Public Works (1898) Department.

G.O., No. 436 I

Dated 3rd June '98

[Despatch Abstract.]

Minor Irrigation Works - Sanctions: Rev. Deptt.

Sanctioning, with remarks, Application for allotment of funds for ——— in the W. West Dt during 1898-99, recorded.

Indexed.

[P. W. 25. 1,000—2-3-98]

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

Note Lands Office C/1 372/98 applic. dated 10/6/98 returned to W&I with reference of 6.6.98

Public Works (1898) Department.

Irrigation Branch

CURRENT No. 4343

From The Revenue Dept.

Order

No. 2052

N-4363/98 3.6.98

B

Dated 10-5-98.

Received

Registered 18-5-98

Enclosures

Spare copies

Recorded

SUBJECT.

Sanctioning with remarks the allotment application for Captain Meurs irrigation works in the N. Canterbury during 1898-99

16/5/98

Lands 26/5/98 To the Chief Surveyor Nelson & Marlborough Districts

W&I for return with papers

Send this on to W&I for record

Lands 26/5/98

BACK PAPERS.

No.	Date.

FURTHER PAPERS.

No.	Date.

F/17 600—5-4-97.

REVENUE DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read Proc: of the Board

of Revenue P.S. L.R. dated 23rd March.
1898, No. 2072 Inis: sanctioning with remarks the allotment applied for a certain minor irrigation works in the Nest Dt. during 1898-99.

Order thereon Inis No. 2052 dated 10th May 1898.

Sanctioned.

(True Extract)

S. Robertson
for Secy. to Govt.

To,

The Board of Revenue Revenue Settlt. &c.
with Inis
Public Works Deptt. (I).

Rec
13/5/98

Govt. of {189 } Madras.

REVENUE.

To

Dated
Recd. } Encl.

Mis. G.O., 189 , No.

SUBJECT.

(Sett. 12—2,000—15-2-98.)

REVENUE BOARD OFFICE. MADRAS.

Proceedings of the Board of Revenue

(Revenue Settlement, Land Records and Agriculture),

Dated 23rd March 189 8.

No. 2076 Mis.

READ endorsement from the Chief Engineer for Irrigation, Tank Restoration Scheme, No. 533 T dated 15th March 1898 on letter from the Collector of North Arcot, Ref. on Current No: 2485/Eng of 1897 dated 4th February 1898 submitting for sanction an allotment application for the Minor Irrigation works to be repaired during 1898-99.

Resolution.

The estimate amounting to Rs 38,014 for all the works entered in the application for allotment received

received with the Collector's letter
read above except those
noted in the margin are
sanctioned.

RS.

Gudiyattam
Vellore item
Wallajah -- 2,77

2. The estimates for the items nos:
1 & 4 to 7 in the Gudiyattam taluk
will be submitted to Government for
sanction with reference to rule 3
of the rules sanctioned in Govern-
ment Order, No: 399 I dated 2nd
May 1893.

3. The estimates for items nos: 2,
7 and 9 in the Wallajah taluk should
be forwarded to the Executive
Engineer for approval as advised
by the Chief Engineer for Irrigation.
The Collector's attention will be
drawn to the concluding sentence
of the Chief Engineer's remarks
regarding item No: 9. The further
information called for by that
officer in regard to item No: 7
of Vellore and the sketch asked
for in respect of item No: 6 in
the Wallajah taluk should be
submitted.

4. The estimates for the items
referred

referred to in the last para of the
Chief Engineer's endorsement
and that for item No: 3 of the
Chittoor taluk should be for-
warded to the Executive Engineer
for approval, before the works
are put in hand.

5. The increase in the revenue
expected after repairs in the
case of items nos: 1, 2, and 15 of
the Wandiwash taluk is out of pro-
portion to the increase in the area
expected to be brought under
irrigation and the revenue now
derived.

6. It should be reported whether
in the case of item No: 15 of
Chittoor taluk, which irrigates
more than 100 acres, a pipe
sluice will answer. The Collector's
attention will in this connection,
be drawn to para 17 of the
Memorandum of instructions,
Communicated with Board's
Proceedings, No: 282, dated
11th July 1894, in which pipe

sluice

sluices is recommended only for tanks irrigating less than 100 acres.

(True extract)

(signed) R. V. Srinivasiar

To, Secretary.
The Collector of North Arcot.
The Chief Engineer for Irrigation, Tank Restoration Scheme.
The Secretary to Government Revenue Department, para 2 of the resolution with extract from the application for allotment relating to works Nos: 1 and 4 to 7 in the Gudiyatam taluk and estimates in original to be returned.

(True copy)

P. Govindaswamy
for secretary

Encls: 3/5781

Revd
Pet
2051
Send Down
11.5
21.5
1-30
24.5
Bd Glw (R&LR Secy)
Madras, 23-5-98.
Forwarded
P. Govindaswamy
A. P. Asst
23.5.98

Rc.
Received 23/5/98
Pet No 4343/98
Mh 23/5/98

1cls
2/ The Executive Officer of the Chingleput Dist Bd.
with copy of G.O. dated 20.2.98
23.5.98

PROCEEDINGS OF THE BOARD OF REVENUE
(REVENUE SETTLEMENT, LAND RECORDS AND AGRICULTURE).

READ—the following letter from L. M. WYNCH, Esq., Deputy Director of Land Records and Agriculture (Land Records Branch), to the Secretary to the Commissioner of Revenue Settlement and Director of the Department of Land Records and Agriculture, dated 14th April 1893, Ref. No. 54-Bd.:—

In its Proceedings, No. 21, dated 14th January 1893, the Board has drawn attention to the irregular practice of providing lump sums in the lists of allotments required for minor irrigation works calculated on the average annual revenue instead of on proper detailed estimates of the amount required for complete repair of the works in question. I have the honour to point out that the practice is the outcome of rules 3 and 5 of Board's Standing Order No. 187-I. Rule 3 distinctly requires the submission of applications with a *rough estimate of cost* in December, while rule 5 says that detailed estimates and plans should be prepared between January and March for works approved by the Chief Engineer and the Board. In order that the lists may reach the Board's office by end of December, Tahsildars have to make out their lists in November when they have no data to go upon except the guess work of Revenue Inspectors and village officers; not unnaturally therefore one year's average revenue which is generally, though erroneously, supposed to be the maximum admissible amount, is set down as the sum required, and this leads to another evil, namely, the preparation of estimates to suit the allotment rather than the actual requirement of the work.

2. The Board in its Proceedings above quoted has now ordered that the selection of works should be made by Tahsildars and that estimates should provide for their complete repair, and that Collectors should note the fact of the preparation of estimates in the lists. Rules 3 and 5 of the Board's Standing Order should, therefore, be amended, and I would suggest that, if possible, the due date for submission of the applications might be postponed to the end of January or beginning of February so as to give time for the preparation of estimates after the first burst of the north-east monsoon, as obviously an estimate for repairs made out early in October is not likely to represent the extent of repairs required when the monsoon is over.

3. The next point is the general ignorance of the taluk officials in all matter connected with preparation of estimates, settlement of rates, and method of execution and supervision of work, ignorance which is not to be wondered at considering that no manual of instructions is available. I have the honour therefore to submit, for the approval of the Board, the accompanying memorandum on estimating for and executing repairs to minor irrigation works which has been kindly drawn up, at my request, by Mr. Ashpitel, Under Secretary to Government, Public Works Department, Irrigation Branch. I intended to incorporate the memorandum in the Revenue Inspector's Manual, which is under preparation, but there seems to be no reason why it should not be published independently at once so as to afford taluk officials time to become thoroughly acquainted with the methods prescribed before the time for the preparation of the lists for 1894–95.

4. (1) The first part contains definitions of the terms and abbreviations used.

(2) The second part gives simple instructions for the preparation of estimates for repairs to earth-work. The estimate form A is intended to be printed with skeleton diagrams in columns 6 and 8 (these diagrams need not be drawn to scale). The only instruments required are a measuring-rod and tape and some pegs.

(3) Then follow instructions for estimates for revetments. The only masonry works which come within the scope of the Revenue Department are sluices, and for these type designs are provided in five varieties according to the depth of the sill below maximum water-level. These designs are to be adopted in future in the Department of Public Works by Tank Restoration Parties. They are accompanied by detailed estimates (not yet received, will follow).

(4) The last section (paragraphs 18—22) provides for the formation of bye-washes for the escape of surplus water.

(5) Rules for the execution of work are given in the "specification" which has been adopted from the specification in use in the North Arcot district.

(6) The third part consists of a few points to be observed when inspecting tanks. A form of "data sheet" for calculation of rates for the different kinds of work to be done to be maintained for each district and taluk is also given.

5. In conclusion, I have the honour to suggest that Revenue Inspectors should be required to qualify themselves in the rudiments of estimating and plan-drawing and in taking out quantities from plans drawn to scale before being promoted to the first grade on Rs. 40. On an average about 4 lakhs are annually sanctioned for minor irrigation works, and it is time that steps were taken to ensure that the officers entrusted with the expenditure of this sum understand how to prepare estimates and see that work is done in accordance therewith.

Enclosures 4.

Reference on the above, dated 1st May 1893.

Referred to the Chief Engineer for Irrigation for favour of remarks on the memorandum and papers submitted by Mr. Wynch.

(Signed) P. RAJARATNA MUDALIAR,
Secretary.

To the Chief Engineer for Irrigation, with letter and enclosures, in original, to be returned.

Read—the following letter from Lieut.-Colonel R. R. E. DRAKE-BROCKMAN, R.E., Chief Engineer for Irrigation, to the Secretary to the Commissioner of Revenue Settlement, Land Records and Agriculture, dated Ootacamund, 9th May 1893, No. 288-M. :—

With reference to Board's Reference on General Register No. 2685, dated 1st May 1893, I have the honour to state that the rules and designs drawn up by Mr. Ashpitel may with advantage be adopted for use in the Minor Irrigation Department. Certain alterations and additions in red ink * have been made by me.

(Intld.) F. W. A.

* The original width of bund of 4′ 0″ has been retained by order of the Chief Engineer for Irrigation.

Read—the following letter from L. M. WYNCH, Esq., Deputy Director of Land Records and Agriculture (Land Records Branch), to the Secretary to the Commissioner of Revenue Settlement and Director of the Department of Land Records and Agriculture, dated Madras, 12th May 1893, No. 79-Bd. :—

In continuation of my letter, dated 14th April last, No. 54-Bd., I have the honour to forward herewith the remaining specimens (7) of type designs of sluices promised in paragraph 4 (3) of the letter.

Resolution—dated 11th July 1894, No. 282.

With the first paper read above, the Deputy Director of Land Records submits a memorandum of instructions for preparing estimates for, and executing repairs to, minor irrigation works. The instructions have been drawn up by the Under Secretary to Government, Public Works Department, Irrigation Branch, and have been approved by the Chief Engineer for irrigation. They are now circulated for the information and guidance of all officers and subordinates entrusted with the repair of minor irrigation works.

2. The instructions given in the memorandum should be carefully followed by the Tank Overseers and Maistries, Revenue Inspectors and Tahsildars. Collectors and Divisional officers during their tours should satisfy themselves that the instructions are properly understood and carried out.

3. For the reasons given by Mr. Wynch, the Board accepts the suggestion made at paragraph 2 of his first letter and directs that the lists of works shall in future be submitted by the end of January through the Chief Engineer for Irrigation. For purposes of the budget, however, an estimate of the requirements of each taluk should be sent in by the Collector before the 8th August, the allotment required being given in lump without any details of works. In framing this estimate, the actual expenditure in past years should of course be taken into account, and the programme of relief works, which has been ordered to be maintained in each district (Board's Proceedings, dated 7th June 1892, No. 411 and 27th February 1893, No. 81), may also be consulted with advantage.

4. In the selection of works for repairs each year, due regard should be paid to their urgency, and a systematic working plan should be prepared beforehand and kept up to date. This can be easily done if a little care is taken in preparing the programme of relief works referred to above. In the case of every irrigation source, the earth-work and masonry have to be kept up to a certain standard of efficiency and the bunds should not be allowed to fall below the prescribed height to an extent likely to endanger the safety of the work. The works requiring repairs should be ascertained by the Revenue Inspectors and reported to the Tahsildars. The Tahsildars should then inspect them, and after satisfying themselves that the repairs are really required should classify the works in the order of their urgency. This list should be kept corrected to date with reference to changes which may occur in their condition, and the works to be repaired every year should be selected in the order of their urgency.

