

India
Committee on Rationalisation
of Steel Sections, 1963
Report.

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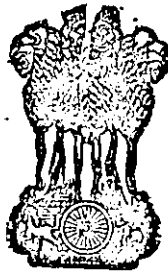
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GOVERNMENT OF INDIA

MINISTRY OF STEEL & MINES

DEPARTMENT OF IRON & STEEL

Iron & Steel Control,
33, N. S. Road, Calcutta-1.



सत्यमेव जयते

REPORT
OF
THE COMMITTEE ON RATIONALISATION
OF
STEEL SECTIONS.

MAY 1964

CONTENTS

	PAGE
Report and Recommendations	01—05
 <i>2. Appendices.</i>	
(1) Notes by Shri Ranbir Sen	60—16
(2) Notes by Indian Standards Institution	17—46
(3) Report by Indian Engineering Association	47—92
(4) Office Memorandum No. SC(C)-4(1)/63, dated 24-7-1964 of Ministry of Steel & Mines (Deptt. of Iron & Steel)	93—97
(5) Order No. C/33(2)/64, dated 26-8-1964 by the Iron and Steel Controller, Calcutta.	98—101

Depth in mm	Tolerances in mm	
	Plus	Minus
75—125	3	1,5
150—200	3	2
225—400	3,5	2,5
450—600	4	3

Depth in mm	Tolerances in mm	
	Plus	Minus
75—200	3	2
225—400	3,5	9,5

REPORT AND RECOMMENDATIONS

Structural shapes in which steel products are commonly rolled comprise of beams, channels, sheet piles, equal angles, unequal angles, bulb angles, tees, squares, round bars and flat bars. The number of such sections included in the relevant Indian Standards alone is about 516. There are many other sections like crossing sleepers, 'Z' section, etc. which have not yet been standardised by the Indian Standards Institution. The number of sections at present being rolled by Indian Producers is also considerable—about 300. Existence of such a large number of sections from which Engineers are permitted to select for designing structures has given rise to two difficult problems:—

(a) *The problem of matching steel :*

Often the Engineers call for, along with large quantities of certain sections comparatively small quantities of certain other sections, which are, according to them more economical. It often so happens that the supply of popular sections are received fairly quickly but even if such supplies comprise of about 90 per cent of the total steel required for the fabrication of the structures, the work, cannot be taken on hand until the remaining 10 per cent of "matching steel" is available. If the Engineers were aware of the difficulty of getting this 10 per cent of the materials, they could have certainly designed their structures in such a way as to avoid the use of these sections which are uncommon and not frequently rolled.

(b) *The problem of economic rolling tonnage for the producers :*

The present out-put of structural steel sections in India (including bars and rods) is about 2.5 million tons. Out of these sections, the annual demand of some popular ones ranges between 50,000 tons to 1,000,000 tons. As a result, total annual demand of several sections is very small. Both for operational efficiency and economics of production, there is a minimum tonnage which could and should be produced in any particular mill. This economic rolling tonnage, of course, varies from mill to mill; for the fast modern mills which are now installed in all the Steel Plants, the minimum economic tonnage is quite high, ranging from 1,000 tons to 3,000 tons per section per rolling. As a result, they find it difficult to produce sections for which the demand is less than the minimum economic tonnage. Even if the demand is up to this minimum tonnage, such sections with relatively smaller demand can be produced only once or twice a year depending on the total demand. Consumers needing such sections as matching steel, therefore, have to wait for a long time to complete their jobs.

2. With a view to finding a solution to the problems mentioned above the Iron & Steel Controller has been considering the question of "rationalising" the number of sections thereby reducing the number of sections to be produced in the country. This matter is obviously a complicated one as it involves not only steel plant operational problems but also problems of engineering construction. The sections to be rationalised should be such as could be more economically produced by the existing steel plants. At the same time a suitable range of sections should be provided for the Engineers to design structures with, without seriously affecting the Govt.'s declared policy of steel economy. The Iron & Steel Controller obtained the services of Shri Ranbir Sen of Tata Iron & Steel Co. Ltd., to study this matter and to make suggestions. Shri Ranbir Sen visited all the Steel Plants, discussed the problems with the Technical Officers of the various Steel Plants. Thereafter he also discussed this question with the Indian Standards Institution in Delhi with Central

Water & Power Commission and the Railway Board, the two important consumers of structural steel. He also had discussions with leading structural fabricators of the country. As a result of these discussions with the Steel Plants Shri Ranbir Sen came to the conclusion that some of the structural sections standardised by the Indian Standards Institution needed some modification to enable the existing mills to produce them without difficulty. This matter was brought to the notice of the Indian Standards Institution by Shri Ranbir Sen and the Institution in its turn prepared a paper giving their views as to why the producers should try to roll the standardised sections.

3. Simultaneously, the Indian Engineering Association also undertook an independent study of this difficult problem. The Association produced a comprehensive report which was of great assistance to the Committee. It provided useful technical data and also recommended a complete list of sections which to be rationalised. The Committee gratefully acknowledge the valuable data furnished in the Association's report.

4. The Iron & Steel Controller circulated the following documents to the Main Steel Plants, Indian Engineering Association and the Indian Standards Institution and convened a meeting to discuss the matter further :—

- (a) Notes by Shri Ranbir Sen on his discussions with various interests concerned.
- (b) Notes prepared by the Indian Standards Institution on the proposal of Shri Ranbir Sen for modification of certain ISI standard sections.
- (c) Report of the Indian Engineering Association giving their views about the sections which should be rationalised.

Copies of these documents are attached as annexures to this report (Appendices 1, 2 and 3).

5. The papers mentioned above were discussed at a meeting held on 22nd August, 1963. It was attended on behalf of HSL by Shri Suku Sen, Shri Cleetus, Shri V. Subramaniam, Shri R.K. Chatterji, Mr. S.I. Malayshev, Mr. N.R. Kurdiavastev, Mr. M.M. Grestov, Shri M.M. Panje, Shri N.K. Mitra, Shri Udayan Sen, and Shri R. Ghose. On behalf of Tata Iron & Steel Co. Ltd., Shri Ranbir Sen, Shri K.N.P. Rao, Shri D.D. Kamat and Shri M.N. Sapru attended. Indian Iron & Steel Co. Ltd. were represented by Shri A.K. Gupta, Shri A.K. Mitra, Shri A.K. Ganguly, Shri M.S. Doshi and Shri A.K. Dutta. Mr. C.E. Cargin represented the Indian Engineering Association. The representative of Indian Standards Institution could not attend this meeting. The meeting generally approved the line of approach recommended by Shri Ranbir Sen and the Indian Engineering Association. It was, however, felt that a number of details about the exact nature of modification required in the existing ISI sections, the exact number of sections that should be rationalised and the producers to whom such rationalised sections should be allotted will have to be gone into and that this could be more conveniently done by a small Committee. The following Committee was therefore set up by the Iron & Steel Controller to give a final shape to this matter :

1. Shri Suku Sen—*Chairman*
2. Shri T. R. Subramaniam, J.D. (I&S)
3. Shri Ranbir Sen
4. Shri B.S. Krishnamachar, ISI

5. Shri K.N.P. Rao
6. Shri A.K. Gupta
7. Shri M.M. Panje
8. Shri R.K. Chatterjee
9. Shri V. Subramaniam
10. Mr. C.E. Cargin
11. Shri R.C. Sen, Martin Burn Ltd.
12. Shri S.C. Mukherjee—*Convenor.*

6. The Committee held five meetings. The problems for consideration of the Committee were broadly three viz.,

- (a) Recommending modification of certain ISI sections for acceptance by the Indian Standards Institution.
- (b) Selection of sections to be rationalised.
- (c) Allocation of the sections proposed to be rationalised among different producers.

7. On the first two points, the Committee has come to unanimous decision. Their recommendations are the following :

(a) *Modification of sections:*

BEAMS :

Section.	Flange Width.	Flange Thickness. tf.	Wed Thickness. tw.	Slop	tf./tw.	Wt. Kg./m.
1. ISMB 100						
Standard	75	7.2	4	98°	1.8	11.5
Proposed	70	7.5	4.5	98°	1.67	*
2. ISMB 125						
Standard	75	7.6	4.4	98°	1.73	13
Proposed	70	8.0	4.8	98°	1.67	*
3. ISMB 150						
Standard	80	7.6	4.8	98°	1.58	14.9
Proposed	75	8.0	5.0	98°	1.60	*
4. ISMB 176						
Standard	90	8.6	5.5	98°	1.56	19.3
Proposed	85	9.0	5.80	98°	1.55	*

ISMB 200 to 600 : As a temporary measure, relaxation be given in the web thickness by increasing it by 2 per cent and the sectional weight of the new section with increased web thickness has to be calculated.

CHANNELS :

Section.	Flange Width	Flange Thickness. tf.	Wed Thickness. tw.	Slop	tf./tw.	Wt. Kg./m.
1. ISMC 75						
Standard	40	7.3	4.4	96°	1.66	6.8
Proposed	40	7.5	4.8	96°	1.56	*
2. ISMC 100						
Standard	50	7.5	4.7	96°	1.60	9.2
Proposed	50	7.7	5.0	96°	1.48	*
3. ISMC 125						
Standard	65	8.1	5.0	96°	1.62	12.7
Proposed	65	8.2	5.3	96°	1.55	*
4. ISMC 150						
Standard	75	9.0	5.4	96°	1.67	16.4
Proposed	75	9.0	5.7	96°	1.58	*
5. ISMC 175						
Standard	75	10.2	5.7	96°	1.70	19.1
Proposed	75	10.2	6	96°	1.70	*

(* To be calculated by the ISI).

ISMC 200 to 400 : The same relaxations as in the case of Beams ISMB 200 to 600 recommended for these sections.

With regard to tolerances, the Committee recommend as follows :—

BEAMS : (A) Tolerance on Flange Width

- | | |
|---|------------------|
| (i) Flange width upto and including 100 mm | ± 2 mm |
| (ii) Flange width above 100 mm
and upto 200 mm | + 3 mm
— 4 mm |
| (iii) Flange width above 200 mm | ± 2 per cent |

(B) Tolerance on Depth

Depth in mm.	Tolerances in mm.	
	Plus	Minus
75 — 125	3	1.5
150 — 200	3	2
225 — 400	3.5	2.5
450 — 600	4	3

CHANNELS : (A) Tolerance on Flange Width

Same as in the case of Beams

(B) Tolerance on Depth

Depth in mm.	Tolerances in mm.	
	Plus	Minus
75 — 200	3	2
225 — 400	3.5	2.5

At the request of the Committee, the above recommendations regarding modification of ISI sections were communicated by the Iron & Steel Controller to the Department of Iron & Steel and the Indian Standards Institution. The matter has also been considered by the Indian Standards Institution and they have agreed to accept these modifications for a period of 2 years. The Indian Standards Institution expects that the producers would be able to switch over to the standard sections within this period.

(b) With regard to the second problem, viz. selection of sections to be rationalised, the Committee's recommendation is embodied in the statement at annexure 'D' to this report.

In addition to these rationalised sections the following special sections will also have to be rolled to meet certain specific important demands :—

1. Crossing Sleepers—BG and MG
2. Bearing Plate Bars
3. Telegraph Channels
4. Bulb Angles
5. Z Section
6. Sheet Piling Sections
7. Crane and Bridge Rails
8. Electric Transmission Pole section (116 mm × 110mm)

It will be seen that the Committee has suggested rationalisation of only 153 sections. With regard to the Tee Sections, the Committee would suggest that the possibility of producing them by slitting the Beam Sections should be explored by the Producers. As and when slitting arrangement is made, it should be possible for the Producers to offer a larger range of Tee sections to meet the country's requirements. This will incidentally save rolls now required to produce Tees. In selecting the rationalised sections, the Committee has taken into account both the engineering properties of these sections and also the present trend of demand of these sections in the country. To enable the producers to achieve maximum productive capacity, the Committee recommend rationalisation of only medium sections which are not only comparatively easier to produce but also give a reasonable quantum of out-put per section. According to the calculations made by the Indian Engineering Association, the additional consumption of steel involved in replacement of certain traditional sections by the rationalised sections for several important jobs now under execution would range between 0.01 per cent to 8.56 per cent but mostly within 2½ per cent, which may be considered negligible.

In putting forward this scheme, the Committee recommend that any reduction in the number of available sections and sizes should be regarded as a temporary expedient. The long term aim should be to provide steel to consumers in India with a wider range of sections and sizes to enable them to approach closer to the Engineering ideal of maximum strength or efficiency for minimum steel (and hence minimum cost). In the export sphere it is particularly important that engineering firms should not be handicapped by having access to a relatively limited range of steel sections and sizes as compared with the much larger range available to exporters in other countries. To this extent a more flexible import policy is essential to ensure that exporters of fabricated steel are not unduly restricted in their choice of matching sections.

The Committee recommend that the Government of India should immediately take all possible steps to ensure that all the rationalised sections are available to consumers as early as possible. All consumers should also be requested to indent for sections on the basis of the Rationalised List only. If any Producer desires to develop any non-rationalised section for which they anticipate sufficient demand, approval of the Joint Plan Committee should be obtained *before* any preliminary action is taken in the matter.

8. With regard to the third problem, viz. allocation of sections to different producers the Committee could not come to any unanimous decision. It is felt that with the statutory decontrol of structural sections and establishment of the Joint Plant Committee, this problem should more appropriately be referred to that Committee to tackle.

9. This Report is confined to the sections to be rolled by the Main Producers. The Re-rolling industry should be left free to roll any other section if sufficient demands are received.

10. The members of the Committee have authorised the Chairman and the Convenor to sign this report on their behalf.

(S.C. MUKHERJEE)
Convenor.

(SUKU SEN)
Chairman.

Dated Calcutta 21st May 1964.

Appendix 1

NOTES BY :—SHRI RANBIR SEN

I. Visit to Bhilai.

In accordance with the instructions given to me by the Iron & Steel Controller, Mr. Banerji, I visited the various Steel Plants to discuss the above subject with the authorities concerned. I made my first trip to Bhilai for two days, 29th and 30th March '62. In order that my survey and discussions are uniform, I had drafted out a Questionnaire which was discussed with Mr. T. R. Subramanian, Joint Director, Iron & Steel Control and had his concurrence, a copy of which is attached herewith.

On 29th March '62 I had preliminary discussions with the General Manager, Bhilai Steel Project, Mr. S. Sen, and the object of my visit was explained to him viz., (i) rationalisation of sections, (ii) planning of sections on different mills with the most economical and productive method with equitable distribution, and (iii) gradual development of new sections making out a yearly programme for different Steel Plants taking into consideration the demand of the Country. The General Manager had called in the Chief Superintendent, Mills, both Russian and Indian, and the Supdt. of Order Department.

It was explained to me that Bhilai's capacity for development of new sections is limited due to (a) shortage of new rolls and (b) due to lack of lathe capacity. They have in all 10 lathes which are used as follows :—

- 4 for 14" Mill and Billet Mill,
- 2 for Cogging rolls and
- 4 for Rail and Structural Mill.

and (c) besides this, they have limited number of trained Roll Turners who could accurately turn the rolls. More and more staff have to be trained and in the course of a year or two they expected to overcome this bottleneck. They told me that they had calibrations and templates ready for 500×180 and 450×150 medium weight beams, but for want of rolls they have not been able to try out these sections. I had to point out to them that I.S.I. in their latest list drawn out for development of sections (copy of which was given to them) had not included 500×180 medium weight beam and as such a reference should be made to I & S.C. before actually turning rolls for this section.

While sitting in conference with the General Manager, I learnt that Bhilai was rolling 125×75 medium weight beams in their 14" Mill for which they have encountered some difficulties because of stalling of motors of different stands.

After having preliminary discussion with the General Manager, I had further meetings with the Chief Supdts. of Mills, both Russian and Indian, Russian Roll Pass Design, Supdt., Rail and Structural Mill and Supdt. Merchant Mill. I am giving below in short the results of my discussion for rolling of different sections both as recommended in my report and as included in the I.S.I. List referred to above.

Bhilai's Remarks on I.S.I. List.

Bhilai agreed to roll the following sections :

ISLB	600	ISLC	350
„	450	„	300
„	300	„	250
„	250	„	200
„	225	„	100
„	125	„	75
„	100		

In short they wanted to roll ISMD sections to the depth of 225 and above in the Rail and Structural Mill and for medium weight beams and medium weight channels to a depth of 125 and below in their 14" Mill.

Regarding trial of new sections, the representatives of Bhilai stated :—

(a) They have rolls ready for ISMC 150 and for want of shear blades they were unable to take trials so far. They expected to do so in the beginning of May '62.

(b) They were developing H beam sections 150 × 150 with modifications granted to them by Mr. T.R. Subramanian of Iron & Steel Control and they had submitted their drawing No. RSP/538 for the revised section. On examining the drawing, I found that this section would have flange height of 152 × 152 with a flange taper of 5* and flange thickness of 11 mm and a web thickness of 7.9 mm and overall weight of 37.00 Kg/M. They were preparing the design in accordance with the above relaxation and as soon as they have some rolls in hand, they would turn rolls and try out these sections. They said that they would refrain from giving their immediate comments on the rolling of ISLB sections. It was pointed out to them that in the I.S.I. List 3 of the heavy sections, viz. ISLB 600, 500 and 300, would have to be rolled in their Mills if it is possible to roll these sections. They agreed to send their comments to me within a week on the possibility of rolling these sections with whatever modifications they thought fit. They however said that they can roll ISLC 400, 300 and 250 if the minimum taper for light channels be increased to 96*.

(c) They did not agree to try to roll any of the junior beams and channels since, in their opinion, these sections cannot be rolled in their mills.

