(1) பக்கங்களின் எண்ணிக்கை 30.

(2) புதுக்கித் திருப்பிய நாள் 6/92

(3) ஆதாரங்குறிப்பவர் சுருக்கொப்பம்

(2)

P. & D துறை

தமிழ்நாடு ஆவணக் காப்பகம்.

தமிழ்நாடு அரசு

அரசாணை எண். 1905 — அச்சகம்

மு. கோப்புத் தாள் எண். — பலவகை

நாள் : 1 — 7 — 1892 198 .

மடிக்கவோ கண்டபடி கையாளவோ கூடாது

15 Sheets

ஆவண, கா-1—18,000—15-6-87.

1905
1

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Account.

READ—the following letter from Colonel W. S. TREVOR, R.E., Secretary to the Government of India, Public Works Department (Civil Works—Miscellaneous), to the Secretary to the Government of Madras, Public Works Department, dated Fort William, 12th January 1886, No. 12 M. :—

I am directed to communicate, for your information and guidance, the accompanying revised rules laying down the procedure to be followed in future in obtaining stores from England for the Public Works Department, other than railway stores, and to request that they may be brought into operation at once.

2. I am to invite your attention to paragraph 3 of Finance Department resolution No. 185, dated 10th January 1883, under which alone English stores may be purchased in this country ; and to state that, whenever English stores are authorised to be purchased locally, the reasons for allowing the purchase must be placed on record, as well as the probable estimated loss or gain caused by adopting such a course.

3. The Examiner of Public Works Accounts should be furnished with a copy of each order issued under the preceding paragraph, and should be requested to enter and attach its substance to the annual return under paragraph 23 of the Finance Department resolution quoted above.

4. I am further to point out that, under the rules in force, the purchase of English stores by means of orders given to agents or firms in India, who have to send such orders to England for execution, is absolutely prohibited. If any case of such a nature should occur, it should be seriously noticed and should be forwarded, together with the orders passed thereon, to the Government of India for information.

ENCLOSURE.

Revised rules for procedure in obtaining stores from England for the Public Works Department, other than railway stores.

Indents for Public Works stores, other than railway stores, so long as they are within the grant assigned for the purpose for expenditure during the year, should be sent direct by the Secretaries in the Public Works Department of the several local Governments and Administrations to the Director-General of Stores, India Office.

2. All indents transmitted to the India Office must be in duplicate, and must give full particulars, and be accompanied by all information likely to be of use in guiding their supply. One copy of each indent and of the documents accompanying should be simultaneously sent to the Government of India in the Public Works Department. If the indents are not printed at the time of first despatch, one manuscript copy only need be sent to the India Office, and one manuscript copy to the Government of India. Or being printed subsequently, two printed copies should be sent to the India Office, and one to the Government of India.

3. Indents must be made out only on the authorised form as at present in use. Calculations and specifications must be clear and complete, and must be accompanied by all necessary drawings, models, or samples ; the indenting officer being responsible that all information necessary for an accurate and complete comprehension of his wants is given.

4. English money, weights and measures are alone to be used in all indents sent to England and in all correspondence thereon, the money values being entered in conventional sterling at two shillings per rupee.

5. Indents are to be numbered progressively ; and should, in addition, have each item numbered consecutively, commencing from unit (1) upwards in each indent. Particular attention must be devoted to this, so that the quotation of the number of an indent and the number of an item may fully identify the article in question.

6. Stores intended for Provincial, as well as for Imperial services, may be included in the same indent; but in such cases the only fund heading to be entered must be "Provincial," subsequent adjustments being made in India.

7. Indenting officers are responsible that the store lists of neighbouring administrations and railways have been, as far as possible, searched, and that none of the items entered can be advantageously procured from such sources.

8. If any indent on England contains items which it is possible to obtain of Indian manufacture, or of indigenous origin, it should be distinctly explained on the face of the indent in the column of remarks why such articles have been indented for from England instead of having been procured in India; otherwise they will be liable to be cancelled.

9. Each indent must carry a certificate of the necessity for the stores indented for, and that they cannot be advantageously procured of local manufacture, or from surplus stores of other departments, railways, or administrations.

10. The Examiner of Public Works Accounts should attach a certificate to each indent to the following effect:—

"I certify that funds to meet the outlay which it is estimated will be incurred in England in connection with this indent during the year 18 18 , *have been provided for in the estimates of the Public Works Department to the extent of* £ ."

or, when necessary, in place of the words italicised—

"*will be provided by the Government of India* in the estimates of that year*, vide *Government of India letter, No.* , *dated* ;"

and, when it is expected that the outlay will be incurred partly in one year and partly in another year, the following addition should be made to the certificate:—

"and that the balance of the estimated outlay in England, or £ , will be provided by the Government of India* in the estimates of the year 18 18 , *vide* Government of India letter, No. , dated ."

11. It must be remembered that the Director-General of Stores will not proceed to consider an indent, if transmitted in an incomplete form.

12. Local Governments and Administrations are authorised to communicate freely with the Director-General of Stores, India Office, regarding future requirements and on all matters connected with the supply of stores; this power may, at the discretion of the Local Government or Administration, be delegated to Superintending Engineers.

13. The Examiner of Public Works Accounts will send forward monthly to the Accountant-General, Public Works Department, a statement showing—

(I)—The grant for outlay in England during the year.

(II)—The number and amount of each indent certified during the month just closed.

(III)—The amount of the grant for the year actually apportioned up to the end of the month, corrected by latest advices from England.

(IV)—The balance available to meet further indents.

* NOTE.—In the case of stores for Provincial services, the sanction of the Local Government or Administration will suffice for the Examiner, but for stores needed for Imperial purposes in a year not yet begun, the sanction of the Government of India must be obtained to the proposed allotment before the Examiner may give his certificate.

ORDER—dated 25th January 1886, No. 202 W., Public Works.

Communicated to officers of the Public Works Department, for information and guidance, with advertence to appendix I to the Public Works Code, in which these rules will in due course be incorporated.

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
To Superintending Engineers.
To the Consulting Architect to Government.
,, Superintendent, Madras Harbour Works.
,, Examiner, Public Works Accounts, for issue of the requisite S.O.

Exd. E. Fernandez.
Spare Copies

GENERAL.
ACCOUNT.

Govt. of {1886} Madras.

PUBLIC WORKS.

Dated January, 25th.

Read. *Encl.*

G.O., 25th Jan. 1886, No. 202 W.

JANUARY.

Stores

Orders of the Government of India communicating revised rules laying down the procedure to be followed in obtaining from England —, other than railway stores, communicated to officers of the Department.

17TH JULY 1891, No. 604, FINANCIAL.

1905
3

GOVERNMENT OF MADRAS.

FINANCIAL DEPARTMENT.

READ— the following paper :—

Proceedings of the Government of India, Finance and Commerce Department, dated Simla, 25th June 1891, No. 2650.

Read—again the following papers :—

(1) Resolution by the Government of India, Department of Finance and Commerce, No. 185, dated 10th January 1883, consolidating the existing rules regarding the procedure to be employed in obtaining for the public service supplies of stores of other than Indian origin or manufacture.
(2) Despatch from Secretary of State, No. 141 (Financial), dated 26th May 1887.
(3) „ „ „ „ 191 („) „ 26th July 1888.
(4) „ „ „ „ 192 („) „ „ „ „
(5) „ „ „ „ 52 (Military Stores), dated 30th Aug. 1888.

