

- (1) பக்கங்களின் எண்ணிக்கை 24
 (2) புதுக்கித் திருப்பிய நாள் 06/1990
 (3) ஆதாரங்குறிப்பவர் சுருக்கொப்பம் 10/2

தமிழ்நாடு ஆவணக் காப்பகம்.

②

தமிழ்நாடு அரசு

P. W. D. துறை

அரசாணை எண். மு. கோப்புத் தாள் எண்.	<u>2077</u>	அச்சகம் பலவகை
நாள் :	<u>1 - 8 - 1891</u>	198

மடிக்கவோ கண்டபடி கையாளவோ கூடாது

10/2

12 Sheets

11 + 1 sheet

ஆவண. கா-1-18,008-15-6-87.

⑨

W 2077 3499

The note refers to
one report only. The
earlier report has
also been quoted at
the head of the
fair draft. For orders
whether this is
correct.

R/S

29. VII - 91

The earlier report
is incomplete, and

it was not in the club to
submit it to print;
it was to up and
recorded

D. 97

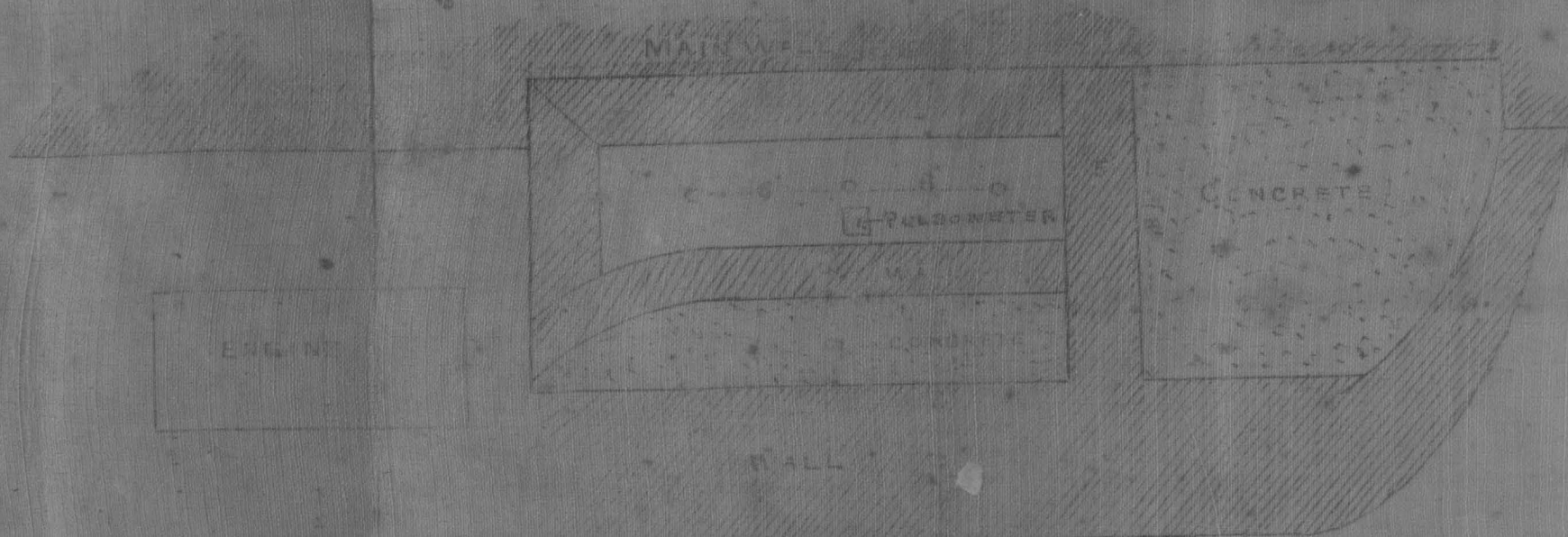
against it. It was

SECTION



Scale 1/100

SKETCH



PLAN

PORTION TO BE FILLED UP NOW
OCCUPIED WITH WATER

SCALE 1/100

SUPERINTENDENT
N.Y. PERMANENT

2077
3

No 387 P.S.

From

The sub-Divisional officer
Bengal

To

The Engr of Works
W.I. Bengal Division

Dated

5th

Despatched 5th } March/91

Enclosure: two viz: one note + one plan

Sir,

I have the honor to
furnish the following report
upon the grouting under
water recently tried here.

The circumstances will
be seen from the annexed
plan. They were, briefly, a
series of leaks through the
bottom of a wall with
about 30' head of water
against it. A second wall
was

was built in near pipes, cut down between the two, broken stone thrown round them, the water inside allowed to rise, and then cement grout forced in through the pipes by its own weight. The pipes, 3 in number, were placed 6' apart and 3' from the ends of the space of 18' x 3' on the average which it was required to fill. They were 4" diameter, and perforated with rows of $3/16$ " holes, 6" apart vertically, and 4 in number on each horizontal section, for a height of 5', starting at 1' from the bottom. They were fixed at 1' from the ground and rose to a level of 10' to 15' above the water. Broken stone to a depth of 3' was now thrown round them.