(d) Since I.S.I. have included two of the wide beams in their list *i.e.* 600 and 500 and since Engineering Firms have also expressed their preference for wide flange beams over equivalent medium beams, and since Hindustan Steel Ltd. wanted 500 × 250 and 450 × 200 wide flange beams in their Expansion Scheme, I enquired of them the possibility of rolling these sections in their Rail and Structural Mill. Bhilai did not want to try out rolling of any wide flange beams since they consider it not practical to roll these sections with the dimensions laid down by I.S.I. They were however willing to try out the sections if certain modifications were made to the sections with respect to flange thickness and web thickness—flange thickness 20 mm against 14.7 and web thickness of 14 mm against 9.9 for ISWB 500 × 250. They further stated that it will not be economical to roll these sections as life on these rolls will be very short and they expected the maximum tonnage of 4000/5000 tonnes per set of rolls against about 15,000 tonnes obtained by them on rolling 600 × 210 medium weight beams. They also stated that the 10" radius at the toe of the flange will not allow fixing up of proper flange guards, and there will be chances of the flange guards getting knocked out. The web of the beam has to be thicker than what it is because of the difference in rolling of the web and the flanges not only after the bar is finished but in between rolling as well. It was pointed out by me that according to the specification of the mill they were supposed to roll broad flange beam from 5 × 5 to 10 × 10 and a depth of 250 mm flange corresponding to 10" giving in the specification. But in spite of this, they were of the opinion that without modifications to the section, they will not be able to roll the section.

(e) Bhilai said that Iron & Steel Control had indicated to them to roll 75 × 50 and 90 × 60 unequal angles but they were not in favour of developing these sections, because TISCO was going to roll the former section and Durgapur the latter. Bhilai was of the opinion that Iron & Steel Control should allocate one section to one producer which would limit the number of sections to be rolled in any Steel Mill and would conserve the roll requirement which in turn would save foreign exchange. Moreover, this would mean less number of changes and would increase the production in the different mills. The present policy of the Iron & Steel Control for having more than one producer for one section was explained to them by me, but still they held to their opinion. Arising out of this, I pointed out to them as to why they were rolling ISLB 125 × 75 beam in the Merchant Mill which they fully know that TISCO is already rolling this section for the last 2 to 3 years and Durgapur is the additional supplier for this section. I told them that in my opinion it was not desirable to roll such a heavy section in their 14" Mill by putting in additional shaping passes in the Billet Mill which would never be economical by cutting down the billet production in the Billet Mill. This was further established by the fact that a day prior to my visit they had the motors stalled at some of the stands of the 14" Mill. But in spite of this they maintained that it was a good section for their 14" Mill and would like to continue rolling this section which however did not answer the question raised by me regarding the theory "one producer for one section". I give below the specifications for the two mills in Bhilai given by Russians for ready reference.

Bhilai

Specification—Merchant Mill :—

Square and rounds	7/8 to 3"
Flats	2" to 5"
Beam	3 × 1½ to 5 × 3
Channel	3 × 1½ to 4 × 2
Angles	1½ × 1½ to 3½ × 3½
Unequal angles	2 × 1½ to 3½ × 3
Light Rails	14 to 18 lb. yard
Tees	1½ × 1½ × ¼" to 2½ × 2½ × ¼"

Specification—Rail and Structural Mill :—

Rails	50/90 lb.
Sleeper bars	50/90
Crossing sleepers—	
Broad Flange beams	5 × 5 to 10 × 10
Std. beam	9 × 4 to 24 × 6½
Std. channels	9" to 15"
Angles	4 × 4 to 8 × 8
Unequal angle	5 × 3 to 6 × 4
Rounds	3½ × 8;

II. Visit to Durgapur.

I visited to Durgapur for two days on 3rd and 4th April 1962 and had discussions with Mr. R. C. Chatterjee, Chief Superintendent of Rolling Mills.

During my stay, they were rolling 125 × 75 medium beams. Unfortunately, on the first day they had a roll breakage on which account the actual rolling could not be witnessed and on the 2nd day again after they had changed rolls they were having trouble in the Section. In order to overcome this problem they were making arrangements to use some kind of lubrication either coal tar or oil on the rolls. Looking in to the roll breakage of the previous day which had broken through the neck, I was of the opinion that neck diameter of 355 mm for 685 mm diameter rolls was rather small. Mr. Chatterjee agreed on this view and said that they had taken up this question with the roll suppliers and the Mill Designers.

The possibilities of rolling different sections were discussed at length with Mr. Chatterji and according to him, the mill has not been designed to roll any light weight or junior sections. In this connection, they had sent me a copy of the letter written to Durgapur by Mr. Krishnamachar, Asstt. Director (SNM) of the Indian Standards Institution. A copy of the letter is enclosed herewith. Although, according to this, Durgapur should be able to roll all the medium beam sections, still Mr. Chatterji maintained that sections like 75 × 50 and 100 × 75 medium beam which have web thickness of 3.7 and 4.0 mm respectively cannot be rolled in their mill as the bars get too cold by the time they are finished. Even the trouble encountered on rolling ISMB 125 × 75 beam as described above were attributed by him to the web thickness being very light *i. e.* 4.4 mm. In short, according to him, their mill cannot roll any section less than 5 mm web thickness. This means that even out of the ISMB series Durgapur can only roll three sections, 150 × 80, 175 × 90 and 200 × 100, because sections with depth of over 200 would again be too heavy to be rolled in a 24" Mill. Similarly, according to Durgapur, they can produce ISMC sections only within the

range of 125 to 200. This means even out of a total number of sections of ISMB and ISMC which are 25, Durgapur can produce only seven sections. In my opinion, therefore, this question needs further looking into as production of only 7 sections in their new mill far from justifies its installation.

Besides structurals, Durgapur were preparing to roll the following other products in their mill some of which have already been rolled out :—

Bearing plates	50 lb. 60 lb. 75 lb and 90 lb.
Fishplates	50 lb. 60 lb. 75 lb and 90 lb.
Rounds	70 mm. 75 mm. 80 mm. and 100 mm.

Out of the above sections, Durgapur has already rolled bearing plates of 50 lb, 60 lb, and 90 lb and they wanted to be the only producers of bearing plates. They were, however, keen to know the actual requirements of the above bearing plate sections. They had also rolls ready for rolling 60 lb, 75 lb fishplates and they were designing the roll pass for rolling 50, 90 and 105 lb. fishplates. They were also cutting rolls for rolling equal and unequal angles in their 24" Mill, *i. e.*

Equal angles	90×90 and 100×100.
Unequal angles	90×60 and 125×75.

I pointed out that Tisco has already successfully rolled out unequal angles 125×75 and till such time as the demand justifies, further action on developing this section at Durgapur should be deferred. They also wanted to plan out the rolling of the following equal and unequal angles :—

Equal angles	130×130, 150×150.
Unequal angles	150×75, 150×115, 125×95.

I explained to them that the advisability of developing these sections can only be decided after I have fully surveyed the requirements of the different consumers, and I shall inform them about this in due course. Although Durgapur was not willing to roll any light sections but still I took this opportunity of discussing light weight beam sections as developed by I. S. I. Mr. Chatterji was of the opinion that light sections as they are difficult produce to since the over all sections are far too light. According to him, ISMB and ISMC section should take the place of ISIB and ISLC series and new sections with a weight of about 10 to 12 per cent lighter than BS sections should be developed by I.S.I. in place of the present ISMB and ISMC series. If the present series of the ISLB sections have to be successfully rolled, he was of the opinion that flange taper should be increased to a minimum of 98° with increase in flange thickness and web thickness.

Merchant Mill

In their Merchant Mill, they were at present rolling the following sections :

12 mm, 16 mm, 20 mm, 25 mm, 30 mm, 32 mm, 40 mm and 50 mm.

They were, however, not rolling any Squares and neither they were interested in rolling any Squares in their Mill. They did not want any planning to be done on Durgapur for rolling Squares.

They were willing to produce Horn-Check Section with 18.27 Kg/M wt for which Durgapur should be the only producer. They wanted to develop rolling of Equal Angle Sections from 25×25 mm upwards with a minimum thickness of 4 mm. They did not want to roll anything less than 4 mm thickness. At present, they were having trials on the rolling of 50×50×6 mm angles. They were also proposing to have a trial rolling for the rolling of flats starting with 35×5 mm going upto 160×25 mm for which they have got the rolls ready.

During the course of my discussions, I learnt that they were able to develop about four sections in a year in each of the mills and fortunately they have plenty of rolls in stock to develop new sections—quite different to the position at Bhilai where they are not able to develop more number of sections on account of shortage of spare rolls.

Regarding development of new sections, they were planning to develop different sizes of bearing plates, fishplates, 50 lb. rails and ISMB 225 and ISMC 225 which, in my opinion would not be advisable to roll in the 24" Mill.

At the end, before concluding our discussions, I asked Mr. Chatterji if he had seen the latest BS specification for hot rolled products i.e. SMDC/6/BSI of 4-9-61 from which it can be seen that even British Standards Institute is trying to follow I.S.I. standards and had revised their sections more or less on similar lines. As such, his point to consider ISMB and ISMC series as light weight series would not be acceptable to I.S.I. and we shall have to get together to roll the light weight series with necessary modifications.

III. Visit to Burnpur.

I visited Burnpur for two days on the 5th and 6th April and had discussions with the General Manager, Mr. McCracken and M. S. Doshi and the Roll Pass Designer. In the beginning the subject of rolling different sections in their Works was discussed with Mr. M.S Doshi at great length and during the course of discussions, Mr. Doshi pointed out that as early as 1957 in reply to Iron & Steel Controller's circular No. 57/632 of 15-11-57, they had indicated their inability to roll any junior or light beams, whereas from records he pointed out that Tisco, Bhilai and Durgapur had agreed to roll some of the ISLB series sections. In reply I stated that 1957 is a story of bygone days and we had to review the position as it stands to-day. He stated that he had discussed this subject of rolling light sections with the staff concerned and they were all of the opinion that none of these sections could be rolled in their existing mills. They were however, willing to roll most of the medium beams and medium channels. They wanted to roll sections upto 150 mm in depth medium channels or medium beams in their 18" Mill and from 225 upto 450 mm depth in their 34" Mill which meant that sections in between 150 and 225 they were not willing to cater. After some discussions, they agreed to reduce the gap by agreeing to roll 200 mm depth medium sections in their 34" Mill.

On my putting up to them the principle that whoever rolls medium sections must also roll the corresponding light sections so that there could be suitable and economical distribution of loading different steel plants instead of loading one steel plant with all light sections and the other steel plant with all medium sections. They agreed to consider the possibilities of doing so if modifications were made to the light weight series. They were not in a position to immediately give their comments to the necessary modifications, but agreed to send me their views later on.

They had tried out rolling of ISH beams 200×200 and after rolling a few blooms, had burst the collar of one of the rolls. Now they were making modifications to the section on the basis of relaxation granted to them by Mr. T. R. Subramanian which are—

- (i) Flange taper 96° against 94°
- (ii) Web thickness 10 mm against 7.8 mm
- (iii) Flange thickness 10.2 mm against 9 mm

The overall weight of the section is 46.8 KG/M against 40 KG/M.

They said they had wasted lot of time and production in trying out H beam sections and the next trial would be taken only when they were sure of getting results.

This naturally induced me to enquire of them the possibility of rolling wide flange beams which according to me would be easier to roll than H beam because of the flange slope being 96° and because of the short height of the flange. The following comparative table was put up to them for giving a thought and for giving the reasons for not being able to roll wide flange beams if they succeeded in rolling H beam,

Section	ISWB			
	Wt.	Web thickness.	Flange thickness	Slope of flange
250×200	40.9	6.7	9 mm	96
200×140	28.8	6.1	9 mm	96
450×200	79.4	9.2	15.4 mm	96

ISHB				
Section	Wt.	Web thickness	Flange thickness	Slope of flange
250×250	51.0	6.9	9.7	94
	54.7	8.8		
200×200	37.3	6.1	9	94
450×250	87.2	9.8	13.7	94

The answer was that if the relaxation granted for rolling H beam was also granted for rolling wide flange beams they were prepared to try out one such section i.e. web thickness to be increased by 15 per cent, flange thickness to be increased 11/12 per cent, and the weight increased by about 16 per cent. Moreover, they said that the results on trial rolling of H-beam would also make them wiser to decide about taking trial for rolling W beams. They however admitted that obviously rolling of W beams should be easier than of rolling H beam.

The latest BS specification for hot rolled products was next discussed i.e. SMDC/6/BSI of 4-9-61 in which British Standard was revised and the new sections developed are about the same as are medium beams and medium channels. The taper on flanges has been reduced to 95° against our 98° and the weight of the section has been cut down. For example, the weight of 8×4 beam has been reduced to 17 lbs. against the previous weight of 18 lb. which indirectly shows that our more for developing new section is in the right direction as far as the medium section are concerned.

Further, their comments sent to the Iron & Steel Controller, vide letter No. CE/33(52) dated 16-1-62, were discussed and their opinion was sought for rolling of ISMC 175 and 200 which they had asked I & S.C. to include it for the mills. They accepted the omission on their part and requested me to delete these sections from the programme. They had asked for some of the flat sections to be excluded from the programme because they had roll life left in British Standard sections. Since, in my opinion, it was not much of modifications required to move over to metric sections, they agreed to reconsider and examine the possibilities of changing over to rolling of metric flants. It was pointed out by me that in their comments they had expressed their inability to roll some of the metric sections because of the roll life left in British Sections but they had no actual roll life in terms of tonnage which would have to be rolled before scrapping the rolls. They promised to send me the information at an early date.

Next, the question of developing new sections was taken up and they said they had rolls ready for ISMB 400×140 which they would develop very soon and they propose to develop ISMB 450, 350, 300, 250 and 225 in the course of next 2 to 3 years. They were rolling ISMB 225 and they propose to develop ISMC 400, 350, 300 and 250 in the course of next 2 to 3 years, in their 18" Mill. They propose to develop the following medium beams and channel sections in the next 2 to 3 years—

ISMB 150, 125 and 100

ISMC 125, 100, 150 and 75.

In their Merchant and Rod Mill, they were at present rolling the following sections—

Rounds	6 mm, 10, 12, 16, 20, 25, 28 and 32 mm.
Angles	40×40, 5 to 6 mm thickness
	45×45, 5 to 6 mm thickness
	50×50, 5 to 6 mm thickness
	55×55, 6 mm thickness.

They propose to develop in 1962 the following equal angles—

25×25, 5 mm thick
 30×30, 5 mm thick
 35×35, 5 to 6 mm thick
 55×55, 5 to 6 mm thick

and also the following unequal angles—

- 30×20, 5 mm thick
- 40×25, 5 to 6 mm thick
- 45×30, 5 to 6 mm thick
- 50×30, 5 to 6 mm thick
- 60×40, 5 to 8 mm thick

At the end, Burnpur, however, raised a very pertinent question about loss in production in changing over to metric sections which, according to them, would be in the range of 25 to 30 per cent in terms of tonnage. This of course is applicable to all the mills and in my opinion, the steel producers have to face this because of the change-over from FBS to metric sections. IISCO had stated that their policy was to develop all the medium weight beams first and then endeavour to roll other series.

The list sent out by I.S.I. to the Iron & Steel Controller, SMD/6/T, dated 7-2-62, was also discussed. It was suggested by me that although Bhilai may take care of heavier sections, IISCO might be required to take care of the series from 275 mm to 450 mm depth sections which included ISLB 275, 300 and ISLC 400. IISCO however were not willing to roll any light sections without modifications.

On my visit to their mills, I found that 34" Mill has been lately modified and the tilting arrangement has been provided at the end of the first stand, something similar to what I had, seen on my visit abroad at Cargofleet which enables the bars to be turned through 180°. This arrangement enhances IISCO's possibilities for rolling heavy beam sections commonly used, because this enables roughing rolls to accommodate more number of passes and also brings down the cost of the rolls. This further eliminates big swing collars at the roughing rolls and cuts down the weight of the rolls.

IV. Visit to Delhi.

I had discussions with the officials of the Central Water & Power Commission (Power Wing), Government of India, New Delhi, on the 21st, 25th and 26th April 1962. Sarvashri K.P.S. Nair, Thaddani and Vinu Gopal were present in the meeting. In the beginning I explained that my services have been loaned to the Iron & Steel Control to assist them in rationalising a number of sections, planning of rolling of sections in different steel plants, gradual development of new sections and lastly, assessing the requirements of various important consumers so that a proper planning could be done in the best advantage of the country.

Shri K.P.S. Nair explained that most of the requirements at present and in future would be for plates and angles of various sizes and thicknesses. They may require a few of the structural sections for their construction work but since the tonnage will not be very heavy they could always use the sections produced by the steel plants for which however they must know exactly what is being produced at present and what are the future plans.

As regards the plates are concerned, they were prepared to use plates of standard sizes and standard thicknesses for which there should be no difficulty, although Shri Nair's conviction was that these are in short supply. I pointed out to Shri Nair that there may be further standardisation for sizes and thicknesses of plates produced by different steel plants. He expected no difficulty in using newly developed standard plates provided they are kept informed well in advance.

On examining the demand for structural sections, it was found that they were planning to use some of the ISLB series sections although the annual requirements for these was very small ranging from about 20 to 100 tonnes per section. They were advised to use corresponding ISHB sections which are available now instead of the ISLB sections till such time ISLB sections are developed. Besides ISLB, their requirement showed some ISJC and ISLC sections. It was explained to them that for the present there is no plan to develop any ISJC sections although we have plan to develop ISLC sections and as such, they shall have to plan the design and use ISLC sections.

They agreed to these suggestions and would pick out suitable sections from the standard roll sections. It was also agreed that as soon as any section of the light series developed, they will be kept informed by the Iron & Steel Control. The list for equal angles was also

discussed. They wanted all the equal angles sections ranging from 45×45 to 200×200 for four different thicknesses. After discussions it was agreed that they would accept these angle sections in two thicknesses only. The attached list gives actual thicknesses required for various sections of angles and the thicknesses now recommended to be rolled in future. It was fairly a good gesture on their part that in the interest of rationalisation they agreed to reduce the number of sections from 56 to 31 by using mostly two thicknesses in the light of various considerations explained by me. They however wanted to refer it to the few Electricity Boards at Madras, Madhya Pradesh and Punjab and to a few fabricating firms as well inviting their comments. They however pointed out that this meant about 10 per cent increase of cost of steel but they were assured that gradually once the mills settle down, they will be able to roll the other thicknesses.

On my enquiry, they stated that they would have some demand of unequal angles as well but since the design for towers have not yet been finalised they were not in a position to see the actual sections required. However they gave indication that they might need $45 \times 30 \times 4$ mm and $75 \times 50 \times 6$ mm unequal angles, about 1,000 tonnes each. There should be no difficulty in meeting their requirements for these two sections. It was also pointed out to them that out of the list of equal angles, 130×130 and 200×200 have not been rolled out and it may take sometime before they are produced. 130×130 being a new section has not yet been developed and we will plan to develop it in 1962-63. Instead of 200×200 , they could at present use equal FPS section 8×8 equal angle.