Read also—

(6) Despatch to Secretary of State, No. 65 (Accounts and Finance—Stores), dated 5th March 1889.
(7) Despatch from Secretary of State, No. 161 (Financial), dated 25th July 1889.
(8) Letter from Messrs. Richardson and Cruddas, Bombay, dated 8th July 1890, forwarding a memorial from the representative Manufacturing Engineers and Ironfounders of India, regarding the restrictions imposed by the Government of India on officers of the Public Works Department against the purchase of iron work of local manufacture.
(9) Despatch to Secretary of State, No. 338 (Accounts and Finance—Stores), dated 15th October 1890.
(10) Despatch from Secretary of State, No. 3 (Financial), dated 8th January 1891.

Resolution—

1. In paragraph 28 of Resolution, No. 185, dated 10th January 1883, the policy of the Government of India in regard to the purchase in India of articles of local manufacture required for the public service was expressed in the following terms :—

Paragraph 28.—The orders of the Secretary of State make it incumbent on all officers of Government requiring stores of European manufacture to obtain them by indenting on the Secretary of State, and permit of the purchase in the local market of articles made in Europe or America only under the special circumstances mentioned in paragraph 3 of this Resolution. The Governor-General in Council therefore desires again to invite the special attention of Local Governments to the expediency of supplying the wants of Government by the purchase in the local market of articles of *bona fide* local manufacture. The Government of India is desirous to give the utmost encouragement to every effort to substitute for articles now obtained from Europe articles of *bona fide* local manufacture or of indigenous origin; and where articles of European and of Indian manufacture do not differ materially in price and quality, the Government would always be disposed to give the preference to the latter; and the Governor-General in Council desires to remind all officers of Government that there is no reason why articles manufactured in India should not be obtained locally, even although the raw material necessary to their manufacture may have been originally imported from Europe. It is most desirable to bear in mind the distinction between articles of European manufacture and articles produced or worked up in India from imported material; the former should not, save in exceptional cases, be purchased in the local market, while the latter should by preference be purchased locally whenever the quality is sufficiently good, and the price not higher than the cost of laying down the imported article. There are many articles which may not be immediately obtained in the local market, but which can be made in the event of Government encouraging the manufacture.

The special circumstances mentioned in paragraph 3 of the same Resolution (as amended by Financial Resolution, No. 2586, dated the 23rd May 1889), in which the purchase in the local market of articles made in Europe or America is held to be permissible, are as follows :—

1st, when for any special reason it may be more economical to do so;

2nd, when stores indented for from England have not arrived, or when a sudden emergency has arisen, and in either case only if serious inconvenience to the public service would be caused by waiting for the stores from England;

3rd, when the articles are perishable.

2. Some misconception appears to have arisen regarding the application of paragraph 28 of Resolution, No. 185, dated 10th January 1883, to manufactured articles of iron and steel. The term "raw material" used therein, the import of which from Europe for the purpose of being worked up into finished articles was declared to be unobjectionable, was held in some quarters to apply to the bars and plates of iron and steel which are made up into bridges, roofs and other finished engineering structures. This, however, was not the intention of the Resolution. It was considered by the Government of India in regard to manufactured articles of iron and steel, that they were classes of stores to which the objections to local purchase applied in the highest degree, mainly on the grounds (1) that much of the material imported into India was of inferior quality; (2) that the delays that unavoidably occur, even in England, on account of the rejection of material, would be aggravated in India, with consequences ruinous to the contractor and most injurious to Government; (3) of the absence in India of the necessary mechanical and chemical appliances required for testing iron and steel; and (4) of the loss of the economical advantage secured by free competition, which could not be obtained in India owing to the limited number of capable firms.

On these grounds the purchase in India for the public service of manufactured articles of iron and steel was prohibited, except under the special circumstances mentioned above.

3. Having regard, however, to the representations contained in the memorial read above, and with the view of encouraging local industries and the development of technical education, His Excellency the Governor-General in Council has now resolved to modify, as a tentative measure, the existing orders prohibiting the local purchase of manufactured articles of iron and steel made up from imported materials. In so doing, the Governor-General in Council desires it to be clearly understood that this relaxation of existing rules is sanctioned solely in the hope of thereby effecting economy in the public administration, both by actual saving in the cost of articles purchased locally and by avoiding the delays that are sometimes inevitable when the articles have to be procured by indent on England. It is not intended to sanction thereby a procedure in any degree of a protective nature, and firms that may obtain orders under this Resolution must be distinctly warned that no claim for compensation of any sort will be admitted in the event of its being found necessary to discontinue the practice of inviting tenders in India.

4. In the annexure to this Resolution is a list of articles, tenders for which may, in the opinion of the Governor-General in Council, be invited in future from local firms. It is not necessary that there should be an absolutely rigid adherence to the items specified. Tenders for any articles of the nature indicated in the list may be invited, but it should be understood that articles on which very little labour in India is required can be best procured through the Secretary of State. It is also intended that the relaxation of the rules regarding local manufacture shall be limited to the less important supplies, *e.g.*, bridges and roofs of *small* span required for the Buildings and Roads and Irrigation Branches of the Public Works Department and for Municipalities and District Boards. In the case of Railways under construction, the whole of the necessary supplies, as far as can be foreseen, will continue as heretofore to be procured by indent on the Secretary of State. The relaxation of the rules will refer only to articles the certain want of which could not be anticipated and delay in supply of which would involve loss in some respect.

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5. The following restrictions must also be rigidly enforced in all cases in order to ensure—

(1) that the articles locally supplied are not imported into India in a finished or partly-finished state;

(2) that the price is not in excess of that at which similar articles could be obtained by indent on the Secretary of State; and

(3) that the quality is not inferior to that of English supplies.

I.—*Firms that may be permitted to tender.*—It is evident that a most careful selection must be made of the firms allowed to tender, and only firms of recognised standing and whose shops are fitted with the necessary plant will be considered eligible. Local Governments and Administrations are therefore directed to furnish the Government of India with a list of the firms within their jurisdiction that they consider should be entitled to the privilege of tendering. The lists should state the principal machines in the shops of each firm, and the means possessed for testing both the raw material and the finished product.

II.—*Checks to ensure that the Articles are manufactured in India from the raw Material.*—Raw material may be understood to mean wrought iron and steel in the form of plates and bars, cast iron in the shape of pig, and steel forgings in the shape of bars and ingots. Local manufacture from raw material imported in these shapes may be permitted, but the contracts for all local supplies of articles of iron and steel should contain a clause insisting that the articles, with the exception of the raw material thus defined, must be made wholly in India. A certificate from the firms to which orders may be given should also accompany the delivery of each order to the effect that this clause of the contract has been complied with. With this object in view, Local Governments and Administrations should also arrange for periodical or other inspections of the Government orders under execution by the selected firms.

III.—*Check as regards the relative Prices of English and Indian Supplies.*—The best check will be furnished by a comparison of the tenders received from Indian firms with the quarterly rate-lists issued by the Director-General of Railways. In cases of doubt, Local Governments and Administrations might ask the Director-General of Stores at the India Office by telegram* for approximate rates, including the prevailing rates of freight.

