

Educational (1904) Department.

ORDINARY MS.

G.O., No.

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DATED

1904

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[Despatch Abstract.]

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Educational (190³) Department.

CURRENT No. 2004

From

[Name] A.G. Bourne Esquire, D.Sc., F.R.S.,

[Designation] Director of Public Instruction,

[Station] Madras.

Ref on Cur No. 5237 of 02

Received 190

Dated 3rd December 1903.

Enclosures Plans & estimates & other documents.

Registered 7.12.1903.

SUBJECT:

Recommending that, under Rule 113 of the Grant-in-Aid Code, a grant of Rs 10870/- be sanctioned for the construction of a new building for ~~the~~ St. Ebba's Girls' School, Sullivan's Gardens Royapet, Madras.

BACK PAPERS.

FURTHER PAPERS.

FURTHER PA

No. Department. Date. G.O.

செப்பனீடுபவர் பெயர் அ. பாரணம்

செப்பனீடுவதற்காக எடுத்த
கொள்ளப்பட்ட நாள் 4.12.97

செப்பனீட்டு முடிந்த நாள் 4.12.97

சரிபார்க்கும் ஆரா யச்சு
மு. பா. எ. உதயா என்
கையொப்பம் கையொப்பம்

To

The Secretary to Government,

Educational Department.

Sir,

I have the honour to submit the enclosed plans with estimates amounting to Rs 32611/- for the construction of a new building for St. Ebba's Girls' School, Sullivan's Gardens, Royapettah, belonging to the Women's Mission Association, S.P.G., and to recommend that a third grant of Rs 10870/- be sanctioned under Rule 113 of the Grant-in-Aid Code.

2. The new building is a well designed school and boarding house capable of accommodating about 100 boarders. From the plan it would no doubt appear that a considerable portion of the building is to be used for living purposes and that the portion to be devoted to school purposes is comparatively small.

3. I have ascertained however that the two dining rooms are to be regularly used as class rooms. This is practicable in this school, as the girls all being natives eat from leaves or plates on the floor and no dining room furniture will be required. The dormitories will be used on wet days for drill and calisthenics, there being no cots to take up the space, as the girls will sleep on mats which will be removed in the day time. The bed rooms are to be used by two mistresses engaged solely in school work and the supervision of the boarders.

4. The school is open to girls of all castes, but on account of caste restrictions, only Native Christians are expected to enter as boarders. The boarders will pay boarding fees which will include a monthly charge for accommodation. Hindu and Muhammadan girls will be admitted as day scholars.

5. The plan and estimates have not been fully approved by the

in the enclosed copy of his letter No. 2659 dated 15th October 1903 are not of a serious character.

6. The building has already been completed, the late Director having permitted the work to be begun in view of the urgent need for accommodation.

7. The site is part of the compound of the Sullivan's Gardens Theological School and belongs to the S.P.G. Mission.

8. The manager's application for a building grant is submitted herewith.

I have the honour to be,

Sir,

Your most obedient servant,

A. G. B. B. B.

Director of Public Instruction.

V. L.
2-12-03-

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11 8p

Copy of a letter from the Consulting Architect to the
Government of Madras, No. 2659 dated 15th October 1903. 2/3

In returning herewith the plans and estimate, which accompanied your Ref on Cur No. 5237 dated 12th December 1902, I have the honour to point out that, in calculating the scantlings of teak beams in this Division the formula $bd^3 W.L^2/180$ is used (where W = total weight, L = length of beam between points of support, d = depth, b = breadth) which gives a result of 9" x 15" and 9" x 15½" for the beams in question placed 8½ feet and 9½ feet respectively from centre to centre. However as the upper floor is to be used as bed rooms the scantlings allowed may stand.

Irrespective of what is laid down in standard works as regards the proper heights for rooms of boarding schools, I am of opinion that in consideration of the climate of this place, high and well-ventilated rooms are necessary.

I do not at all approve of the arrangement of the beds especially in the main Dormitory. It is not only objectionable on hygienic principles but there is hardly any walking room between the beds which is so very essential.

As regards the mortar to be used, two of sand to one of lime is generally adapted in this Division. Please see appendix A to F of the Public Works Department Standard Specification, page 6, para 12.

The plans and estimates in other respects are approved.

I have the honour to be, &c.

Signed/ W.G. Molesworth,

Offg: Consulting Architect to Govt.

(True Copy)

A. G. B. B. B.
Director of Public Instruction.

J. L.
2-12-03

7c
The Masonic Hall, Mount Road.
Madras. November 15th 1902.

Rev. G. H. Smith M.A.