Mr. Nair complained that his office was not getting copy of the rolling programme for every quarter as finalised by the Iron & Steel Control with different producers. I assured him that I would request the Control to send him copies of the finalised rolling programme.

ISI list of rationalised sections was further discussed and as stated earlier, they agreed to pick out whatever structural sections were rationalised for their use. On the 26th April, Mr. Nair gave me a copy of his letter addressed to me for an indent calling for 12 mm thick plates for their H.E. Projects. I have already discussed this with Mr. Mukherjee and it was agreed that Tisco should take early steps to supply these plates. I have also lined up accordingly with the Tisco.

Discussions with Mr. Hira, Member of the Railway Board, Mr. Bhatnagar, ADS (Metric), Mr. Krishnan of RDSO at Rail Bhavan, starting 19th April till 27th April '62.

On the 19th instant, discussions took place with Mr. Hira and Mr. Bhatnagar and after I explained the object of my visit they suggested to go through the list prepared by RDSO for Railways requirements, item by item so that they could exactly know the availability of each item. On going through this list, it was realised that RDSO should be present during these discussions since alternative supplies were suggested by me and since they were not in a position to accept without consulting RDSO. Since RDSO's office is located in Simla, I was requested by them to proceed to Simla about these discussions. Since I had not gone prepared to go to Hill Station, I expressed my inability to do so and requested them to call their representative for Delhi. Accordingly, arrangements were made and Mr. Krishnan of RDSO's office was called to Delhi to have detailed discussions with me with which Mr. Bhatnagar was also associated. Unfortunately, Mr. Hira could not join further discussions except on the first day as he was proceeding on six months leave preparatory to retirement.

The note on the discussions and the remarks made by me were recorded and these were again discussed with Mr. Rajagopalan, Additional Member of the Railway Board. A draft copy of the record notes which is self-explanatory is attached herewith from which it will be seen that further information has to be sent to RDSO, especially regarding the roll life on FPS sections and supplies of sections which are not being produced by the Main Producers. Moreover, in view of the fact that ISI has not yet finalised some of the specifications such as metric bars for black bolts and studs, standard rivets, hexagonal bars etc. their requirements for non-rationalised sections could not be assured. No sooner the fair copy of the minutes is received from the O.S.D. (Metric), it will be forwarded to you.

V.—Meeting with I.S.I. on 23rd 27th and 28th April '62.

Mr. B. S. Krishnamachar, Deputy Director (S&M) and Mr. H. N. Krishnamurty, Asst. Director, were present. After I had explained the object of my visit, Mr. Krishnamachar stated that such work should have been taken on hand much earlier in order that steel producers would have by now increased their range of sections. The planning and development of new sections forms a great vital part in the development of the country and as such, they were willing to extend all necessary help for the same.

The list prepared by ISI and sent to Iron & Steel Control was next examined and it was pointed out that two of the sections ISMC 75×40 and ISMC 100×50 which are rolled at present have not been included in their list. These sections have been produced at great cost and since the manufacturers have already got rolls and tackles, a place must be found to include these two sections.

The difficulties encountered by Tisco in trying to roll ISJC series and the light weight series were also explained. The views of Bhilai, Durgapur and Burnpur, as embodied in my reports, were also put up to them for taking into consideration any further development. As a matter of fact, they went through all the copies of my reports already submitted. Moreover, the discussions that had taken place with RDSO with their requirements were also conveyed to them.

Taking all the above facts into consideration, the list as originally prepared was revised and a copy of the revised list is attached herewith. They were further made aware of the requirements of different sections by various Engineering Firms and consumers in the country and the practical difficulties of the steel producers to fulfill these requirements. After discussing at great length, the following changes were proposed by me to the ISI Sections :—

1. All junior beam and channel sections to be deleted.
2. All light beam and channel sections in the range of 75 mm to 200 mm width, which have only 91½° flange taper, this taper to be raised to 96°.
3. Some light beams have a flange height more than that of equivalent medium beams. This should be reduced to same as that of equivalent medium beams.
4. The flange thickness of all light beams and light channels to be increased by about 10 to 12 per cent.
5. The web thickness of all light channels in the range 75 mm to 125 mm width to be increased by about 5 per cent.
6. The web and flange thickness of all the wide flange beams to be increased by about 15 to 20 per cent.
7. The flange toe radius of all light beam and light channel sections should not be less than half the roof radius.
8. Consideration to be given to increase the web thickness of medium beams and channels by about 4 to 3 per cent and then redesign all light sections to be maximum 10 to 12 per cent lighter than equivalent medium sections.

Mr. Krishnamachar said that he would examine the difference these changes would make in the properties of the sections and then would further discuss in the next meeting of the structural section Committee which would be held on 24th and 25th May 1962. He requested me to attend this meeting in order that I could personally explain the difficulties encountered in producing the sections as already evolved by the Committee. The question of preparation of a list of rationalised sections to be produced immediately in the various steel plants would then be finalised.

Proposed changes to ISI sections :—

List of Indian Standard Beam and Channel Sections to be Produced.

Section	Modulus	Section	Modulus
			cm ³
ISMB	600		3060·4
ISWB	550		2723·9
ISLB	600		2428·9
ISWB	500		2091·6
ISWB	450*		1558·0

ISLB 500	1543.3
ISMB 450	1350.7
ISMB 400	1022.9
ISMB 350	778.9
ISLC 400	699.5
ISMB 300	573.6
ISWB 250 }	475
ISLB or 300 }	
ISMC 300	424.2
ISMB 250	410.5
ISMB 225	305.9
ISMC 250	305.3
ISMC 225	239.5
ISMB 200	223.5
ISMC 200	181.9
ISLC 200	172.6
ISMB 175	145.4
ISMC 175	139.8
ISLC 175	131.3
ISMC 150	103.9
ISMB 150	96.9
ISLB 150	91.8
ISMB 125	71.8
ISMC 125	66.6
ISMB 100	51.5
ISMC 75	20.3
ISMC 100	37.3

Angles Sections as per IS-808-1957 and recommended list of sections to be produced in the country.

Equal angle sections as per IS : 808-1957

Size in mm	Thickness in mm			
	3	4	5	6
45 × 45				
50 × 50				
55 × 55				

1 × 60	.	.	.	.	.	.	.	.	.	5	6	8	10
65 × 65	.	.	.	.	.	.	.	.	.	5	6	8	10
70 × 70	.	.	.	.	.	.	.	.	.	5	6	8	10
75 × 75	.	.	.	.	.	.	.	.	.	5	6	8	10
80 × 80	.	.	.	.	.	.	.	.	.	6	8	10	12
90 × 90	.	.	.	.	.	.	.	.	.	6	8	10	12
100 × 100	.	.	.	.	.	.	.	.	.	6	8	10	12
110 × 110	.	.	.	.	.	.	.	.	.	8	10	12	15
130 × 130	.	.	.	.	.	.	.	.	.	8	10	12	15
150 × 150	.	.	.	.	.	.	.	.	.	10	12	15	18
200 × 200	.	.	.	.	.	.	.	.	.	12	15	18	25

Recommended angle section to be rolled in future.

Size in mm	Thickness in mm													
45 × 45	5	6
50 × 50	5	6
55 × 55	5	
60 × 60	6	
65 × 65	6	8
70 × 70	6	8
75 × 75	6	8
80 × 80	6	8
90 × 90	6	8
100 × 100	6	8 10
110 × 110	8	10
130 × 130	8	10
150 × 150	10	12 18
200 × 200	15	18

APPENDIX 2

Notes by

INDIAN STANDARDS INSTITUTION

Indian Standard

Rolled, Beam, Channel and Angle Sections.

(IS : 808-1952)

0. General—

0.1 It is proposed to deal in this Note briefly the manner in which Indian Standard for Rolled Steel Beam, Channel and Angle Sections (IS : 808-1957) was evolved with a view to appraising members with full background information both historical and technical.

0.2 On a recommendation made by the Planning Commission and at the request of the Government of India, Indian Standards Institution took up a Steel Economy Programme in 1954. The Project consisted of :

- (i) Evolution of new standards for steel products,
- (ii) Laying down codes of practice for fabrication and use of structural steel in buildings,
- (iii) Popularisation of welding in the country.

The main object of the Steel Economy Programme was that most economical types of materials should be produced in the country taking into consideration available indigenous materials and at the same time keeping in view the industrial development contemplated in the years ahead. Further, the steel produced in the country should be put into most economical use.

0.3 It is proposed to confine in this Note details with regard to development of Indian Standard Rolled Steel Beam, Channel and Angle Sections only.

1. Initial Work and Formulation of IS : 808-1957 Rolled Steel Beam, Channel and Angle Section.

1.1 A separate Technical Committee called Structural Steel Sectional Committee, BDC 7 consisting of representatives of Tata Iron & Steel Co. Ltd., (TISCO), Indian Iron and Steel Co. Ltd., (IISCO), and many other major consumers of steel with Shri J. J. Ghandy, Director-in-Charge, TISCO, as its Chairman was set up in 1954. A separate Sub-committee called Steel Sections Sub-committee, BDC 7:1 was also set up under the Sectional Committee BDC 7 to deal with the subject of steel sections. The full composition of the Sectional Committee BDC 7 and Sub-committee BDC 7 : 1 is given in Annexure I (p. 6). At the first meeting of the Sectional Committee, it was unanimously agreed that the present sections were wasteful from the point of view of load carrying capacity and that there was considerable scope for redistribution of the metal among the various elements of the shapes. The representative of TISCO was requested to make suggestions for improvements. Accordingly, Dr. Krebs of TISCO put forward a set of proposals for I beams and channels for consideration of the Committee after taking into account the sections rolled in Europe and USA. The I Beams were divided into three categories, viz.

- (a) broad flange sections,
- (b) normal sections, and
- (c) light sections.

The Committee felt that there was further scope for improving the sections and accordingly revised series were prepared by ISI Directorate. The Committee also took note of the fact that beams with parallel flanges could not be produced in the existing mills of TISCO or IISCO and therefore, standardization programme for these sections was agreed to be so oriented that these could be produced in the new mills to be put up in the public sector. The Committee also agreed that light beams could not be produced in the existing mills of TISCO or IISCO but they could produce the normal beam sections. As the statical properties of beams were not appreciably affected whether the flanges are sloping or parallel, it was decided that the normal beam series may, in the first instance, be designed with parallel

flanges and subsequently changed to sloping flanges to enable TISCO and IISCO to roll them. It was also suggested by Dr. Krebs that as a rough guidance, a thinning out of webs by about 20 per cent of the present beams could be attempted keeping the flange thickness the same or slightly modifying it.

1.2 Based on these discussions, a second series of trial sections was prepared by ISI Directorate. On further discussion it was agreed that a set of sections which should be theoretically best efficient, should be worked out by the Secretariat and the sections would be subject to later corrections as it was noted that practical considerations have considerable effect in deciding how far the theoretical analysis would be applicable. It was also agreed that in the grouping of beams, it would be an advantage if the gradation of weights followed a convenient pattern in addition to the grading of section modulus.

1.3 Subsequently, Mr. H. W. A. Paulsson of North Light Weight Construction Co. gave certain detailed suggestions about theoretical considerations for preparing a series of sections with maximum efficiency in use. These were referred to the experts in United States and also a statistical analysis of the production data within the country was made by ISI Directorate. The object of this investigation was to examine the existing series with a view to determining its efficiency and to evolve the basis for arriving at an efficient new series. The idea was that once the series had been fixed, efficient beams constituting the series could be ascertained from other technical considerations. As a result of this study, it was evident that the section modulus of the section in the series could be arranged in geometric progression.

1.4 In order to prepare the theoretical sections, information with regard to minimum thickness of web and flanges of sections rolled in the then existing mills was obtained from TISCO and IISCO. The flange thicknesses in the ideal series prepared by ISI Directorate were in some cases less than those desired by the rolling mills but it was felt that for the new mills, the thinner flanges as shown were alright.

1.5 A series of broad flange beams of certain sizes ranging from 10 in. \times 8 in. to 24 in. \times 8 in. for varying values of t_f/t_w were also prepared keeping the thickness of web close to the minimum values adopted by other countries for similar sizes. A similar tabular statement for square column sections in sizes varying from 5 in. \times 5 in. to 12 in. \times 12 in. was also prepared. The properties of light weight and junior beams rolled in USA were also circulated to the members of the Committee.

1.6 At the second meeting of the Sub-committee, BDC 7 : 1, the new series and all data collected were considered. By this time, sufficient progress had been made with regard to establishment of three steel plants in the public sector. The Committee, therefore, felt that the experts concerned with the planning of the steel plants in the public sector should also be closely associated with the work of the Sub-committee.

1.7 The Sub-committee BDC 7 : 1 considered the proposals regarding beam sections and agreed on specific depths, weights and web thicknesses. A detailed account of these decisions is given in Annexure II (p. 13) where relevant extracts from the minutes of the meeting are reproduced.

1.8 A few days after the meeting, a letter was received from TISCO stating that they had decided to install a new medium and light structural continuous mill at their works in their expansion programme and they were in a position to roll junior beam and channel sections of the type produced in USA.

1.9 Based on the discussions which took place at the second meeting of the Sub-committee, a revised series of sections was worked out by ISI Directorate and this was circulated along with a Note to members of the Technical Committee scrutinizing the Russian Project Report for the Bhilai Steel Plant. Further, ISI Directorate also had discussions with the member of the Technical Committee, and a number of points were clarified to them. Based on these discussions and other data collected, and the request received from TISCO for standardizing junior beam and channel sections, preliminary draft Indian Standard covering the following items was prepared by ISI Directorate and sent to the Ministry of Iron and Steel, on 31st January 1956 :

- (i) Indian Standard Junior Beams (Designation—ISJB),
- (ii) Indian Standard Normal Light Beams (ISLB),
- (iii) Indian Standard Normal Beams (ISMB),
- (iv) Indian Standard Wide Flange Beams (ISWB), and
- (v) Indian Standard Column Section 'H' Beams (ISHB).

The ISJB sections were meant for production in the new medium and light structural continuous mill which was planned to be put up by TISCO. The proportions, weights, etc. of these beams were kept more or less similar to those produced by Jones and Laughlin in USA.

ISLB sections were meant for production mainly in the new Government mills (Bhilai and Durgapur) and in the new medium and light structural mill at TISCO. It was understood that Bhilai Plant would concentrate on the heavier sections, and Durgapur and TISCO will be able to roll smaller sections.

ISMB sections were meant for production mainly through the then existing mills of TISCO and IISCO. It was, however, understood that if the rail and structural mill at TISCO was to limit its production to 450 mm depth, heavier beams in these series would also be required to be rolled at Bhilai. The dimensions of these beam had been so selected as to suit the limitations of the equipment of the existing mills.

ISWB sections were to be rolled mainly in Bhilai and Durgapur plants.

ISHB sections were meant to be rolled in Bhilai Steel Plant.

Subsequently, TISCO also made a request that they were urgently in need of the draft standard for junior beams as they had to place order for equipment. The draft standard was supplied to them.

The following groups of channels were prepared by ISI Directorate on similar lines :

- (i) Indian Standard Junior Channels (ISJC),
- (ii) Indian Standard Normal Light Channels (ISLC),
- (iii) Indian Standard Normal Channels (ISMC), and
- (iv) Indian Standard Special Channels (ISSC).

ISJC were meant to be produced by TISCO in their new medium and light structural mill. ISLC sections were meant for production in the Government mills (Bhilai and Durgapur) and in the new medium and light structural mill at TISCO.

ISMC sections were meant for production in the existing mills and their dimensions were fixed accordingly.

1.10 A meeting was held on 6 February 1956, where representatives from the International Construction Co. (Consultants for Durgapur Steel Plant), Ministry of Iron and Steel, and ISI Directorate were present, to consider the rolling of new sections at Durgapur. Certain modifications to be carried out in the draft series were agreed upon. In conclusion, it was decided that the reaction of the Russian and British Steel Mills should be obtained on the proposals made by ISI before finalizing the standards.

Subsequently, a meeting was held on 2 March 1956 with Russian Experts. A copy of the minutes of this meeting is included at Annexure III (p. 19). At this meeting, certain modifications were suggested by the Russian Experts.

1.11 Third Meeting of the Sub-committee, BDC 7 : 1 was held on 20 March 1956. At this meeting, certain decisions were taken to modify the standards for beams and channels and the draft standard was issued in wide circulation. Relevant extracts from the minutes of this meeting are given at Annexure IV (p. 20).

In the meantime, comments were received from Russian Experts and the International Construction Co. Copies of these letters are included at Annexure V (p. 32). These comments were referred to Shri S. Das Gupta of TISCO and his reply is given in Annexure VI (p. 35). From the comments received from the British experts, it was noted that Durgapur Steel Plant would be able to produce only ISMB sections. From the views expressed by Russian experts, it was found that ISLB sections could be produced in Bhilai with loss in production and with greater roll wear, they were also able to produce ISMB, ISWB and ISHB sections with certain further modifications.

1.12 The fourth meeting of the Sub-committee BDC 7 : 1 was held on 4 December 1956 in which the draft standards were finalized after agreeing to the changes suggested by Russian and British Experts. Relevant extracts from the minutes of this meeting are included at Annexure VII (p. 37).

Subsequent to the fourth meeting of the Sub-committee, further clarifications from the Russian and British Experts were obtained. Accordingly to these clarifications, it was clear that for ISMB sections, the ratio between the thickness of flange and thickness of web could be as high as 1.85, in view of the fact that even the existing mills were capable of producing sections with that ratio; It was also understood that for ISWB beams, the slope of flange should not be reduced from 6° to 4°.

For column sections, it was required that slope of flanges should be increased from 3° to 4° and the minimum flange thickness should be kept at 9 mm.

After agreeing to all these suggestions, the draft standard was published as IS : 808-1957 Rolled Steel Beam, Channel and Angle Sections, in 1957.

2. Subsequent Position-

2.1 After publication of IS : 808-1957, attempt has been made for production of different sections by TISCO, IISCO, Durgapur and Bhilai Steel Plants. Many of these mills have tried to produce sections which were not meant to be produced by them originally. This is, no doubt, a welcome position. But, it should be noted that even at the time of preparation of IS : 808-1957, these mills were not meant to roll some of the lighter sections. Therefore, naturally several difficulties have been experienced by these mills. It is, however, unfortunate that TISCO who were to roll some of the lighter sections and the junior beam sections, have not been able to roll them although even the equipment was ordered after finalizing some of these sections. Similarly, it is unfortunate that Bhilai Steel Plant is not able to roll many of the sections although the sections which Bhilai was to roll were completely modified to conform to the requirements of Russian Experts.