The following were the instructions for mixing and applying the Cement.

"The grout will consist of pure English Cement. About 40 barrels will be wanted, & preparation should be made to mix it all at once. It is indispensable that it should be all poured down in a very short time.

A platform having been made the cement should be mixed with spades and a little water into a thick paste. It should then be put into

20
buckets and stirred while water is added until it is thin enough to flow down the pipe but not thinner. The whole being prepared it should be poured rapidly down the pipes until it rises over the tops or until divers below report that it is coming up through the stone.

A long iron bar should be kept in each pipe to agitate the grout and prevent it sticking to the pipe. There should also be for each pipe a wooden rammer $3 1/2$ " diameter, to be pressed from above when the pipe is nearly full and so help to force the grout down.

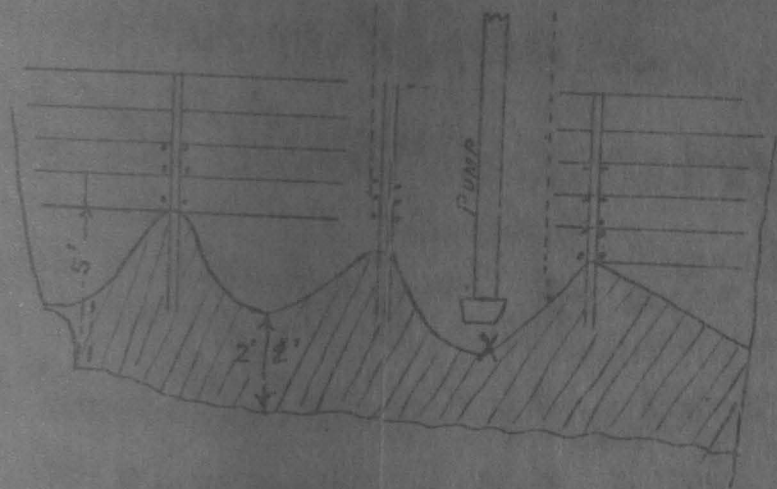
These instructions were carried out scrupulously, except that the grout was perhaps not mixed quite intimately enough. After using 28 barrels of Cement (about 140 cubic feet) the grout rose to the top of the pipes and refused even with the help of a plunger to go down any more.

After two days for setting the water was pumped out and the case with which this was done showed that at any rate some good had resulted.

As soon as the stone was exposed it was found that the cement had not penetrated to the top layers, which were therefore removed until the

to ^{the} ~~bottom~~ ^{surface} was reached. It was found to have ~~not~~ ^{been} perfectly. It not to have penetrated sufficiently far from the holes and not to have entirely filled the interstices of the stone.

A longitudinal section showed something like this. —



The leakage was however very small indeed, except one large spring at X. A pump was placed over this spring, walls were built at the points shown by dotted lines and concrete was laid and rammed dry behind them. When this was finished another pipe was put down near the spring perforated similarly but with $1\frac{1}{4}$ " holes for a length of 7' broken stone to a depth of 9' was thrown round it and the water allowed to rise.

In this case the space to be filled was about 5' x 4' x 9'. The grout was well mixed this time and

made a good deal more ^{20 2 1/2} fluid than before. Twenty barrels or about 100 Cubic feet were poured down and the cement then rose through the concrete but did not appear at the top of the pipe. Fifty six hours were allowed for setting and the water pumped out. Three inches of soapy water cement was taken from above the stone, and the upper six inches of concrete had not set much, but the rest was good and there was practically no leakage. The whole mass was then covered with concrete laid dry and rammed.

I regret that I did not on either occasion measure the actual proportion of water to cement used to form the grout. This is a most important matter and will, I hope, receive attention from the next experimenter. I am inclined to think that $3\frac{1}{4}$ " perforations are too small and $1\frac{1}{4}$ " too large in a 4" pipe, and that the grout in the first case was too thick and in the second a little too thin. I am also very much of opinion that the cement should not be mixed in a mortar mill, and not

2077
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The following is a description of the process adopted for laying concrete under water for filling in the space between the near walls of the main dam.

2. The space enclosed between the two walls was 30 feet long 12 feet broad at top, and about 5 feet broad at bottom. The head of water against the ^{head} wall was about 20 feet over the deepest point.

3. The heads were so severe as to require 3 pulleys constantly working to keep them down.

4. The water inside the space

by hand. The latter method, with large quantities is never properly carried out. It is worthy of notice that the broken stone (by size) of 3" cube or under thrown pell-mell into water contains interstices equal to one half the total contents.

