

Public Works (1890) Department.

RAILWAY BRANCH.

G.O., No. 344 Ry.

DATED 12th March

[Despatch Abstract.]

Indents for Iron and steel. — Circular from the Govt of India Communicating despatch from the Secretary of State containing instructions for the preparation of —, communicated to the Consulting Engineer for Railways.

To The Joint Secretary to the Government of Madras,
(Railway Branch) Public Works Department.

[Enclosure in above Despatch.]

SUGGESTIONS AS TO THE PREPARATION IN INDIA OF INDENTS FOR IRON AND STEEL.

Bar Iron and Bar Steel (Mild).

1. Unless certain lengths are required for a specific purpose the indent should show for each item the section and total weight only, the bars will then be supplied in commercial lengths (see paragraph 6 of Specification of Iron and paragraph 9 of Specification of Bar Steel). When dead lengths are required, *i.e.*, lengths correct to within one-eighth of an inch, "in dead lengths" should be specified in the indent. Commercial lengths are generally correct to within about 3 inches, *i.e.*, 19 ft. 9 ins. or 20 ft. 3 ins. would be passed as 20 feet.

Plates and Sheets (Iron and Mild Steel).

2. The dimensions and total weight required should in all cases be stated, but unless a certain number of plates or sheets is required the number should not be stated but only the total weight required. When plates of special sizes are demanded it should be stated whether the length or width is to be adhered to, in case manufacturers are unable to supply plates of the dimensions required. The limits given below should in no case be exceeded:

MAXIMUM.			
Thickness.	Length.	Width.	Area.
	Feet.	Ft. ins.	Sq. feet.
$\frac{1}{8}$	14	4 0	28
$\frac{3}{8}$	18	4 6	31
$\frac{1}{2}$	22	5 0	40
$\frac{5}{8}$	25	5 3	50
$\frac{3}{4}$	30	5 6	65
$\frac{7}{8}$	33	6 3	75
1	35	6 9	80
$1\frac{1}{8}$	38	7 3	90
$1\frac{1}{4}$	40	7 9	100
$1\frac{3}{8}$	40	8 0	110
$1\frac{1}{2}$	40	8 4	120
$1\frac{3}{4}$	37	8 9	130
2	35	8 9	130
$2\frac{1}{4}$	31	8 9	125
$2\frac{3}{4}$	31	8 9	120
3	28	8 9	110

The maximum area divided by any length (not exceeding maximum) will give maximum width for that length; maximum length for any given width (not exceeding maximum) can be similarly determined.

Corrugated Sheets.

3. The thickness should be stated by the Imperial Standard wire gauge (S. W. G.) before galvanizing, and the size of the flutes given; those most commonly used are 3 ins. $\times$ $\frac{3}{4}$ in. and 5 ins. $\times$ $1\frac{1}{2}$ ins. The usual dimensions for length and width (from centre to centre of outside flutes) are 7 to 8 feet and 2 $\frac{1}{2}$ feet respectively. Sheets of larger dimensions are charged for as extra sizes. The number of sheets required or the weight should be stated in the indent, if both are stated the number will be followed in execution.

Cast Steel.

4. In demanding cast steel care should be taken to specify the percentage of carbon required or the purpose for which the steel is to be used, as otherwise manufacturers cannot determine the most suitable "temper" (or percentages of carbon) for the supplies. When this information is omitted the size is the only clue to guide the manufacturer, and it affords no guidance whatever in the case of round or square sections. The following is a list of the most useful tempers:—

Razor temper ($1\frac{1}{2}$ per cent. of carbon) can only be placed in the hands of skilful workmen. If properly treated, useful for turning chilled rolls.

Saw-file temper ($1\frac{3}{8}$ per cent.) requires careful treatment, should not be heated above cherry red.

Tool temper ($1\frac{1}{4}$ per cent.), useful for turning tools, drills, and planing machine tools; can only be welded with greatest care and skill.

Spindle temper ($1\frac{1}{8}$ per cent.), useful for circular cutters, very large turning tools, taps, screwing dies, &c.; considerable care required in welding.