2.2 In view of this position, the representatives from the steel mills have come forward suggesting modifications to the sections already included in IS : 808-1957.

At its fifth meeting held on 24 and 25 May 1962, the Structural Sectional Committee, SMDC 6 was not inclined straightaway to make any further modifications as it felt that sufficient trial had not been given to produce sections according to IS : 808-1957.

However, at its December 1962 meeting, SMDC 6 considered this question and it was decided that in the light of experience so far gained, the matter should be reconsidered. In the meantime, one of the representatives of TISCO, Shri Ranbir Sen, at the request of the Iron and Steel Controller, has visited all the steel plants and he has been able to suggest the minimum changes required in IS : 808-1957. These changes are reproduced below :

- (1) All junior beam and channel sections to be deleted for the present.
- (2) All light beam and channel sections in the range of 75 mm to 200 mm width, which have only 91½° flange taper, this taper should be raised to 96°.
- (3) Some light beams have a flange height more than that of equivalent medium beams. This should be reduced to same as that of equivalent medium beams.
- (4) The flange thicknesses of all light beams and light channels to be increased by about 10 to 12 per cent.
- (5) The web thickness of all light channels in the range 75 mm to 125 mm width to be increased by about 5 per cent.
- (6) The web and flange thickness of all wide flange beams to be increased by about 15 to 20 per cent.
- (7) The flange toe radius of all light beams and light channels should not be less than half the root radius.
- (8) Consideration to be given to increase the web thickness of medium beams and channels by about 3 to 4 per cent and then redesign all light sections to be maximum 10 to 12 per cent lighter than equivalent medium sections.

It is suggested that representatives from Durgapur, Bhilai, TISCO, IISCO, alongwith Shri Ranbir Sen and ISI Directorate, be invited under the auspices of Iron and Steel Controller, so that the minimum agreed modifications required in IS : 808-1957 be worked out. The matter would, thereafter, be processed through the relevant technical committee of ISI as early as possible. At this meeting, it would probably be possible to decide on a set of sections to be produced by different mills and distribution of these sections amongst various mills.

ANNEXURE I

(Item 1.1)

Composition of Structural Steel Sectional Committee, BDC 7

Serial No.	Name and address of Representative	Organization Represented
	<i>(Chairman)</i>	
1.	<p>Sir J. J. Ghandy Director-in-Charge, Tata Iron & Steel Co. Ltd., Jamshedpur.</p> <p>Shri P. H. Kutar, Technical Director, Tata Iron & Steel Co. Ltd., Jamshedpur.</p>	
	<i>(Alternate Chairman)</i>	
2.	<p>Shri N. C. Bagchi, Asst. Director (Physical), Government Test House, Alipore, Calcutta.</p> <p><i>Alternate</i></p> <p>Shri M. K. Haldar, Asst. Director (Chemical), Government Test House, Alipore, Calcutta.</p>	Government Test House, Calcutta.
3.	<p>Shri S. L. Bazaz, Deputy Bridges Officer, Roads Organization, Jamnagar House, Shahjehan Road, New Delhi.</p> <p><i>Alternate</i></p> <p>Shri P. C. Poonen, Superintendent Engineer, Ministry of Transport, Roads Organization, Shahjehan Road, New Delhi.</p>	Roads Organization, Ministry of Transport, New Delhi.
4.	<p>Shri D. S. Desai, Chief Designer, M/s. Braithwaite & Co. (India) Ltd., Hide Road, Kidderpore, Calcutta-23.</p>	Braithwaite, Burn & Jessop Construction Co. Ltd., Calcutta.
5.	<p>Shri D. S. Desai, Chief Designer, M/s. Braithwaite & Co. (India) Ltd., Hide Road, Kidderpore, Calcutta-23.</p> <p><i>Alternate</i></p> <p>Shri M. P. Nagarsheth, Divisional Engineer Consultant, Ministry of Transport, Roads Organization, Jamnagar House, New Delhi.</p>	Indian Roads Congress, New Delhi.

ANNEXURE I—contd.

Serial No.	Name and address of Representative	Organization Represented
6.	Shri D. S. Desai, Chief Designer, M/s. Briathwaite & Co. (India) Ltd., Hide Road, Kidderpore, Calcutta-23.	Institution of Engineers (India) Calcutta.
7.	Shri R. N. Dutta, Deputy Iron & Steel Controller, 33, Netaji Subhas Road, Calcutta.	Iron & Steel Controller, Calcutta.
8.	Shri T. J. Manickam, Senior Architect, Central Public Works Department, New Delhi.	Indian Institute of Architects, Bombay.
9.	Shri S. Das Gupta, Master Roll Turner, Tata Iron & Steel Co. Ltd., Jamshedpur.	Tata Iron & Steel Co. Ltd., Jamshedpur.
	<i>Alternate</i> Mr. H. Hodgkinson, Structural & Mechanical Engineer, The Tata Iron & Steel Co. Ltd., Jamshedpur.	
10.	Dr. A. K. Mallick, Chief Metallurgist, Indian Iron & Steel Co. Ltd., Burnpur.	Indian Iron & Steel Co. Ltd., Burnpur.
11.	Shri S. K. Mitra, M/s. James Alexander Co. Ltd., 8, Dalhousie Square East, Calcutta.	Engineering Association of India Calcutta.
	<i>Alternate</i> Shri S. Srinivasan, M/s. K. T. Steel Industries Ltd., Broach Street, Opp. Victoria Docks (Blue Gate), Bombay-9.	
12.	Mr. J.W. Miller, Chief Draughtsman, Kumardhubi Engineering Works, P.O. Kumardhubi, Distt. Manbhum (Bihar).	Indian Engineering Association Calcutta.
	<i>Alternate</i> Mr. W.D. Holton, M/s. Bird & Co. Ltd., Industrial Department, Chartered Bank Buildings, Calcutta.	
13.	Shri K.K. Mathani, Director of Inspection, Directorate General of Supplies and Disposals (Inspection Wing), Shahjehan Road, Block No. 2, New Delhi.	Directorate General of Supplies and Disposals, New Delhi.

ANNEXURE I—*contd.*

Serial No.	Name and address of Representative	Organization Represented
14.	Mr. E.P. Nicolaides, Chief Engineer, M/s. J.C. Gammon Ltd., Hamilton House, Ballard Estate, P.O. Box No. 503, Bombay.	M/s. J.C. Gammon Ltd., Bombay.
15.	Dr. O.G.F. Paulssen, Dipl. Ing., New Standard Engineering Co. Ltd., Carrol Road, Bombay-13.	
16.	Shri A.L. Rao, Executive Engineer, Central Public Works Deptt., Planning Circle (W.Z.), 'E' Block, New Delhi.	Central Public Works Deptt., New Delhi.
17.	Shri H.K. Ramanujam, General Manager, The Mysore Iron & Steel Works, Bhadravati (S. India).	Mysore Iron & Steel Works, Bhadravati.
	<i>Alternate</i> Shri A.S. Vallishayee, Designing and Estimating Officer, The Mysore Iron & Steel Works, Bhadravati (S. India).	
18.	Mr. J.W. Rankin, Bridge & Roof Co. (India) Ltd., C/o. Balmer Lawrie & Co. Ltd., 21, Netaji Subhas Road, P.O. Box. No. 4, Calcutta.	Bridges & Roof Co. (India) Ltd., Calcutta.
19.	Col. G.S. Sihota, Chief Engineer Air Force Works, E-In-C's Branch, Army Headquarters, New Delhi.	Engineer-in-Chief's Branch, New Delhi.
	<i>Alternate</i> Shri R.S. Mehandru, SO I (E2 AIR), E-in-C's Branch, Army Headquarters, New Delhi.	
20.	Dr. B. D. Kalekar, Industrial Adviser (Engineering), Ministry of Commerce & Industry, (Development Wing), Shahjehan Road, New Delhi.	Ministry of Commerce and Industry, (Development Wing), New Delhi.
	<i>Alternate</i> Shri N. Krishnaswami, Development Officer, Ministry of Commerce and Industry, (Development Wing), Shahjehan Road, New Delhi.	
21.	Shri V. Venkataramayya, Chief Design Engineer (Civil), Central Standard Office, Ministry of Railways, Baroda House Annexe, New Delhi.	Railway Board, New Delhi.

ANNEXURE I—contd.

Serial No.	Name and address of Representative	Organisation Represented
22.	Shri K. Vyasulu, Asst. Chief (Industry Division), Planning Commission, Rashtrapati Bhavan, New Delhi.	Planning Commission, New Delhi.
23.	Shri Suku Sen, B. Sc., Hindustan Steel Ltd., 2, Fairlie Place, Calcutta-1.	Hindustan Steel Ltd., Calcutta.
	<i>Alternate</i>	
	Shri S. N. Srivastava, Superintendent of Workshops & Training, Hindustan Steel Ltd., 2, Fairlie Place, Calcutta-1.	
	<i>Alternate</i>	
	Shri L. N. Misra, Assistant Technical Adviser, Hindustan Steel Ltd., 2, Fairlie Place, Calcutta-1.	
24.	Shri S. L. Kumar, Director Research, Railway Testing & Research Centre, Alambagh, Lucknow.	Structural Steel Research Sub-committee, (BDC 7:4).
25.	The Director, Central Building Research Institute (CSIR), Roorkee.	Central Building Research Institute (CSIR), Roorkee.
26.	Shri K. F. Antia, Concrete Association of India, 1-2, Queens Road, Fort, Bombay-1.	The Concrete Association of India, Bombay.
27.	Shri Rama Verman, Technical Secretary, National Building Organization, Ministry of Works, Housing and Supply, 11-A, Janpath, New Delhi.	National Building Organization, Ministry of Works, Housing and Supply, New Delhi.
	<i>Alternate</i>	
	Shri L.G. Toye, Deputy Director (Design), National Building Organization, Ministry of Works, Housing and Supply, 11-A, Janpath, New Delhi.	

ANNEXURE I—contd.

Composition of Steel Sections Sub-Committee, BDC 7:1

Serial No.	Name and address of Representative	Organization Represented
1.	Dr. O.G.F. Paulssen (Convener), Dipl. Eng., C/o. New Standard Engineering Co. Ltd., Carrol Road, Bombay-13.	
2.	Shri M.S. Doshi, Technical Assistant to General Manager; The Indian Iron & Steel Co. Ltd., Burnpur (<i>Via</i> Asansol Eastern Rly.)	Indian Iron & Steel Co. Ltd., Burnpur.
3.	Shri R. N. Dutt, Deputy Iron & Steel Controller, 33, Netaji Subhas Road, Calcutta-1.	Iron & Steel Controller, Calcutta.
	<i>Alternate</i>	
	Shri S. Banerjee, Assistant Iron & Steel Controller, 33, Netaji Subhas Road, Calcutta-1.	
4.	Shri S. Das Gupta, Master Roll Turner, The Tata Iron & Steel Co. Ltd., Jamshedpur.	Tata Iron & Steel Co. Ltd., Jamshedpur.
	<i>Alternate</i>	
	Mr. H. Hodgkinson, Structural & Mechanical Engineer, Tata Iron & Steel Co. Ltd., Jamshedpur.	
5.	Dr. Ing. W.E. Krebs, Works Manager and Technical Adviser, M/s. Kalinga Tubes Ltd., Choudhwar, Dist. Cuttack (Orissa).	M/s. Kalinga Tubes Ltd., Calcutta.
6.	Shri T. Krishnappa, General Manager, The Mysore Iron & Steel Works, Bhadravati (South India).	Mysore Iron & Steel Works, Bhadravati.
	<i>Alternate</i>	
	Shri A. S. Vallishayee, Designing & Estimating Officer, The Mysore Iron & Steel Works, Bhadravati (South India).	
7.	Shri O.S. Murthy, Engineer-in-Charge, Integral Coach Factory, Perambur, Madras.	Railway Board, New Delhi,
8.	Shri V. Narayanan, Executive Engineer, Planning Circle (S.Z.), C.P.W.D., New Delhi.	Central Public Works Dept., New Delhi.

ANNEXURE I—*contd.*

Serial No.	Name and address of Representative	Organization Represented
9.	Shri H. Pandit, Burn & Co. Ltd., Howrah.	Braithwaite, Burn & Jessop Construction Co., Calcutta.
	<i>Alternate</i>	
	Shri D. S. Desai, Chief Designer, Braithwaite & Co. (India) Ltd., Hide Road, Kidderpore, Calcutta-23.	
10.	Shri C.B. Patel, Superintending Engineer, Housing Adviser, Ministry of Works, Housing and Supply, New Delhi.	Institution of Engineers (India), Calcutta.
11.	Shri S.K. Puri, Secretary, North India Light-Weight Steels Limited, 63, Najafgarh Road, Industrial Area, New Delhi-15.	North India Light-Weight Steels Ltd., New Delhi.
12.	A Representative	National Buildings Organization, Ministry of Works, Housing & Supply, New Delhi.
13.	A Representative	Ministry of Iron & Steel, New Delhi.
14.	A Representative	Bhilai Steel Project
15.	A Representative	Durgapur Steel Project
16.	Shri A.R. Sen, SO2-Planning, Army Headquarters, Engineer-in-Chief's Branch, DHQ PO, New Delhi-11.	Engineer-in-Chief's Branch, Army Headquarters, New Delhi.
17.	Shri Suku Sen, B.Sc., Hindustan Steel Ltd., 2-Fairlie Place, Calcutta-1.	Hindustan Steel Ltd., Calcutta.
	<i>Alternate</i>	
	Shri S. N. Srivastava, Superintendent of Workshops and Training, Hindustan Steel Ltd., 2-Fairlie Place, Calcutta-1.	
	<i>Alternate</i>	
	Shri L.N. Misra, Assistant Technical Adviser, Hindustan Steel Ltd., 2-Fairlie Place, Calcutta-1.	

ANNEXURE II.

(Item 1.7).

Extracts from the Minutes of the Second Meeting of Steel Sections Sub-committee, BDC 7 : 1.

2.3 Standardization of Hot Rolled Sections

2.3.1 Re-orientation of Programme.

2.3.1.1 The Sub-committee discussed in detail the re-orientation now found necessary in the standardization programme for hot-rolled sections due to the prospect of immediate implementation of the expansion programme for production of steel in India. The Sub-committee noted that the production of steel in India would in the next five to six years be increased to 5 to 6 million tons per year. Apart from the proposals being finalized for expansion of the existing mills and installation of the Rourkela mill, there is every prospect of two more new Government mills being installed.

2.3.1.2 The Sub-committee noted that the ISI Directorate has no positive information about these expansion schemes other than that collected from newspaper reports and that casually obtained from other sources. Shri T. V. Joseph informed the Sub-committee that the Directorate had contacted the Government of India and repeatedly urged the need for close co-ordination between the ISI and the agencies responsible for the planning of the steel expansion programmes, as the final advantage to the country on account of the rationalization and standardization of structural sections would greatly depend on this co-ordination being established very early in the planning stage. But so far it has not been possible to establish any contact with the technical staff responsible for the planning of the new mills.

2.3.1.3 The Sub-committee considered that this position was entirely unsatisfactory. The expansion programmes for the production of hot-rolled sections, if proceeded with, without a proper understanding for the need and possibilities of increasing the efficiency of the sections would be detrimental to the country's industrialization programme. It would not only nullify the possible advantage to be gained out of this aspect of the Steel Economy Programme but would in the future be a permanent obstacle to the implementation of any economy programme being successfully accomplished. If the new mills and their machinery are designed on conservative lines they would later have the same difficulties and limitations in producing higher efficiency sections as the existing mills in India now have.

2.3.1.4. The hot-rolled sections to be standardized by the Sub-committee have to be suitable for production in India and this standardization could not be properly proceeded with unless the Sub-committee has a clear idea of the type of equipment being installed in these mills. The Sub-committee would further desire information as to whether the Government is considering possibilities of allocating the over-all production of structural sections in India to the existing and new mills in such a way that each mill takes up such items as could be economically and efficiently produced in it.

2.3.1.5 The Sub-committee DECIDED that these aspects should receive the urgent and earnest consideration of the Structural Steel Sectional Committee (BDC 7) and of the ISI Directorate and all possible means should be adopted for remedying the present position where the Sub-committee is entirely in the dark as regard the expansion programmes and is not associated in any way with the planning of the expansion programmes.

2.4 Beams

2.4.1 The Sub-committee considered the technical memoranda referred to under items 2.1 to 2.6 of the Agenda and also the information contained in letters No. 3194-196A, 197A, 198A and 199A dated 4 April 1955, received from the Consulting Engineers. The Sub-committee DECIDED that in the formulation of standard beam sections the properties of sections should be studied and series of standard beams drawn out under the groupings mentioned below :

- (a) Normal beams,
- (b) Broad flange beams designed for beam use,
- (c) Broad flange column sections designed for column use,
- (d) Light beams designed for beam use.

2.4.2 *Design of Series*—The Sub-committee DECIDED that for the four groups mentioned under item 2.4.1 above the arrangement of sections in the series should follow the principles enunciated below.

2.4.2.1 *Normal Beams*—The Sub-committee studied the memoranda prepared by the Statistical Section of the ISI and agreed that the approach suggested in this memoranda for the design of the beam series has a rational basis, since it is based on the statistical data of production of beams in India. It was felt that the statistical data relating to production of sections in the higher section modulus range could not be considered as sufficiently representative for forecasting future production, especially in view of the fact that broad flange beams would represent an appreciable percentage of the production in the future. The Sub-committee INSTRUCTED the Secretariat to request the Statistical Section to evolve a modified equation for the series, ignoring the production of heavier beams. The Secretariat was INSTRUCTED to base the gradation of the normal beams in the lower range on this equation to the extent as possible from practical considerations. The beams above this range are to be arranged in a geometric progression, assuming a suitable number of beams to fit in with the number of depths etc. as decided upon and recorded in the succeeding items of the Minutes.

The Secretariat was INSTRUCTED to investigate whether it is possible to work out the comparative efficiency of normal beams as designed (a) in a series based on the statistical analysis, (b) in a geometrical series without reference to statistical data and (c) the existing series of beams. For the purpose of this investigation it may be possible to base the percentage use in each range as given by the statistical analysis.