5. Unforeseen monsoon damages requiring immediate repairs will of course have to be dealt with specially. Applications for allotments in such cases should be submitted, as at present, before the 15th December or in sufficient time to admit of the work being carried out before the next rains set in.

6. In order to avoid delay in the utilization of grants for each year pending the receipt of orders on the allotment applications, the Collectors will be authorized to adopt the following procedure :—

(*a*) All repairs sanctioned and in progress at the end of a financial year may be continued in the new year.

(*b*) All repairs for which an allotment has been sanctioned by the Board in the application for the past year, but which may not have been begun in that year, may be commenced in the next year, the expenditure on account of any such work in anticipation of orders on the allotment application for the year not being allowed to exceed the amount of the previous year's allotment; it being further understood that the total expenditure of the new year must not exceed the sanction unless a supplementary allotment is received from the Board.

7. The Board is prepared to admit that to ensure the proper maintenance of the minor irrigation works it may be necessary in districts where these works are numerous and important to give the Tahsildars the assistance of a better staff of tank overseers and maistries than is employed at present. The Deputy Director of Land Records would have the work of estimating and drawing up plans for repairs done by Revenue Inspectors, and with this view he proposes that it be ruled that no Revenue Inspector

shall be eligible for promotion to the first grade on Rs. 40 before he has qualified himself in the rudiments of estimating and plan-drawing and in taking out quantities from plans. The Board agrees with the Deputy Director that all Revenue Inspectors should be required to qualify themselves in the manner indicated, but it is of opinion that it would be impossible for these officers to devote much time to preparing estimates and plans. Their duties should chiefly consist in supervising the work of the tank overseers and maistries, in checking estimates prepared by them and measuring up work carried out by them. The Board does not consider it necessary at present to recommend a rule debarring promotion to Revenue Inspectors who have not qualified themselves in estimate-making and plan-drawing.

In every district a small permanent staff of maistries is at present maintained on salaries ranging from Rs. 15 to Rs. 30 or 35. This staff may be supplemented, where necessary, during the working season by men temporarily entertained to supervise the execution of works, which may be found too much for the ordinary staff to do. In taluks in which the number of works is large, a Superintendent of the standing of a Public Works Department Overseer or Sub-overseer will be sanctioned to assist the Tahsildars in supervising the repairs to the more important works. The increased expenditure that may thus be incurred can be met from the annual grants and will be more than compensated for by the saving in the annual cost of repairs, which will be effected by the efficient and thorough work that will be done under stricter supervision.

8. All Collectors are accordingly requested to submit proposals for the establishments required by them drawn up on the lines indicated above and for any measuring instruments, &c., that may be deemed necessary for the use of the establishment. The scale of establishment should be so drawn up as not to exceed 15 per cent. of the average outlay on minor irrigation repairs in the district during the past five years. The average cost of establishment in the past three years amounted to less than Rs. 29,000. Assuming that the annual grant will not be less than four lakhs of rupees, fully half a lakh can be made available in future to meet the cost of establishments.

9. Copies of the type designs of sluices and calingulas referred to in the memorandum have already been supplied to Collectors with Board's Proceedings, dated 5th April 1894, No. 153.

(True Copies and Extract.)

(Signed) P. RAJARATNA MUDALIAR,
Secretary.

(True Copy.)

(Signed) I. SARABHALINGAM NAIDU,
First Assistant.

To all Collectors.
„ the Deputy Director, Land Records.
Copy to the Secretary to Government, Revenue Department.
„ „ Chief Engineer for Irrigation.

Memorandum on a Rough Method of preparing Estimates for the Repair of Tanks.

Part I.—Definitions.

Full-tank level.

1. Full-tank level (F.T.L.) is the level at which it is customary to store water in a tank.

Maximum water-level.

2. Maximum water-level (M.W.L.) is the highest level to which water rises in a tank during maximum floods and may be determined by ascertaining the greatest depth of water which is known to have passed over the escapes (See also II, paragraph 3).

Proposed height of bund above M.W.L.

3. Proposed height of bund above M.W.L. is the height to which the bund should be raised above M.W.L. and may for the class of tanks in charge of the Revenue Department generally be taken as 3′ 0″ except for small tangals when 2′ 6″ will be sufficient, or for tanks with a large waterspread and considerable depth of water where 4′ 6″ may be required.

The top width of a tank bund should never be less than 4′ 0″, as if less it soon wears to a knife-edge.

Side slopes of bund.

4. The side slopes of a tank bund may be 1½ to 1 or 2 to 1, according to the nature of the soil. For revetment a slope of 1 to 1 is generally sufficient. A slope of 1½ to 1 means that for every foot of height a base width of 1½ feet is given. Similarly a slope of 2 to 1 means that for every foot of height a base width of 2 feet is given.

Bye-wash.

5. A bye-wash is a natural ground or paved escape at the end of a tank bund designed to serve as a means of escape for flood or surplus water. A bye-wash can only be effective when the natural level of the ground is at or near to F.T.L. or when the soil is rocky.

Part II.—Instructions.

Details of repairs to be executed by the Revenue Department.

1. The repairs to tanks to be undertaken by the Revenue Department as a rule consist of (1) earth-work repairs to bund, (2) repairs to revetment, which may include raising the existing revetment, (3) repairs to masonry works including the re-construction of sluices, (4) formation of bye-washes, (5) the construction of loose stone calingulahs.

Earth-work repairs to bund.

2. The estimate for repairs to a tank bund should be prepared when there is water in the tank as near to F.T.L. as possible. The water surface then affords a reliable basis for an estimate of the repairs required. If, however, it is not possible to prepare the estimate when there is water in the tank, pegs should be driven at the edge of the waterspread along the front slope of the bund before the tank is empty. These pegs may be put in the charge of the village officials with orders that they are not to be removed. The estimate can then be prepared later on provided that the height of the pegs below F.T.L. has been noted. If repairs are urgently required and pegs have not been previously driven, it is often possible to trace the water-mark along the front slope of the bund, revetment and sluices.

Method of preparing an estimate using only a tape, measuring-rod and string.

3. The first thing to be done is to measure and note on form A the height below (*a*) F.T.L. at which water stands in the tank on the date the estimate is prepared (3′ 0″ in the case selected in form A) and also from inquiries made locally, the greatest known height (*b*) above F.T.L. to which water has been known to rise in the tank (2′ 0″ in the case selected). This information should be noted in the heading of form A.

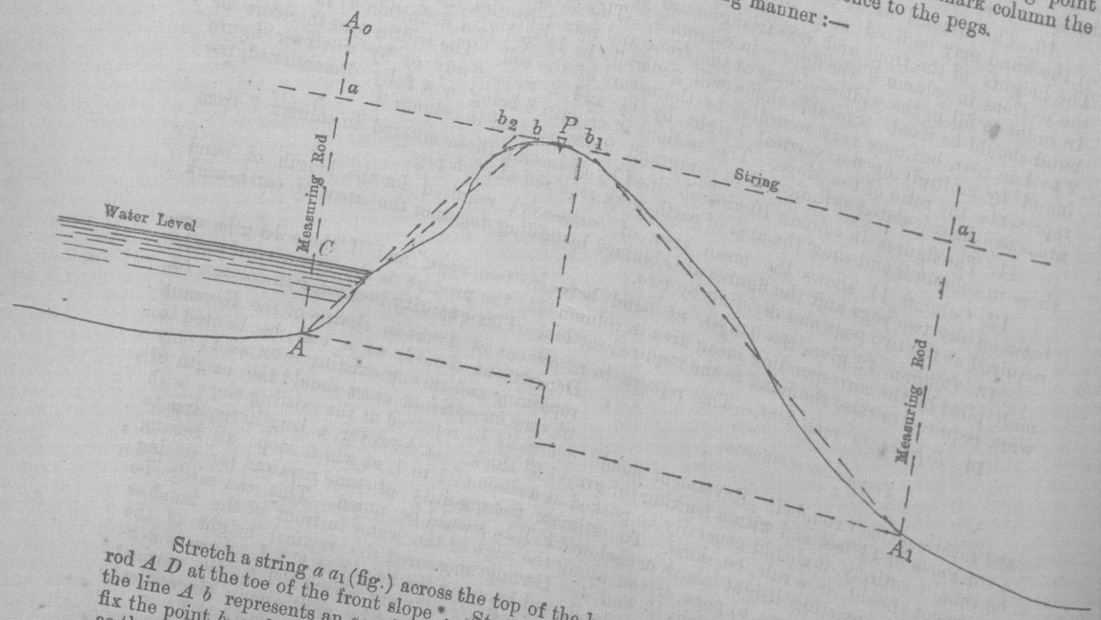
(*a*) The estimate is not likely to be prepared when the water-level in the tank is above F.T.L., that is, when the tank is surplusing. Consequently it is assumed that water in the tank will be at or below F.T.L. when the estimate is prepared.

(*b*) If M.W.L. is reported to be more than 2′ 0″ above F.T.L., the surplus works are probably insufficient and M.W.L. should be reduced by providing an additional length of bye-wash as indicated in paragraph 19.

4. The next operation is to drive pegs at the edge of the waterspread along the front slope of the bund wherever a cross section is required and with a maximum distance between any two pegs of 200 feet. Pegs will then be driven in the top of the bund opposite those driven in front, the first peg being driven at the commencement of the proposed bund. Everything is then in readiness for the preparation of an estimate.

5. To prepare the estimate (1) measure the distance of each peg from the starting point and enter these distances in column 1 of form A, taking care to note in the remark column the position of all masonry works and other conspicuous objects with reference to the pegs.

(2) Take cross sections at each peg in the following manner :—



Stretch a string $a\ a_1$ (fig.) across the top of the bund, level it by eye, and set up a measuring rod $A\ D$ at the toe of the front slope *. Stretch a string from A to b_2 and fix the point b, so that the line $A\ b$ represents an equalising line for the front slope of the bund. In the same way fix the point b_1 and measure the distance $b\ b_1$ and enter it in the section in column 6 of form A as the top width of the bund. Measure with the tape the distance ab from the measuring-rod and enter the figures in the section and the height $A\ a$ at which the string $a\ a_1$ crosses the rod and enter the figures in the section in column 6. The height $C\ a$ or height of top of existing bund above water-level must also be noted and entered in column 2.

The measuring-rod will then be set up at the toe of the rear slope and the figures obtained also entered in the section in column 6. When this has been done at every peg, all the field work necessary for the preparation of the estimate for earth-work required, form A must be completed.

6. In order to determine the total quantity of earth-work required, form A must be completed. Columns 1, 2 and 6 have already been filled and the figures in column 3 can be at once obtained by subtracting from the figures in column 2 the difference between F.T.L. and the observed water-level. In the case selected, the observed water-level is taken as 3′ 0″ below F.T.L. and at the peg at 200 feet (form A) the existing height of the bund is 7 feet above the observed water-level. Consequently the existing top of the bund is 7—3 = 4 feet above F.T.L. as entered in column 3.

7. Column 4 can now be filled in. The height of M.W.L. above F.T.L. has already been noted (see paragraph 3) in the heading of form A (2′ 0″ in the case selected) and the proposed height of the bund above M.W.L. has also been fixed (see definition 3). In the case selected, this height has been taken as 3′ 0″, thus making the proposed height of bund above F.T.L. 3 + 2 = 5 feet. This figure should be entered in column 4.

8. The figures in column 5 are obtained by deducting those in column 3 from column 4 and show the height of raising required. If the existing height of bund happens to be greater than the proposed height, that is if the figures in column 3 are greater than in column 4, the difference should be entered in column 5 with a *minus* sign to show that no raising is required

* In the case of a high bund, it may be necessary to repeat this operation.

though the slopes may require repair. The heights on the section in column 6 should also be reduced to the required height as shown at peg at 500 feet (form A), where the heights measured are reduced by one foot for the purpose of calculation.

9. Column 7 can now be filled in. The areas are obtained by dividing the section into three parts, viz., two triangles and a rectangle. The area of the section is equal to (half the height × the base of the triangle in front) + (the top width × the height of the rectangle in the centre) + (half the height × the base of the triangle in rear).