Chisel temper (1 per cent.), very tough when unhardened, and hardens at a low heat. Well adapted for tools such as cold chisels, hot setts, &c., which require a hard cutting edge, but whose unhardened parts must stand the blow of a hammer without snipping.

Sett temper ($\frac{2}{3}$ per cent.), useful for tools such as cold setts whose unhardened parts have to stand the blows of a very heavy hammer. Easily welded by skilled workmen.

Die temper ($\frac{3}{4}$ per cent.), useful for tools requiring the surface only to be hard, and capable of standing great pressure, such as stamping or pressing dies. Easily welded by a skilled workman.

The above information as to cast steel is taken from a paper by Henry Seebohm, read before the Iron and Steel Institute in 1884.

Calculation of Estimated Weights.

To ensure uniformity in the method of estimating the weights of iron and steel demanded it is desirable that Jordan's Tabulated Weights of Iron and Steel should be used.

INDIAN STATE RAILWAYS.

SPECIFICATION OF STEEL.

NOTE AS TO SCHEDULE WEIGHTS OF IRON AND STEEL.

Sizes and Quantities.

[In cases where the number and dimensions of bars, plates, &c., are specified, the schedule weights include an allowance of 5 per cent. above "book" weights, and show the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.]

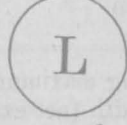
1. The sizes given must be strictly adhered to, and the quantities in no case be exceeded. To make up the weight specified, one shorter bar, &c., of each description will be accepted, unless the numbers and dimensions are stated in the schedule, in addition to the weights, which, in such cases, include an allowance of 5 per cent. above book weights. These weights are therefore the maximum that will be paid for. Payment will not, however, be made for more than the actual weight supplied of any size.

Materials.

2. All the materials comprised in this Specification are to be the very best of their respective kinds, and free from defects and imperfections of every description. The name of the maker and the letters "I.S.R." are to be stamped on every piece.

Cast Steel.

3. The cast steel is to be of the very best description made from blister steel made of

Swedish iron, of the  Leufsta or O.O. brands, well selected, and of suitable temper

for the purpose intended, and very carefully cast in small crucibles. Every bar is to be perfectly sound, free from defects, and in lengths of 10 feet unless otherwise arranged.

Shear Steel.

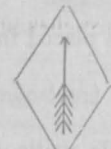
4. The shear steel is to be the best warranted "double" shear steel made from O.O. blister steel, and every bar must be carefully made, so that it may be perfectly sound from end to end.

Blister Steel.

5. The blister steel is to be of the kind known under the brand O.O.

Ferrule Steel.

6. The ferrule steel is to be of the sizes specified, and made from Swedish iron of the

brands  , C.B. or A.M., or , properly cemented.

7. The shear, blister, and ferrule steel are to be in lengths of 15 feet, unless otherwise specified.

Steel Wire.

8. The steel wire is to be made of the same brands of Swedish iron as the ferrule steel, and is to be bound up in coils not exceeding $\frac{1}{2}$ cwt. each.

Testing.

9. Samples of each kind of steel will be taken from the bulk for testing. The samples taken from the crucible cast steel will be made into tools and tested in such a manner as the Superintendent, India Store Depot, shall direct, and no steel will be accepted which, in the opinion of the Superintendent, India Store Depot, falls short of the tests and requirements of this specification.

The manufacture of the tools, and the testing of all other descriptions of the steel, are to be carried out at the Contractor's works at his expense, and the tools and tested samples are to be forwarded free of charge to the Superintendent, India Store Depot.

10. The Superintendent, India Store Depot, is to have full power to subject every bar to any test or tests to determine if the steel is suitable for the purpose intended, should he deem it advisable to do so.

Oiling, Packing, and Marking.

11. All the steel of every description is to be thoroughly cleansed and then coated with the best quickly-drying linseed oil. The cast and shear steel and steel wire, when dry, is to be packed in cases made in accordance with the Specification of Packing Cases annexed hereto. The blister and ferrule steel, when dry, are to be packed in bundles not exceeding 2 cwt. each, bound round with $\frac{3}{8}$ -inch iron wire.