2.4.2.2 *Broad Flange Beams for Use as Beams*—Since broad flange beams have not so far been produced in India, it is not possible to arrive at a pattern for the future demand. The Secretariat was INSTRUCTED to design the series of broad flange beams for use as beams, with their section moduli following a geometric series.

2.4.2.3 *Broad Flange Beams for Use as Columns*—It was agreed that for use as columns the weight, i.e. the cross-sectional area of the section, should be the characteristic to be considered for the arrangement of the series. In the arrangement of the weights in the series the two factors requiring consideration are :

- (a) that it should be possible to obtain satisfactory and efficient sections for a column passing through the different floors of a multi-story building and carrying the varying loads from floor to floor, and
- (b) the need for columns of varying carrying capacities to meet the requirements of varying floor and loads floor areas supported.

The Sub-committee felt that though a series to cover the uncertain variations in the floor loads and the floor areas may perhaps to meet by an arrangement of the weights in geometric series, the variation of load on a column from floor to floor need not necessarily follow the geometric pattern. The Secretariat was INSTRUCTED to study this aspect further and also to find out the square area requirements for columns carrying different floor loads and floor areas and passing through a number of floors.

2.4.2.4 *Light Beams for Use as Beams*—The Sub-committee DECIDED that the consideration governing the arrangement of series for the light beams should be the same as those for the broad flange beams for use as beams.

2.4.3 Proportions of the Beam Sections

2.4.3.1 *Normal Beams*—The Sub-committee DECIDED that the nominal depths, widths and the web thicknesses in inch units of the beam sections in the series should be as given below :

Depth	Width	Web thickness
in.	in.	in.
24	8	0.48
22	7	0.44
20	6½	0.40
19	6	0.38
18	6	0.36
17	6	0.35
16	6	0.34

Depth	Width	Web thickness-
in.	in.	in.
15	5½	0.33
14	5½	0.32
13	5	0.31
12	5	0.30
11	5	0.29
10	5	0.28
9½	4½	0.27
9	4	0.26
8½	4	0.25
8	4	0.24
7½	4	0.23
7	3½	0.22
6½	3½	0.20
6	3	0.19

It was AGREED that the beam sizes 19×6 and 17×6 may be eliminated if the Secretariat on further study finds this possible. It was also AGREED that the width of flange of the 7 inch beam may be reduced to 3½ inch, if this is found necessary to bring the proportion within rollable limits.

The Sub-committee AGREED that normal beams of sizes 5×3, 4×3 and 4×2 in. should also be standardized. But since their proportions would be very similar to those of light beams they should be included in that series for purpose of investigation.

The Sub-committee DECIDED that the thickness of the flanges should be so arranged that the ratio, thickness of flange/thickness of web should be within the limits 1.5 to 2.0.

2.4.3.2 *Broad Flange Beams for Use as Beams*—The Sub-committee DECIDED that the nominal depths and widths in inch units for broad flange beams should be standardized as mentioned below :

Depth	Width.
in.	in.
24	In widths of 12, 10 and 8 in.
22	
20	
18	
16	
14	In widths of 10 and 8
12	
10	In widths of 8 and 6 in.
8	6

The thickness of webs for the broad-flange beams, 8 in. and less in widths, may be the same as those adopted for normal beams of the corresponding depth. The Secretariat was INSTRUCTED to examine whether for the 10 and 12 in. width beams only increase in web thickness would be justified from the point of view of the shear carrying capacity, and to adopt suitable web thicknesses for these beams on the basis of this study. The Sub-committee DECIDED that the thicknesses of the flanges should be so arranged that the ratio, thickness of flange/thickness of web is within the limits 1.5 to 2.0.

The Sub-committee appreciated that neither the existing mills nor the new mills now planned may immediately be able to produce beams of widths up to 12 in. It is even possible that the new mills may restrict the maximum width of sections to 8 in. It is realized that the demand for beams with very broad flanges is not large at present and may not be so in the immediate future. But it is noted from the production figures of the steel industry in the U.S. and U.K. that as the tempo of industrialization in any country increases, there is a definite tendency for the demand and the production of structurals in the broad-flange beam range to increase sharply. It is felt that the vast increase of industrialization planned in India through the Five Year Plans would justify the eventual production in India of broad-flange beams. The Sub-committee, therefore, felt that it is necessary that standard be now made available to provide for the production of broad flange sections and that the new mills should have equipment suitable for production of as wide flanges as possible, consistent with considerations of reasonableness of increase in capital investment.

On the basis of the considerations mentioned above, the Sub-committee decided that the standardization of broad flange sections should be up to a maximum flange width of 12 in. Sections for which the immediate production in India is not possible will be specially noted to indicate that a check on their availability must be made by the design engineer before considering them for construction use.

2.4.3.3 Broad Flange Beams for Use as Columns—The Sub-committee DECIDED that the nominal depths, widths and thicknesses of webs in inch units of the column sections should be standardized as mentioned below :

Depth	Width	Thickness of Web.
in.	in.	in.
12	12	0.33
10	10	0.28
8	8	0.23
6	6	0.20
5	5	0.20
4	4	0.17

The thickness of flange should be so adjusted that the ratio, thickness of flange/thickness of web is within the limits 1.5 to 2.0.

2.4.3.4 Light Beam Sections—The Sub-committee DECIDED that the nominal sizes in inches for the depths, widths and web thicknesses for the light beam sections should be as mentioned below :

Depth	Width	Web thickness
in.	in.	in.
12	4	0.20
10	4	0.18
8	4	0.17
6	4	0.16
5	4	0.16
5	4	0.16
4	3	0.15
4	3	0.15
4	2	0.15

The Sub-committee DECIDED that the thickness of flanges for the light beams should be proportioned so that the beams could be conveniently rolled. On this basis the ratio, thickness of flange/thickness of web may, in this case, be lower than 1.5.

2.4.3.5 *Junior Beams*—The Sub-committee felt that junior beam with very light webs and flanges, if produced in India, may have to face severe competition from cold formed light gauge sections and INSTRUCTED the Secretariat to investigate this aspect before proceeding further with this item.

2.5 Channel Sections

2.5.1 The Sub-committee DECIDED that channel sections should be standardized both for ordinary structural use and for special industrial use. For ordinary structural use the nominal depth and width of flange in inch units for channels should be standardized as given below :

Depth	Width of flange.
in.	in.
15	4
12	4
10	3½
9	3
8	3
7	3
6	3
5	2½
4	2
3	1½

2.5.2 The thicknesses of webs for the channel sections should be kept the same as those for normal beams of the corresponding depths. The thicknesses of flanges should be so proportioned as to be convenient for rolling in the mills and should be adjusted to give a suitable gradation in the series.

The Sub-committee DECIDED that the series for channel sections should be arranged on the basis of weights and the weights should follow a geometric progression. The Sub-committee felt that the use of individual channels as beams is very limited and for use as components of built-up columns and beams the sections area, i.e. weight rather than the section modulus, is the important factor.

2.5.3 Standardization of channel sections for special industry use has to be based on data collected from the ship-building, wagon-building, etc., industries and the Secretariat was INSTRUCTED to collect the necessary data.

2.6 Angle Sections

2.6.1 The Sub-committee felt that the equal and un-equal angles now produced in India according to the British standards cover the range required for all practical purposes. For the mills at present this wide range of sizes and thicknesses is a source of difficulty, but the Sub-committee felt that with the over-all production in steel increasing in the near future, there may not be any justification for rationalizing the standards for angle sections by the removal of certain of the sizes and thicknesses. The Sub-committee INSTRUCTED the Secretariat to ascertain from the Sub-committee members and also from as many of the industrial users in India as possible as to whether it would be feasible to reduce the number of angle sections by cutting out the thicker sections for the larger sizes in order to reduce the number of angle sections by cutting out the thicker sections for the larger sizes in order to reduce the overlapping in weights between the different sizes.

2.7 Standardization of Light-gauge Sections

2.7.1 Requirement of Strip Steel—The Sub-committee FELT that the strip for structural purposes to be produced in India should have specifications relating to chemical and physical properties corresponding to the specifications of strip steel used for similar purposes in U.S. and U.K. It was FELT that the strip for structural purposes should be of the hot-rolled variety and should be available either as pickled and oiled or as galvanized. The Subcommittee FELT that it would be possible to obtain all the structural sections expected to be used in the foreseeable future from strip of widths varying from 4 in. to 20 in. rising in widths in full one inch units. It was agreed that for special type of cold-formed sections needed in the building industry it would be necessary to have strip in widths larger than 20 in. also, but it is not possible to standardize specific width requirements for such purposes. But the Rourkela mill will have capacity to supply strip to any required width greater than 20 in. for such use.

ANNEXURE III.

(Item 1.10).

Standards for structural sections for production in Bhilai Steel Plant.

Minutes of the meeting held in the Ministry of Iron & Steel on the afternoon of 2nd March, 1956.

The following were present :

1. Shri R. N. Dutt—Dy. Iron & Steel Controller.
2. Mr. E. P. Gora.
3. Mr. A. M. Rybalchenko.
4. Shri T. V. Joseph
5. Shri A. P. Sivaramakrishnan ISI.

The proposals of the Indian Standards Institution for beam and channel sections were considered. During the discussion, the Russian Engineers pointed out that as regards the normal light beams Table I, Doc: BDC 7(200)P1 it is possible to produce the sections in the Bhilai Steel Plant. The seven degree slope provided for flange is satisfactory. As regards the normal light channels, Table I, Doc : BDC 7(232)P1, it is not possible to produce these sections at the Bhilai Steel Plant unless the slope of the flange is increased from 50as now shown to a slope of 1/10 (approximately 60). As regards the wide flange beams, Table III Doc : BDC 7(200)P1 and column sections—H Beams, Table IV Doc : BDC 7(200)P1, it is possible to produce the sections with the thickness shown in the ISI proposals provided the flange is given a slope of 1/10 (approximately 60). In case, it is not possible to provide the slope, it will be necessary to increase the web and flange thickness of the wide flange beams and column sections—H Beams to thickness, corresponding to wide flange beams and H beams rolled in similar type of mills in other countries.

The Russian Engineers pointed out that the sections proposed by the ISI are lighter than what is ordinarily rolled in many countries and there is likely to be some loss in production and heavier consumption of rolls. They are unable to, present give any exact figures, as regards the likely loss in production or other aspects of difficulties. They suggested that the ISI standards for beams and channels should be prepared as tentative and after the sections to these standards have been rolled for a year or two, it would be possible to find out whether modifications are necessary to these sections to avoid loss of production and wastage in rolls.

The Russian Engineers also pointed out that a new mill during the training period of workmen would have difficulty in rolling the lighter type of sections and it would be preferable to start production in the mills with the sections corresponding to the present British and American standard sections rolled by same type of mills.

The detailed study made by the Russian Engineers corresponds to the normal light beams, Table I Doc : BDG 7(200)P1, 300×120 mm, 400×165 mm, 125×75 mm, 100×50 mm, and 75×50 mm, normal light channels, Table I Doc : BDC 7(232)P1, 250×100 mm, 225×90 mm, 125×65 mm, 100×50 mm and 75×40 mm and wide flange beams, Table III Doc : BDC 7(200)P1, 400×250 mm and 200×200 mm. But they feel that the same remarks will apply to other corresponding sections in the lists discussed at the meeting. They suggested that after the ISI has prepared its detailed proposals for the standards for hot rolled sections, the Russian Experts may be given a copy of the proposals so that they may have an opportunity to study them and offer their comments.

ANNEXURE 12

(Item 1.11).

Extract from the MINUTES of the THIRD MEETING of the Steel Sections Sub-committee (BDC 7 : 1).

Item 0. GENERAL

0.1 In opening the meeting, Dr. O. G. F. Paulssen expressed his appreciation for the large number of Sub-committee members attending this meeting. He pointed out that this meeting was the most important meeting held so far and that he hoped the decisions arrived at this meeting would enable the Sub-committee to finalize the series of standard sections which were developed by it in the past two years. He emphasized that this work was undertaken as a part of the Steel Economy Programme and that the aspect of the steel economy must be given due importance in arriving at the final decisions. Before discussing the details of the individual section, which were being submitted for approval to the Sub-committee, he wished to point out that though the sections suggested in the proposed series were a major modification on those sections which are at present being produced in India, the proposed sections were by no means of any experimental nature and were based on the world's best practices now in use.

1.1.4.1 In reporting the latest position with regard to the contacts with the Ministry of Iron & Steel, Shri Joseph read out to the Subcommittee the two letters reproduced below :

1. *Copy of letter No. 4(2)-7/56, dated 24th March 56, received from Ministry of Iron and Steel by the ISI Directorate*

"The list of IS sections for beams, channels and angles (Doc : BDC 7 (200)P Tables I, II, III and IV, Doc : BDC 7(232)P Tables I and II, Doc : BDC 7(231)P Tables I and III) have been examined by our consultants. They are of the view that the suggested new Indian Standard sections are lighter viz. webs and flanges are thinner than those generally accepted as standards in other countries. Before these are fully finalized, it is suggested that the views of the Soviet organizations the Indian Steel Works Construction Co. Ltd., TISCO and IISCO may be invited in order to ascertain whether they can roll these sections. A preliminary examination shows that rolling of these lighter sections will result in fall of production to the extent of 10 percent to 25 percent. The consultants are, however, of the opinion that the "normal standards" should be such that they can be conveniently rolled by all the large steel works within their range of mills.

It is accordingly suggested that while discussing the question in the next meeting to be held on the 20th of March the above points may also be taken into consideration."

2. *Copy of ISI's letter No. SE 1/A-2, dated 15 March 1956 to the Ministry of Iron and Steel in reply to their above quoted letter*

"This letter has reference to your letter No. 4(2)-7/56, dated 14 March 1956. It is pointed out that the specific and definite comments from the consultants to the Ministry of Iron and Steel, the Soviet organizations and the Indian Steel Works Construction Co. Ltd., are necessary on the proposals for beams, channels and angles contained in Tables I, II, III and IV of Doc : BDC 7(200)P1, Tables I and II of Doc : BDC 7(232)P1 and Tables I and III of Doc : BDC 7(231)P1. In the absence of such specific comments it is not possible for the ISI committees to come to any conclusion with regard to these standards.

At the meeting of the Steel Sections Sub-committee (BDC 7 : 1) proposed to be held at Bangalore on 20, 21 and 22 March 1956, the Subcommittee had intended to finalize its views with regard to these standards. Representatives of TISCO and IISCO and the Iron and Steel Controller are already attending this meeting. It is essential that the views of your consultants, the Soviet Organizations and the Indian Steel Works Construction Co. Ltd., are available to the Sub-committee at this meeting, and it is, therefore, requested that representatives of these organizations may be requested to attend this meeting. Three sets of the agenda and the documents mentioned above are sent with this letter.

In view of the fact that the standardization of hot rolled sections is an important part of the Steel Economy Programme which the ISI has taken up on the specific request of the Government of India and on the recommendation of the Planning Commission, and since further progress of work on this item is not possible except with the co-operation of the organizations mentioned by you in your letter, we shall be grateful if you would kindly arrange for the representatives of the above three organizations to be present at the meeting to be held at Bangalore.

This letter has reference to the telephonic conversation which the undersigned had with Shri P. N. Bhalla today afternoon."

1.1.4.2 The Sub-committee APPROVED of the invitation extended to the Ministry of I & S and NOTED with regret that the Ministry of Iron and Steel was unable to arrange for the presence of the representatives of the Soviet and British Mills and of the Government of India's Consultants, at the present meeting.

1.1.4.3 The members were informed that the Ministry of Iron and Steel has intimated that at the present meeting of the Sub-committee, Shri R. N. Dutt, Deputy Iron and Steel Controller will represent the Ministry of Iron and Steel also. Shri Dutt informed the Sub-committee that he may be considered as representing the Bhilai and Durgapur mills also at this meeting.

1.1.4.4 The Sub-committee INSTRUCTED the Secretariat to Press the Ministry of Iron and Steel for the nomination of representatives from the new mills at an early date.

Item 2. TECHNICAL WORK

2.0 General—Shri T. V. Joseph reported that as required by the Sub-committee and the Sectional Committee at their last meetings, the Directorate had established close liaison with the Ministry of Production, which had been responsible for the installation of the new mills. After the Ministry of Iron and Steel was set up the liaison was established with them. Details regarding the work of the Steel Economy Section and particularly regarding the work of standardization of sections were furnished to them. They were informed that when the proposals for the new mills are considered, it was necessary to ensure that the lay-out of the mills and the equipment are suitable for production of the higher efficiency sections being standardized by the ISI.

2.0.1 At the time the Directorate received information that the Russian project report for the steel mill at Bhilai was under consideration by a team of Indian experts, the Ministry of Iron and Steel was again remained about the matter of co-ordination of our work with the new projects. A number of discussions were held with the members of the Expert Committee and with the officers of the Iron and Steel Ministry. On their request they were given the details of the types of beams, channels and angles expected to be standardized, the basic depth and width dimensions, the minimum web thicknesses and also the minimum values of ratios for flange thickness/web thickness. They were informed that the new mills should be capable of producing beams, channels and angles of the types indicated by these basic properties. It was specially reported to the Sub-committee by Shri Joseph that it was possible at this stage to arrive at a very close understanding with the members of the Expert Committee and with the Ministry of Iron and Steel because a number of members of the Expert Committee were closely associated with the work of this Sub-committee and also the Sectional Committee.

2.0.2 Similar contacts were also established with the International Construction Company who are acting as the Consulting Engineers to the Ministry of Iron and Steel. At a special meeting held with them details of the Steel Economy Programme and also the basis of work and progress so far made as regards standardization of higher efficiency structural sections were explained to them.

2.0.3 At the time the Russian Project Report for the Bhilai steel plant was being finally discussed for acceptance, Shri T. V. Joseph, together with Shri R. N. Dutt, had meetings with the Russian engineers. The following aspects brought out in the Minutes of the meeting were reported to the Sub-committee.