10. The dimensions of the sections in column 8 are obtained as follows. The top width of the bund may be fixed at 4′ 0″ as being generally a convenient width (see definition 3). The heights of the front and rear triangles are obtained by adding to the heights entered in the sections in column 6 the figures in column 5. This gives the height of the proposed bank. In order to fill in the widths of base of the front and rear triangles, the proposed slopes of the bund should be fixed. Suitable slopes will generally be $1\frac{1}{2}$ to 1 (see definition 4) in front and 2 to 1 in rear, but may vary according to the nature of the soil. The widths can therefore be found by multiplying the vertical height by $1\frac{1}{2}$ and 2 respectively or by whatever figure represents the ratio of the slope. The sections in column 8 being now fully dimensioned, the areas can be calculated as indicated in paragraph 9 and entered in column 9.

11. The figures in column 10 are obtained by deducting those entered in column 7 from those in column 9 and show the area of earth-work required at each peg.

12. Column 11 shows the mean area of earth-work required for the length of bund between any two pegs and the figures are obtained by adding together the areas of earth-work required at the two pegs and dividing by two.

13. Column 12 gives the length of bund between two pegs, and if these lengths are mult plied by the corresponding mean area in column 11, the product is the quantity of earth-work required to raise the bund to the required section. This quantity is entered in column 13.

14. *Repairs to revetment.*—The repairs to revetment of tanks in charge of the Revenue Department should, as a rule, be limited to repacking and raising existing revetment ; only in very exceptional cases should the length of the revetment be extended. Revetment should generally be repaired at the existing slope with a thickness of $1\frac{1}{2}$ feet and with a backing of gravel 6″ thick. If, however, a length requires to be rebuilt entirely, it should generally be packed at a slope of 1 to 1, at which slope all raising revetment should, as a rule, be done. To estimate the quantity of stone required for raising revetment, the existing height above or below F.T.L. should be noted. This can easily be determined with reference to pegs driven along the edge of the water in front of the bund as previously described in paragraphs 3 and 4. Having measured the vertical height of the existing revetment above or below water-level, and knowing the height of F.T.L. above water-level, and the height to which it is proposed to raise the revetment above F.T.L., the vertical height of raising is also known. The slant height can be obtained by multiplying the vertical height by 1·41 if the proposed slope is 1 to 1 and by 1·8 if the proposed slope is $1\frac{1}{2}$ to 1.

Preparation of estimates.

15. The mean of the slant heights at any two pegs × the length between the pegs × the proposed thickness will give the quantity of stone required. The calculation can be entered in the ordinary estimate form. If the proposed revetment is $1\frac{1}{2}$ feet thick, the quantity of gravel backing required will be $\frac{1}{3}$ of the quantity of revetment.

16. *Repairs to masonry works.*—Repairs to masonry works should be limited to petty repairs to existing works and to the re-construction of irrigation sluices.

Limit of repairs to masonry works.

17. Photo-zincographed designs of masonry sluices suitable when the proposed sill is about $5\frac{1}{2}$′, 7′, $8\frac{1}{2}$′, 10′, $11\frac{1}{2}$ feet below M.W.L. in the tank, are supplied together with printed estimates. These sluices are designed with stone ware pipes, arched tunnels, or with covering stones, and may be adopted according to the locality and materials available. Pipe sluices should be built when the area to be irrigated is less than 100 acres, but no absolute rule on the subject is advisable. The small pipe sluice plan and estimate No. I is intended for high level sluices and to replace pot sluices. The figured depth of foundations may have to be increased or diminished according to the nature of the soil, but will ordinarily be found sufficient. The designs will require slight modification in certain cases, which modification can be effected by merely altering the dimensions on the plans. (1) If the proposed height of the bund is 4′ 6″ above M.W.L., the tunnel must be lengthened by 5′ 3″. (2) If the proposed height of bund is 2′ 6″ above M.W.L., the tunnel may be reduced in length by $1\frac{3}{4}$ feet, but in this case the difference is so small that it is probably not worth while to alter the plan and estimate. (3) If the sluice is required to supply more than one channel in rear, the tunnel must be lengthened by 7 feet in order to bring the rear cistern beyond the rear slope of the bund. The opening in the rear cistern will be closed and vents allowed as may be required. These modifications of the plans entail corresponding alterations in the estimate, but the labour

Sluices.

involved is very slight. If the height of M.W.L. above sill exceeds 12 feet, the Public Works Department should be asked to frame an estimate, as the designs supplied are not suitable.

18. *Formation of byewashes.*—If a tank has been known to breach, unless there is some other special reason, it is probable that the surplus outlets are inadequate. These may be lengthened by the construction of loose stone calingulahs (*Plan* No. XIV), or by forming natural or paved byewashes (*definition* 5).

19. The table gives a rough method of calculating the length of byewash required in order to reduce M.W.L. in a tank to a safe limit:—

Observed height of M.W.L. above F.T.L.	Proposed height of M.W.L. above F.T.L.	Multiplier.
(1)	(2)	(3)
2′ 0″	1′ 0″	3
2′ 0″	1′ 6″	1½
2′ 6″	1′ 6″	2
2′ 6″	2′ 0″	1½
3′ 0″	1′ 6″	3
3′ 0″	2′ 0″	2

Column (1) shows the observed or measured height of M.W.L. above F.T.L. and column (2) the height to which it is proposed to reduce M.W.L. by providing additional surplus works. If the actual length of the existing escape or escapes be multiplied by the figure in column (3) opposite to the observed height of M.W.L. above F.T.L. in column (1), the product will be (roughly) the total length of escape required. If the existing length of escape is deducted from the total length, the additional length of byewash required is known. For instance, suppose in a tank the observed M.W.L. is 2′ 6″ above F.T.L. and in order to avoid excessive earthwork it is proposed to reduce M.W.L. to 1′ 6″ above F.T.L. If the length of the existing escape is 50 feet, the total length required is 50 × 2 = 100 feet and the additional length of escape required is 100 — 50 = 50 feet.

20. The question of lengthening escapes and thus reducing M.W.L. in a tank is of great importance if the length of the bund is considerable; as it is generally cheaper to lengthen byewashes than to raise banks.

21. Natural byewashes are only suitable when the natural level of the ground is fairly level or has a very gradual fall in rear or where the soil is rocky. If there is any abrupt fall in rear, the surface, unless protected by pavement or masonry work, will soon be cut up by the action of the water. As a rule tanks irrigating less than 50 acres do not require masonry weirs, but every tank should, if possible, be provided with byewashes, that is, the bund should be stopped at either flank when the natural level of the ground is at F.T.L., unless there are special reasons why water should not be allowed to flow round the end of the bund. Byewashes may be formed by simply cutting the ground at the end of the bund to F.T.L. If the ground is soft and stone is cheap, they may be paved. This pavement should generally be laid flat, but if this is not feasible it may be laid at a slope. The pavement may be 5′ 0″ to 10′ 0″ wide, 1½ feet deep and the end of the tank bund should generally be revetted. Natural byewashes should be located where the soil is of a hard nature and not liable to erosion by the flow of water over it.

22. Plan No. XIV shows a type of loose stone calingulah which may be adopted when the ground level at the site of a proposed surplus work is below F.T.L. The level of the pavement should be at ground level and the top of the damstones at F.T.L. These calingulahs should only be constructed where the ground level does not exceed 2′ 0″ below F.T.L.

23. It appears to be a common practice when repairing a tank bund to extend it at the flanks. The result is that many tanks breach owing to the natural byewashes having been blocked up. When a tank is repaired the possibility of providing additional surplus escapes by removing the bund at the flanks should always be considered.

FORM A.

tank District Taluk.

CALCULATION sheet for earthwork required at M.W.L. 2 feet above F.T.L.

Water level on * 20th March 1893, 3 feet below F.T.L.

Distance.	Existing height of bund above observed water level.	Existing height of bund above F.T.L.	Proposed height of bund above F.T.L.	Height of raising required.	Section of existing bund as measured.	Area of section of existing bund.	Section of proposed bund.	Area of section of proposed bund.	Area of earthwork required.	Mean area.	Length.	Contents.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	8	5	5	..		162·5		196·7	34·2				Peg 50 feet from left wing of calingula.
										44·0	200	8,800	
200	7	4	5	1		126·5		180·0	53·5				
										99·0	100	9,900	
300	6·5	2·5	5	2·5		162·0		307·0	145·0				
										106·0	200	21,200	
500	6	6	5	—1		174·0		240·7	66·7				
										84·0	175	14,700	Peg 150 feet south of sluice.
675	6·5	3·5	5	1·5		179·0		281·0	102·0				
										118·0	150	17,700	
825	5	2	5	3		106·5		240·7	134·2				
										128·0	75	9,600	Peg 50 feet north of palmyra tree in centre of bund.
900	5·5	2·5	5	2·5		116·5		238·0	121·5				
									Total earthwork, c. ft. ..			81,900	

* Here fill in the date on which the pegs are driven.

SPECIFICATION FOR TANK WORKS.

ஏரி வேலைகளை நடத்தும் விவரம்.

1. *Removal of bushes and trees.*—The first thing to be done is to remove bushes and prickly-pear. Trees on the front slope and top of the bund should, if ordered, be cut down and sold afterwards by public auction. The bank will then be benched (stepped) throughout in steps 2′ 0″ deep and 2 feet high.

1. **புதருகளையும் செடிகளையும் அப்புறப்படுத்துவது.**—முதலாவது செய்யவேண்டியது புதர்களையும் நாகதாளியையும் அப்புறப்படுத்துவது. முன் ஸ்லோப்பிலும் கரையின்மீதும் இருக்கும் மரங்களை வெட்டிவிடும்படி உத்தரவானால் வெட்டிப் பிறகு பயிரங்கமான ஏலத்தில் விற்பனைசெய்யவேண்டியது. அதன்பிறகு கரையை முற்றிலும் 2-அடி ஆழத்திற்கும் 2-அடி உயரத்திற்கும் படிப்படியாக வெட்டவேண்டியது.

2. *Setting out work.*—When the maistry reports that the above rule has been complied with, the tank overseer will put up model sections of earth at each peg or closer if necessary. These model sections will be turfed with turf from the tank bed; when this cannot be done, pegs and string may be used, but these are liable to be knocked down or removed.

2. **வேலைசெய்தல்.**—மேற்கண்டபடி நடந்ததாக மேஸ்திரி தெரிவித்தபிறகு ஏரி ஓவர்ஸியர்னுல் இன்னும் நெருக்கமாகவாவது மாதிரி மண் மட்டங்களைக் குறிக்கவேண்டியது. ஏரி உள்வாயிலிருந்து புல்பத்தையெடுத்து இந்த மாதிரி மட்டங்களின்மேல் அடிக்கவேண்டியது; இந்தப்படி செய்யமுடியாவிட்டால் மூளைகளையடித்துக் கயிறு கட்டிவைக்கலாம்; ஆனல் இவைகள் தகர்க்கப்படுவதற்காவது அப்புறப்படுவதற்காவதுள்ளாகத்தக்கன.

3. *Earthwork.*—The earthwork will then be commenced, the earth being taken from taks to be marked out by the overseer or maistry in charge. The earth should then be thrown up in 1 to 1½ feet layers to the full section of the bank and watered and tamped if so specified.

3. **மண்வேலை.**—மண்வேலை பிறகு ஆரம்பிக்கவேண்டியது. ஓவர்ஸியர் அல்லது வேலை நடத்தும் மேஸ்திரியால் காட்டப்பட்ட தாக்குகளிலிருந்து மண் எடுக்கவேண்டியது. பிறகு மண்ணை 1-க்கு 1½-அடியாக அடுக்கடுக்காய்க் கரையின் அளவுமுழுமைக்கும்போட்டு, உத்தரவுசெய்திருக்கும்பக்ஷத்தில் தண்ணீர் ஊற்றித் தியமிசுபோடவேண்டியது.

4. *Disposal of prickly-pear.*—Prickly-pear must be rooted up and buried in pits at least one yard deep with 1′ 6″ of earth on top. These pits will be dug in the bed of the tank. Contractors may be allowed to throw prickly-pear into the water, but if the prickly-pear is not destroyed by the water, it must be buried in the tank-bed before the work is passed, or it may be burnt.