No case when full must weigh more than 7 cwt. Each case and bundle is to have clearly stencilled upon it in such colours as may be directed, the address and such descriptive and shipping marks as may be required by the Officers of the Department, and each of the bars packed in bundles is to have both ends painted with the same colour as the address for a length of 12 inches.

Address.

All samples sent to the India Store Depot, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch," and accompanied by a delivery note (Form 140) similarly marked.

SPECIFICATION OF BAR STEEL (ALL SECTIONS).

NOTE AS TO SCHEDULE WEIGHTS OF IRON AND STEEL.

[In cases where the number and dimensions of bars, plates, &c., are specified, the schedule weights include an allowance of 5 per cent. above "book" weights, and show the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.]

1. The steel is to be thoroughly well made, uniform in texture, and free from lamination and all defects of manufacture.

2. The Superintendent of the India Store Depot, or his deputy, will select such samples as may be necessary, at the Contractor's works, and will see pieces 16 inches in length cut from them for machine and forge tests; these pieces will be tested at the Contractor's works or elsewhere under direction of the Superintendent or his deputy, as may be directed at the time. The pieces are to be of parallel width for at least 8 inches of their length, and are to be turned or cut in a planing machine; those for forge tests are to have the sharp edges taken off.

3. The steel is to have an ultimate tensile strength of not less than 26 and not exceeding 30 tons per square inch of section, with a reduction of area of 40 per cent. at point of fracture.

4. Pieces heated uniformly to a low cherry red, and cooled in water of 82° Fahrenheit, must stand bending in a press to a curve of which the inner radius is one-and-a-half times the thickness of the steel tested.

5. The ductility of the bars will be ascertained by the application of one or both of these tests, or by bending them cold by the hammer.

6. Any steel not standing the specified test will be rejected.

7. The Contractor is, at his own expense, to cut and forward, as may be directed by the Superintendent, the samples which have been tested at his works, or which may be required for testing elsewhere.

8. No charge is to be made for the samples used in testing, nor for any testing carried out at the Contractor's works.

9. Bars, &c., are to be supplied in the following lengths, unless otherwise specified in the Schedule, and sent loose with the exceptions mentioned in paragraph 10:

Description of Steel.	Lengths.
Round,—	Feet.
$\frac{3}{8}$ inch diameter and under	14
$\frac{7}{8}$ inch to $1\frac{1}{8}$ inch diameter	16
Above $1\frac{1}{8}$ inch diameter	20
Square,—	
$\frac{3}{8}$ inch side and under	14
$\frac{7}{8}$ inch to $1\frac{1}{8}$ inch side	16
Above $1\frac{1}{8}$ inch side	20
Angle, tee, channel,—	
$\frac{3}{8}$ inch and under in thickness	16
Above $\frac{3}{8}$ inch in thickness	20
Flat bars	20
Hoop	36 to 40

The weights given in the Schedule must in no case be exceeded. To make up the Schedule weights one shorter bar, &c., of each description will be accepted, unless the numbers and dimensions are stated in the Schedule, in addition to the weights.

10. The following descriptions of steel are to be made up in bundles not exceeding 1½ cwt., and securely bound with $\frac{1}{4}$ -inch round iron, viz.,—Round, $\frac{3}{8}$ -inch diameter and under; square, $\frac{1}{4}$ inch side and under; flat bars, angle, tee, and channel, not exceeding 56 lbs. per length ordered; hoop, the bundles of latter to be about 8 feet long.

11. After approval in bulk, each piece of the steel is to be thoroughly cleansed from rust and dirt, and coated with best boiled quickly-drying linseed oil; all bundles and 10 per cent. of the pieces sent loose are to have the address stencilled on them in metallic paint near one end. Both ends of every piece, whether loose or in bundles, are to be painted same colour as the address for a length of 12 inches. The stencil plates must be supplied by the Contractor.

12. All steel is to bear the maker's name or brand legibly stamped.

13. Any inattention to these instructions will cause the steel to be rejected.

14. Notice in writing is to be given to the Superintendent of the India Store Depot, Belvedere Road, Lambeth, S.E., when the Contractor is ready to cut samples or to have steel examined.

Address.

All samples sent to the India Store Depot, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch," and are to be accompanied by a delivery note (Form 140) similarly marked.