* Either direct or through the Government of India according to the rules regulating the despatch of Foreign State messages.

IV.—*Testing of the raw Material employed and when necessary of the finished product.*—With the system of careful selection that is prescribed, the Government of India is convinced that the selected firms would be careful to employ material of none but the best quality. To ensure this, however, the contracts should also provide for the employment of steel in the majority of cases in preference to wrought iron, and it should be insisted that Siemens Martin or Bessemer steel of English make should be used, and the use of Basic steel and of foreign steel or iron in any form should be prohibited. In the case of articles of any importance it will be necessary, however, to test the raw material employed. It is believed that some of the engineering firms interested in local manufacture either possess, or are prepared to erect, the necessary testing plant. This should be insisted upon so far as possible. Another means of testing the raw material will be by sending samples for the purpose to the Railway workshops which exist in all the large centres, and which are generally provided with some testing plant. Enquiry will be made by the Government of India in what Railway shops the necessary tests could be carried out, and the scale of fees that would be charged. Such fees would be payable by the manufacturing firms in all cases. The tests will invariably be carried out in the presence of a competent officer of the Public Works Department, and all specifications for articles to be locally supplied will specify the tests which the material employed is to undergo. To assist Local Governments and Administrations in preparing such specifications and in the carrying out of the tests, they will be furnished with copies of Professor Unwin's handbook on "The Testing of Materials of Construction." Should it subsequently be found necessary, Government will be prepared to arrange for the erection of adequate testing machinery at selected centres.

In cases where structures, such as roofs and bridges of small span, are locally manufactured, the contract should in all cases provide for the efficient testing of the finished structure before delivery, either in the shops of the manufacturer or else in those of the nearest Railway Company.

Order—

Ordered, that this Resolution be communicated to the Local Governments and Administrations noted on the margin, for information and guidance.

The Governments of Madras, Bombay, Bengal, the North-Western Provinces and Oudh, and the Punjab.
The Chief Commissioners of the Central Provinces, Burma, Assam, Mysore, and Coorg.
The Resident at Hyderabad.
The Agents to the Governor-General in Central India, Rajputana, and Baluchistan.

Ordered also, that a copy be forwarded to the Military and Public Works Departments, and that it be published in the Supplement to the *Gazette of India*.

(Signed) J. E. O'CONOR,
Asst. Secy. to the Govt. of India.

ANNEXURE.

LIST of Articles which may be made up in India from imported raw materials, subject to the restrictions specified in paragraph 5 of the Resolution.

ROOFING.

Roof trusses under 30 feet span with purlins, &c.
Ironwork for timber trusses.
Cast-iron columns of small size.

BRIDGE-WORK.

Bridges of simple design and of small span, also bridges of which only a small number of such spans of similar design are required.
Well-curbs.
Suspension rods and bond rings for wells.
Straps and bolts for timber bridges.
Pile shoes and rings.
Cast-iron cylinders and screw piles.
Petty ironwork, such as holding down bolts, &c., sizes of which cannot be known until works are started.

MISCELLANEOUS.

Cast-iron sleepers.
Cast-iron pipes, special lengths, such as are required for closers, special bends, &c.

MISCELLANEOUS—*cont.*

Wrought-iron signals.
Signal winches.

PLANT.

Workshop stores, except tool steel and varnishes.
Trolly wheels and axles.
Iron-work for trollies.
Mining tubs and buckets.
Ironwork for tip wagons.
Asphalte boilers.
Iron cisterns.
Dobbin carts.
Hand pile driving engines (all necessary iron work).
Grapnels.
Small mortar mills.
Concrete skips.
Wall boxes for shafting.
Small cupolas.
Hand foundry ladles.
Cold and hot sets or chisels.
Snaps for rivetting.
Fire buckets for rivetting.
Dollies.

ORDER—dated 17th July 1891, No. 604, Financial.

Communicated to Departments of Government.

(True Extract.)

J. F. PRICE,
Chief Secretary.

To the Departments of Government.
„ Heads of Departments.

Exd. A. Raitt.

1905/5

Govt. of {1891} Madras.

FINANCIAL.

Issued

Recd. Encl.

G.O., 17th July 1891, No. 604.

JULY.

Stores.

Communicating to Departments of Government resolution of the Government of India modifying, as a tentative measure, the existing orders prohibiting the local purchase of manufactured articles of iron and steel made up from imported materials.

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No 2268 W dy 21st Augt 1891.

Communicated to Offices of the Public Works Dept for information & guidance with reference to the rules in Appendix G. Public Works Code.

2. The Supdg Engineer V Circle will report with reference to Clause I, para 5 of the Govt of India Resolution

Jdy Jt. 13-8
Jdy C & B 11-8

To

The Ch Engr for Irrign.
" C. E. for Rys
" Supdg Engrs "
" C & A to Govt "
" S of W. P. Project
" Exr P. W. Accts.

No. 494 M.

1905
b

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Miscellaneous.

To

THE GOVERNMENTS OF MADRAS, BOMBAY, BENGAL, THE NORTH-WESTERN PROVINCES AND OUDH, AND THE PUNJAB.

THE CHIEF COMMISSIONERS OF THE CENTRAL PROVINCES, BURMA, ASSAM, AND COORG.

THE RESIDENTS AT HYDERABAD AND IN MYSORE.

THE AGENTS TO THE GOVERNOR GENERAL IN CENTRAL INDIA, RAJPUTANA, AND BALUCHISTAN.

THE DIRECTORS GENERAL OF RAILWAYS AND TELEGRAPHS.

THE CONSULTING ENGINEERS TO THE GOVERNMENT OF INDIA FOR RAILWAYS, CALCUTTA, CENTRAL DIVISION, AND LUCKNOW.

Calcutta, the 17th December 1891.

SIR,

I am directed to request that in the annual returns* of expenditure on stores, commencing with those for the year 1891-92, special mention may be made of the effect of the instructions contained in Government of India, Finance and Commerce Department, Resolution No. 2650, dated the 25th June 1891, relaxing, as a tentative measure, the existing orders prohibiting the local purchase of articles of iron and steel manufacture made up from imported raw materials.

2. I am to take this opportunity to remind you of the necessity of expediting the submission of the list of firms that may be permitted to tender as called for in para. 5, I, of the Resolution referred to.

I have the honour to be,

SIR,

Your most obedient Servant,

C. VINCENT,

Under Secy. to the Govt. of India.

* Prescribed in para. 23 of Finance and Commerce Department Resolution No. 185, dated the 10th January 1883 (Appendix O to Volume I of the 5th Edition of the Public Works Department Code).

No. 495 M.

Copy forwarded to the Military / Finance and Commerce Department, [for information, with reference to that Department's No. 4851, dated the 4th December 1891.] } to Finance Dept. only.

By order,

C. VINCENT,

Under Secy. to the Govt. of India.

Documents accompanying.

Nil.