4. **நாகதாளியை அப்புறப்படுத்துவது.**—நாகதாளியை வேரோடு எடுத்து குறைந்த பக்ஷம் ஒரு கெஜ ஆழமுள்ள பள்ளங்களில் போட்டு அதற்குமேல் 1½-அடி மண் போட்டுப் புதைக்கவேண்டியது. இந்த பள்ளங்கள் ஏரி உள்வாயில் வெட்டப்படவேண்டும். நாகதாளிகளைத் தண்ணீரில்போட கன்ட்ராக்டர்களுக்கு அநுமதிகொடுக்கலாம்; ஆனல், தண்ணீரில் அவைகள் அழிந்துபோகாவிட்டால் இந்த வேலைசரியாய் நடந்ததென்று (மேலாவாயில் பள்ளம்வெட்டி அதைப் புதைக்கவேண்டும்; அல்லது அதைக் கொளுத்திவிடலாம்.

5. *Revetment.*—Stone revetment should never be less than 1′ 0″ thick with a 6″ gravel backing, well watered and tamped. Before commencing work all gravel required for backing, jelly and quarry chips to the extent of ¼ cubic yard for every cubic yard of revetment work to be done must be collected and stacked for measurement. The revetment to be repacked will then be marked with tar and work commenced. The revetment to be repacked will be brought as near as possible to one level to facilitate measurement and the top stones tarred. No new stones will be brought to the work spot until the old revetment has been repacked, measured and tarred. New stone will be of the minimum size of 1½′ × 1½′ × 1′ or 1½′ × 1½′ × 2′ if the revetment is to be 2′ 0″ thick. If more than 10

5. **ரிவேட்மென்டென்னும் கல் கட்டடம்.**—கல் கட்டடம் ஒரு அடி கனத்தக்கு ஒரு பொழுதும் குறையாமல் பின்னல் 6 அங்குலத்தக்கு பருக்கைக்கற்கள் போட்டுத்தண்ணீருற்றித் திம்மிசுபோட்டுக் கட்டவேண்டியது. வேலை ஆரம்பிப்பதற்குமுன் பாகிங் (பின்னல்) செய்கிறதற்கு வேண்டிய எல்லாமுரம்பும், செய்யவேண்டியதாயிருக்கிற கட்டடவேலையின் ஒவ்வொரு கனகெஜத்திற்கும் ¼ கனகஜ அளவுகு, ஜல்லியும், கல்வெட்டிரம்செய்யப்பட்டு, வேலைத்தலையில் கொண்டுவெடுத்த இடத்தில் விழும் சக்கைக்கற்களும் சேகந்து அளவெடுக்கிறதற்குத்திப்பை கட்டிவைக்கப் பட்டிருக்கவேண்டும். அதற்குப்பின், பழங்கல் பிரித்துக் கட்டப்படுகிற பாகத்தைத்தாரினுல் குறிப்பிட்டு வேலை ஆரம்பிக்கப்படும். இப்படி பிரித்துடம் கூடுமானவரையில் ஒரு மட்டமாய், அளவெடுக்கிறதற்குச் சுலபமாயிருக்கும்படி கட்டி மேல் கல்லுகளுக்குத் தார்பூசவேண்டியது. பழம் கல்

per cent. of the stone collected is smaller than this it should be rejected. The stones will always be packed so that the thickness is made up by one stone and the work should be done in lengths of 100 feet and brought up layer by layer. As each layer is completed the interstices must be filled with jelly and the gravel backing to the required thickness put in, watered and tamped. The face of the revetment will be wedged with quarry chips.

பிரித்துக்கட்டும் வேலையை முழுமைக்கும் தீர்மானமாய்த் தீர்த்து அளவெடுத்துத் தார் மார்க் செய்கிறவரையில் புதுக்கற்களையும் வேலைத்துறைக்குக் கொண்டுவரக்கூடாது. புதிதாய்க்கொண்டுவரும் கல் குறைந்தபக்ஷம் 1½′×1½′×1′ அளவுள்ளதாயும் ரிவெட்மென்ட் கட்டடம் 2′ (இரண்டு) அடி கனமுள்ளதானுல் 1½′×1½′×2′ அளவுள்ளதாயும் இருக்கவேண்டும். சேகரிக்கப்பட்ட கற்களிலே நூற்றில் பத்துபாகத்துக்குமேல் இந்த அளவுக்குகுறைந்த சிறுகற்களாயிருந்தால் அவ்விதக் கறகள் தள்ளிவிடப்படும். கட்டடம் கட்டும்போது ஒரே கல்லின் கன அளவுக்கிருக்கும்படி கற்களை எப்பொழுதும் அடுக்கிக்கொண்டு போகவேண்டும்; இப்படி நூறு அடி நீளத்திற்கு வரிசை வரிசையாய் கட்டவேண்டும். ஒவ்வொரு வரிசை பூர்த்தியானபோது மத்தியிலுள்ள சந்துகளில் ஜல்லிபோட்டுக் கெட்டித்து, வேண்டியிருக்கிற கனத்தக்குப்பின்னல் முரம்பு பாக்கிங்போட்டுத் தண்ணீர்விட்டுத் திம்மிசுபோடவேண்டும். கட்டடத்தின் முகப்பில் ஏவாரி கற்செக்கைகளைக் கொண்டு பிடிய வேண்டும்.

6. *Planting grass.*—In the case of tanks having no stone revetment a fringe of valal grass may be planted along the toe of the bund at least one yard wide and thickly.

6. **விழல்நடுவது.**—கல் கட்டடம் இல்லாத ஏரிகளுக்கு விழல் கரையோரமெல்லாம் ஒரு கஜம் அகலத்தக்குக் குறையாமல் அடர்த்தியாய் நடலாம்.

7. *Turfing.*—Turfing will be done as a rule during the north-east monsoon. Payments only to be made after the growth is assured. The rate allows for watering.

7. **புல்பத்தை அடித்தல்.**—புல்பத்தை அடிக்கும் வேலையை எப்பொழுதும் மழைக்காலத்திலேயே செய்யவேண்டுமென்பதை விதியாகவைத்துக்கொள்ளவேண்டும். புல் நன்றாய் வேரூன்றி வளரும்படியான ஸ்திதிக்கு வந்தபிறகுதான் அதற்குப்பணம் பட்வாடாசெய்யப்படும். தண்ணீர் பாய்ச்சுவதற்கும் கூலியுண்டு.

8. *Excarating foundation and refilling.*—Cutting open of banks and excavation of foundations are not to be put in hand till all the materials have been collected. If any excess earth is excavated below floor level, the contractor must fill up the excess space with concrete at his own cost. At each masonry work a bench mark of concrete 2′ 0″ × 2′ 0″ × 2′ 0″ with a stone or brick cap must be fixed and the contractor given a statement in writing regarding the depth of the foundation below this bench mark. Refilling will be done in layers and will follow the superstructure being kept 1′ 6″ below the top of the masonry whilst the work is in progress in order to avoid disturbing the top courses when tamping. No materials to be stacked within a distance equal to 1½ times the depth of cutting for foundations.

8. **கடைக்கால் தோண்டுவதும் தூர்ப்பதும்.**—கரையைவெட்டுவதையும் கடைக்கால் தோண்டுவதையும் எல்லாச்சாமான்களும் சேகரிப்பதற்குமுன் ஆரம்பிக்கக்கூடாது. கடைக்கால் பள்ளம் கடைக்கால் மேல் மட்டத்தக்கு ஜாஸ்தியாய் வெட்டப்பட்டால் அந்த ஜாஸ்தி அளவுக்கு கன்ட்ராக்டரர் தம் சொந்த செலவிலேயே கான்க்ரீட் என்னும் பொடிக்கற்கள்போட்டுத்தூர்த்தக்கொடுக்கவேண்டும். ஒவ்வொரு கட்டடத்திற்கும் (லெவல்) மட்டம் குறிக்க கான்க்ரீட்டினுல் 2′×2′×2′ இந்த அளவுக்கு இப்பைட்டினுல் அதற்குமேல் கல் அல்லது செங்கலினுல் மேல்மூடி மாதிரி கட்டவேண்டும். இப்படி கட்டிய இப்பை மேல்மட்டத்திற்கு இவ்வளவு கடைக்கால் ஆழம் இருக்கவேண்டுமென்று லிகித மூலமாய் கன்ட்ராக்டர்களுக்கு ஒரு ஸ்ட்டேட்மென்ட் கொடுக்கவேண்டும். கட்டடம் உயர்ந்தக்கொண்டு வரும்பொழுதே பக்கங்களில் மண்போட்டு மேலே 1½ அடி உயரம் தெரியும்படிக்கு அடுக்கடுக்காய்த் தூர்த்தக்கொண்டு வரவேண்டியது. மேலே ஒன்றரை அடிக்கட்டடம் இருந்துகொண்டிருந்தால் மாத்திரமே மண்வேலைக்கு திம்மிசு செய்யும்பொழுது கட்டடத்திற்குக் கெடுதி இல்லாமலிருக்கும். கடைக்காலுக்குச் சமீபத்தில்கடைக்கால் ஆழம் எவ்வளவோ அதற்கு ஒன்றரை அத்தனை தூரத்திற்குள் எவ்வித சாமானும் கொண்டுவந்து சேர்த்துவைக்கக்கூடாது.

9. *Concrete*—will consist of 1½ cubic yards of jelly to 2 parahs lime and 4 parahs sand. The jelly will be of brick or stone broken to 1″ cubes. All flat, flaggy and earthy stones to be rejected. The jelly will be heaped on a clean platform and will be well wetted. The mortar in the proper proportion will then be added and the whole will be twice turned over dry and twice again after a sufficient quantity of perfectly clean water has deen added. The concrete

9. **கான்க்.**—1½ குழி ஜெல்லிக்கு 2 பொரை சுண்ணாம்பு 4 பொரை மணல் கலந்திருக்கவேண்டும். ஜெல்லி ஒரு அங்குல பிரமாணமுள்ள செங்கல் தண்டு (பொடி) அல்லது உடைத்தெடுத்த கல் (பொடி) ஆயிருக்கவேண்டும். மழுங்கலாயும், மட்பாங்காயும், பிஞ்சுக்கல்லாயு மிருக்கிற கற்களை யெல்லாம் நீக்கிவிடவேண்டும். ஜெல்லி அதறகாகத் தயார்செய்யப்பட்டச்சுத்திசெய்யப்பட்டிருக்கிற (ப்ளாட்பாரம்) மேடையில் குப்பலாகப் போடப்பட்டுத் தண்ணீர்விட்டு நன்ருய் நனைக்கப்படவேண்டும். மண்கலந்து குத்தி வெ

will then be put in position in 9″ layers and will be tamped until this thickness is reduced to 6″. The set surface of a layer of concrete will be roughed and wetted before a new layer is added in order to obtain perfect cohesion. The top surface of concrete will be flooded. Concrete will never be plastered without special orders.

10. *Rough stone in mortar.*—No boulders to be used and all stone to be broken with faces. Every fourth stone to be a through stone for walls 2′ 0″ thick and under and every fourth stone to be at least 2′ 0″ long for walls of greater thickness than 2′ 0″. All interstices to be filled with quarry chips. The mortar will consist of 1 lime to 2 sand.

11. *Burnt stone in chunam.*—The stones will be obtained from the quarry roughly squared and all irregular shaped stones to be rejected. Every fourth stone to be a through stone for walls 2′ 0″ thick and under and every fourth stone to be at least 2′ 7″ long for walls of greater thickness. All interstices to be filled with quarry chips. The thicker stones to be towards the bottom of the wall and every stone to be bedded on its longer side. Every third course the work must be brought up level throughout. Mortar should not be smeared over the face of the stones.

12. *Brick in chunam.*—The minimum size of the bricks to be 9″ × 4⅜″ × 2¼″. English bond to be observed throughout; the bricks to be thoroughly wetted before being used, and proper water troughs must be provided by the contractor for this purpose. No joint to exceed ⅜″ in thickness. Only 10 per cent. of bats to be used.

13. *Pointing*—to follow the outlines of the stones and the mortar not to be plastered over the face. When pointing brick-work no false pointing to be done.