SPECIFICATION OF STEEL PLATES AND SHEETS.

NOTE AS TO SCHEDULE WEIGHTS OF IRON AND STEEL.

[In cases where the number and dimensions of bars, plates, &c., are specified, the schedule weights include an allowance of 5 per cent. above "book" weights, and show the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.]

1. The steel is to be made by the Siemens-Martin or open-hearth process. Steel made by the basic process will not be accepted.

2. The Superintendent of the India Store Depot, or his deputy, will select such samples as may be necessary, at the Contractor's works, and will see pieces cut from them for machine and forge tests.

The pieces are to be 16 in. $\times$ 1 $\frac{1}{4}$ in. and are to be stamped with an arrow, indicating the direction of the length of the plate or sheet. They will be tested at the Contractor's works or elsewhere under direction of the Superintendent of the India Store Depot, or his deputy, as may be directed at the time.

3. Strips cut crosswise or lengthwise are to have an ultimate tensile strength of not less than 26 and not exceeding 30 tons per square inch of section, with a reduction of area of 35 per cent. at point of fracture.

For furnace and other plates exposed to flame, the ultimate tensile strength is not to exceed 26 tons per square inch, with a reduction of area of 35 per cent. at point of fracture.

4. Strips cut crosswise or lengthwise 1 $\frac{1}{2}$ inches wide, heated uniformly to a low cherry red, and cooled in water of 82° Fahrenheit, must stand bending in a press to a curve of which the inner radius is one and-a-half times the thickness of the steel tested.

5. The strips are to be of parallel width for at least 8 inches of their length, and are to be cut in a planing machine; those for forge tests are to have the sharp edges taken off.

6. The ductility of every plate or sheet will be ascertained by the application of one or both of these tests to the shearings, or by bending them cold by the hammer. Any which do not stand the tests will be rejected.

7. No charge is to be made for the samples used in testing, nor for any testing carried out at the Contractor's works.

8. The edges of all plates and sheets are to be cleanly sheared and truly squared to the dimensions given.

9. Plates and sheets above $\frac{1}{16}$ inch thickness are to be sent loose, those of $\frac{1}{16}$ inch and under are to be made up in bundles not exceeding 1 $\frac{1}{2}$ cwt. each; each bundle to be securely bound with not less than four clips of $\frac{3}{4}$ -inch half-round iron.

10. After approval in bulk, the plates or sheets are to be thoroughly cleansed from rust and dirt, and coated with best boiled quickly-drying linseed oil. All bundles and 10 per cent. of the plates or sheets sent loose are to have the address stencilled on them in

metallic paint near one end, and the number and dimensions of the plates or sheets near the other end. Both ends of every plate or sheet, whether loose or in bundles, are to be painted the same colour as the address for a length of 12 inches.

11. Stencil plates must be furnished by the Contractor.

12. Each plate or sheet is to bear the maker's name or brand legibly stamped on it.

13. Any inattention to these instructions will cause the steel to be rejected.

14. Notice in writing is to be given to the Superintendent of the India Store Depot, Belvedere Road, Lambeth, S.E., when the Contractor is ready to cut samples, or to have the plates or sheets examined.

Address.

All samples sent to the India Store Depot, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch," and are to be accompanied by a delivery note (Form 140) similarly marked.

SPECIFICATION OF IRON.

1. The iron is to be soft and fibrous, thoroughly well made, uniform in texture, and perfectly free from lamination and all defects of manufacture.

It will be subjected to the following tests for tensile strength and contraction of area, as well as to the forge tests in use in the India Store Depot, where patterns of these forge tests can be seen:—

Description of Iron.	Tensile Strains per Square Inch of original Section to be borne without breaking.	Reduction of Area at point of Fracture to be not less than	Pattern Nos. of Forge Tests.
	Tons.	Per cent.	
Bar, round or square	.	.	.
" flat and hoops	.	.	.
Angle	.	.	.
T	.	.	.
Rivet	.	.	.

2. The Superintendent of the India Store Depot, or his deputy, will select such samples as may be necessary, at the Contractor's works, and will see pieces 16 inches in length cut from them for machine and forge tests; these pieces will be tested at the Contractor's works or elsewhere under direction of the Superintendent or his deputy, as may be directed at the time.