- (a) The Russian engineers agreed that the normal light beams, as given in Table I of Doc : BDC 7(200)P1, could be produced in the mill to be put up at Bhilai. The properties of the sections with a seven degrees slope provided for the flange are satisfactory.
- (b) There would be difficulty in producing the normal light channels of Table I, Doc : BDC 7(232)P1 in the Bhilai steel plant unless the slope of the flange is approximately 6 degrees. (1/10).
- (c) It would be possible to produce wide flange beams as per Table III, Doc : BDC 7(200)P1 and the Column Sections-H Beams as per Table IV (Doc : BDC 7(200)P1) in the Bhilai steel plant provided the flange is given a slope of 1/10 (approximately 6 degrees). The Russian engineers mentioned that if it is not possible to provide the slope in the flanges, as indicated by them, it would be necessary to increase the web and flange thicknesses of the wide flange beams and column sections to correspond to the thicknesses of similar sections produced in mills of the same type in other countries.

- (d) The Russian engineers pointed out that the sections proposed by the ISI are lighter than what is ordinarily rolled in many countries and there is likely to be some loss in production and somewhat heavier consumption of rolls. They were unable to give at present any exact figures as regards the likely loss in production or other aspects of difficulties. They suggested that the ISI standards for beam and channels should be prepared as tentative standards. After the sections to these standards have been rolled for a year or two, it would be possible to find out whether modifications are necessary to these sections to avoid loss of production and wastage in rolls.

2.0.4 The question as to the type of sections with which the Bhilai steel plant should start production was also discussed incidentally. Even though the Sub-committee is not directly concerned with this matter of detail, it was reported by Shri Joseph for their information that the Russian engineers felt that the new mill, during the training period of workmen, would have difficulty in rolling the lighter type of sections. They felt that it would be preferable to start production in the mills with the sections corresponding to the present British and American standard sections.

2.0.5 In connection with this meeting the Ministry of Iron and Steel have been informed by the ISI Directorate that this Sub-committee and the Sectional Committee would take into consideration the various aspects brought out during the discussions with the Ministry of Iron and Steel and with the Russian engineers while finalizing the standards for hot rolled sections. The Russian Engineers pointed out that in Russia also they were working on a programme of standardizing similar hot rolled sections, but the work in this line has not advanced enough for them to be 100 percent sure that the mills being installed by them in India will have no difficulty in producing the proposed new sections. The ISI Directorate had specially pointed out to the Ministry of Iron and Steel that in case any serious difficulty as regards convenience of production, loss in output or wastage of rolls was anticipated in producing, the proposed sections in the new mills, it was essential that the Ministry of Iron and Steel should consider the possibility of the proposed design for the mill equipment and lay out being suitably modified to avoid such difficulties in producing the higher efficiency sections.

2.0.6 As regards the programme for the first year of production, it has been pointed out by the ISI Directorate that it would be undesirable for continuation of the production of hot rolled sections to standards other than the Indian Standards, once these standards are made available. It was also pointed that in case there is likely to be difficulty in arranging for the whole production of the mills being in the normal light beams, wide flange beams and H Sections and corresponding channels sections, the new mills could also take up production of certain of the normal beam and channel sections also being standardized for production in the existing equipment of TISCO and IISCO.

2.0.7 Shri T. V. Joseph further pointed out that Shri R. N. Dutt, who represented the Ministry of Iron and Steel also, may like to give the committee further information regarding the position with regard to the new mills.

2.0.8 Shri Dutt stated that the report made by Shri Joseph concisely covered the general discussions and conclusions arrived at the meetings referred to above. He further explained to the Sub-committee that the proposals for standards for Beam, Channel and Angle Sections which are to be discussed at this meeting still being considered by the Russian and British mill experts. He expected to receive, very shortly, their comments as to whether the sections proposed for their mills would lead to any difficulties in operation. In the light of previous discussions with them, he would be able to give some tentative ideas of possible difficulties in the production of certain individual sections. These remarks are given under the reports of discussions on the individual series of Beam and Channel Sections.

2.0.9 The Sub-committee NOTED and APPROVED the action taken by the Directorate in keeping the Ministry of Iron and Steel informed of the progress of the work being done on standardization of hot rolled sections and in impressing upon them the importance of the new mills being capable of producing the more efficient sections.

2.0.10 In discussing the latest letter received from the Ministry of Iron and Steel (see item 1.1.41) the Sub-committee agreed with the views expressed by the Consultants to the Ministry of Iron and Steel that the proposed IS Sections are in general lighter than the sections designated as 'Standard' Beams and Channels in the U.K., U.S. and certain other countries. However, the Sub-committee wished to point out that most of the sections designated as "Standards" were standardized many years ago when the rolling mills technique and knowledge of the use to which these sections could be put, was not as well developed as at present. In the more industrially advanced countries the demands of the consumers and the fight for existence in a competitive market have led to the production of an idencrasing amonnt of lighter and more efficient sections. The efficiency of a section is dependant upon the proper distribution of material in the section to meet the physical requirements from the

section under different conditions of use. In the dsections standardized many years ago, much of the material in the section did not contribute to the strength carrying capacity of the sections and resulted in creating unnecessarily heavy sections. In recent years, in Germany, U.S. and France, sections have been produced ranging from 5 percent to 40 percent lighter than those which had been previously produced. As previously pointed out, in Russia, mills are presently investigating ways for meeting the demand for lighter sections from the Russian consumers. The Commission Mixte des Aciers of Belgium, Luxembourg has recently submitted proposals to the CECA countries of Europe for standardizing Beam sections similar in weight and proportions to the lighter sections proposed by the ISI. It can therefore be stated that the proposed IS series of sections are in general, not lighter than similar sections being produced or being presently proposed for production in most of the industrialized countries of the world.

2.0.11 The Subcommittee wished to point out that the statement of consultants to the Ministry of Iron and Steel regarding loss of production will have significance only in relation to mills specifically designed for production of the heavier types of sections now in use. For the existing mills now producing heavy sections, the possibilities of loss of production in rolling the proposed lighter IS sections must be studied and evaluated. The evaluations must take into account the true gain or loss in end use and not just decrease in total tonnage of the finished products from the mill, since such decrease in tonnage production is brought about by the elimination of unnecessary and wasted material in the existing sections. From the point of view of overall economy of steel production and utilization in the country, efficiency of the section is as important as the total tonnage of sections produced. The total tonnage has a significance only when each ton produced is utilizable to the full advantage of the material used. The Subcommittee considered it essential that the new mills be of modern design, capable of producing modern efficient sections, to the full rated capacity of the mills. The question of loss of production cannot arise if the new mills are designed to produce the sections they will eventually roll.

2.0.12 The Sub-Committee Notes that the aspect of production of efficient Indian Standard sections is being kept in view in the design of the new additions of TISCO and IISCO. The Sub-Committee wished to place on record its appreciation of the assistance given by TISCO in contributing to the work of this Sub-Committee and in the action taken by them in their planning of the types of new mills to be added as a result of their expansion programme.

2.1 Hot Rolled Structural Sections

2.1.1 Beams

2.1.1.1 Shri Joseph pointed out that the proposals contained in Doc : BDC 7 (200)P1 are based on the committee's decisions at its last meeting. He requested Shri Das Gupta, who represents the Tata Iron and Steel Company, to give the Sub-committee further information as possible with regard to the proposals of TISCO for the installation of the light and medium structural mild and also whether this mill would produce the junior type of beams and channels. The question of standardization of the junior beam channels depends on whether the mill mentioned above is to be installed in the near future. He requested the Sub-committee to take into consideration the comments made by the Russian Engineers regarding the proposals. He also mentioned that it is important that the representatives of TISCO and IISCO inform the committee regarding the definite views of their organizations on the proposals for the sections to be produced at their mills. He requested the representative of the Indian Iron and Steel Co. Ltd., to inform the Sub-committee as to whether to proposal for the installation of a finishing stand to their structural mill has been finalized and also give as definite an indication as possible about the capacity of this mill after the installation of the finishing stand.

2.1.1.2 Shri Joseph informed the Sub-committee that the documents and memoranda containing the proposals for the standardization of hot rolled beams, channels, angles and for cold formed light gauge sections had been circulated to the members of the Sectional committee also, requesting them to offer their comments. He placed before the committee the following letters : i) letter No. ER/ISI/SSC dated 20 February 1956, received from Shri V. Venkatarmayya, Chief Design Engineer, Ministry of Railways, mentioning that for certain uses such as in members of bridge girders; the minimum thickness of material permitted is 5/16th inch, ii) letter No. 86/Misc. dated 14th March 1956 from Shri D. M. Sen.

2.1.1.3 The Sub-committee considered the note and tables in Doc : BDC 7(200)P1 regarding standardization of beam sections and APPROVED the basic procedures and overall scope of the types of sections to be standardized as proposed in this document.

2.1.1.4 *Normal Light Beams Table I, Doc : BDC 7(200)P1*—The Sub-committee approved of the entire series of sections presented in this Table and noted that the majority of these sections were to be produced in the new mills. Shri Das Gupta of TISCO informed the sub-committee that the first six sections indicated in this Table would be producible at TISCO

where the new Light and Medium Structural Mill is installed and indicated his approval to the dimensions as specified therein. Shri Dutt requested that final approval of this series be postponed until the final comments were received from the engineers of the Durgapur and Bhilai Steel mills. The Sub-committee AGREED to this procedure.

2.1.1.5 *Normal Beams Table II, Doc : BDC 3(200)PI*—The Sub-committee considered the sections listed in this Table. The representatives from TISCO and IISCO informed the Sub-committee that their mills would only be producing sections up to a maximum depth of 18 inches (or 450mm) and would, therefore, restrict their specific comments to the first nine sections of the Table. Regarding beam No. 1 (ISB 150), Shri Doshi of IISCO informed the Sub-committee that the sections proposed would be rollable in his mill provided the flange thickness was increased to 0.368 inch. Referring to the same section Shri Das Gupta informed the Sub-committee that the proposed section is not rollable at Tata's unless the web thickness is increased to 0.203 in. and the flange thickness to 0.205 in. Referring to Beam No. 2 (ISB 175), representatives of both TISCO and IISCO Agreed the web thickness of this section should be increased to 0.219 inch for production at their mills. Beams 3, 4 and 5 (ISB 200, 225 and 250) were approved, as they are by both the representatives. Referring to beams 6, 7 and 8 (ISB 300, 350 and 400), the representatives of TISCO and IISCO requested that the average flange thickness be increased to 0.476, 0.562 and 0.628 respectively. It was pointed out that these thickness were the minimum thicknesses desired even if the flange width were reduced. Beam No. 9 (ISB 450) as proposed was approved by both representatives. Shri Dutt pointed out to the Sub-committee that the Russian Engineers have indicated that difficulties in rolling were anticipated in the production of beam 10, 11 and 12 (ISB 500, 550 and 600). Pending further study by the Russian technicians, he suggested that the web thicknesses for these three sections be increased by approximately 0.015 inch.

The Sub-committee DECIDED that it was desirable to maintain the basic series while making the necessary adjustments. The Sub-committee decided that adjustment of the first two sections for production in the existing mills be attempted but pointed out that if the adjustments required for making these sections producible in the existing mills were such that the basic series would be completely upset, it may be more desirable to limit the production of these sections to the new mills. The Sub-committee accepted the modification suggested to beams 6, 7 and 8 and indicated that the flange widths of these sections may be altered if necessary, to maintain a proper series. It was pointed out from the Secretariate side that the webs proposed for beams 10, 11 and 12 were thicker than that of similar sections produced in other countries. The Sub-committee DECIDED that this point be thoroughly discussed with the Ministry of Iron and Steel and the Russian technicians before any modifications to the proposed sections are made. The Sub-committee felt that the modern mills proposed for Bhilai should be capable of rolling these proposed sections without any modifications to the web or flange thickness.

2.1.1.6 *Wide Flange Beams Table III, Doc. BDC 3(200)P7*—The Sub-committee APPROVED the details given for the wide flange beams in Table III of the document. Shri Doshi informed the Sub-committee that IISCO has decided not to incorporate vertical rolls gadget at the third stand of the 34 mills. The possibility of rolling wide and parallel flange beams at IISCO is, therefore, ruled out. He added that it would have been possible for IISCO to roll some of these sections with sloping flanges, had the web and the flange thicknesses been adopted considerably heavier than those suggested in the series. Shri Dutt informed the Sub-committee that these sections would be rollable only at the Bhilai Mill and suggested that approval of these sections be made tentative pending the receipt of comments from Russian technicians.

The Sub-committee AGREED with Shri Dutt's suggestion and APPROVED the wide flanges sections with the understanding that this approval would be made final only after reactions of the Russian technicians are received regarding the rollability of the proposed sections in their mills. The Sub-committee agreed to the proposal previously made by the Russian technicians that these sections be produced with a flange slope of 60.

2.1.1.7 *Column Sections Table IV, Doc. BDC 3 (200)P7*—Shri Doshi pointed out that the IISCO mills would only be able to produce column sections with flanges and webs much thicker than those given in the present proposal. The Sub-committee decided that the Standard H sections are therefore to be finalized with a view to their production in the Bhilai Mill. Shri Dutt informed the Sub-committee that the column sections producible at the Bhilai Mills must be restricted to a minimum flange slope of 6. Shri Dutt further pointed out that since the Bhilai Steel Mill would be the only mill which could produce column section as proposed in Table IV and since they were also expected to produce the entire range of wide flange sections, there would be advantage in reducing the number of basic sizes in column sections to be standardized for production at the Bhilai Steel Mill. The Sub-committee decided that Beam No. 2 (ISHB 175) could be dropped from Table IV. The Sub-committee APPROVED beams 1, 3, 4, 5 and 6 for production at the Bhilai Steel Mills and suggested that

two weights in each size, producible from the same rolls, be standardized. It was DECIDED that beams 7, 8 and 9 (ISHB 350, 400 and 450) should also be approved as Indian Standards for production in future mills to be erected in India even if the Bhilai mill may not produce them in the near future.

2.1.18 The Sub-committee APPOINTED a panel to look into details of finalizing the series of sections given in Table I to IV of Doc : BDC 7 (200) P1, taking into account the modification decided upon at this meeting, and after discussion with the Ministry of Iron & Steel and the Russian and British technicians, the modifications required by them. The composition and terms of reference of this Panel BDC 7 : 1 : 2 are given in Annexure A.

2.1.1.9 Shri Das Gupta, representative of TISCO pointed out that the light and medium structural mill being installed as a part of the expansion programme of TISCO will be able to roll not only junior beams and channels but also light beams and channels. As regards beams it is possible for this mill to produce sections of sizes such as 3" x 3", 4" x 3", 4" x 4", 5" x 3", 5" x 4", 6" x 3", 6" x 4", 7" x 4" and 8" x 4". In this mill it is possible to roll conveniently the lighter type of sections with thin flanges and webs. Since the mill will have a vertical finishing stand, the flanges could be rolled parallel i.e. with a slope of only 1/2 degree. The Sub-committee NOTED that with the installation of this mill at TISCO the limitations and difficulties as regards production of light beams and channels up to a depth of 8" would be removed even if the Bhilai and Durgapur mills may have difficulties for the production of light sections below 8" size. This aspect need not hold up standardization of efficient light weight sections in this range since they could be conveniently produced in the new mill at TISCO. The Subcommittee decided that the panel BDC 7:1:2 should consider incorporation of these beams as a part and if necessary an extension of normal light beam series. The square sections, namely, 4" x 4" and 3" x 3" may have to come in as light column sections as an extension of the H beams series. The Subcommittee decided that in incorporating these beams, every effort should be made not to increase the overall total number of beams for standardization.

2.1.1.10 *Junior Beams*—The Sub-committee decided that it was difficult at present to predict the demand and use for junior beams in this country. Shri Das Gupta of TISCO informed the Sub-committee that one of the items being included in the Expansion Programme of TISCO was the installation of a continuous mill capable of producing junior beams and channels. The Sub-committee suggested that Shri Das Gupta in co-ordination with the Directorate may work out a series of rationalized depths, widths and thicknesses for the junior beams which would be suitable for production at this new mill. Shri Rama Varman of the National Buildings Organization informed the Sub-committee that the NBO may be able to assist in making a study of the possible uses of junior beams and channels as a building material in this country. It was further suggested that the Iron & Steel Controller may be requested to assess the possibilities for the use of junior sections for both building and industrial use. The representative of TISCO agreed to obtain from U. S. the details of the use of such sections in that country.

2.1.2 Channels

2.1.2.1. Shri Joseph read out in the meeting the relevant portion about channels from the letter No. 86/Misc. dated 14 March 1956 from Shri D. M. Sen.

2.1.2.2 The Sub-committee studied the note and tables included in Doc : BDC7(232)P1 containing the proposals for standardization of channel sections. The Sub-committee approved the general procedure adopted in arriving at them.

2.1.2.3 *Normal Light Channels Tables I and III, Doc : BDC 7(232)P1*—The Sub-committee decided that the series given in Table III was preferred to the series given in Table I and decided that Table I may be deleted. Shri Das Gupta informed the Sub-committee that normal light channel sections from 1 to 6 only would be producible at TISCO and the remaining must be produced at the new Steel Mills. The Subcommittee decided that the proposed series of normal light channels was acceptable subject to the same conditions as indicated for normal light beams.

2.1.2.4 *Normal Channels Table II, Doc: BDC 7(232)P1*—The representative of TISCO and IISCO approved the entire series of channel sections subject to the following modification :

"For Channel No. 3 and 4 (ISC 125 and IS 150), it was requested that the flange thicknesses be increased to 0.320 in. and 0.355 in. respectively."

For channel No. 7 and 8 (ISC 225 and 250), it was requested that the flange width be reduced to 3 inches, keeping the same web and flange thicknesses as a minimum. The Sub-committee agreed to the above modifications and instructed the Secretariat to modify these sections without upsetting the final series.

2.1.2.5 *Special Channels*—The Sub-committee requested the Secretariat to contact users of special channel sections such as the railways, and ship building organisations, etc. to determine the details of sections other than those proposed in Tables II and III, Doc it BDC7 (232)P1, which might be required for their use. Shri Murthy pointed out that : may be possible to produce several section of the same size from the same set of rolls and that since the railway requirements regarding depths and widths are more specific for use be suggested that the final dimension regarding depths of the normal channels be dermned from the railway requirements and be used for establishing the basic depths of both normal and special channel sections. The Sub-committee agreed to Shri Murthy's suggestions provided any modifications which would be required to the proposed normal channel sections did not upset substantially the basic series developed.