10. **தண்டுக்கல் சுண்ணும்பு கட்டடம்.**—உருண்டையாய் முகமில்லாத கல்லுகளை வேலையில் உபயோகப்படுத்தக்கூடாது. எல்லாக் கற்களும் முகமுள்ளவைகளாக உடைக்கப்படவேண்டும். இரண்டு அடி அல்லது அதற்குக் குறைந்த கனமுள்ள சுவர்களில் ஒவ்வொரு நாலாவது கல்லும் ஒரே கல்லாய்ச் சுவர் அகலத்துக்கும்போட்டு கட்டவேண்டும். இரண்டு அடிக்குமேல்பட்ட கனமுள்ள சுவர்களில் ஒவ்வொரு நாலாவது கல்லும் குறைந்தபக்ஷம் இரண்டு அடி நீளமுள்ளதாயிருக்கவேண்டும். கல்சந்துகளுக்கெல்லாம் செக்கைக்குக் குத்தியெடுக்கும் சுண்ணும்பு இரண்டு தட்டு மணலுக்கு ஒரு தட்டு சுண்ணும்பு இரண்டு தட்டு நந்நதாயிருக்கவேண்டும்.

11. **செக்கைக்கல் சுண்ணும்பு கட்டடம்.**—செக்கைக்கல், கல் உடைக்கும் பாறை (க்வாரி) யிலிருந்து கூடுமானவரையில் மொக்கை மூளி அதிகமில்லாததாய் எடுத்து, அதிகவிகாரமாயிருக்கிறதான உருவில்லாதகற்களைத் தள்ளிவிடவேண்டும். இரண்டடி அதற்கு குறைந்த கனமுள்ள சுவர்களுக்கு ஒவ்வொரு நாலாவது கல்லும் ஒரே கல்லாய் சுவர் அகலத்துக்குப் போடப்படவேண்டும். இரண்டடிக்கு ஜாஸ்தி அகலச் சுவர்களுக்கு ஒவ்வொரு நாலாவது கல்லும் குறைந்தபக்ஷம் இரண்டடி 7 அங்குலம் நீளமுள்ளதாயிருக்கவேண்டும். கல்சந்துகளுக்கெல்லாம் செக்கைகள்போட்டு நன்றாய் கெட்டிக்கவேண்டும். கனத்த கல்லுகளையெல்லாம் அடிவரிசைகளில்விட்டுக்கட்டவேண்டும். கல்லுகளில் அதிக நீளமானபாகம் கட்டடத்தில்படியும்படிக்குப் போட்டுக்கட்டவேண்டும். ஒவ்வொரு மூன்று வரிசைக்கும் கட்டடத்தை முழுமைக்கும் ஒரே மட்டமாய்க்கொண்டுவந்து கட்டடத்தை எற்றிக்கொண்டு வரவேண்டும். கல்லுகளின் முகத்தின்மேல் சுண்ணும்புபடும்படி செய்யலாகாது.

12. **செங்கல் சுண்ணும்பு கட்டடம்.**—செங்கற்கள் குறைந்தபக்ஷம் 9″ × 4⅜″ × 2¼″ இந்த அளவை உள்ளதாக இருக்கவேண்டும். இந்த அளமுமைக்கும் இங்கிலீஷ் பாண்டுவைத்து கட்டவேண்டும். செங்கற்களை வேலைக்கு உபயோகிக்கிறதற்குமுன் நன்றாய் நனைக்கவேண்டும். இதற்காக கன்ட்ராக்டர்கள்சரியான தண்ணீர்த்தொட்டிகளை வேலைத்துறையில் கொண்டுவந்து வைத்தக்கொண்டிருக்கவேண்டியது. கல் சந்துகள் ⅜″ அங்குல அகலத்திற்கு மேற்பட்டிருக்கக்கூடாது. பொடிக்கற்களை கட்டடத்தில் பத்தில் ஒருபங்குக்கு மேற்பட உபயோகப்படுத்தக்கூடாது.

13. **சந்துபூசுதல்.**—(பிசைதல்) கல் ஓரங்களில் சந்துபார்த்துப் பூசவேண்டும். கல் மேல்மட்டத்தில் சுண்ணும்பு படவேகூடாது. செங்கல் கட்டடத்திற்கு இந்த வேலை நடத்தும்பொழுது சுண்ணும்பினால் செங்கல் உருவு ஏற்படுத்தக்கூடாது.

14. *Cut stone.*—Covering stones to have side joints and ends resting on masonry dressed. Platform, coping, vent, guide, beam, and all cut stone other than covering stones to be neatly dressed to size.

15. *Plugs.*—Plugs to be of hard seasoned wood. The shoulder must be bound with iron. The plug spear will be of iron ⅝″ diameter and will be fitted with chain. Holes at 3″ intervals will be punched in the spear at convenient heights for the regulation of water. The chain will be secured to the shaft and will have an additional length to which a pin will be attached to fit the holes in the spear. A hasp will be leaded into the platform stone so that the plug can be locked.

16. *Ramps.*—Ramps for village and cattle crossings should have a minimum slope of ⅛, be 2 feet higher than bank and 2 feet wider than top of bank on each side. Cattle ramps to be paved and gravelled; the width should be at least 9 feet.

17. *Payments.*—Payments will be made by pit measurements; no measurements to be paid for except on continuous completed taks.

18. *Clearing up site and general remarks.*—All surplus materials and debris to be removed from the work spot by the contractor and the site thoroughly cleared before the final bill is passed. If any additional work is required to make the work neat, the subordinate in charge must apply for permission to carry out this work, stating the probable cost, and whether it can be met from contingencies or savings. Additional work must never be done merely to work out an estimate. Any work not mentioned in this specification will be done according to the standard specification of the Public Works Department. If contractors fail to work according to this specification, they will be liable to a fine, to cancelment of contract, and forfeiture of deposit. It is the contractor's duty to see that he is given proper bench-marks and levels and otherwise carries out the orders given in this specification. The contractor must also see that he receives orders in writing as no attention will be paid to verbal orders. If the contractor does work without orders in writing, he does so at his own risk. All masonry work must be watered at the contractor's cost for 10

14. **பொளிந்த கல் கட்டடம்.**—மூடுபோறைக்கல்லுகள் ஓரங்களும் கட்டடத்திற்கு மேல் படியும் பக்கங்களும் (துனியும்) சரியாய் பொளியப்பட்டிருக்கவேண்டும். (ப்ளாட் பாரம்) மேடைக்கல், கோப்பிங் (கட்டடத்தின்மேல் மட்டத்தின்) கல், கண்கள் பக்கத்தக்கும் அடியிலும் போடும் கல் (கட்டடத்திற்குமத்தியில் குறுக்கேபோடும்) சயிட் கல் இவைகளெல்லாம் கொடுக்கும் அளவுக்குச் செவ்வையாய்ப் பொளியப்படவேண்டும்.

15. **நாழிவாசல் கட்டைபோடுதல்.**—நாழிவாசல் கட்டை உறுதியாயும் வைரம்பற்றினதாயும் இருக்கவேண்டும். அதின் மேல்பாகம் கைப்பிடியைப்போல இருக்கிறதற்கு இரும்புகட்டு போடவேண்டும். இந்த கட்டைக்குப்போடும் இரும்புக்கம்பி ⅝ அங்குலக் குறுக்களவுள்ளதாய்ச் சங்கிலியினால் மாட்டப்பட்டு (போடவும் எடுக்கவும் சுலபமாயிருக்கும்படி) அந்த சங்கிலியை ப்ளாட்பாரம்கல்லில் தூளசெய்து மாட்டவேண்டும். நாழிவாசல்கட்டையை, போதுமான உயரத்துக்கு ஜலம் விட, தூக்கி போடவும் எடுக்கவும் இருக்கும்படி ஷை கம்பியில் சரியான உயரத்தில் மையத்துக்கு மையம் 3 அங்குலம் இருக்கும் வதமாகத் தூளைகள் போடவேண்டும். கம்பியில் மாட்டும் சங்கிலிக்கு ஜாஸ்தி நீளம்விட்டு அதின் நுனியில் ஷை கம்பி தூளைகளில்போடும் குறுக்காணி மாட்டியிருக்கவேண்டும். ப்ளாட்பாரம் கல்லில் தூளபோட்டு அதில் ஈயம் காய்த்துவிட்டு நாழிவாசல் கட்டையை யாரும் எடுக்காதபடிக்கு பூட்டுபோட்டு வைக்க இரும்பு மூளை பிகியவேண்டும்.

16. **கரை இறக்கம்.**—கிராமஸ்தர்களும், கால்நடைகளும் எரியைக் கடந்துபோவதற்காகக் கட்டப்படும் கரை யிறக்கங்கள 8-க்கு 1 அடி வாட்டத்திற்கு மேற்படாமலும் கரையின் உயரத்திற்கு 2 அடி அதிகமாகவும் ஒவ்வொருபக்கத்திற்குகரையின் மேல்மட்டத்தின் அகலத்திற்கு 2 அடி அதிகமாகவும் இருக்கவேண்டும். கால்நடைகளுக்காக எற்படும் இறக்கங்கள் தளவரிசை இட்டும் மற்றவைகள் முரம்புபோட்டும் இருக்கவேண்டும். அகலம் குறைந்தபக்ஷம் 9 அடி இருக்கவேண்டியது.

17. **பட்வாடா.**—பட்வாடாக்கள் தாக்குஅளவுக்கேற்றபடி செய்யவேண்டும்; தாக்குகள் தொடர்ச்சியாகப் பூர்த்திசெய்யப்பட்டாலன்றி பட்வாடா செய்யக்கூடாது.

18. **வேலை ஜாகாவைச் சுத்திசெய்வதும் பொதுப்பட மற்றபடி கவனிக்கவேண்டிய விஷயங்களும்.**—கடைசிபில் ஜாரிசெய்யப்படுவதற்குமுன்னே வேலைத்துறையிலிருக்கும் ஜாஸ்தி சாமான்களையும் பழைய கட்டடத்தில் இடித்து எடுத்த உபயோகமாகாமலிருக்கிற கல் மண் முதலானவைகளையும் எடுத்து அப்புறப்படுத்தி கன்ட்ராக்டர் இடத்தைச் சுத்திசெய்யவேண்டும். வேலையைச் சரியாய்ப் பூர்த்திசெய்ய இன்னம் அதிகவேலை ஏதாவது செய்யவேண்டியதா யிருந்தால் அந்த வேலைநடத்தும் கீழ் உத்தியோகஸ்தர்கள் அது உத்தேசம் இவ்வளவு தொகையில் நடத்தப்படலாமென்றும்கன்டின்ஜென்ட் அல்லதுமிகுதிப்பணமேதாவதிருந்தால் அதிலிருந்து செலவு செய்யக்கூடும், கூடாதென்றும் விவரங்கண்டு, வேலை நடத்துவதற்காக அனுமதிவேண்டுமென்று விண்ணப்பஞ் செய்துகொள்ளவேண்டும். எஸ்டிமேட்டில் பணம் மிகுதி இருக்கிறதென்றே ஜாஸ்தி வேலைகளைச் செய்யக்கூடாது. இந்த ஸ்பெஸிபிகேஷனில் காணுத மற்ற வேலைகளெல்லாம் என்ஜினியர் டிபார்ட்மெண்ட் ஸ்டாண்டார்ட் ஸ்பெஸிபிகேஷன்படிக்கு நடத்தப்படும். இந்த ஸ்பெஸிபிகேஷன்படி கன்ட்ராக்டர்கள் வேலைநடத்தத்தவறினால் அவர்களுக்கு அபராதம்போடப்படுவதன்றியும் கன்ட்ராக்டை ரத்துசெய்யப்படுவதுடன் அவர்கள் கட்டியடேவணியையும் இழந்துவிடுவதற்குள்ளாவார்கள். பென்சமார்க், மட்டங்கள், இவைகள்கொ

days after completion. All labour required for any work connected with setting out work must be supplied by the contractor at his own cost, or will be deducted in the bill.