3. Any iron not standing the specified test will be rejected.

4. The Contractor is, at his own expense, to cut and forward, as may be directed by the Superintendent, the samples which have been tested at his works, or which may be required for testing elsewhere.

5. No charge is to be made for the samples used in testing, nor for any testing carried out at the Contractor's works.

6. Bars, &c., are to be supplied in the following lengths, unless otherwise specified in the Schedule, and sent loose with the exceptions mentioned in para. 7:—

Description of Iron.	Lengths.
	Feet.
Rod,—	14
$\frac{3}{8}$ inch diameter and under	16
$\frac{1}{2}$ inch to $\frac{1 1}{8}$ inch diameter	20
Above $\frac{1 1}{8}$ inch diameter	
Square,—	14
$\frac{3}{8}$ inch side and under	16
$\frac{1}{2}$ inch to $\frac{1 1}{8}$ inch side	20
Above $\frac{1 1}{8}$ inch side	
Angle, tee, channel,—	16
$\frac{3}{8}$ inch and under in thickness	20
Above $\frac{3}{8}$ inch in thickness	20
Flat bars	36 to 40
Hoop	

The weights given in the Schedule must in no case be exceeded. To make up the Schedule weights one shorter bar, &c., of each description will be accepted, except in cases where the number and dimensions of the bars, &c., are specified, in addition to the weight. The Schedule weights in such cases include an allowance of 5 per cent. above "book" weights and show the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.

7. The following descriptions of iron are to be made up in bundles not exceeding 1 $\frac{1}{2}$ cwt., and securely bound with $\frac{1}{4}$ inch round iron, viz.:—Rod, $\frac{3}{8}$ inch diameter and under; square, $\frac{1 1}{8}$ inch side and under; flat bars, angle, tee, and channel, not exceeding 56 lbs. per length ordered; hoop, the bundles of latter to be about 8 feet long.

8. After approval in bulk, each piece of the iron is to be thoroughly cleansed from rust and dirt, and, unless otherwise ordered, coated with best boiled quickly-drying linseed oil; all bundles and 10 per cent. of the pieces sent loose are to have the address stencilled on them in metallic paint near one end. Both ends of every piece, whether loose or in bundles, are to be painted same colour as the address for a length of 12 inches. The stencil plates must be supplied by the Contractor.

9. All iron is to bear the maker's name or brand legibly stamped.

10. Any inattention to these instructions will cause the iron to be rejected.

11. Notice in writing is to be given to the Superintendent of the India Store Depot, Belvedere Road, Lambeth, S.E., when the Contractor is ready to cut samples or to have iron examined.

Address.

All samples sent to the India Store Depot, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch" and are to be accompanied by a delivery note (Form 140) similarly marked.

INDIAN STATE RAILWAYS.

SPECIFICATION OF WROUGHT IRON (PLATE, SHEET, ANGLE, TEE, BAR, AND ROD).

1. The iron is to be soft and fibrous, uniform in texture, well and cleanly rolled to the sections and dimensions given in the schedule, and free from scales, blisters, laminations, cracked edges, and defects of every sort; the name of the maker, and the letters are to be stamped on every piece. The iron must be particularly suited for smithing purposes.
2. It will be subjected to the following tests for tensile strength, contraction of area, and elongation, as well as to the forge tests in use at the India Store Depot, where patterns of the forge tests can be seen:—

Description of Iron.	Tensile Strain per square inch of original Section to be borne without breaking.	Contraction of Area at point of Fracture to be not less than	Pattern Nos. of Forge Tests.
Bars and rods, 4 square inches and under in sectional area, and hoop	Tons.	Per cent.	
Ditto ditto 4 to 8 square inches in sectional area	24	40	
Ditto ditto 8 square inches and above in sectional area	24	30	
Channel, angle, and tee iron	24	25	
	22	20	
Plates and sheets, lengthways of grain		Elongation in a length of 8 inches to be not less than	
Ditto, across grain	21	10	
	18	5	

3. In addition to standing the forge and machine tests, the plate and sheet iron is to bend cold through the following angles, viz.:—