2.1.3 *Angles*—Shri Joseph requested the Sub-committee that while considering Doc : BDC 7 (231) P1 the suggestions made by the Convonor and intimated to the Subcommittee members under the Directorate letter No. SE1/T-4 dated 28 February 1956 may also be kept in view. He presented at the meeting the following letters :

- (i) Letter No. DSD/99/56 dated 11 March 1956 from Shri D. S. Desai ;
- (ii) Letter No. CCI/13 dated 13 March 1956 from Director Research, Ministry of Railways ;
- (iii) Letter dated 5 March 1956, received from Mr. J. W. Miller, C/o Kumardhub-Engg. Works Ltd., Kumardhubi P. O. Bihar ;
- (iv) Letter No. 22 dated 15 March 1956 from Shri H. N. Pandit ; and
- (v) Letter No. 86/Misc of 14 March 1956 from Shri D. M. Sen.

Shri Joseph also invited the attention of the Sub-committee to the comments received from the Consulting Engineers and others on the same subject and circulated to the committee members under this Directorate letter No. SE1/2A dated 27 September 1954.

2.1.3.1 Dr. Paulssen agreed with the views contained in the above mentioned comments and suggested that the standardization of bevelled angles should be dropped for the present. He suggested that instead of bevelled angle corners, the Sub-committee may consider the production of similar angle sections with a rounded corner. Shri Das Gupta brought to the notice of the Sub-committee that certain angle sections with rounded corner were presently produced by the TISCO mills. Those sections were specifically required for uses other than structural purposes. The Sub-committee decided that standardization of bevelled or round corner angles need not be undertaken at present. It was pointed out that where there was a demand from users, as at present, for this special shaped sections, the mills would continue to supply them.

2.1.3.2 *Equal Angles Table I, Doc BDC 7(231)P1*—The Sub-committee APPROVED the proposals made for equal angles as given in the document, and recommended the addition of a fourth thicknesses of 6.5 mm for angle sections ISA 35, 40 and 45. The Sub-committee agreed that the final thicknesses indicated may be modified to conform to the system for metric conversions which will be finally adopted at the ISI Directorate.

2.1.3.3 *Unequal Angles, Table III, Doc: BDC 7(231)P1*—The representatives of TSICO and IISCO pointed out that the production of unequal angles with the ratio of leg lengths of 1 to 2 would present certain difficulties in the smaller sizes. They considered that the proposed unequal angle sections ISA 8040, ISA 9045, ISA 10050 and ISA 12065 would lead to difficulties. The Subcommittee considered this aspect and decided instead of two angles ISA 7035 and ISA 7055, there need be only one angle designated ISA 7045 in size 70mm×45 mm. They also decided that the proposed two angles ISA 8040 and ISA 8060 may be replace by one angle ISA 8050 in size 80mm×50mm. Similarly the proposed angles ISA 9045 and ISA 9070 are to be replaced by one angles ISA 9060 with size 90mm×60mm. They further agreed that the proposed angles ISA 10050 and ISA 12565 be replaced by angles ISA 10065 and ISA 12575 with size 100mm×65mm and 100mm×75mm respectively. Subject to the modification mentioned above the sizes of unequal angles were APPROVED. The thicknesses proposed for the unequal angles were also APPROVED with the modification that as agreed in the case of equal angles thickness of 6.5mm should be provided for the three angles ISA 4025, ISA 4530 and ISA T030.

2.1.3.4 Mr. Goldsmith pointed out to the Sub-committee that there is a substantially large demand in the U. S. for larger size unequal angles for the design of crane girders, runways etc. Angle sections larger than 6 in. ×4 in. are at present produced in most countries and with the increase in industrial activity, it can be anticipated that the demand for the bigger angle sections would manifest itself in India. The Sub-committee agreed that unequal angle sections 8 in. ×4 in. and 8 in. ×6 in. be standardized in the heavier range of thicknesses.

2.1.3.5 The Sub-committee was informed by Shri Dutt that for wagon building 6 in. \times 3½ in. angles were at present being used. The Sub-committee decided that the Secretariat should ascertain from the Ministry of Railways whether this size of angles could be replaced by one of the angles proposed for standardization. In case there are difficulties in using another size of angle, the 6 in. \times 3½ in. size of unequal angle also should be standardized.

2.1.4 *Tee Sections*.—The Sub-committee noted the statement containing particulars of the production of Tee Sections in various countries. It was generally discussed that Tee Sections are mainly used in wagon and ship building industries, in open web truss constructions in welded plate girders and also in large variety of non-structural uses. It was noted that the tee sections presently produced in India were in very small depths and of only limited use for structural purposes. The Sub-committee requested the Panel BDC 7:1:2 to determine whether the new mills would be able to roll the deeper web sections presently produced in other countries. It was also suggested that inquiries be made as to whether the facilities for forming tee sections by the splitting of hot rolled beams could be made available at the existing or the new mills.

2.1.5 *Special Sections*.—Shri Dutt informed the Sub-committee that the ship and wagon building industries have requested that bulb angle sections be made available in India. The Sub-committee suggested that the Iron & Steel Controller should furnish information to the Directorate on the types and sizes of bulb angles required to be standardized by the wagon and ship building industries. Shri Das Gupta pointed out to the Sub-committee that bulb bars and plates were presently produced in other countries. The Sub-committee DECIDED that until the information is available regarding the use of which these types of sections are put, it was not possible to determine the need for standardization of these sections. The Sub-committee DECIDED that standardization of Z shape sections need not be considered at present.

2.1.5.1 *Piling sections*.—Shri Doshi informed the Sub-committee that the demand for piling sections is likely to increase in India and suggested that the Sub-committee consider the possibilities of standardization of piling sections. It was pointed out by the Sub-committee members that in general, piling shapes were a patented item in most countries and that the practicability and desirability of standardizing such shapes for production in India mills should be studied before a definite commitment is made. The Sub-committee appointed a Panel to go into a detailed study of this item. The composition and terms of reference for this Panel BDC 7 : 1 : 3 are given in Annexure A.

2.1.6 *Tubes for Structural Use*.—The Sub-committee NOTED that Panel BDC 7:1:1s at present preparing a preliminary draft specification for steel tubes for use in structures. The Sub-committee DECIDED that discussion on this item could be withheld until the preliminary draft is available.

2.1.7 *Work of the Commission Mixte des Aciers (CMA)*.—Shri Joseph presented at the meeting a note giving further information regarding the work of the CMA.

2.1.7.1 The Sub-committee NOTED that the basic considerations of the approach taken by the CMA in their work are very much similar to that adopted by this Sub-committee in standardization of beam sections. The Sub-committee felt that there would be considerable advantage if personal contacts were established with the CMA and also with the countries of the CECA who are co-operating with the CMA in the work of standardization of hot rolled sections. The Sub-committee INSTRUCTED the Secretariat to investigate how best such personal contacts could be established.

2.1.8 *Tolerances and Dimensional Details*

2.1.8.1 The Sub-committee considered the comparative statement distributed to the Sub-committee members giving details of the radius at fillet toe, slope of flange and tolerances on the structural sections rolled in different countries. Shri Dutt pointed out that as regards the normal light beams Table I, Doc : BDC 7 (200) P1 it is possible to produce the sections in the Bhilai Steel Plant with the seven degrees slope provided for the flange. As regards the normal light channels, Table I, Doc : BDC 7 (232) P1, it is not possible to produce these sections at the Bhilai Steel Plant unless the slope of the flange is increased from 50 as now shown, to a slope of 1/10 (1 approximately 6°). As regards the wide flange beams, Table III, Doc : BDC 7 (200) P1, it is possible to produce the sections with the thickness shown in the ISI proposals provided the flange is given a slope of 1/10 (approximately 6°). In case, it is not possible to provide the slope, it will be necessary to increase the web and flange thickness of the wide flange beams and column Sections—H Beams to thickness corresponding to wide flange beams and H Beams rolled in similar type of mills in other countries.

2.1.8.2 Representatives of TISCO and IISCO informed the Subcommittee that except for the proposed continuous mills to be installed at TISCO to roll the junior sections the existing mills would have difficulty in rolling beam sections having less than an eight degree slope to the flanges. As far as channel sections are concerned, the Subcommittee was informed that the present slope of 50 would have to be increased to 60 to overcome the difficulties in producing the thinner flanges of the new sections. The Subcommittee DECIDED that the following slopes should be standardized :

Beams		Channels	
ISLB	8°	ISLC	6°
ISB	8°	ISC	6°
ISWFB	6°	ISSC	5° or less as required by Special In- dustries.

2.1.8.3 The Sub-committee DECIDED that the radius of fillet and radius of toe of the beam and channel sections should be decided in consultation with the representatives of the existing and new mills. Shri Das Gupta and Shri Doshi pointed out to the Subcommittee that the tolerances at present allowed in India are much more severe than the tolerances and sections permitted in many of the other steel producing countries of the world. The Sub-committee suggested that M/s. Das Gupta and Doshi in consultation with the representatives of the new mills, should submit a proposal on the rolling tolerances to be permitted.

2.1.9 *Experimental Investigations.*—Shri Joseph brought to the Sub-committee' notice the scope of work of Panel BDC 7 : 4 : 3. He suggested to the Sub-committee to consider whether any additional theoretical investigations on hot rolled sections need be undertaken by this Panel and also whether the sections tentatively approved at this meeting require further practical investigations. The Sub-committee DECIDED that the investigations conducted by the Sub-committee BDC 7 : 1 in arriving at its final proposals for hot rolled steel sections indicated that no further theoretical analysis appears to be required. The Sub-committee could not foresee the need for any laboratory investigations on the proposed sections at this time and RECOMMENDED that Panel BDC 7:4:3 be requested to consider the need for continuing their activities.

ANNEXURE V

(Item 1.11)

EMBASSY OF THE UNION OF SOVIET
SOCIALIST REPUBLICS IN INDIA
COUNSELLER FOR ECONOMIC AFFAIRS.

124—126 Sundar Nagar,
NEW DELHI

Mr. K. S. Raghupathi, I.A.S.,
Deputy Secretary,
Ministry of Iron & Steel,
Government of India,
New Delhi.

3rd October 1956, No. 037-1385.

My dear Mr. Raghupathi,

Please refer to your letter No. 16 (61)/55 dated the 23rd July, 1956 regarding the types of sections to be rolled at the Bhilai Iron & Steel Works.

We have received a cable from the Ministry of Iron & Steel of the USSR Moscow containing observations on the sections proposed by the Indian Standards Institution and indicated in the documents attached to your above mentioned letter. These observations are given hereunder for your information.

Table No. II Normal Light Beams :

These sections can be rolled at Bhilai but there will be in this case upto 50 per cent loss in production compared to the standard sections originally proposed to be rolled in the Detailed Project Report. Deterioration in the life of the rolls will increase 2-3 times. As regards Nos. 225 and 250 the average thickness of flange should be fixed as 8 mm.

2. Table No. III Normal Beams :

To avoid the formation of wavyness in the web during process of cooling it is suggested to fix the ratio of thickness of flange to that of the web not more than 1.75.

3. Table No. IV Wide Flange Beams :

It is desirable to fix the thickness of flange not less than 9 mm.

4. Table No. V Column Sections :

Taking into account the thin and wide flange of this section, it is desirable that the flange should be given a slope of 4 and the thickness of the same be fixed not less than 9 mm.

5. Table No. II Normal Light Channels and Table No. III Normal Channels :—

There are no, any remarks.

6. Equal and unequal angles :

It is expedient to fix the thickness of the angles to be rolled on the Rolling Mill 350 not less than 5 mm.

7. Provided these observations are taken into account, the proposed sortment for the Bhilai Iron & Steel Works will be acceptable.

The Ministry of Iron & Steel of the U. S. S. R. have also intimated to us that it does not seem possible now to delegate to India a rolling mill specialist.

Yours faithfully,
Sd/-

FIRST SECRETARY TO THE EMBASSY
OF THE USSR IN INDIA

Copy of letter No. 83834/SLB/DM, dated the 15 August, 1956 from Mr. S. L. Bengtson, Director, International Construction Co. Ltd., 56 Kingsway London W.C. 2, to Shri K. S. Raghupathi, Deputy Secretary, Ministry of Iron & Steel.

DURGAPUR

I thank you for your letter of the 24th ultimo, reference No. 16(61)/65 Vol. II—Coord., with enclosures, in regard to new Indian Standard Sections to be rolled at Durgapur.

We have now again contacted Davy and we give below the sections that the Durgapur mills can roll :—

The Durgapur Rolling Mills, as per ISCON's tender in May 1956 will be able to the following sections :—

BEAMS :**Table III—Normal Beams (BDC 7 (200)P₂)**

1. ISB 100 × 75
2. ISB 125 × 75
3. ISB 150 × 80
4. ISB 175 × 90
5. ISB 200 × 100 (corresponding to 8" × 4")

Larger beams cannot be rolled at Durgapur.

Table I—Junior Beams (BDC 7(200)P₂) cannot be rolled at Durgapur.

Table II—Normal Light Beams (BDC 7(200)P₂) cannot be rolled at Durgapur.

Table IV—Wide Flange Beams (BDC 7(200)P) cannot be rolled at Durgapur.

Table V—Column Sections—'H' Beams (BDC 7 (200)P₂) cannot be rolled at Durgapur.

CHANNELS :

Table III—Normal Channels (BDC 7(232)P₂)

1. ISC 75 × 40
2. ISC 100 × 50
3. ISC 125 × 65
4. ISC 150 × 75
5. ISC 175 × 75
6. ISC 200 × 75 (corresponds to 8" × 3")

Larger channels cannot be rolled at Durgapur.

Table I—Junior channels (BDC 7(232)P₂) cannot be rolled at Durgapur.

Table II—Normal Light Channels (BDC 7 (232)P₂) cannot be rolled at Durgapur.

It should be pointed out that the above Beams and Channels are already Lighter than British Standards.

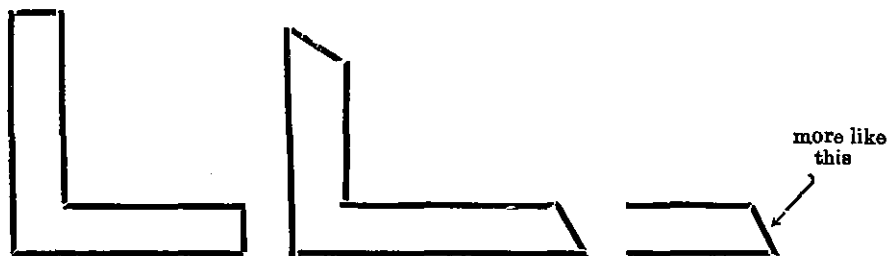
EQUAL ANGLES :

Equal Angles (BDC 7(232)P₂)

All angles from 20 × 20 to × 125 × 125 (14 sections) can be rolled at Durgapur.

The 150 × 150 and 200 × 200 are too large for Durgapur.

It should be noted that the angles except the largest that are rolled at Durgapur will not be angles with a radiused too but the too will be chamfered sketched below. This however, is no drawback—if anything an advantage ; nobody will object to this.



All rolls and roll designs will be to standard Indian metric sections.

You say that "If we can possibly adjust our rolling mills to produce these sections we should do so. But, I agree, these adjustments should not result in inefficient or un-economic production. It would help a decision if you could indicate clearly what alterations would be necessary and what, in your considered opinion, would be the loss in production if we carried out these alterations":

It may be that, after some years of experience, the mills at Durgapur may be able to roll some of the sections specified above as not to be rolled at Durgapur, but, even in that case, I should say that it would be necessary not to roll such, sections in very long lengths as otherwise they would be too cold. If successful, it would anyhow mean a lower yield and more roll wear, but hot much is impossible to say.

To adjust or alter the mills as now envisaged to roll the thinner sections is not possible ; the only way to do it would be new and much more expensive design of mill altogether instead of the 24 "mill—in fact it would mean a mill more or less like the one that Tata is putting in, which will have a capacity, we believe, larger than the Durgapur 24" Mill.

As asked for by you, we have discussed this with Mr. Bhoothalingam today and he is in agreement with the above.

ANNEXURE VI

(Item 1.11)

Copy of letter dated 5 November 1956 from Shri S. Das Gupta representative of TISC to Shri T. V. Joseph, Officer on Special Duty, ISI, Delhi.

I have duly received your letter No. SE 1/T-1 of 31st October together with the enclosures. I have noted the comments expressed by Shri Bengtson on behalf of Durgapur and Shri Kudin for Bhilai Works. I have also noted with interest the ISI Directorate's comments on the above mentioned two letters. In general, I am in full agreement with the views expressed by the Directorate with regard to Durgapur and Bhilai.

As regards Durgapur's comment, I can see the reasons why Durgapur is not keen to roll junior beams and junior channels and naturally these two groups of sections will have to be left out of Durgapur's rolling programme. As regards normal light beam and normal light channels, which according to Mr. Bengtson cannot be rolled at Durgapur, I am of the opinion, when Durgapur gets going with their normal production of ISI normal beams and normal channels, most of sections shown in groups of normal light beams and normal light channels Doc : BDC 7 (200)P₂ and Doc: BDC 7 (232)P₂ could also be produced in due course of time.

As regards the proposal of producing angles with chamfered too, I feel that we should stick to the conventional shape of too which is being produced throughout the world and I find no justification in deviating from this practice.

The above views expressed with regard to Durgapur's comments may be considered by them because I feel that the plants should have a wide range of products to handle and not limit themselves to a small group of sections. This will have a far better effect on the total demand of the country and a consequent distribution of the rolled products from the various mills.

As regards Bhilai's comment, in addition to the points already expressed by ISI Directorate I have following observations to make :

- (1) As regards normal light beam Doc: BDC 7 (200)P₂, it has been suggested that the flange thickness be increased to 8 mm. For the sections No. 7 and 8, which I have no objection if the weight is maintained by proportionally reducing the present web thickness, because the difference between 7.3 and 7.6 from 8mm is very small.

The Russian engineers assume that to produce this group of sections there will be a loss of production by app. 50 percent. You will remember that in the various meetings in the past we seriously discussed to determine the app. loss of production and loss of roll life for producing such light beam sections. According to our past experience when TISCO used to produce light weight beams we could figure only a loss of production by 20 to 25 per cent. This loss will amply justify for the most efficient series of sections to be produce and the increased length per ton which the customers will get.