கெக்கும்படி செய்துகொண்டு வேலைகளை மற்றப்படி இந்த ஸ்பெஷிபிகேஷன்படி நடத்தவேண்டியது கன்ட்ராக்டர் கடமையாயிருக்கிறது. வாய்மொழி யாகச்செய்யப்படுகிற உத்தரவுகள் கவனிக்கப்பட மாட்டாதாகையால் கன்ட்ராக்டர் உத்தரவுகள் எழுத்து மூலமாகத் தமக்கு வருகிறதா வென்றும் பார்க்கவேண்டும். லிகிதமூலமாய் உத்திரவில்லா மல் செய்யும் வேலைக்கு கன்ட்ராக்டரே உத்திரவா தி - அதனல் வரும் நஷ்டமும் கன்ட்ராக்டர்களு டையதே. கன்ட்ராக்டர் செலவில் எல்லாக க ட்டங்களும் வேலைமுடிவாய் 10 நாள்வரையில் ஜ லம்கொட்டி ஈரமாய வைக்கப்படவேண்டும். எந் தவேலைசெய்கிறதற்கும் கூலிக்காரர்களைக் கன்ட் ராக்டர்கள் தங்களுடைய செலவில் கொடுக்கவே ண்டியது. அதற்காக அவர்கள் கூலிகளைச் சர்ப் பரா செய்யாவிட்டால் அதற்காகப் பிடிக்கும் செ லவு அவர்களுக்குச் சேரவேண்டிய பில் தொகை யிலிருந்து கழித்துக்கொள்ளப்படும்.

SPECIFICATION FOR TANK WORKS.

చెఱువు పనులను నెరవేర్చుటయందు నిర్దేశ వివరణము.

1. *Removal of bushes and trees.*—The first thing to be done is to remove bushes and prickly-pear. Trees on the front slope and top of the bund should, if ordered, be cut down and sold afterwards by public auction. The bank will then be benched (stepped) through-out in steps 2′ 0″ deep and 2 feet high.

1. పొదలను చెట్లను తీసివేయుట.—పొదలను నాగజెముడును తీసివేయుట మొదట చేయవలసినదని. కట్టయొక్క ముందరి (స్లోపు) ఏటవాలు ప్రదేశమునం దును పై భాగమందును ఉండు చెట్లను, ఉత్తరువు ఇయ్యఁబ డినయెడల నతికివేసి పిమ్మట బహిరంగమయిన వేలములో విక్రయింపవలయును. అటు పిమ్మట కట్టను కడవలకు 2 అడుగుల లోఁతునను 2 అడుగుల పొడుగునను పెట్లు పెట్లుగా త్రవ్వవలయును.

2. *Setting out work.*—When the maistry reports that the above rule has been complied with, the tank overseer will put up model sections of earth at each peg or closer if necessary. These model sections will be turfed with turf from the tank bed ; when this cannot be done, pegs and string may be used, but these are liable to be knocked down or removed.

2. పని ప్రారంభించుట.—పైనచెప్పిన విధిప్ర కారము జరిపించినట్లు మేస్త్రి తెలియఁజేసిన మీదట, చెఱువు ఓవర్‌సియరు ఒక్కొక మేకువద్దను లేక ఆవశ్యక మయిన చక్రమున ఇంక సమీపమునను మాదిరి మట్టి దిన్నెలను గుర్తించవలయును. ఈ మాదిరి దిన్నెలమీఁద చెఱువులొక్క లోతట్టునుండి పచ్చిక పెళ్లలను తెచ్చి ఆదుమవలయును. ఇట్లు చేయుటకు వల్లపడని చక్రమున మేకులను దారమును ఉపయోగింపవచ్చును, కాని వీనిని పడఁగొట్టివేయుటకుఁగాని, లేక తీసివేయుటకుఁగాని వీలుం డును.

3. *Earthwork.*—The earthwork will then be commenced, the earth being taken from taks to be marked out by the overseer or maistry in charge. The earth should then be thrown up in 1 to 1½ feet layers to the full section of the bank and watered and tamped if so specified.

3. మట్టిపని.—తర్వాత మట్టిపని ఆరంభింపవల యును; పనిజరిగించెడు ఓవర్‌సియర్ వల్లఁగాని మేస్త్రివల్లఁ గానిచూపఁబడు (తాకులనుండి) స్థలములనుండి మట్టిని ఎత్త వలయును. అటుతర్వాత ఆ మట్టిని ఒకటి ఒకటిన్నర అడుగువలకు పొరలు పొరలుగా కట్టయొక్క నెక్కునకు పూర్తిగా వేసి నిర్ణయించియుండినపక్షమున నీళ్లుపోసి గట్టన చేయవలయును.

4. *Disposal of prickly-pear.*—Prickly-pear must be rooted up and buried in pits at least one yard deep with 1′ 6″ of earth on top. These pits will be dug in the bed of the tank. Contractors may be allowed to throw prickly-pear into the water, but if the prickly-pear is not destroyed by the water, it must be buried in the tank-bed before the work is passed, or it may be burnt.

4. నాగజెముడును తీసివేయుట.—నాగజె ముడును వేరుతో పెల్లగించి అధమము ఒక గజము లోఁతుగల పల్లములలో వేసి దానిమీఁద 1½ అడుగు మన్ను వేసి పూడ్చవలయును. ఈ పల్లములను చెఱువులలో తట్టున త్రవ్వవలయును. కంట్రాక్టర్లు నాగజెముడును నీళ్లలో చేయవచ్చునుకాని, నీటిచే అది నశించిపోని దెండల, (పైయధ్యోగస్థులు) సరదు చని సరిగానడిచినదని అంగీకరించుటకుఁ బూర్వము చెఱువు లోతట్టున దానిని పూడ్పవలయును, లేదా కాల్చివేయవచ్చును.

5. *Revetment.*—Stone revetment should never be less than 1′ 0″ thick with a 6″ gravel backing, well watered and tamped. Before commencing work all gravel required for backing, jelly and quarry chips to the extent of ¼ cubic yard for every cubic yard of revetment work to be done must be collected and stacked for measurement. The revetment to be repacked will then be marked with tar and work commenced. The revetment to be repacked will be brought as near as possible to one level to facilitate measurement and the top stones tarred. No new stones will be brought to the work spot until the old revetment has been repacked, measured

5. (రివెట్‌మెంటు) రాతికట్టడము.—రాతి కట్టడము 1 అడుగు మందమునకు తక్కువ లేకుండ (బాకింగ్) వెనుకభక్క 6 అంగుళముల కంకర వేసి నీళ్లుపోసి గట్టనచేసి కట్టవలయును. చని ఆరంభించు టకుముందు (బాకింగ్) వెనుకభక్కకుఁగాను కావలసిన యావత్తు కంకరయను చేయవలసియుండు రాతి కట్టడిపు ఘనపరిమాణపు గజమునకు ¼ ఘన ప్రతి (గుంటకు) రాళ్లు చెక్కలను సేకరించి కాలత యెక్కుటకు దిబ్బకట్టి యుండవలయును. అటు వెనుక విచ్చి మరల కట్టవలసిన రాళ్లు తారుతో గుర్తువేయఁబడి చని ఆరంభింపవలయును.

and tarred. New stone will be of the minimum size of $1\frac{1}{2}' \times 1\frac{1}{2}' \times 1'$ or $1\frac{1}{2}' \times 1\frac{1}{2}' \times 2'$ if the revetment is to be 2′ 0″ thick. If more than 10 per cent. of the stone collected is smaller than this it should be rejected. The stones will always be packed so that the thickness is made up by one stone and the work should be done in lengths of 100 feet and brought up layer by layer. As each layer is completed the interstices must be filled with jelly and the gravel backing to the required thickness put in, watered and tamped. The face of the revetment will be wedged with quarry chips.

కొలత యెత్తుటకు సులభముగానుండు నిమిత్తము, విప్పి మరల కట్టవలసిన రాళ్లను కూడినంతమట్టుకు ఒక మట్టముగా పేర్చి వై రాళ్లకు తారుతో గుర్తువేయవలయును. ప్రాంత రాళ్లను మరల కట్టి కొలతయెత్తి తారుతో గుర్తించుటకు క్రొత్తరాళ్లను యేమాత్రము పని జరుగు స్థలమునకు తీసికొనిరాగూడదు. క్రొత్తరాయి అధమ పక్షము $1\frac{1}{2}' \times 1\frac{1}{2}' \times 1'$ కొలత కలిగినదిగాను లేదా రివెట్‌మెంటుకట్టడము 2 అడుగుల మందము ఉండవలసినయెడల $1\frac{1}{2}' \times 1\frac{1}{2}' \times 2'$ కొలత కలిగినదిగాను ఉండవలయును. సేకరింపబడిన రాళ్లలో నూటికి పదికంటె అధికము దీని కన్న చిన్నవిగా నున్నయెడల, రాళ్లను అంగీకరించకూడదు. రాళ్లతో కట్టునపుడు ఎల్లను మందను ఒక రాయిపెట్టి యేర్పడునట్లు పేర్చవలయును; మటియు నూఅుసూఅు అడుగుల నిడివిని అంతస్థు అంతస్థులుగా కట్టెడకు కట్టవలయును. ఒక్కొక వరుస పూర్తికాగానె సందులను జల్లిపోసి పూడ్చి (బాకింగ్) వెనుకభాగమున కంకరను కావలసినంత మందిమువఅకు వేసి నీళ్లుపోసి గట్టనచేయవలయును. రివెట్‌మెంటుకు వైపట్టు సందులకు గనిరాళ్ల చెక్కలు వేసి బిగించవలయును.

6. *Planting grass.*—In the case of tanks having no stone revetment a fringe of valal grass may be planted along the toe of the bund at least one yard wide and thickly.

6. విడవలినాటుట.—రాతి కట్టడములేని చెరువుల సంగతిలో పచ్చికను ఒక గజము వెడల్పుకు తగ్గకుండ కట్టక్రింది భాగపు వెంబడిగా దట్టముగ నాటవలయును.

7. *Turfing.*—Turfing will be done as a rule during the north-east monsoon. Payments only to be made after the growth is assured. The rate allows for watering.

7. పచ్చిక పెళ్లలను పెట్టుట.—పచ్చిక పెళ్లలు పెట్టెడు పని ఎల్లప్పుడు వర్షాకాలములో జరిపించవలయును. పచ్చిక చక్కగా వేరూని పెరుగునట్టి స్థితికి వచ్చిన వెనుకనే దానికి వైకము ఇయ్యవలెను. ఈ పనికిగాను యేర్పడియుండు రేటు క్షళపోయటకును యేర్పడియున్నది.

8. *Excavating foundation and refilling.*—Cutting open of banks and excavation of foundations are not to be put in hand till all the materials have been collected. If any excess earth is excavated below floor level, the contractor must fill up the excess space with concrete at his own cost. At each masonry work a bench mark of concrete 2′ 0″×2′ 0″×2′ 0″ with a stone or brick cap must be fixed and the contractor given a statement in writing regarding the depth of the foundation below this bench mark. Refilling will be done in layers and will follow the superstructure being kept 1′ 6″ below the top of the masonry whilst the work is in progress in order to avoid disturbing the top courses when tamping. No materials to be stacked within a distance equal to $1\frac{1}{2}$ times the depth of cutting for foundations.

8. పునాదిని త్రవ్వుటయును మరల దాని పూడ్చుటయును.—కట్టలను తెగగొట్టుటయును పునాదికిగాను త్రవ్వుటయును సామానులను అన్నిటిని సేకరించువఅకు ఆరంభించకూడదు. తలవరుస మట్టమునకు క్రింద యేమాత్రమయిన అధికముగా త్రవ్వబడిన యెడల ఆ యధికమయిన స్థలమును కంట్రాక్టరు తన సొంత ఖర్చు పెట్టుకొనియే కాంక్రీటు వేసి పూడ్చవలయును. ఒక్కొక రాతి కట్టడమునకు కాంక్రీటువల్ల 2′ 0″ × 2′ 0″×2′ 0″ కొలతగల బెంచి మార్కును దానిమీద రాతి మూతతోగాని లేక యిటికమూతతోగాని కట్టవలయును. ఇట్లు కట్టిన బెంచి మార్కునకు క్రింద పునాది యొక్క లోతు ఇంతమాత్రము ఉండవలెనని కంట్రాక్టరుకు వ్రాతమూలముగ ఒక స్టేటుమెంటు ఇయ్యవలయును. కట్టడము కట్టబడుచుండునపుడు ప్రక్కలలో మన్ను త్రోసి దిమ్మిసచేయునపుడు కట్టడపు వైవరుసలకు అపాయము లేకుండ చేయుటకుగాను సైన $1\frac{1}{2}$ అడుగు కనబడునట్లు అంతస్థు అంతస్థుగా పూడ్చుచురావలెను. పునాదికి సమీపమున పునాదియొక్క లోతు ఎంతయో దానికి ఒక టిన్నంత దూరములోగా యే సామానునయినను పోగు పెట్టగూడదు.