G. I. C. P. O.—No. 966} P. W. D.—18-12-91.—275.

No 53 Wdy 5th Jany/92

Communicated to the Secretary Engineer & Secretary for guidance with reference to G.O. 2268 F dated 21st Aug. 1891, the reply to para 2 of which should be expedited

Sd/ ow/3
DW

To S.E. & Circle
Exn. P.W. Secretariat

1905
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11TH JANUARY 1892, No. 36, FINANCIAL.

GOVERNMENT OF MADRAS.

FINANCIAL DEPARTMENT.

READ—the following paper:—

No. 5178.

GOVERNMENT OF INDIA.

FINANCE AND COMMERCE DEPARTMENT.

Accounts and Finance—Stores.

ERRATUM.

In clause IV of paragraph 5 of Resolution, No. 2650, dated 25th June 1891, *for the sentence*—

"To ensure this, however, the contracts should also provide for the employment of steel in the majority of cases in preference to wrought-iron, and it should be insisted that Siemens, Martin or Bessemer steel of English make should be used, and the use of Basic steel and of foreign steel or iron in any form should be prohibited"

read—

"To ensure this, however, the contracts should also provide for the employment of steel in the majority of cases in preference to wrought-iron, and the specification should stipulate for steel made in England by approved makers and by an approved process."

CALCUTTA,
30*th December* 1891.

(Signed) J. E. O'CONOR,
Asst. Secy. to the Govt. of India.

To the Governments of Madras, Bombay, Bengal,
the North-Western Provinces and Oudh, and the Punjab.
" Chief Commissioners of the Central Provinces,
Burma, Assam, Mysore and Coorg.
" Resident at Hyderabad.
" Agents to the Governor-General in Central India,
Rajputana and Baluchistan.
" Military and Public Works Departments.
" Publisher of the *Gazette of India* for publication in the Supplement.

ORDER—dated 11th January 1892, No. 36, Financial.

Communicated to Departments of Government, in continuation of G.O., dated 17th July 1891, No. 604, Financial.

(True Extract.)

J. F. PRICE,
Chief Secretary.

To Departments of Government.
" Heads of Departments.

Exd. A. Raitt.

Govt. of {1892} Madras.

FINANCIAL.

Issued

Read. Encl.

G.O., 11th January 1892, No. 36.

JANUARY.

Stores.

Communicating to Departments of Government an erratum in clause IV of paragraph 5 of resolution of the Government of India modifying as a tentative measure the existing orders prohibiting the local purchase of manufactured articles of iron and steel made up from imported materials.

No. 234 W 2/23 Jany 92

Comd to offices of the P.W.D. for information and guidance in connection of G.O. 2268 W dated 21-8-91

1st / 100B

D.W

C.E. for S
C.E. for Ry
C.E. to Govt.
Supdy Engineer
Supdt of Works' Ry
Exec to Accts

1905
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No. 226-M.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Miscellaneous.

Simla, the 14th June 1892.

Conditions under which certain selected firms in India may be permitted to tender for the supply of articles of iron and steel of local manufacture.

Read again the following papers:

Resolution by the Government of India in the Finance and Commerce Department, No. 2650, dated 25th June 1891.

Erratum to the above Resolution, Finance and Commerce Department, No. 5178, dated the 30th December 1891.

Government of India, Public Works Department, letter No. 494 M., dated the 17th December 1891, to all Local Governments, &c.

Read also—

Letter No. 12341-106 A., dated the 30th October 1891, from the Chief Commissioner of Burma, and enclosures.

Letter No. 1685, dated the 19th December 1891, from the Government of Bengal, General Department, and enclosure.

Letter No. 26, dated the 4th January 1892, from the Chief Commissioner of Assam, and enclosure.

Letter No. 640 M., dated the 5th January 1892, from the Director General of Telegraphs.

Letter No. 118-91, dated the 6th January 1892, from the Chief Commissioner of the Central Provinces.

Letter No. 62 S., dated the 8th January 1892, from the Secretary to the Agents to the Governor General in Rajputana and Central India.

Letter No. 16-11, dated the 9th January 1892, from the Chief Commissioner of Coorg.

Letter No. 77, dated the 7th January 1892, and No. 872, dated the 6th February 1892, from the Government of the Punjab, Public Works Department, and enclosures.

Letter No. 26 G.-A., dated the 19th January 1892, from the Resident at Hyderabad, and enclosures.

Letter No. 349 W., dated the 5th February 1892, from the Government of Madras, Public Works Department, and enclosure.

Letter No. 1198-152 W. A., dated the 7th March 1892, from the Government of the North-Western Provinces and Oudh, Public Works Department, and enclosure.

Letter No. 494 S., dated the 17th March 1892, from the Consulting Engineer to the Government of India for Railways, Central Division, and enclosures.

Letter No. 164 A-540, dated the 30th March 1892, from the Government of Bombay, Public Works Department, and enclosures.

OBSERVATIONS.—In paragraph 5, clause I, of Finance and Commerce Department Resolution No. 2650, dated 25th June 1891, Local Governments and Administrations were directed to furnish the Government of India with lists of

the manufacturing firms that might be permitted, in view of their general standing and the completeness of their manufacturing and testing plant, to tender for the supply of articles of iron and steel made up from imported raw materials, subject to the conditions and restrictions mentioned in that Resolution.

2. The replies read above furnish the information required. A preliminary list of selected firms is published as Appendix A to this Resolution; other firms that, in the opinion of a Local Government, satisfy the necessary conditions will be added to this list from time to time, and subject to the checks and limitations prescribed in Finance and Commerce Department Resolution No. 2650, dated 25th June 1891, which must be strictly enforced, the firms specified are at liberty to tender for any of the less important supplies of articles of iron and steel manufacture required by all branches of the Public Works Department, except State Railways under construction. As regards the latter, the only circumstances in which supplies may be locally obtained are stated in paragraph 4 of that Resolution.

3. The conditions as regards the tests to be applied to the raw material, and, when necessary, to the finished product, as defined in paragraph 5, clause IV, of Finance and Commerce Department Resolution No. 2650, dated 25th June 1891, require, however, to be re-stated. It has been ascertained that, except in isolated cases, the various railway workshops are not prepared to undertake the necessary tests. As a general rule, therefore, these tests must be carried out by the manufacturers themselves. In the case of all articles requiring to be tested before delivery, the specification must specify the tests that the material employed is to undergo. Such tests will be carried out invariably in the presence of a competent officer of the Public Works Department, one who has received special training in testing operations either at Cooper's Hill College or elsewhere being employed whenever available. Local Governments and Administrations that may place orders with firms outside their jurisdiction—as, for instance, orders placed by the Government of the Punjab or of the North-Western Provinces and Oudh with firms in Bombay or Calcutta—should as a rule arrange with the administration in which the manufacturers' works are situated for the necessary supervision of the tests. In special cases, however, they may be authorised to depute an officer to supervise the testing under the rules for deputations on special duty laid down in the Civil Service Regulations. The actual testing will be in all cases at the sole cost of the manufacturer.

4. The annexed specifications (Appendix B), drawn up by the Director General of Stores at the India Office, show the conditions as regards tests and manufacture that are exacted in the case of iron and steel work procured from England for use in India, and will serve as a guide to officers in this country. No relaxation of the tests specified should be permitted, except on the express authority of the Local Government or Administration in each case. The conditions as regards manufacture may be modified as required by local conditions.