Thickness of Plate.	With the Grain.	Across the Grain.
1 inch and $\frac{1}{8}$ inch	Degrees.	Degrees.
$\frac{1}{8}$ " " $\frac{1}{8}$ "	15	5
$\frac{1}{4}$ " " $\frac{1}{4}$ "	20	7 $\frac{1}{2}$
$\frac{3}{8}$ " " $\frac{3}{8}$ "	22 $\frac{1}{2}$	10
$\frac{1}{2}$ " " $\frac{1}{2}$ "	25	10
$\frac{5}{8}$ " " $\frac{5}{8}$ "	27 $\frac{1}{2}$	12 $\frac{1}{2}$
$\frac{3}{4}$ " " $\frac{3}{4}$ "	30	12 $\frac{1}{2}$
$\frac{7}{8}$ " " $\frac{7}{8}$ "	35	15
1 " " 1 " "	42 $\frac{1}{2}$	17 $\frac{1}{2}$
$\frac{1}{2}$ " " $\frac{1}{2}$ "	50	20
$\frac{3}{4}$ " " $\frac{3}{4}$ "	60	25
$\frac{7}{8}$ " " $\frac{7}{8}$ "	70	30
1 " " 1 " "	125	80
$\frac{1}{2}$ inch to $\frac{3}{4}$ inch	130	85
Under $\frac{3}{4}$ inch	135	90
	180	180

The inner radius of the curve at the bend not to exceed $1\frac{1}{2}$ times the thickness of the plate or sheet.

Ditto, ditto, $\frac{1}{2}$ thickness of sheet; i.e., the iron is to bend double round its own thickness.

4. The Superintendent of the India Store Depot, or his deputy, will select such samples as may be necessary at the Contractor's works, and will see pieces 16 inches in length cut from them, which will be sent to the Depot or elsewhere to be tested as may be directed by the Superintendent at the time; those for sheet iron should invariably be 16 inches by 3 inches and, with those for plate, are to be lightly stamped with the letters L and C, and with an arrow indicating the direction of the grain. Pieces for forge test (8 inches by 6 inches) will be cut at the same time. Any iron not standing the specified tests will be rejected.

5. The Contractor is, at his own expense, to cut and forward, as may be directed by the Superintendent, the samples which have been tested at his works, or which may be required for testing elsewhere.

6. No charge is to be made for the samples used in testing, nor for any testing carried out at the Contractor's works.

7. The edges of all sheets and plates are to be cleanly sheared and truly square to the dimensions given. Bars, &c., to be supplied in the following lengths:—

Description of Iron.	Lengths.
	Feet.
Rod, $\frac{3}{8}$ inch diameter and under	14
" $\frac{1}{2}$ inch to $\frac{1}{4}$ inch diameter	16
" above $\frac{1}{4}$ inch diameter	20
Square, $\frac{3}{8}$ inch side and under	14
" $\frac{1}{2}$ inch to $\frac{1}{4}$ inch side	16
" above $\frac{1}{4}$ inch side	20
Angle, tee, channel, $\frac{3}{8}$ inch and under in thickness	16
" above $\frac{1}{2}$ inch in thickness	20
Flat bars " " above $\frac{1}{2}$ inch in thickness	20

8. The weights given in the schedule must in no case be exceeded. To make up the schedule weights one shorter plate, sheet, or bar, &c., of each description will be accepted except where the number and dimensions of the bars, &c., are specified, in addition to the weight. The schedule weights in such cases include an allowance of 5 per cent. above "book" weights, and show the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.

9. After approval in bulk, each piece of iron is to be thoroughly cleansed from rust and dirt, and coated with best boiled quickly-drying linseed oil. All bundles and 10 per cent. of the pieces sent loose are to have the address stencilled on them in metallic paint near one end, and each loose piece or bundle is to have a shipping number. Both ends of every piece, whether loose or in bundles, are to be painted the same colour as the address for a length of 12 inches; on sheets or plates the dimensions, stencilled at opposite end from address, must be added. The stencil plates must be supplied by the Contractor.