The philosophy of the thing is evidently to keep the grout always on the move until the operation is completed and not to let it stick any where and obstruct the free passage to all the interstices; and for this the grout must be poured in continuously and must also be more fluid than ordinary mortar. It follows that this method can never give really impervious concrete: and though it is excellent for harbour blocks and the like I do not think it can be recommended except as a makeshift, where impermeability is of consequence. The inventor and ardent advocate of it is Mr Kniffle, M.I.C.E. whose opinion everyone must respect, but he does

2076
not recommend it in so many words for anything but harbour blocks. His views on the subject will be found in his lectures on subaqueous foundations delivered before the R.E. Institute at Chatham and published in various numbers of Engineering from September to December 1890.

I have the

Sd/ A. J. Mackenzie
Sub- Divisional Officer
Perryar

(True copy)

Perryar
23rd March 1891

As. Dyke
Supt of Works
No. 1 Perryar

Having been allowed to
rise to the level of that
outside the Concret. was
deposited from one end
by being poured down a
wooden shoot. The shoot
1 foot square in section
was suspended from a
crane in an almost
vertical position, its lower
end being close to the
bottom, as the Concrete
was poured into its mouth,
the lower end was traversed
along the space to be filled,
being also raised gradually
by the crane.

5 From the other end
the concrete was deposited
by two ships. Ball's dredgers
in the ordinary way. These
operations were carried
out

$\frac{27}{8}$
on simultaneously until
there was a thickness of
concrete of about 5 or 6 ft
over the heaviest beams

6. The Concrete used was
composed of 3 parts broken
stone to 1 of Portland
Cement mortar, the latter
consisting of 2 sand to one
of English Portland Cement.
The mixing the concrete was
commenced at 3 A.M. the
laying commencing at
8 A.M. so that the first
lot used had been mixed
for five hours at least, before
being laid.

7 After two days the
water was pumped out, a
layer of soft mortar &
Cement appeared at the top,
and then some loose
stones

stones and sand, under
neath this the concrete
appeared to have set very
fairly well and the leaks
were practically stopped.

Per. [unclear]
23. March 1891
[unclear]
Supt. of Works
No. 1. Periyar Division
[unclear]

2079
No. 1475.82
Office of the Superintendent of Works
No. 1. Periyar Division

13. March 1891
24

From

M. S. Taylor Esq.
Superintendent of Works
No. 1. Periyar Division

Encls: 3.
1. copy of S.D.O.'s
report.
1. Plan.
1. Memo showing
the description
of the process
adopted for
laying concrete
under water.

The Chief Engineer
Public Works Department

I have the honor to forward
a report by Mr Mackenzie upon
the operation of grouting under
water recently carried out, for
filling in the space between the
upper walls of the Main dam.

2. Also is appended a description of the process of laying concrete under water adopted for the rear wall.

3. The points which appear to me to be worthy of notice from these operations and from a comparison of them with each other are—

(1) never to lay concrete under water when it is possible to lay and ram it dry.

(2) to mix the concrete for some hours before putting it down, so that the mortar has just begun to set; the cement then does not separate so readily from the sand.

(3) the concrete is laid most quietly and therefore best by the wood. & shoot, but it is ^{very} so cumbersome that it is almost impossible to manipulate it so that it is always full of concrete and not of water. as soon as the latter happens, that is when the shoot is raised too quickly; the first lot of concrete poured down must be washed clean and rendered useless as concrete.

(4) With the skips, when the power is simply that of a number of men pulling at a rope over a single pulley, the principal difficulty consists in training the men to lower away gently until the

the water has closed over the ship.

(5) For the grouting operation, in order to keep the pipe constantly full, and so to get the full benefit of the head a cistern of sufficient dimensions should be erected over the mouth of the pipe and never allowed to empty until the grout ceases to descend.

(6). The advantage of the grouting is its extreme simplicity, its disadvantage being its comparatively high cost, owing to the large expenditure of pure cement.

4. A comparison of the operations leads me to the opinion that where it is absolutely necessary to

to put concrete under water, in confined spaces, say of 4 feet breadth at bottom and less, the grouting is the best, and that for larger spaces the process of depositing in skips should be adopted.

I have the honor to be,
Sir,

Your most obedient servant,

H. J. Gayer
Superintendent of Works

No. 1 Periyar Division
S. M.

2077
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Know,

The Supt of works

Mr. I. Periyar Esq.

To

The Chief Engineer

P. W. D.

No. 4756.6

Dated 23rd March 1911

Encls: 3.

Laying concrete under
water for filling in
the space between
the rear walls of
the main Dam.

Reports upon the
process adopted
for —

In the order

B
No. 2077 of 1st July 1911

Recorded.

S. 1911

Note.
A later and more com-
plete report on the 1911
has since been received.

X To Council 29.1.11

(12)

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