Secretary M.D.C.S.P.G. Madras

Dear Sir,

I am in receipt of your letter enclosing the objections made by The Ag Consulting Architect to Government through The Director of Public Instruction, regarding my plans and estimates for The W.M.A. School Buildings at Sullivan's Gardens, and beg to offer the following explanations:-----

1. "No detail estimate accompanies the plans etc, etc."

I was not aware that The Government Architect would require all the pages of Measurements from which The Quantities have been abstracted, as I was under the impression that such estimates would be checked by the less laborious method of estimating by cubical capacity, at so much per foot cube for Schools built of this description. However, I now forward the "Dimension Sheets" and "Abstracts" for perusal. *(attached to estimates returned)*

2. "The Foundations, Nature of Soil etc "

The foundations are loaded up to $\frac{1}{2}$ a ton on the sup1 foot. The surface is sandy clay, and the subsoil of a harder clay overlying a very deep stratum of fine sand. I sank a well when building the adjoining Church of The Good Shepherd, and found the soil to be most satisfactory.

3. "Scantlings of Timber"

All the timber scantlings have been calculated by myself. I fail to see how The Consulting Architect arrives at a scantling of 16" x 9" for a 16 foot span beam at 8'-6" interval, loaded up to 150 lbs per sup1 foot of floor. I think some clerical error must have occurred, as the D.P.W. tables give for a similar beam 13" x 9". However I will give the details of my calculations for the perusal of The Consulting Architect;-- as follows;--

Preliminaries

Interval of beams

Span

Load taken at 150 lbs per supl foot

Length of beam 16' x 12 = 192 inches

$W = 8\frac{1}{2}' \times 16' \times 150 \text{ lbs} = 20400 \text{ lbs}$

$w = \frac{W}{L} = 106 \text{ lbs per s in}$

$F =$ factor of safety $= 6$

$f^* =$ for teak Modulus of Rupture $= 13,000 \text{ lbs}$

$E =$ Modulus of Elasticity of Teak $= 1,800,000 \text{ lbs}$

$n = \frac{5}{384}$ coefficient of the load

$d =$ Max deflection allowed one thirtieth of an inch to every foot length of span

$b =$ required breadth of beam

By the Strength Formula

$$\text{depth} = \sqrt[3]{\frac{6(F.w.)l^2}{8f^*}} = \sqrt[3]{\frac{6 \cdot 6 \cdot 106 \cdot 192^2}{8 \cdot 13,000 \cdot 9}} = \sqrt[3]{\log 2.17694} = \log 1.08847 = 12.3 \text{ inches}$$

By Stiffness Formula --(maximum deflection 16/30ths of an inch)

$$d = \frac{16}{30} \times \frac{16}{12} = \frac{16}{15} \quad \therefore d = \frac{12 \pi W l^3}{E b d^3} \quad \text{then}$$

$$d^3 = \frac{12 \pi W l^3 \times 30}{E b \times 16} = \sqrt[3]{\frac{12 \pi W l^3 \times 30}{E b \times 16}} = \sqrt[3]{\log 3.39336} = \log 1.13112 = 13.5 \text{ inches}$$

As the stiffness formula gives the higher result, I have adopted 13½ inches as the required depth, and made it 14 inches by 9 inches. This agrees very accurately with the D.P.W. tables 13" x 9" .but is very different to the result obtained by The Consulting Architect i.e. 16" by 9" .

Girders cheaper than teak beams

Taking into account the delay in procuring these from Europe, and the very erratic safe loads given by various Manufacturers, I do not consider them preferable to teak. These lists differ so much that they cannot be relied on at all. Thus Messrs Dorman & Long quote a girder of 16'-0" span 12" x 5" at 32 lbs per foot

17 2/6
to carry 9 tons. The Carnegie Company quote the same section to bear 11.9 tons, whilst the following recognized and accepted formula gives for the same section a safe load of 7.035 tons. 3/2

Thus;---

$$0.67(w - 0.3bd) \frac{d}{L} = 7.035 \text{ Tons} \quad w = 32 \text{ lbs or section weight}$$

$d = \text{depth in}$
 $L = \text{length ft}$

This section is therefore perfectly useless for the girder and load of 9 Tons required. The next manufactured section is 13" x 5' at 41.5 lbs per foot run, which gives by calculation as follows

$$0.67(w - 0.3bd) \frac{d}{L} = 11.97 \text{ Tons safe load}$$

and as the deflection $\frac{5 W l^3}{384 E I} = 0.3 \text{ inches, or less than}$

16/30ths of an inch, this is the section required, and not 12" x 5' at 32 lbs as quoted in the Manufacturers' erroneous lists.