5. Nothing in this Resolution is to be taken as interfering with the discretion of the Local Governments concerned in regard to the employment of the agency of the various Government workshops for purposes of manufacture, or as implying that tenders must be called for in all cases from the firms named, or as restricting the power of the officers receiving the tenders to reject any or all of them as they may think fit.

6. Attention is drawn to paragraph 3 of Finance and Commerce Department Resolution No. 2650, dated 25th June 1891, which is quoted in the margin.

Paragraph 3 of Finance and Commerce Department Resolution No. 2650, dated the 25th June 1891.

"Having regard, however, to the representations contained in the memorial read above, and with the view of encouraging local industries and the development of technical education, His Excellency the Governor General in Council has now resolved to modify, as a tentative measure, the existing orders prohibiting the local purchase of manufactured articles of iron and steel made up from imported materials. In so doing the Governor General in Council desires it to be clearly understood that this relaxation of existing rules is sanctioned solely in the hope of thereby effecting economy in the public administration, both by actual saving in the cost of articles purchased locally, and by avoiding the delays that are sometimes inevitable when the articles have to be procured by indent on England. It is not intended to sanction thereby a procedure in any degree of a protective nature, and firms that may obtain orders under this Resolution must be distinctly warned that no claim for compensation of any sort will be admitted in the event of its being found necessary to discontinue the practice of inviting tenders in India."

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The Governments of Madras, Bombay, Bengal, the North-Western Provinces and Oudh, and the Punjab.
The Chief Commissioners of the Central Provinces, Burma, Assam, and Coorg.
The Residents at Hyderabad and in Mysore.
The Agents to the Governor General in Central India, Rajputana, and Baluchistan.
The Directors General of Railways and Telegraphs.
The Consulting Engineers to the Government of India for Railways, Calcutta, Central Division, and Lucknow.
The Accountant General, Public Works Department.

ORDER.—Ordered, that this Resolution be communicated to the Local Governments and Administrations noted on the margin for information and guidance.

Ordered also, that copy be forwarded to the Military and Finance and Commerce Departments, and that it be published in the Supplement to the *Gazette of India*.

J. G. FORBES, *Colonel, R.E.,*

Secretary to the Government of India.

Documents accompanying.

1. Appendix A.—List of selected firms referred to in paragraph 2 of Resolution.
2. Appendix B.—Specifications referred to in paragraph 4.

G. C. Press, Simla.—No. 83 P. W. D.—16-6-92.—1,000.

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Enclosure No. 1 to P. W. D. Resolution No. 226-M. of 1892.

Appendix A.

List of the selected firms referred to in paragraph 2 of the Resolution.

In the Bengal Presidency.

1.—The Bengal Iron and Steel Company, Limited, Barrakar.

2.—Messrs. Burn & Co.
3.— ,, Jessop & Co.
4.— ,, John King & Co.
5.— ,, Parry & Co.
6.— ,, Ahmuty & Co.
} of Calcutta.

In the Bombay Presidency.

7.—Messrs. G. Gahagan & Co.
8.— ,, Richardson & Cruddas
} of Bombay.

9.— ,, Cosser & Co.
10.— ,, Mackenzie & Co.
} of Karachi, Sind.

In the Madras Presidency.

11.—Messrs. Massey & Co.
12.— ,, Oakes & Co.
13.— ,, Bhoram & Co.
} of Madras.

In the Punjab.

14.—Messrs. J. Robson & Co. of Lahore.

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Enclosure No. 2 to P. W. D. Resolution No. 226-M. of 1892.

APPENDIX B.

METRE GAUGE.

Specification of Ironwork of Bridges, spans of 6, 12, 20, and 40 feet.

Materials.

2. The wrought-iron is to be well and cleanly rolled to the full sections shewn on the drawing or in the specification, and free from scales, blisters, laminations, cracked edges, and defects of every sort, and the name of the maker is to be rolled or stamped on every piece.

It must be of such strength and quality as to be equal to the following tensional strains, and to indicate the following percentages of contraction of the tested area at the point of fracture, and percentages of elongation:

	Tensional stresses per square inch.	Percentage of contraction of fractured area.	Percentages of elongations in a length of 10 inches.
	Tons.		
Round and square bars, and flat bars under 6 inches wide .	24	20	15
Angle and T- bars, and flat bars 6 inches wide and upwards .	22	15	12
Plates	21	10	8
Plates across grain	18	5	4

The rivet iron must be of such a quality that any rivet will stand the following tests without showing signs of failure:

Bending double upon itself whilst cold.

Bending double upon itself whilst red hot.

The shank being nicked whilst cold and bent double, showing the fibre of the iron to be of good quality.

Flattening down the head whilst red hot until its diameter is equal to $2\frac{1}{2}$ times that of the shank, without showing any signs of cracking at the edges.

Punching through the shank when at a red heat, with a taper punch, a round hole the diameter of the rivet, without showing signs of cracking or splitting.

The tests are to be conducted at the works of the Contractor or elsewhere, or both, as may be determined by the Consulting Engineer. The expense of the tests is to be borne as provided for in the Conditions of Contract.

No material is to be used which, in the opinion of the Consulting Engineer, falls short of the tests and other requirements of the specification, and no iron of foreign manufacture is to be used throughout the Contract.

Manufacture.

3. It is to be expressly understood that the greatest accuracy is to be observed in every part of the work, a main object of the designs being to facilitate as much as possible the erection of the work in India by perfection of workmanship in this country. All corresponding parts of all spans must be made exactly similar and interchangeable.

4. All plates and bars must be rolled to the full sections, and the angle irons to the full widths and weights per foot, shown on the drawings. All angle irons which do not hold their full widths and weights from end to end, or which have rough, jagged, or imperfect edges or ends, will be rejected.

5. All plates, bars, T-bars, and angle irons must be carefully levelled and straightened (the angle and T-bars by pressure and not by hammering) before and after they are punched or drilled. All edges of all plates, and the ends of all angle irons and bars, must be planed dead true to the dimensions, or, where planing is impossible, they must be dressed off fair with hammer, chisel, and file. No rough edges fresh from the shears will be permitted anywhere throughout the work.

6. All rivet holes to be filled in India are to be *drilled*.

All other rivet holes may be either drilled or punched, at the option of the Contractor, but any plate or bar in which the holes are not accurately in place will be rejected. The holes through which any one rivet passes must correspond in any number of plates or bars.

Although the word "rivets" may be used on the drawings, the rivet *holes* are to be made the sizes figured, and in no case must the diameter of the rivet be more than $\frac{1}{32}$ inch less than the diameter of the hole it has to fill. All loose rivets, and rivets with cracked, badly formed, or deficient heads, must be cut out and replaced by others. Rivets must also be cut out when required for the examination of the work. All riveted work must be absolutely in contact all over the whole surface.

All rivets, unless otherwise specified, are to be cup-headed at each end, and the heads are to contain not less than $1\frac{1}{4}$ diameters of the rivet.

Whenever necessary for the division of the work for transport, the rivets are to be left out, but the holes in all cases must be drilled ready for riveting, and all the requisite rivets, including the spare rivets, must be sent with the ironwork.