9. *Concrete*—will consist of $1\frac{1}{2}$ cubic yards of jelly to 2 parahs lime and 4 parahs sand. The jelly will be of brick or stone broken to 1″ cubes. All flat, flaggy and earthy stones to be rejected. The jelly will be heaped on a clean platform and will be well wetted. The mortar in

9. కాంక్రీట్.—రెండుపారల సున్నమునకును నాలుగుపారల ఇసుకకును $1\frac{1}{2}$ ఘన గజముల జల్లి చేర్చవలయును. జల్లి ఒక అంగుళము ఘన చరిమాణ ముండునట్లు చుగులగొట్టబడిన ఇటికలుగా లేక రాళ్లగా ఉండవలయును. చాప చట్టుగా నున్నటువంటియ బలహీనమయి

the proper proportion will then be added and the whole will be twice turned over dry and twice again after a sufficient quantity of perfectly clean water has been added. The concrete will then be put in position in 9″ layers and will be tamped until this thickness is reduced to 6″. The set surface of a layer of concrete will be roughed and wetted before a new layer is added in order to obtain perfect cohesion. The top surface of concrete will be flooded. Concrete will never be plastered without special orders.

నటువంటియు మట్టి కలిసియున్నటువంటియు రాళ్లను యావత్తు త్రోసివేయవలయును. జల్లిని శుద్ధిచేయబడిన (క్లట్‌ఫారం) ఉన్నతస్థలముమీద కుప్పలుగాచేర్చి నీళ్లు పోసి చక్కగా తడుపవలయును. తర్వాత తొక్కినను న్నమును సరియయినదామాసా త్రకారముచేర్చి మొదట పొడిగానుండునపుడు మరల మరల రెండుసారులు చక్కగా దానినంతయు కలిపి వెనుక చాలినంత మిక్కిలి పరిశుద్ధజలముచేర్చి సరిగా మరల మరల రెండుసారులు కలుపవలయును. తర్వాత సవరు కాంక్రీటును వేయవలసిన స్థలమునకు తీసికొనిపోయి 9 అంగుళముల మందముగావేసి ఆ మందము 6 అంగుళములకు తగ్గువఅకు చక్కగా దిమ్మిసచేయవలయును. ఇట్లు గట్టిపడ్డ కాంక్రీటుకు క్రొత్తపొరనుచేర్చుటకుం బూర్వము అంతకుముందు వేసియుండు పొరయొక్క మట్టసమును గీచి తడుపవలయును. కాంక్రీట్ వైమట్టసమును అతికినట్లుచేయవలయును. విశేషమయిన ఉత్తరులులేకయే ఎప్పటును కాంక్రీటుకు పూతపని చేయగూడదు.

10. *Rough stone in mortar.*—No boulders to be used and all stone to be broken with faces. Every fourth stone to be a through stone for walls 2′ 0″ thick and under and every fourth stone to be at least 2′ 0″ long for walls of greater thickness than 2′ 0″. All interstices to be filled with quarry chips. The mortar will consist of 1 lime to 2 sand.

10. గచ్చుతో పనిచేయని రాళ్లకట్టడము.—ఒడ్డు గుండ్లను ఉపయోగపరుపగూడదు; అన్నిరాళ్లను ముఖములెర్పడునట్లు తీర్చవలయును. 2 అంగులములు లేక దానికి తక్కువ మందముగల గోడలకు ప్రతి నాలుగవరాయి గోడలెడల్పునకు ఒకటేరాయిగా ఉండవలయును. 2 అడుగులకు వైబడిన మందముగల గోడలకు ప్రతి నాలుగవరాయి కనీసము 2 అడుగులు నిడివి కిలిగినదిగా ఉండవలయును. రాళ్ల సందుల నన్నిటిని రాళ్ల చెక్కలువేసి బిగించవలయును. గచ్చులో రెండింతల ఇసుకకు ఒకపాలు సున్నము ఉండవలయును.

11. *Burnt stone in chunam.*—The stones will be obtained from the quarry roughly squared and all irregular shaped stones to be rejected. Every fourth stone to be a through stone for walls 2′ 0″ thick and under and every fourth stone to be at least 2′ 7″ long for walls of greater thickness. All interstices to be filled with quarry chips. The thicker stones to be towards the bottom of the wall and every stone to be bedded on its longer side. Every third course the work must be brought up level throughout. Mortar should not be smeared over the face of the stones.

11. గచ్చుతో రాళ్లచెక్కల కట్టడము.—ఈ రాళ్ల రాళ్లగనిలోనుండి కొంచెము ఇంచుమించుగా చదరముచేయబడి యొత్తబడును; సరియయిన రూపములేని రాళ్లను అన్నిటిని త్రోసివేయవలయును. 2 అడుగులు లేక దానికి తక్కువమందముగల గోడలకు ప్రతినాలుగవరాయిని గోడవెడల్పునకు ఒకటేరాయిగా ఉండవలయును. దానికి వైబడిన మందముగల గోడలకు ప్రతి నాలుగవరాయి కనీసము 2 అడుగులు 7 అంగుళముల నిడివికలిగినదిగాఉండవలయును. రాళ్ల సందులను అన్నిటిని రాళ్లచెక్కలువేసి బిగించవలయును. మందమయిన రాళ్లను గోడయొక్క అడుగున వేయవలయును; మటియ ప్రతిరాతిని నిడుపార పండవెట్టి కట్టడములో ఇమిడియుండునట్లు కట్టవలయును. మూడవవరుస మూడవ వరుసకు కట్టడమునకు కడవెళ్ల ఒకటే మట్టము కుదురునట్లు చేయవలయును. రాళ్లముఖములమీద గచ్చుపూయగూడదు.

12. *Brick in chunam.*—The minimum size of the bricks to be 9″×4$\frac{3}{4}$″×2$\frac{1}{4}$″. English bond to be observed throughout; the bricks to be thoroughly wetted before being used, and proper water troughs must be provided by the contractor for this purpose. No joint to exceed $\frac{3}{4}$″ in thickness. Only 10 per cent. of bats to be used.

12. గచ్చుతో ఇటికరాళ్లకట్టడము.—ఇటికరాళ్ల కనీసపరిమాణము 9″×4$\frac{3}{4}$″×2$\frac{1}{4}$″ ఈ కొలతకలవిగా ఉండవలయును. కట్టడమును కడవెళ్ల ఇంగ్లిషు బాండు పద్ధతిప్రకారము కట్టవలయును; ఇటికరాళ్లను పనికి ముంచెదానికుం బూర్వము చక్కగా తడుపవలయును; ఇందునిమిత్తమై కంట్రాక్టరు తగిన నీళ్లతొట్లను అమర్చవలయును. రాతి సందులు కి అంగుళము వెడల్పుకుమించబడి యుండగూడదు. పొడిరాళ్లను నూటికి పదివంతునమాత్రమే ఉపయోగింపవలయును.

13. *Pointing*—to follow the outlines of the stones and the mortar not to be plastered over the face. When pointing brick-work no false pointing to be done.

13. సందు పూయుట.—రాళ్ల అంచులలో సందుచూచి పూయవలయును. రాతి పైమట్టముమీద గచ్చు పూయఁగూడదు. ఇటికరాళ్లకట్టడమునకు సందు పూయునపుడు సున్నముతో ఇటికల రూపము సేర్పఁజు ఁగూడదు.

14. *Cut stone.*—Covering stones to have side joints and ends resting on masonry dressed. Platform, coping, vent, guide, beam, and all cut stone other than covering stones to be neatly dressed to size.

14. మలిచిన రాళ్లకట్టడము.—మూఁడరాళ్ల ప్రక్క అంచులను కట్టడముమీద ఆనియుండు కొనలను మలుపవలయును. మూఁడరాళ్ల తళ్ళు, ప్లేట్‌ఫారపు (కోపింగు) పైమట్టమునకు వేసెడురాళ్లు, కంఠీకరువేయు ఇతరములయిన మలిచిన రాళ్లు ఆన్నియు కావలసిన కొల ప్రకారము అందముగా మలుపవలయును.

15. *Plugs.*—Plugs to be of hard seasoned wood. The shoulder must be bound with iron. The plug spear will be of iron $\frac{3}{4}$" diameter and will be fitted with chain. Holes at 3" intervals will be punched in the spear at convenient heights for the regulation of water. The chain will be secured to the shaft and will have an additional length to which a pin will be attached to fit the holes in the spear. A hasp will be leaded into the platform stone so that the plug can be locked.

15. చెరువుతూముల కొయ్యబిరడాలు.—చెఱువుతూముల కొయ్యబిరడాలు చక్కఁగా ఎండి గట్టిపడిన కొయ్యతోచేసియుండవలయును. వానిలో భూజము వలెఁడుభాగమునకు ఇనుపకట్టువేయవలయును. తూము బిరడా శలాక 3 అంగులము మధ్యకొలతకలిగి యినుము తోచేయఁబడి గొలుసుచే తగిలింపఁబడి యుండవలయును. నీళ్లదిట్టము సరిచరుచుటకయి సపరు శలాకలో ఆనుకూలమైనంత ఎత్తున ఒకటికొకటి 3 జేసి అంగులములుండునట్లు రంధ్రములు వేయవలయును. గొలుసు కొంచెము జాస్తిగా మిగులునట్లు (పట్టు) కాఁడకు తగిలించి అట్లు మిగిలినచాని కొనకు శలాకలోని రంధ్రములలో మూఁడు నట్టి అడ్డుచీల తగిలించి యుండవలయును. తూము బిరడాకు బిగముచేసి యఁచుటకుఁగాను ఒక చిలకును ప్లాట్‌ఫారమ్ రాతిలో సీసము కాఁచిపోసి బిగించవలయును.

16. *Ramps.*—Ramps for village and cattle crossings should have a minimum slope of $\frac{1}{8}$, be 2 feet higher than bank and 2 feet wider than top of bank on each side. Cattle ramps to be paved and gravelled; the width should be at least 9 feet.

16. దిగుళ్లు.—గ్రామస్థులను పశువులను చెరువును చాఁటుటకుఁగాను కట్టఁబడు దిగుడు చారుకు కనీసము $\frac{1}{8}$ వాటముకలిగి కట్టకంటె 2 అడుగులు ఉన్నతముగాను ప్రతి పార్శ్వమున కట్టయొక్క పైమట్టమునకంటె రెండు అడుగులు వెడల్పుగాను ఉండవలయును. పశువులు దిగెడుచారులకు రాళ్లపఱచి కంకరవేయవలయును; వెడల్పు తక్కువపక్షము 9 అడుగులు ఉండవలయును.

17. *Payments.*—Payments will be made by pit measurements; no measurements to be paid for except on continuous completed taks.

17. పైకపు బట్వాడా.—బట్వాడాలు గుంటలకొలతలనుబట్టి చేయఁబడును; (తాకులు) మట్టియెత్తెడు స్థలములు ఒకటివెనుక ఒకటి పూర్తిగా యెత్తబడినవేగాని కొలిచినభాగములకు పైకము బట్వాడా చేయఁగూడదు.