Some of these lists put the Modulus of Elasticity down as "12,000 ~~lbs~~ for our steel", whilst others quote their steel at 12,900 tons, but most Manufacturers' lists have the usual note thus "we do not guarantee etc etc". Whilst such differences exist, I prefer to adhere to the recognized formula. Thus the necessary strength would be 41½ lbs, which for a length of 18 ft at Rs 8/8/- per cwt would cost Rs 65, whereas the same 18 ft of teak beam of 14" x 9" at Rs 3/8/- would only cost Rs 55/2/- Doubtless, larger sections of R.S.Gs may come cheaper than teak for wider spans than ordinary buildings, but this does not concern the present case. The "raking" timbers of this building such as rafters etc have all been calculated by myself at a vertical component load of 24 lbs per s foot, and a horizontal component wind stress of 50 lbs per s foot, resolved normally to roof on the latest "Perry-Fuller" method.

5 The rooms are very low, 13 feet is insufficient.

The accepted cubic capacity for each scholar is 117 to 130 cubic feet, as given by such eminent authorities as de Chamont, Wilson, Parkes, Rooson, Pettenhofer, Snell, etc. Parkes in his celebrated work on Hygiene also gives 130 cubic feet. Now as the Grant-in

13 2/7

Errata 3 || -Aid Code gives a maximum suppl area of 10 sq feet per each scholar, then $\frac{130}{10}$ gives a height of 13 feet. Ugh

If this is sufficient in a climate where all doors and windows have to be kept closed, surely it is sufficient in India where all doors and windows are kept constantly open. Looking over a series of Schools built in India I find 13 feet is seldom exceeded.

Dormitory:---

I submit a plan showing the way of arranging the regulation school mats of 5'-0" x 2'-6", which drawn to a scale of 1/8th inch shows the gangways between the rows. The Grant -in-Aid Code ^{in rule} allows the Verandahs to be included in the area of all rooms but this I have not taken advantage of at all, although doubtless many would sleep out in these verandahs. These mats are rolled up, and taken down to the Box-Rooms by each scholar during the day. Cots are never used in Native School Dormitories.

Rates----

The rates I priced the quantities at, are the rates supplied to me by The Consulting Architect in the year 1895, and I was not aware that they had been reduced, in some cases actually below Prime Cost, although ~~the~~ labour and materials have increased in price since 1895.

Mortar:-----

Mortar of 1 to 3 is advocated in Nicholson's exhaustive and elaborate tensile and adhesive tests published in "Appendix A to F Standard Specifications of The D.P.W., and chemically forms a better double Silicate of Calcium than 1 to 2 will do.

In conclusion I beg to note that the building is at present built up to the first floor level, and all the beams and joists have been cut and partly fixed. In submitting the calculations of the scantlings, may I call the attention of The Consulting Architect to the fact that all the teak used for beams etc, is of the L.R. Brand, whereas it is usual to use the inferior W.D. brand of teak. Also that I have used the Minimum Modulus of Elasticity 1,900,000 whilst Rankine gives 2,400,000 lbs per sq inch. Also in using The Modulus of Rupture I have used the Minimum 18,000 lbs whereas Rankine gives 15,000 lbs per sq inch. In using the maximum

15 2/8 5
deflection of one thirtieth of an inch per foot span of beam,
I see that the D.P.W. orders allow a maximum deflection of one
twentieth of an inch to every foot span.

This difference would materially lessen the scantlings, which The
Consulting Architect even now condemns as "not strong enough".

Yours faithfully,

W. H. Pogson -

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, No. 5137, dated 3 - 12 - 1903

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ORDER No. 2, dated 5-1-1904

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The Director's letter with its enclosures will be forwarded to the Sanitary Commissioner with the request that he will be good enough to inspect the new building constructed for St. Ebba's Girls' school and report as to the sufficiency of the ventilation ~~and cubic space~~ of the dormitories which are intended to provide sleeping accommodation for 102 girls - 72 in the larger one & 30 in the smaller one -

At present
(2.) The Educational rules con-
tain no provision as to the mini-
mum amount of sq. feet and cubic
feet of space required for each
person who has to be accommodated in hostels & dormitories
~~attached to educational institutions. It is however~~
~~very necessary that such provision~~
~~should be made~~
for the information of managers
of schools constructing students'
hostels and dormitories and expecting
aid from Govt. & the Sanitary
Board will be requested to
advise what minimum re-
quirements may be prescribed.

M.
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~~2. Inf...~~

2. The D.P.D. is requested
not in future to put
works to be begun in
anticipation of approval
of the plans & estimates.

2.1.04

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The Sanitary Com. - with
Sanitary Board