7. In all cover plates, except in webs, the fibre of the iron must run in the direction of the length of the span.

The gussets and cover plates must be shaped to the full sizes shewn on the drawings, and any plate in which the rivet holes have been drilled nearer to the edge than shewn on the drawings will be rejected.

Where cover plates are used to connect plates of different thicknesses, so much of the covers must be planed down as will make them fit fairly over the joint, no packing plates being allowed. The figured dimensions on the drawings, shew the different thicknesses after the cover plates have been planed down.

8. The main girders of all spans above 20 feet are to be built with a camber in the arc of a circle, the upper members being proportionately longer than the lower. The extent of the camber is in each case figured on the drawing.

The joints to be riveted in India must be chipped and filed so as to butt with perfect accuracy over the whole of the meeting surfaces to the true radius necessary for the specified camber, and any joint which fails to form a perfect butt all over will involve the rejection of the length or lengths of the members which cannot be made to fit without being shortened.

The spans of 20 feet and under are to be without camber.

9. The underside of the bearing plates of all main girders must be perfectly level and the rivets countersunk.

All bed plates are to be absolutely flat, and the guiding edges planed and truly parallel.

10. All bolts are to be screwed to Whitworth's standard thread, and all nuts must fit too tightly to be turned by hand. The heads and nuts for all timber bolts (except where otherwise shewn on the drawings) and service bolts are to be square; for other bolts they are to be hexagonal.

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The head and body of all bolts are to be forged out of one piece of rod or bar iron. All bolts are to be screwed for a length of three diameters.

Completion of Work and Erection.

11. All the spans are to be temporarily erected complete, so that accuracy of fit and perfection of workmanship may be assured.

As the work is erected, all the holes which are left to be riveted in India must be filed at one and the same time by temporary bolts $\frac{1}{16}$ inch less in diameter than the holes which they fill firmly screwed or keyed up. It will not be sufficient that bolts shall be placed in a certain number of holes only at a time, nor will it be sufficient that only such a number of bolts shall be inserted as may temporarily hold the span together.

Painting, Marking, &c.

12. The whole of the ironwork, with the exception of the bolts and rivets, is to be scraped perfectly free from rust, scale, and dirt, and then brushed all over with boiling hot linseed oil. It is afterwards to be painted with two coats of good oil paint, the first being of red lead and the second of Roman ochre, or other colours to be specially approved by the Consulting Engineer. Wherever plates or bars are to be riveted together, the surfaces that will be in contact are to be thoroughly cleaned immediately before plating, and one of them is to be covered with a good coat of red lead paint.

One end of every case is to be painted the same colour as the span for which its contents are intended.

The bolts (including the service bolts) and rivets are to be heated to the temperature of melted lead, and then dipped into boiled linseed oil.

13. Every portion of every span is to be very distinctly stencilled with paint and marked with the punch for guidance in erection in India, and every piece or bundle of iron is to be similarly marked, and every packing case branded, with such shipping marks as the Consulting Engineer may require.

All parts of the work are to be stamped with the letters "I. S. R."

A neat casting bearing the name of the manufacturer, with place and date of manufacture, is to be bolted conspicuously on every main girder.

5' 6" GAUGE.

Specification of Ironwork of Bridges, spans of 6, 12, 20, 40, and 60 feet.

Materials.

2. The wrought-iron is to be well and cleanly rolled to the full sections shewn on the drawing or in the specification, and free from scales, blisters, laminations, cracked edges, and defects of every sort, and the name of the maker is to be rolled or stamped on every piece.

It must be of such strength and quality as to be equal to the following tensional stresses, and to indicate the following percentages of contraction of the tested area at the point of fracture, and percentages of elongation:

	Tensional stresses per square inch.	Percentage of contraction of fractured area.	Percentages of elongations in a length of 10 inches.
	Tons.		
Round and square bars, and flat bars under 6 inches wide	24	20	15
Angle and flat bars, 6 inches wide and upwards	22	15	12
Plates	21	10	8
Plates across grain	18	5	4

The rivet iron must be of such a quality that any rivet will stand the following tests:

Bending double upon itself whilst cold or red hot without showing signs of fracture.

The shank being nicked whilst cold and bent double, showing the fibre of the iron to be of good quality.

Flattening down the head whilst red hot until its diameter is equal to $2\frac{1}{2}$ times that of the shank, without shewing signs of cracking at the edges.

Punching through the shank when at a red heat, with a taper punch, a round hole the diameter of the rivet, without shewing signs of cracking or splitting.

The tests are to be conducted at the works of the Contractor or elsewhere, or both, as may be determined by the Consulting Engineer. The expense of the tests is to be borne as provided for in the Conditions of Contract.

No material is to be used which, in the opinion of the Consulting Engineer, falls short of the tests and other requirements of the specification, and no iron of foreign manufacture is to be used throughout the Contract.

Manufacture.

3. It is to be expressly understood that the greatest accuracy is to be observed in every part of the work, a main object of the designs being to facilitate as much as possible the erection of the work in India by perfection of workmanship in this country. All corresponding parts of all spans must be made exactly similar and interchangeable.

4. All plates and bars must be rolled to the full sections, and the angle irons to the full widths and weights per foot, shown on the drawings. All angle irons which do not hold their full widths and weights from end to end, or which have rough, jagged, or imperfect edges or ends, will be rejected.

5. All plates, bars, and angle irons must be carefully levelled and straightened (*the angle bars by pressure and not by hammering*) before and after they are punched or drilled. All edges of all plates, and the ends of all angle irons and bars, must be planed dead true to the dimensions, or, where planing is impossible, they must be dressed off fair with hammer, chisel, and file. No rough edges fresh from the shears will be permitted anywhere throughout the work.

6. All the rivet holes to be filled in India are to be *drilled.*

All other rivet holes may be either drilled or punched, at the option of the Contractor, but any plate or bar in which the holes are not accurately in place will be rejected. The holes through which any one rivet passes must correspond in any number of plates or bars.

All holes to be punched must be marked off with a centre punch, and punched with a nipple punch.

Although the word "rivets" may be used on the drawings, the rivet *holes* are to be made the sizes figured, and in no case must the diameter of the rivet under the head be more than $\frac{1}{32}$ inch less than the diameter of the hole for which it is intended. All loose rivets, and rivets with cracked, badly formed, or deficient heads, must be cut out and replaced by others. Rivets must also be cut out when required for the examination of the work. All riveted work must be absolutely in contact all over the whole surface.

All rivets, unless otherwise specified, are to be cup-headed at each end, and the shank of the rivet must project through the rivet hole before closing by a length of at least $1\frac{3}{8}$ diameters for a drilled hole and $1\frac{1}{2}$ diameters for a punched hole, a further and sufficient allowance for filling the hole being also made when the rivet passes through more than two plates or bars.

Whenever necessary for the division of the work for transport, the rivets are to be left out, but the holes, except those hereinafter mentioned, must in all cases be drilled or punched for riveting, and all the requisite rivets, including the 50 per cent. extra, must be sent with the ironwork.

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7. In all cover plates, except in webs, the fibre of the iron must run in the direction of the length of the span.

The gussets and cover plates must be shaped to the full sizes shewn on the drawings, and any plate in which the rivet holes have been drilled nearer to the edge than shewn on the drawings will be rejected.

