINSENT,
Secretary, Harbour Trust Board.

Transferred to the Public Works Department.

Ootacamund,
23rd June 1888.

(Signed) H. E. STOKES,
Chief Secretary.

Note by the Chief Engineer, Public Works Department.

To a member of the committee appointed in 1883, which first suggested a north-east entrance to the harbour, a perusal of the report of the committee appointed by the Secretary of State to consider the subject, with the interesting notes of evidence, must be satisfactory. It seems now at last to be allowed generally that a north-east entrance is necessary, and it is the opinion of eminent nautical men that steamers can enter and leave the harbour by such an entrance without much difficulty.

2. This opinion was all that was needed by this Government.

3. There seems to be no reason why the Government should not accept, without hesitation, the position of entrance as approved by the Home committee, and generally by the Harbour Trust Board; the only apparent objection to it is that it necessitates the removal of a very considerable extent of old work which would have been avoided by the adoption of either plan No. 1 (originally proposed) or plan No. 2. It has, however, the advantage of opening in deeper water rather further from the shore and this may be worth the extra cost.

4. There is, however, another plan very recently submitted by Sir G. Molesworth, which was not before the Home committee, and which, coming from such an authority, deserves consideration. This plan is a considerable modification of one formerly submitted by Sir G. Molesworth, as it provides, by an altered form of the arms, for completely sheltering the entrance from waves approaching the coast from any possible direction north of the normal, which his former plan did not. It would, moreover, increase the accommodation within the harbour, and would bring the entrance further from shore than the plan approved by the Home committee. In all respects, therefore, the proposal is a good one; but we have no estimate of its cost, and it is evident from the length of the arms and the depth of water in which they are to be constructed that it must much exceed that of the proposal by the Home committee,

while it would seem that at least as much old work has to be removed in one case as in the other. The Harbour Trust Board are opposed to the scheme (*see* their letter, No. 1086, dated 21st June 1888).

It is right that Sir G. Molesworth's note and proposal should be laid before the Secretary of State, but it seems to be questionable whether the advantages which it secures are sufficient to warrant additional outlay and consequent delay in completion of the harbour.

5. In his remarks on the report of the Home committee, Mr. Parkes enters very fully into the subject of the advance of sand on the works which the evidence before the committee led them to suppose was a very serious matter, and which they adduced as one reason for their preference for a north-east entrance. The Harbour Trust Board briefly dispose of this subject, considering that it is a matter of no present practical importance, and that had the committee been in possession of information which Mr. Parkes states he received after the sittings of the committee, they would probably never have alluded to the subject. The committee apparently had before them surveys of the harbour up to 1887, and from the soundings in 1886 came to the conclusion that the sand was advancing south of the works faster than was anticipated. Mr. Parkes maintained that the apparent advance in 1886 was due to the heavy cyclone sea in May 1886, and would not be found to be a real advance; the information which he received after the committee ceased their sittings was from a survey made in September 1887, and which showed that the actual advance during the year near the works was considerably less than that anticipated by the committee. This certainly strengthens Mr. Parkes's position, and the result of examination, made at different times, of the soundings leads to the conclusion that the advance of sand need not be considered as such a serious matter as the committee think. The committee considers the sand will have advanced to the end of the south arm in twenty years, Mr. Parkes says 50 or 60 years, but he calls attention to another point; he says, "I contend that it is now well established how the sand comes, and in what quantities it comes, and therefore how it may be intercepted when it becomes necessary, and what the cost of intercepting it will be. It may be added that that cost, which will not be required for 50 years, will not therefore be a serious burden on the trade." It is submitted that Mr. Parkes's views on the question are sound, and that the advance of sand is not a matter for present consideration.

6. Mr. Parkes's views as to the question of a north-east entrance are not definitely stated in his remarks on the committee's report. He refers to the conflict of opinion between the two committees appointed by the Secretary of State, and apparently considers the question to be still unsettled. He doubts whether the present strong feeling in favor of the north-east entrance will be permanent at Madras, and suggests that Captain Taylor's successor may hold different views, that the Harbour Trust Board is a changing body, and that the financial view of the question may alter the present opinion. To this it may be replied that from June 1883, when the committee appointed in Madras proposed the north-east entrance, all authorities in Madras have persistently advocated the north-east entrance; the Harbour Trust Board, from the date of their constitution, were strongly in favor of it, and as at present constituted, with the successor of the late Captain Taylor as member, have expressed themselves more strongly than ever in favor of it, and the financial position has been carefully estimated by the Board and reviewed by Government in G.O. No. 151, Marine, dated 25th April 1888. The Government have always been in favor of the north-east entrance, while allowing that the question was one on which nautical opinion deserved the highest consideration, and, now that a committee of eminent naval and engineering authorities, selected by the Secretary of State, have reported in favor of it, it is considered that the question should be finally disposed of and the north-east entrance adopted.