10. Plates and sheets above $\frac{1}{8}$ inch thickness are to be sent loose, those of $\frac{1}{8}$ inch and under are to be made up in bundles not exceeding $1\frac{1}{2}$ cwt. each; each bundle to be securely bound with not less than four clips of $\frac{3}{4}$ inch half-round iron.

11. The following descriptions of iron are also to be made up in bundles not exceeding $1\frac{1}{2}$ cwt. and securely bound with $\frac{1}{4}$ inch round-iron, viz.:—

Rod, $\frac{3}{8}$ -inch diameter and under.

Square, $\frac{1}{4}$ -inch side and under.

Flat bars, angle, tee, and channel, not exceeding 56 lbs. per length ordered.

All hoop iron; length of bundles about 8 feet.

12. Any inattention to these instructions will cause the iron to be returned to the Contractor.

13. Notice in writing is to be given to the Superintendent when the Contractor is ready to cut samples or to have iron examined.

14. The iron is to be delivered as provided in Clause of Conditions of Contract, and addressed as under:—

All samples sent to the India Store Depot, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch," and accompanied by a delivery note (Form 140) similarly marked.

SPECIFICATION OF PLATE AND SHEET IRON.

1. The iron is to be soft and fibrous, thoroughly well made, uniform in texture, perfectly free from lamination, buckles, blisters, and all defects of manufacture. It will be subjected to the following tests for tensile strength and elongation, as well as to the forge tests in use at the India Store Depôt, where a pattern (No. 2845) of the forge tests can be seen:—

Lengthways of the grain. { tons per square inch } per cent. elongation in a
Across " " of original section length of 8 inches.

In addition to the forge and machine tests, the iron is to bend cold through the following angles:—

Thickness of Plate.	With the grain.	Across the grain.
	Degrees.	Degrees.
1 inch and $\frac{1}{8}$ inch	15	5
" " $\frac{1}{8}$ "	20	7 $\frac{1}{2}$
" " $\frac{1}{4}$ "	22 $\frac{1}{2}$	10
" " $\frac{1}{4}$ "	25	10
" " $\frac{1}{4}$ "	27 $\frac{1}{2}$	12 $\frac{1}{2}$
" " $\frac{1}{4}$ "	30	12 $\frac{1}{2}$
" " $\frac{1}{4}$ "	35	15
" " $\frac{1}{4}$ "	42 $\frac{1}{2}$	17 $\frac{1}{2}$
" " $\frac{1}{4}$ "	50	20
" " $\frac{1}{4}$ "	60	25
" " $\frac{1}{4}$ "	70	30
" " $\frac{1}{4}$ "	125	80
" " $\frac{1}{4}$ "	130	85
" " $\frac{1}{4}$ "	135	90
$\frac{1}{8}$ inch to $\frac{1}{4}$ inch	180	180
Under $\frac{1}{8}$ inch.		

The inner radius of the curve at the bend not to exceed $1\frac{1}{2}$ times the thickness of the plate or sheet.

Ditto, ditto, $\frac{1}{2}$ thickness of sheet; i.e., to bend double round its own thickness.

2. The Superintendent of the India Store Depôt, or his deputy, will select such samples as may be necessary, at the contractor's works, and will see pieces cut from them 16 inches by 3 inches for machine test, and 8 inches by 6 inches for forge test.

These pieces are to be stamped with an arrow indicating the direction of the grain, and with the letters L and C respectively. They will be tested at the Contractor's works or elsewhere under direction of the Superintendent of the India Store Depôt, or his deputy, as may be directed at the time.

3. Any iron not standing the specified test will be rejected.

4. The Contractor is, at his own expense, to cut and forward, as may be directed by the Superintendent of the India Store Depôt, the samples which have been tested at his works, or which may be required for testing elsewhere.

5. No charge is to be made for the samples used in testing, nor for any testing carried out at the Contractor's works.

6. The edges of all plates and sheets are to be cleanly sheared and truly squared to the dimensions given.

7. The weights given in the schedule must in no case be exceeded. To make up the schedule weights one shorter plate or sheet of each description will be accepted, except in cases where the number and dimensions of the plates, &c., are specified in addition to the weight. The schedule weights in such cases include an allowance of 5 per cent. above "book" weights and shew the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.