8. The main girders of all spans above 20 feet are to be built with a camber in the arc of a circle, the upper members being proportionately longer than the lower. The extent of the camber is figured on the drawing. Spans of 20 feet and under are to be without camber.

The joints to be riveted in India must be chipped and filed so as to butt with perfect accuracy over the whole of the meeting surfaces to the true radius necessary for the specified camber, and any joint which fails to form a perfect butt all over will involve the rejection of the length or lengths of the members which cannot be made to fit without being shortened.

9. The underside of the bearing plates of the main girders must be perfectly level and the rivets countersunk.

10. All bolts are to be screwed to Whitworth's standard thread, and all nuts must fit too tightly to be turned by hand. The heads and nuts for all timber bolts (except hook bolts) and service bolts are to be square; for other bolts they are to be hexagonal.

The head and body of all bolts are to be forged out of one piece of rod or bar iron. All bolts, except those which are fitted, are to be screwed for a length of three diameters.

5′ 6″ GAUGE.

Specification of Steelwork, &c., for Bridges, spans of 40, 20, 12, and 6 feet.

Materials.

2. The bridges, including bolts, nuts, and rivets, are to be entirely of steel, except that iron may be used for service bolts, packings, and washers. The steel is to be well and cleanly rolled to the full sections shewn on the drawings or named in the specification, and free from scales, blisters, laminations, cracked edges, and defects of every sort, and the name of the maker, and the distinguishing number of the plate or bar, are to be rolled or stamped on every piece. The names of the makers from whom it is proposed to obtain the steel are to be submitted for approval to the Consulting Engineer.

The steel must be of such strength and quality as to be equal to the following tensional stresses, and to indicate the following percentages of elongation:

	Tensional stresses per square inch.	Percentages of elongation in a length of 10 inches.
	Tons.	
Steel in plates, either with or across the grain, and in angle or other bars, not less than	27	20
Or more than	31	
Steel rods for rivets and bolts not less than	25	25
Or more than	28	

Strips of steel, whether cut lengthwise or crosswise of any plate or bar, heated to a low cherry red, and cooled in water at a temperature of 82° Fahrenheit, must stand bending double round a curve of which the diameter is not more than three times the thickness of the piece tested. In addition to this, angle and other bars must stand the test known at Lloyd's as the ram's horn test.

All rivets and bolts are to be of steel, and the steel used for them must be ingot steel of a special quality, and the rivets and bolts must stand bending double, both hot and cold, and also flattening down from the head, without shewing cracks or other defects.

Side and end shearings must be taken as samples from every plate and flat bar and from as many angle, T, channel, and other bars as the Consulting Engineer shall require. At least 20 per cent. of the samples so taken will be tested for tensile strength, and the whole of them for bending in the manner described above; but it is to be distinctly understood that power is reserved to test every plate and bar for tensile strength if the Consulting Engineer think fit; also that such power will be exercised in the event of there being in his opinion any indication that the material supplied is not equal in every respect to the requirements or intentions of this specification. For this purpose each sample must bear a number stamped to the satisfaction of the Consulting Engineer corresponding to the plate or bar from which it is taken, and all samples must be kept until the completion of the Contract.

In addition to the above tests, samples of the steel supplied for use will be from time to time chemically examined; and should such examination shew the presence of silicon, phosphorus, or sulphur to a greater extent than 0·06 per cent. of any one of them, no further supplies of steel will be accepted from the makers of the bad sample until the Consulting Engineer is satisfied that in future supplies the percentages of silicon, phosphorus, and sulphur will be reduced so as not to exceed the maximum limit.

All the above tests, with the exception of the analyses, are to be conducted at the works where the steel is manufactured by some person to be appointed by the Consulting Engineer. Other tests may be conducted elsewhere, as the Consulting Engineer may direct. The expense of the tests and analyses is to be borne as provided for in the Conditions of Contract.

No plate or bar is to be annealed or otherwise manipulated after leaving the rolls without the special authority of the Consulting Engineer and his approval of the process employed, and when annealing is permitted, the test pieces are not to be cut off till the annealing is completed.

No material is to be used which, in the opinion of the Consulting Engineer, falls short of the tests and other requirements of the specification.

Firms tendering are required to submit with their tender the names of the makers from whom they propose to obtain the steel, and, in the event of the acceptance of their tender, it will be upon the understanding that the steel will actually be obtained from such firms, unless written permission be given to the contrary.

Manufacture.

3. It is to be expressly understood that the greatest accuracy is to be observed in every part of the work, a main object of the designs being to facilitate as much as possible the erection of the bridges in India by perfection of workmanship in this country. All corresponding parts of them must be made exactly similar and interchangeable.

4. All plates and bars must be rolled to the full sections, and bars to the full weights per foot, shown on the drawings. All angle or other bars which do not hold their full widths and weights from end to end, or which have rough, jagged, or imperfect edges or ends, will be rejected.

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5. All plates and bars must be carefully levelled and straightened (*by pressure and not by hammering*) before and after they are punched or drilled. All edges of all plates, and the ends of all bars, of every kind, must be planed dead true to the dimensions, or, where planing is impossible, they must be dressed off fair with hammer, chisel, and file. Every sheared edge, whether of a plate or bar, must have at least $\frac{1}{8}$th of an inch taken off it by machine or by the chisel, and any plate or bar too small to leave $\frac{1}{8}$th of an inch for planing or chipping on every sheared edge will be rejected.

6. All holes are to be drilled, but the Contractor may, if he think proper, first punch a smaller hole of such diameter in each case as to leave at least $\frac{1}{8}$th inch of material all round to be subsequently drilled out; thus the *punched* hole intended to be enlarged to $\frac{3}{4}$ inch must not exceed at the largest end $\frac{3}{4}$ inch in diameter. When punched holes are thus drilled out, the punching must be so accurate that when the work is put together before drilling, a rivet $\frac{1}{32}$ inch less in diameter than the size of the punched hole can be easily passed through all the holes. All burrs left by the drill are to be completely removed. All punched holes are to be marked off with a centre punch, and punched with a nipple punch.

7. Although the word "rivets" may be used on the drawings, the rivet *holes* are to be made the sizes figured. All riveting is to be done by hydraulic, steam, or other machines of approved construction, and in no case must the diameter of the rivet under the head be more than $\frac{1}{32}$nd inch less than the diameter of the hole it is intended to fill. All loose rivets and rivets with cracked, badly formed, or deficient heads must be cut out and replaced by others.

Rivets must be cut out when required for the examination of the work.

All rivets are to be cup-headed at each end, and the heads are to project through the holes before closing not less than $1\frac{3}{8}$ diameters for a drilled hole and $1\frac{1}{2}$ diameters for a punched hole, a further and sufficient allowance for filling the hole being also made when the rivet passes through more than two plates or bars.

All plates must be shaped to the full sizes shewn on the drawings, and any plate or bar in which the rivet holes have been made nearer to the edge than shewn on the drawings will be rejected.

8. The ends of all plates, &c., must be chipped and filed so as to butt with perfect accuracy over the whole of the meeting surfaces, and any joint which fails to form a perfect butt all over will involve the rejection of the plates and bars which cannot be made to fit.