7. Considering, therefore, the question settled and the form of entrance suggested by the Home committee adopted, it remains to be decided how the work is to be carried out, and on this point the Board has little to say. Mr. Parkes is evidently in favor of proceeding on the sanctioned plan till each pier is built to within about

300 feet of its termination; in fact, almost completing the harbour on the present sanctioned design, and then removing part of the work to form a north-east entrance. He suggests that the question of a change of entrance might then be reconsidered, but following what has been said above, the suggestion should be rejected. He says, "To carry out the work to that extent would take about eighteen months, during every month of which time the shelter would be improving. To proceed on the plan recommended by the committee, the first two or three years would be spent in opening the harbour still more to the sea, and that in the most dangerous possible form, while a further three years would be occupied before anything like efficient shelter would be obtained." This may be true, but it has to be remarked that the work to be removed to form a north-east entrance at present is much shattered and comparatively easy of removal, while if the harbour is nearly completed on the present design, the work to be removed will be the strongest part, most carefully fitted together, and the difficulty of removing it may then be considered too serious to be overcome. In either case special machinery will probably have to be procured for the removal of the old work, and we ought to have careful estimates of what the cost would be in both cases. It may possibly prove, as the best way of completing the harbour expeditiously, that the northern arm should be nearly completed on the line of the present design, so that one crane could be used in constructing the protecting arm of the committee's approved plan, while another is pushing on the southern arm, but it can hardly be the most economical plan, and it should be considered, if this method of working is be adopted, whether the section of the work, which would only have to stand for a year or two, should not be modified with a view to the easy removal of the blocks as soon as the protecting arm is completed. The most economical method of working would, it is believed, be to clear the north-east entrance as expeditiously as possible, and then close the existing entrance and run on the protecting arm, for which a very large amount of material would be in readiness. The harbour would be more exposed than it is at present for the time, but probably even then it would only be for a few days in the north-east monsoon that the sea inside would be too rough for work; during the south-west monsoon it would be quite sheltered.

8. If the question of a north-east entrance is now definitely settled, this question of how the revised plan is to be carried out will be of the first importance. The Board might, it is suggested, be asked to prepare detailed estimates of the cost of removing the old work, and to state their views on the subject of opening the north-east entrance at once, in order that there should be no delay in proceeding with the work on receipt of approval of the Secretary of State to a change in design.

Bangalore,
27th June 1888.

(Signed) J. O. HASTED, Colonel, R.E.,
Chief Engineer, P.W.D.

Order—dated 1st August 1888, No. 2335 W., Public Works.

In accordance with the earnest request of the Government, in their letter No. 1437 W., dated 9th June 1884, to the Secretary to the Government of India that the question of a north-east entrance to the harbour should be referred to more competent nautical authority, the Right Honorable the Secretary of State appointed a committee composed of Admirals Salmon and Nares and Sir J. Coode, to report on the subject.

2. The Governor in Council has read with much interest the committee's report and the voluminous notes of evidence taken by them, and is gratified to learn that the committee shares the views held by this Government as well as by all competent authorities in the Presidency, and is in favor of an entrance at the north-east corner of the harbour, with a covering arm. An entrance at this corner would possess the additional advantage of being fully protected against naval attack by the shore batteries, which it is proposed to construct to the north of the harbour; but an entrance in the centre of the eastern arm can receive but little protection from shore

batteries, and that arm would, within a certain distance, afford cover to boats attempting to force an entrance for the purpose of destroying the shipping in the harbour.

3. The plan proposed by the committee has been generally approved by the Harbour Trust Board and by the Chief Engineer, and is accepted by the Government.

4. The Harbour Trust Board will be requested to submit their views as to the best method of carrying out this plan with an estimate of the cost, and of any further machinery that may be required, and the Secretary of State will be asked to communicate by wire his sanction to the prosecution of the work on the committee's design.

Ordered that the Secretary of State be addressed.

(Here enter No. $\frac{11}{2335\ W.,}$ dated 1st August 1888.)

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chairman, Madras Harbour Trust Board.
„ Marine Department.

Endorsement—dated 1st August 1888, No. 2336 W., Public Works.

Copy of the above, with copy of the despatch to the Secretary of State, forwarded for the information of the Government of India.

(Signed) J. O. HASTED, Colonel, R.E.,
Secretary to Govt., P.W.D.

Exd. F. R. Bantleman.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of {1888} Madras.

PUBLIC WORKS.

Dated August, 1*st*.

Recd. *Encl.*

G.O., 1st Aug. 1888, Nos. 2335, 2336 W.

AUGUST.

Madras Harbour

Forwarding copy of Proceedings on the report of the Home committee regarding the best position for an entrance to the Madras Harbour; and requesting early intimation of the final adoption of the committee's plan.