8. Plates and sheets above $\frac{1}{16}$ inch thickness are to be sent loose, and those of $\frac{1}{16}$ inch and under are to be made up in bundles not exceeding $1\frac{1}{2}$ cwt. each; each bundle to be securely bound with not less than four clips of $\frac{3}{4}$ inch half-round iron.

9. After approval in bulk, the plates or sheets are to be thoroughly cleansed from rust and dirt, and coated with best boiled quickly-drying linseed oil. All bundles and 10 per cent. of the plates or sheets sent loose are to have the address stencilled on them in metallic paint near one end, and the number and dimensions of the plates or sheets near the other end. Both ends of every plate or sheet, whether loose or in bundles, are to be painted the same colour as the address for a length of 12 inches.

(Note.—Paras. 8 and 9 do not apply to galvanized sheets.)

10. Stencil plates must be furnished by the Contractor.

11. Each plate or sheet is to bear the maker's name or brand legibly stamped on it.

12. Any inattention to these instructions will cause the iron to be rejected.

13. Notice in writing is to be given to the Superintendent of the India Store Depôt, Belvedere Road, Lambeth, S.E., when the Contractor is ready to cut samples or to have the plates or sheets examined.

Address.

All samples sent to the India Store Depôt, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch," and are to be accompanied by a delivery note (Form 140) similarly marked.

SPECIFICATION OF GALVANIZED IRON SHEETS, PLAIN AND CORRUGATED.

1. The iron in the black or ungalvanized state is to be as described in the annexed Specification of Sheet Iron, and subject to the tests, &c., therein mentioned, and is to be of the following "book" weights per foot super, viz.:—

Item 1.	lbs. (No.	S.W.G.)
2.	" "	" "
3.	" "	" "
4.	" "	" "

The allowance for increase of weight by galvanizing is 20 lbs. per foot super. (plain), including both sides.

The weights quoted in the schedule include an allowance of 5 per cent. above the "book" weights of iron in the black, and also the above allowance for galvanizing, and show the maximum weight of any particular size for which payment will be made. Payment will not, however, be made for more than the actual weights.

2. Each sheet is to be carefully sheared to the stipulated dimensions, thoroughly cleaned, and afterwards galvanized with best Silesian zinc containing not more than $2\frac{1}{2}$ per cent. of impurities. A sample of the zinc will be taken at the Contractor's works by the Superintendent of the India Store Depôt, or his deputy, for analysis, and if found to be inferior to the above Specification the galvanized sheets will be rejected.

3. Each corrugated sheet is to have corrugations, inches in width and inches in depth, to cover feet inches, to measure inches from out to out, and feet inches in the flat before corrugation. The iron is to be corrugated before being galvanized in the case of sheets thicker than 20 S.W.G. in the black. Sheets not exceeding 20 S.W.G. may be corrugated after galvanizing.

4. The galvanizing is to be well executed, the surface to be perfectly clean and entirely free from black spots and blemishes.

5. Unless otherwise directed by the Superintendent, the sheets will not be finally examined and approved until one month after galvanizing, when any that exhibit spots or other defects will be rejected.

6. The Contractor is to give notice in writing to the Superintendent of the India Store Depôt, Belvedere Road, Lambeth, S.E., when three weeks have elapsed from date of galvanizing.

7. When the sheets have been approved they are to be packed in skeleton cases, to contain about 10 cwt. each, made of sound well seasoned spruce deal, the tops, bottoms, and sides 1 inch thick, the ends $1\frac{1}{4}$ inch thick, clamped at the corners with sheet iron of No. 19 "S.W.G."

8. The address, description of contents, &c., are to be stencilled by the Contractor on each case.

Address.

All samples sent to the India Store Depôt, Belvedere Road, Lambeth, S.E., are to be marked "Iron Branch," and are to be accompanied by a delivery note (Form 140) similarly marked.

P.W. C. No. 2232.

36 S.C.

Rd. 4-3-90.

Am. R. R. Co. 1890.
R. 344 R 7 12th March 1890.

Communicated to
the Consulting Engineer for
Railways for information
and guidance.

W. J. P.
P. J. P.

R.

R.
R. 344 R 7 12th March 1890.

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