9. All screwed bolts are to be screwed to Whitworth's standard thread, and all nuts must fit too tightly to be turned by hand. The heads and nuts (except those for timber bolts, which are to be square) are to be hexagonal. The head and body of all bolts are to be forged out of one piece.

10. The bearing plates are to be perfectly level, and all rivet heads bearing on them countersunk and chipped flush with the surface.

Specification of Ironwork for Engine and Goods Sheds Roofing.

Materials.

2. The wrought-iron is to be well and cleanly rolled to the full sections shewn on the drawings or in the specification, and free from scales, blisters, laminations, cracked edges, and defects of every sort, and the name of the maker, and the distinguishing number of the plate or bar, are to be rolled or stamped on every piece.

The wrought-iron must be of such strength and quality as to be equal to the following tensional stresses, and to indicate the following percentages of elongation:—

	Tensional stresses per square inch.	Percentage of elongation in a length of 10 inches.
	Tons.	
Wrought-iron, round and square bars, and flat bars under 6 inches wide	24	15
Wrought-iron, angle, T, H, and channel bars and flat bars 6 inches wide and upwards	22	12
Wrought-iron plates	21	8
" " " across grain	18	3

The rivet iron must be of such a quality that any piece of it made into a rivet will stand the following tests:

Bending double upon itself whilst cold or red hot without shewing signs of failure.

The shank being nicked whilst cold and bent double shewing the fibre of the iron to be of good quality.

Flattening down the head whilst red hot until its diameter is equal to $2\frac{1}{2}$ times that of the shank, without shewing any signs of cracking at the edges.

Punching through the shank when at a red heat, with a taper punch, a round hole the diameter of the rivet, without shewing signs of cracking or splitting.

The tests are to be conducted at the works of the Contractor or elsewhere, or both, as may be determined by the Consulting Engineer. The expense of the tests is to be borne as provided for in the Conditions of Contract.

No material is to be used which, in the opinion of the Consulting Engineer, falls short of the tests and other requirements of the specification.

Manufacture.

3. It is to be expressly understood that the greatest accuracy is to be observed in every part of the work, a main object of the designs being to facilitate as much as possible the erection of the work abroad by perfection of workmanship in this country. All corresponding parts must be made exactly similar and interchangeable.

4. All plates and bars must be rolled to the full sections and weights per foot shown on the drawings. All bars which do not hold their full widths and weights from end to end, or which have rough, jagged, or imperfect edges or ends, will be rejected.

5. All plates and bars must be carefully levelled and straightened (*by pressure and not by hammering*) before and after they are punched or drilled. All edges of all plates, and the ends of all bars, of every kind, must be planed dead true to the dimensions, or, where planing is impossible, they must be dressed off fair with hammer, chisel, and file.

6. All holes which are left unfilled are to be drilled, but the Contractor may, if he think proper, first punch a smaller hole of such diameter in each case as to leave at least $\frac{1}{8}$th inch of material all round to be subsequently drilled out; thus the *punched* hole intended to be enlarged to $\frac{3}{4}$ inch must not exceed at the largest end $\frac{1}{2}$ inch in diameter. All burrs left by the drill are to be completely removed. The other holes may be punched or drilled, at the option of the Contractor, but any plate or bar in which the holes are not accurately in

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place will be rejected. All punched holes are to be marked off with a centre punch, and punched with a nipple punch. All ironwork intended to be riveted or bolted together must be absolutely in contact over the whole surface.

Although the word "rivets" may be used on the drawings, the rivet *holes* are to be made the sizes figured. All riveting is to be done by hydraulic, steam, or other machines of approved construction, and in no case must the diameter of the rivet under the head be more than $\frac{1}{32}$nd inch less than the diameter of the hole it is intended to fill. All loose rivets, and rivets with cracked, badly formed, or deficient heads, must be cut out and replaced by others.

Rivets must be cut out when required for the examination of the work.

All rivets are to be cup-headed at each end, and the heads are to contain not less than $1\frac{1}{2}$ diameters of the rivet.

7. The gussets and cover plates must be shaped to the full sizes shewn on the drawings, and any plate or bar in which the rivet holes have been made nearer to the edge than shewn on the drawings will be rejected.

8. In all cover plates the fibre of the material must run in the direction of the length of the principal strains.

9. The ends of all plates, &c., to be jointed abroad must butt with perfect accuracy over the whole of the meeting surfaces, and any joint which fails to form a perfect butt all over will involve the rejection of the plates and bars which cannot be made to fit without being shortened.

10. All screwed bolts are to be screwed to Whitworth's standard thread, and all nuts must fit too tightly to be turned by hand. The head and body of all bolts are to be forged out of one piece of rod or bar iron.

11. All bolts are to be turned and fitted to the work. The holes are to be bored for them the exact size, so that the bolts have no shake whatever in the holes.

Completion of Work and Erection.

12. The work is to be erected temporarily complete as a whole in every respect, with all bolts, nuts, and washers in place, so that accuracy of fit and perfection of workmanship may be ascertained by inspection.

Painting, Marking, &c.

13. The whole of the ironwork, with the exception of the bolts, nuts, washers, and rivets, after being scraped perfectly free from rust, scale, and dirt, and well brushed with steel brushes, is then to be immediately painted with one good coat of red oxide of iron paint. It is afterwards to be painted with one coat of good oil paint of such colour as shall be approved by the Consulting Engineer. The bolts are to be heated to the temperature of melted lead, and then dipped into boiling linseed oil. Wherever plates or bars are to be riveted together, the surfaces that will be in contact are to be well cleaned immediately before plating.

14. Every portion of the work is to be very distinctly stencilled with paint and marked with the punch for guidance in erection, and every piece or bundle of iron is to be similarly marked, and every packing case branded with such shipping and other marks as the Consulting Engineer may require.

Packing, &c.

15. The work is to be sent out in convenient parts for shipping and for erection, divided as indicated on the drawings.

All projecting plates or angle bars are to be kept in shape by timber or angle irons bolted or spiked to them, as may be directed by the Consulting Engineer.

16. All straight bars and plates, except small pieces, are to be sent out in convenient bundles temporarily riveted or bolted together, or bound with rod iron, as may be directed by the Consulting Engineer.

All bolts, nuts, and washers, all plates under 12 inches square, and generally such small articles as may be selected by the Consulting Engineer, are to be packed in strong cases, each weighing, when full, not more than 7 cwt. The cases are to be made of 1¼-inch deal boards, with 1½-inch elm ends, nailed with 3½-inch wire nails, and strengthened by battens and 1½-inch No. 16 B. W. G. hoop iron, and the whole made secure for transit to India.

17. The cost of all painting, temporary erection, testing, marking, packing, and delivery is to be included in the price named in the tender.

No. 1905 W dt 12th July '92

Comd to officers of the P.W.D. for information and guidance with reference to the undermentioned orders.

G.O. No. 2268 W dt 21-8-91
" 53 W dt 5-1-92
" 234 W dt 23-1-92

by order J.S.
W.

To
E I
E R
S Es
C A to Govt
S of W P Projects
Ex P W Accts
Financial Dept.

[K. C. M.] G. C. Press, Simla.—No. 83 P. W. D.—15-7-92—1,000.