18. *Clearing up site and general remarks.*—All surplus materials and debris to be removed from the work spot by the contractor and the site thoroughly cleared before the final bill is passed. If any additional work is required to make the work neat, the subordinate in charge must apply for permission to carry out this work, stating the probable cost, and whether it can be met from contingencies or savings. Additional work must never be done merely to work out an estimate. Any work not mentioned in this specification will be done according to the standard specification of the Public Works Department. If contractors fail to work according to this specification, they will be liable to a fine, to cancelment of contract, and forfeiture of deposit. It is the contractor's duty to see

18. పనిచేయుస్థలమును శుద్ధిపరుచుటయు సామాన్య షరాలును.—చివరబిల్లు అంగీకరింపబడుటకుఁ బూర్వము కంట్రాక్టరు పనిచేయు స్థలమంతయుఁ మిగత సామానుల నన్నిటిని, మటియు ప్రాఁతకట్టడములో కొట్టియెత్తిన ఉపయోగముకాని రాళ్లు మన్ను మొదలయిన వాని నన్నిటిని ఎత్తివేయించి సదరుతావును చక్కఁగా శుద్ధిచేయించవలయును. పనిని విలక్షణముగాచేయుటకు ఇంక పైపని ఏదయిన చేయవలసియుండినయెడల, ఆ పని జరిపించెడు క్రిందియుద్యోగస్థుఁడు దానికిగుమారు ఇంత ఖర్చు తగులుననియును కంటింజెంటుపైకముతో లేదా ఖర్చుగాక మిగిలినపైకముతో దానిని చేయవచ్చుననియును తెలుపుచు సదరు పనిని జరిపించుటకై ఉత్తరువు కొఱకు దరఖాస్తు పెట్టవలయును. ఎట్టిమేటు మొత్త

that he is given proper bench-marks and levels and otherwise carries out the orders given in this specification. The contractor must also see that he receives orders in writing as no attention will be paid to verbal orders. If the contractor does work without orders in writing he does so at his own risk. All masonry work must be watered at the contractor's cost for 10 days after completion. All labor required for any work connected with setting out work must be supplied by the contractor at his own cost, or will be deducted in the bill.

మును భర్తీచేయుటకుఁగానుమాత్రమే పైబడుపనులను ఎప్పుడుచేయఁగూడదు. ఈ (స్పెసిఫికేషను) నిర్దేశ వివరణములో కనఁబఱుపఁబడని యే పనిపైనను పబ్లిక్ బర్క్-స్ డిపార్టుమెంటు స్టాండర్డు స్పెసిఫికేషన్ ప్రకారము నడిపించవలయును. ఈ స్పెసిఫికేషన్ ప్రకారము కంట్రాక్టర్లు చూనిజరిపింపక తప్పిపోయినయెడల వారు జుల్మానాకును, కంట్రాక్టు రద్దుపడిపోవుటకును, ధరాఖతును పోగొట్టుకొనుటకును, పాత్రులగుదురు. సరిపైన పెంచిమార్కులు (లెవల్స్) మట్టములు, వీనిని తనకు ఇచ్చునట్లు చేసికొని, ఈ స్పెసిఫికేషనులో చెప్పియుండు ఉత్తరులప్రకారము జరిపించుట కంట్రాక్టరుకు విధాయకముగా నున్నది. ఇదిగాక మూఁజూపని ఉత్తరులను గమనించకుండుటకు కంట్రాక్టరు వ్రాఁతమూలమయిన ఉత్తరులను పుచ్చుకొనవలయును. కంట్రాక్టరు వ్రాఁతమూలమయిన ఉత్తరులులేకుండ పనిచేసినయెడల చానిచే వచ్చు నష్టము ఆతఁడే అనుభవింపవలయును. కట్టుపనుల కన్నిటికి అవిముగిసినతర్వాత 10 దినములవఱకు కంట్రాక్టరుయొక్క ఖర్చునసే శుభ్రపోయవలయును. పని ప్రారంభించుటతోచేసిన ఏ పనినయినను చేయుటకుకావలసిన కూలివాండ్రనందఱిని కంట్రాక్టరు తనసొంత ఖర్చునసే సర్వరాచేయవలయును. అట్లు సర్వరా చేయనిపక్షమున దానికి తగిలెడు ఖర్చుబిల్లులోనుండి తీసివేయఁబడును.

PART III.—NOTE ON POINTS TO BE OBSERVED WHEN INSPECTING TANKS.

A.—When inspecting a tank with a view to its repair, the following points should be noted :—

(1) Whether the tank has ever been known to breach, and, if so, when and from what cause.

(2) The state of the bund—

(*a*) What is the average height above F.T.L.

(*b*) Is it clear of prickly-pear and bushes.

(*c*) Is the revetment high enough and in good order.

(*d*) Can additional surplus escapes be formed by removing the bund at the flanks where the natural level of the ground is at or about F.T.L.

(3) The state of the masonry works—

(*a*) Are the sluices in good order and have they shutters or plugs for the regulation of water.

(*b*) Are the surplus works sufficient and in good order.

(4) When was the tank last repaired.

B.—When inspecting a tank whilst work is in progress—

(1) See whether the contractor is doing the work strictly according to the specification.

(2) See whether the proper proportions of lime and mortar are being used. This can be roughly ascertained by putting some of the mortar which is being used on the work into an ordinary glass bottle about half full of water and shaking it for a few minutes. When the shaking is stopped, the lime and sand will settle at the bottom of the bottle, and it will be possible to find out approximately whether the proper proportions are being used. The sand being heavier than the lime will form a layer at the bottom of the bottle.

(3) Check the work that has been done.

C.—When inspecting a tank with a view to finally pass the work done—

(1) Have all the earthwork pits numbered according to the numbers in the measurement book and check a certain proportion at random.

(2) Dig a few holes in the bund here and there to see if the earth has been properly broken up and consolidated. Do not allow a wodder or contractor's cooly to dig these holes as in that case lumps will not, as a rule, be found.

(3) Pull out a few stones here and there in the revetment to see if the proper thickness has been built and if this thickness has been made up of one stone as specified. Also see if the proper thickness of gravel backing has been put in.

(4) Tap the plaster of masonry works to see whether it is solid. If it is easily dented the work should be redone. Examine the masonry and see if it is solid and hard.

"Data sheet" for calculation of rates.

Description of labor or materials.	Rates of Labor and materials by talukas. Rs. A. P.	Rs. A. P.	Rs. A. P.	Per.	Rates of work exclusive of carriage, by talukas. Rs. A. P.	Rs. A. P.	Rs. A. P.
Bricklayer.							
Stone-cutter.							
Men coolies.							
Women coolies.							
Boys.							
Wall bricks 1000 $9" \times 4\frac{1}{2}" \times 2\frac{1}{4}"$							
Lime, parahs.							
Sand, parahs.							
Surki, parahs.							
Burnt stone, cubic yards.							
Rough stone, cubic yards.							
Grinding mortar, annas.							
Quarry chips, cubic yards.							
Brick jelly, parahs.							
Stone jelly, parahs.							
Cut-stone, cubic yards.							

| | | | | | | |

TABLE showing rates of earthwork (these rates vary in different districts).
Rates are shown in pies per cubic yard.

Height raised, yards.	Average distance carried measured from centre of excavation to centre of spoil bank, measured horizontally in yards.											
	10	20	30	40	50	60	70	80	90	100	110	120
1	10	11	12	13	14	15	16	17	18	19	20	21
2	11	12	13	14	15	16	17	18	19	20	21	22
3	12	13	14	15	16	17	18	19	20	21	22	23
4	13	14	15	16	17	18	19	20	21	22	23	24
5	14	15	16	17	18	19	20	21	22	23	24	25
6	15	16	17	18	19	20	21	22	23	24	25	26

N.B.—In addition to the above rates, 3 pies per cubic yard, to be allowed in estimate as a separate item for tamping earth and dressing slopes. For gravel, the starting point should be 15 pies, that is, add 5 pies to any of the figures in different columns, according to distance and lift. For sand, the starting point should be 6 pies, or deduct 4 pies from any of the figures in different columns, according to distance and lift. For rock, the starting point should be 4 annas, that is, add 38 pies to any of the figures in different columns, according to distance and lift.

Carriage.

THE daily hire of a cart is from 8 to 12 annas.

Distance.	100 yards to ½ a mile.	½ a mile to ¾ a mile.	¾ mile to 1 mile.	1 mile to 1¼ miles.	1¼ miles to 1¾ miles.	1¾ miles to 2½ miles.	2½ miles to 3½ miles.	3½ miles to 4½ miles.	4½ miles to 5½ miles.	5½ miles to 8 miles.	Remarks
Number of trips.	10	8	6	5	4	3	2	1½	1¼	1	

The following quantities of different materials make a cart-load—
200 Bricks $9'' \times 4\frac{3}{8}'' \times 2\frac{1}{4}''$.
10 Parahs of lime.
6 Do. of sand.
6 Do. of gravel.
From ⅛ to ½ cubic yard of rough stone.

N.B.—A solid or estimate yard of gravel or sand is 12 parahs.
A parah measure is $20'' \times 20'' \times 10'' = 4{,}000$ cubic inches.

REVENUE DEPARTMENT.

1894.

Board of Revenue

(Revenue Settlement, Land Records and Agriculture),

MADRAS.

Printed August 3rd.

Proceedings, 11*th July* 1894, *No.* 282.

Minor Irrigation Works.—Communicating, with remarks, to all Collectors Mr. Ashpitel's memorandum of instructions for preparing estimates for and executing repairs to —.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following papers :—

From Major A. W. SMART, R.E., Executive Engineer, North Arcot, to the Superintending Engineer, IV Circle, dated 16th March 1893, No. 706 S.E.

I have the honour to bring to your notice that a number of estimates have been sanctioned under Tank Restoration Works in the Vellore taluk for the clearance of channels, many of which are of the nature of spring channels, which fill in every year when freshes come down the rivers. The work to be done therefore simply relieves the ryots of the cost and expense of clearing for one year. I would request to know if this is the intention of the framers of the estimates. The clearing will effect no permanent improvement. These remarks of course do not extend to the repairs and construction of masonry works along the channels.

No. 112 N.A.

Clearances of the kind referred to should be left to the ryots.

(Signed) J. C. LARMINIE,
Superintending Engineer, IV Circle.

20th March 1893.

No. 84 E.I.

Copy forwarded to the Chief Engineer for Irrigation for information.

(Signed) A. W. SMART, Major, R.E.,
Superintending Engineer, IV Circle.

12th April 1893.

No. 66 I.

Note by the Chief Engineer for Irrigation.

Estimates both in the Public Works and Revenue Departments are frequently submitted for sanction for clearing silt from spring channels, and the Superintending Engineer, IV Circle, in his endorsement No. 84 E.I., dated 12th April 1893, on North Arcot division Executive Engineer's No. 706 S.E., dated 16th March 1893, brings to notice that estimates prepared in the Tank Restoration Scheme office have been sanctioned and sent for execution which provide to a large extent for clearing silt from spring channels. Government has on several occasions (*vide* orders in the margin) ordered that this work should be done by the interested ryots but no distinct ruling on the subject appears to have been issued. The following rules are therefore submitted for the approval of Government :—

P.M.G. No. 3019, dated 23rd Oct. 1874.
" " 270 I. " 31st Aug. 1877.
" " 279 I. " 31st " "
" " 312 I. " 10th Sept. "

(1) Repairs to spring channels to be ordinarily limited to works which will effect a permanent improvement and in no case to include "annual silt clearance."

(2) Permanent improvements ordinarily to consist of —

(*a*) The construction and repair of head sluices, cross drainage and other masonry works.

(*b*) Closing breaches due to the want of suitable masonry works.

(3) Estimates for repairs to spring channels other than as noted above to be submitted for the sanction of Government.

OOTACAMUND, 25th April 1893. (Signed) R. R. E. DRAKE-BROCKMAN, Lt.-Col., R.E., Ag. Chief Engineer for Irrigation.

To the Secretary to Government, Public Works Department, Irrigation Branch.

ORDER—dated 2nd May 1893, No. 399 I., Public Works.

The rules proposed by the Chief Engineer for Irrigation are approved.

(True Extract.)

(Signed) R. R. E. DRAKE-BROCKMAN, Lt.-Col., R.E., Ag. Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
„ the Superintending Engineers.
„ the Examiner of Public Works Accounts.
„ the Revenue Department.

Exd. C. A. Munisawmy.
Spare Copies

430/r

IRRIGATION.

Govt. of {1893} Madras.

PUBLIC WORKS.

Dated May, 2nd.

Recd. *Encl.*

G.O., 2nd May 1893, No. 399 I.

MAY.

Rules

Certain — proposed by the Chief Engineer for Irrigation for clearance of silt from spring channels, approved.