As regards Russian engineers' assumption of loss of roll life becoming 2 to 3 times, it must have been assessed on the basis of using the usual grade of rolls which are commonly in service in structural mills but the modern roll-making has advanced to such an extent that new grade of rolls such as Nodular Iron (Spheroidal Graphite) and suitably heat-treated alloy steel rolls give more than double the life than the normal grade of rolls used by the structural mills. If such rolls are used frequent roll changing will not be necessary and loss of production can be brought in control and sacrifice of roll life will be negligible. But the roll cost per ton will naturally go up by 50 per cent or slightly more, it being a negligible figure because the average roll cost for such mill comes to app. Rs. 6 per ton. When better rolls are used the roll cost per ton will go up to Rs. 9 or 10 per ton, which will keep to maintain increased rate of production in the mill and avoid unnecessary roll changes.

2. As regards normal beam Doc: BDC 7 (200)P₂, the Russian engineers suggested the ratio t_f/t_w to be less than 1.75. As you have already explained thoroughly in your comments that the ratio suggested by ISI is being produced in other countries and we expected Bhilai

Works also should have no difficulty in producing this section. On checking up I find if we have to maintain the ratio of 1.75 as suggested, it will not make any serious change from what has been specified as shown below :

Section	Web	Flange	Ratio $\frac{t_f}{t_w}$
(i) 225 × 100 ISI	6.3	12.05	1.91
can be modified to	6.8	11.45	1.68
(ii) 250 × 225 ISI	6.8	13.00	1.91
can be modified to	7.3	12.5	1.71
(iii) 400 × 140 ISI	8.6	16.76	1.95
can be modified to	9.3	15.8	1.7
(iv) 450 × 150 ISI	9.1	18.20	2.0
can be modified to	9.8	17.00	1.7

The above proposed change of t_f and t_w may have to be slightly modified to maintain our weight.

(3) Regarding wide flange beams Table IV Doc: BDC 7(200)P₂, the Russian engineers suggested the dimension of t_f should be minimum 9mm. But the first three sections have been shown 7mm, 7.8 mm and 8.37 mm. The depth of flange for first two sections being smaller we felt that the flange thickness specified by ISI should offer no difficult problem, but if the Russian engineers feel that these sizes must be modified, I have no comments to make.

(4) Column Sections : As regards Table V Doc: BDC 7 (200)P₂, the Russian engineers want the thickness of t_f minimum 9mm and slope of flange 94° instead of 93°. As regards the changing of slope from 93° to 94° it is presumed that the section will not be seriously affected if the angle is thus modified. So far as the changing of thickness of t_f to min. of 9mm is concerned, this revision may affect the efficiency of the serious of sections. The Russian engineers may therefore be requested to reconsider their comment at least for the first three sections.

I therefore feel all the above points raised in this letter should be gone through carefully and referred to Russian engineers and Shri Bengtson for further consideration.

It should be noted that in spite of the various difficult rolling problems, loss of production and increased roll cost per ton of material produced, when we have agreed to try a large number of light sections in our mills I do not see any justification why similar attitude should not be taken up by Durgapur and Bhilai.

This will ultimately mean a better series of efficient sections and real economy of steel which the Planning Commission wants to introduce in the country.

Your reactions on the above suggestions are solicited.

With best wishes to you and Goldsmith,

Yours sincerely
Sd/- (S. Das Gupta)

ANNEXURE VII

(Item 1.12)

Extracts from the minutes of the fourth meeting of the Steel Sections Sub-committee, BDC 7:1.

1. TECHNICAL WORK

1.1 Finalization of Draft Standards for Hot Rolled Beams, Channels and Angles. Doc : BDC7(272) and Doc: BDC3(271) Respectively—The three drafts standards for Hot Rolled Beams, Channels and Angles, Doc: BDC 7 (200), Doc: BDC 7 (232) and Doc: BDC 7 (231) respectively, were discussed at length and the decisions arrived at by the Sub-committee are recorded in Annexure B (page 8) to these minutes. Shri Joseph reported that as decided by

the Steel Sections Sub-committee, BDC 7:1, at its third meeting, a special request had been made to the Ministry of Iron & Steel, while forwarding to them the copies of the drafts standards or beams, channels and angles that their detailed comments and suggestions and also of the Durgapur and Bhilai Steel Mills and M/s. International Construction Co., consultants to the Ministry, might be made available. Subsequently, it had been suggested to the Ministry that it might be desirable for a discussion being held with the representatives of these organizations. As a result of these references, the comments from Mr. Bengtson, containing views on the standards as regards Durgapur Steel Mills and a letter from the Russian Embassy, containing the views on the standards as regards the Bhilai Steel Mills, had been received from the Ministry of Iron & Steel, with their endorsement. These comments are enclosed as a part of the agenda for this meeting.

Enclosed as a part of the agenda were also the copies of the reference made from the Directorate to the Ministry of Iron & Steel requesting for further clarification on the specific points, as regards the ratio between flange thickness and web thickness in the case of the medium weight beams and the slope of flange in the case of wide flange beams. These references had been followed up by reminders.

Towards the end of November 1956, Shri Padmanabha Ayyar who represents the Ministry of Iron & Steel on this Sub-committee, was contacted and reminded about these details. He had informed the Directorate that the reply from the Russian Engineers was expected very shortly on the references regarding the ratio between thickness of flange and thickness of web and the slope of flange and that this information was expected to be available before the meeting. He further mentioned that it might not be possible for him to be present for this meeting of the subcommittee due to his having some very important and unavoidable trip to make out of Delhi at that time. He desired that the information as conveyed to the Directorate might be placed before the committee. It is found that these comments from the Bhilai Engineers have not yet been received.

1.1.1 Shri Nathani enquired whether the tolerances for structural steel sections would incorporate in the specifications now being finalized for the beams, channels and angles. It was pointed out that such tolerances are already included in IS : 226-1955 Structural Steel. The members of the committee felt that there is a case for a review of these tolerances with a view to bringing them more in line with the practices adopted in various countries and also for elaborating the provisions to cover all the aspects of variations in dimensional properties, shapes, etc. from the nominal values. Shri R. N. Dutt agreed to obtain the views of the steel mills on this subject and it was decided that the ISI Directorate should bring up the subject at the next meeting of the Steel Sectional Committee (SMDC 5) for further consideration.

APPENDIX 3

*Report on Rationalisation of Steel Sections by Indian Engineering Association**Introduction*

During 1962 a number of representations were made by the Association to the Government and to the Planning Commission concerning the difficulties of fabricators in obtaining certain sections or sizes of steel. As a result of a survey among member firms in December 1962 it was found that shortage of matching steel was one of the main causes of idle capacity : four member firms alone had lost production during 1962 of at least Rs. 6½ crores worth of railway wagons for lack of matching sections.

2. Early in 1963 the position became still more acute. Certain major fabrications in the country were working at only 50 per cent capacity on a single shift and several construction projects important to the Third Five Year Plan were being delayed by months or even years. In February the Association made further representations to the Union Ministry of Steel and Heavy Industries and to the Union Ministry of Economic and Defence Coordination. These representations were followed up on 19th March by a personal discussion between representatives of the Association and the Minister of Economic and Defence Coordination. The relevant extract from a record note on this meeting is given in annexure A to this report.

Formation of a special committee

3. One of the decisions reached at the meeting on 19th March was that the Association should study the possibilities for rationalising steel consumption with a view to reducing the number of different sections or sizes which the producers are called upon to roll. A preliminary investigation by a member firm had already shown that there was considerable scope for such 'rationalisation' without adding significantly to the weight of steel to be used in particular products or projects.

4. It may be noted here that the Raj Committee, in its preliminary report to the Government in January 1963, drew attention to the need to reduce the number of sections and sizes which producers are expected to roll. The suggestion was made that "immediate action should be taken by the Ministry of Steel in consultation with fabricators, design engineers traders and consumers to standardise the sections to be rolled by the big plants".

5. Accordingly, in April 1963, the Association set up a special Steel Rationalisation Sub-Committee consisting of representatives of certain large fabricators and of the two main producers in the private sector. The member firms represented on the Sub-Committee were Braithwaite & Co. (India) Ltd., Bridge & Roof Co. (India) Ltd., Burn & Co. Ltd., Indian Iron & Steel Co. Ltd., Jessop & Co. Ltd., Rivers Steam Navigation Co. Ltd., and Tata Iron & Steel Co. Ltd.

6. The Committee met five times during the ensuing three months and their findings are set out below.

Appraisal of the situation

7. The Committee noted that before the introduction of the metric system both Tisco and Iisco used to produce a rationalised range of inch sections, as given in their abridged list of products published periodically. When metric sections were added, without any comparable rationalisation, the total demand for steel was diffused or scattered over a wider range of sections and in many cases the individual demand for a particular section became too small to provide an 'economic rolling' for the producers. On the other hand, with the installation of modern high speed rolling mills, the quantities required to achieve an 'economic rolling' increased considerably.

8. This has resulted in a widening gap between the demand for and the supply of matching steel. In some cases large stocks of unmatched steel have been immobilised for as long as two years or more in the stockyards of fabricators for lack of relatively small quantities of matching steel sections. Apart from the general cost to the nation through delays in implementing construction projects, production costs have been increased through enforced storage of steel, to the extent of 15 per cent of the value of the steel each year or say, Rs. 100 per tonne per year.

Theoretical approach to the problem

9. The Committee's first attempt to reduce the current range of sections was based purely on theoretical considerations. It was assumed that the index of efficiency of a section is either related to its area (as in the case of angles, rounds, squares, etc.) or to sectional moduli (as in the case of joists and channels). Four graphs were then plotted showing the angles and the flats against co-ordinates of weight and area and joists against co-ordinates of section modulus and weight. A study of these graphs, which are reproduced in annexure C, shows that the present number of sections gives too many alternatives for similar purposes and there is therefore enormous scope for reducing the number of sections without undue sacrifice of economy in the use of steel. Following this line of thought it was calculated that the range of sections could be reduced to what is shown in thick lines on these graphs. A summary is given below :—

Category	Total number of sections	Rationalised number of sections
equal angles	72	24
unequal angles	65	21
joists	65	14
flats	228	48

Empirical approach to the problem

10. The Committee then proceeded to examine and analyse the actual pattern of demand for different sections on the basis of the returns submitted by the major structural fabricators to the office of the Iron and Steel Controller and also on the basis of the approximate requirements of manufacturers of railway wagons and transmission line towers. The total annual demand for each section was assessed, inch sections being bulked together with equivalent metric sections, and the Committee's findings are summarised in columns 2 and 4 of eight statements reproduced in annexure D. From this empirical study the Committee found that the total demand for a large number of sections was very small indeed. The Committee's findings are summarised below :—

Category	Total number of sections	Number of sections for which demand is less than 500 tonnes per year
joists	14	4
channels	16	2
equal angles	72	21
unequal angles	65	51
rounds	32	16
squares	32	31
flats	228	221

Preparation of a rationalised list

11. The results of the analysis of demand were then compared with the results of the original theoretical study, and the Committee drew up preliminary rationalised lists of sections as per column 6 of the eight statements in annexure D. These preliminary lists were circulated to the main steel plants and to the major fabricators and in the light of the comments received in reply a consolidated final list was drawn up which is given in annexure B.

12. In preparing this final list, the Committee gave special consideration to the ability of the producers to roll each particular section. Accordingly, the light or heavy sections beyond the medium range of beams and channels were omitted as the producers have not yet been able to roll these sections. It should also be noted that the rationalised list is meant to cater only for the normal demands of steel fabricators, it being assumed that any special demand will be met either by special arrangements with the producers or by imports.

13. From the table given at the end of annexure B it will be seen that *the effect of the proposed rationalisation is to reduce the number of sections to be rolled by the producers from 553 to only 129—a reduction of 77 per cent.* This number is still less than the number of sections included in the Tata/IISCO abridged list of products of August 1959.

The need to modify engineering designs

14. Having prepared a rationalised list, the Committee proceeded to examine the practical effect of applying the reduced range of sections to a number of existing projects. The results are summarised in annexure E. In all cases except for the Foundry Forge Project (mill buildings only) at Ranchi it was found that the increase in the weight of steel consumed would be negligible.

15. It should be noted that this study does not presuppose any general changes in design. If the overall designs are modified, the weight increases resulting from rationalisation will be still smaller, particularly in the case of the buildings for the Foundry Forge Project.

Improvement envisaged in matching steel supply

16. The rationalised list of sections was circulated to the five main steel plants and comments were invited, particularly on the question of the expected improvement in the supply of matching steel as a result of the proposed rationalisation. However, in the absence of information from Bhilai, Durgapur and Rourkela at the time of finalising this report, and without a plan for distributing the 129 sections equitably among the five main producers, it has not been possible for the Committee to estimate the probable effect on production. Nevertheless the Committee are of the view that the drastic reduction in the number of sections to be rolled will lead to a rapid and substantial increase in the availability of matching steel.

17. The Committee considers it essential, however, that there should be a proper distribution of the reduced number of sections amongst the various steel plants. It is pointed out that the individual annual demand for each of the 129 sections is above the quantity required to achieve an economic rolling during a quarterly period. Reference may be made here to the producers' remarks as recorded under columns 12 to 17 in the statements given in annexure D.

Recommendation of the Association

18. The Association supports the recommendation of the Steel Rationalisation Sub-Committee that immediate steps should be taken, on the basis of the rationalised list given in annexure B, to reduce the number of steel sections which the main producers are required to roll. It is suggested that this scheme for a reduced range of sections should be implemented for an initial period of five years, and that the whole question should then be reviewed again.

19. In putting forward this scheme the Association further recommends that any reduction in the number of available sections and sizes should be regarded as a temporary expedient. The long term aim should be to provide steel consumers in India with a wider range of sections and sizes to enable them to approach closer to the engineering ideal of maximum strength or efficiency for minimum steel (and hence minimum cost). In the export sphere it is particularly important that engineering firms should not be handicapped by having access to a relatively limited range of steel sections and sizes as compared with the much larger range available to exporters in other countries. To this extent a more flexible import policy is essential to ensure that exporters of fabricated steel are not unduly restricted in their choice of matching sections.

ANNEXURE 'A'

Extract from a record note of the meeting with Mr. T. T. Krishnamachari at 10-30 a.m. on Tuesday 19th March 1963 at 3, Motilal Nehru Place, New Delhi

"Shortage of Matching Steel

Mr. Cargin drew attention to the difficulties faced by steel fabricators in obtaining supplies of steel, particularly in certain sections and sizes. The position had been set out in the Association's letter dated 12th February to the Ministry for Steel and Heavy Industries and a copy had been forwarded to the E. & D. C. Ministry. Owing to the shortage of matching steel the major fabricators were working at only 50 per cent of their capacity and were unable to give prompt delivery for projects of such great national importance as the Foundry Forge at Ranchi, the Alloy Steel Plant and various railway bridges. It was for this reason that the Railways had recently issued a tender for the import of fabricated steel though on further consideration arrangements had been made to import the steel for fabrication in India. The position in regard to matching steel for wagon manufacture was also giving cause for concern.

Mr. Krishnamachari seemed to be fully aware of the situation and agreed that it would be necessary to import steel to supplement local production. He asked whether the Association would supply the Ministry with details of the particular sections and sizes which were urgently required; a decision could then be made concerning the items to be imported. Mr. Krishnamachari stated that it was necessary for the Government's policy to be more flexible in this respect, particularly to ensure that structural work, which was not of a repetitive nature, was not held up.

In this connection Mr. Krishnamachari gave his view that the private sector should instal further capacity for structural fabrication. He pointed out that there were good potential markets in Africa and elsewhere for the export of fabricated steel-work. This would be a useful addition to India's foreign exchange earnings even though part of the additional earnings might have to be spent on additional imports of steel. He also gave his view that the main impediment to the creation of new structural engineering units was the shortage of technical skill and talent in India, but he thought there was some scope for speeding up the training of skilled workers by applying American methods of production involving great division of labour. Mr. Cargin agreed that there was great scope for structural steel export on the basis of expanded capacity provided that the shortage of steel and other impediment to production could be overcome. In the matter of technical training he pointed out that the main hurdle was to train new workers in the trades of template and jigmaking, and it would be difficult to shorten training periods in these trades without sacrificing quality. Mr. Krishnamachari suggested that the structural fabricators might combine together to set up a 'Design Advisory Bureau' and indicated that this might qualify for Government assistance as an aspect of scientific research. He agreed, in commenting generally on the need to expand the structural engineering industry, that the private sector could not be expected to put up further units unless proper incentives were provided. He indicated that the Government would be looking further into this matter.

Mr. Cargin described a study which had recently been made by a member firm into the quantities required each year of different sections and sizes of steel. It had been found that if those sections were eliminated for which the total annual requirement was less than 50 tonnes, the number of different sections required by the units could be reduced from about 200 to only 70. From this it appeared that there was considerable scope for reducing the number of sections and sizes to be rolled by the main producers without adding materially to the weight of steel which would be used in the end-product following the elimination of certain sections. The Minister stated his interest and agreed that it would be useful if a study of this kind could be conducted among steel fabricators throughout the country. Mr. Cargin stated that the Association would be pleased to take the initiative in conducting a survey of this kind.....".

ANNEXURE 'B'.

INDIAN ENGINEERING ASSOCIATION.

Recommended list of rationalised sections.

Ref.	Srl.	Sections.	Remarks.
I. Joists	1	ISMB 125	(i) All beams beyond 'medium' range have been left out as the Producers have not yet been able to roll those sections.
	2	ISMB 150	
	3	ISMB 175	
	4	ISMB 200	
	5	ISMB 225	
	6	ISMB 250	(ii) It is however, suggested that ISMB 150 & 200 should also be included in the rationalised list if the Producers are able to roll them.
	7	ISMB 300	
	8	ISMB 400	
	9	ISMB 450	
	10	ISMB 600	
II. Channels	1	ISMC 100	(i) Same as remark (i) against Joists.
	2	ISMC 125	
	3	ISMC 150	(ii) For channels with special webs for wagon building, it is suggested they should be taken up separately with the Producers or changed to standard medium sections.
	4	ISMC 200×7.5 web	ISMC 200×7.5 and ISMC 250×10 are however included as these will be necessary for centre long or sole bar = channels for wagon under-frame.
	5	ISMC 250	
	6	ISMC 250×10 web	
	7	ISMC 300	
	8	ISMC 400	

Ref.	Srl.	Sections.	Remarks.
Thickness.			
III. Equal Angles	1, 2 ;	200×200 18*, 16	*It is suggested that I. S. I. should be requested to modify 18 mm thickness to 20 mm thickness in order to maintain proper thickness gradation.
	3, 4, 5, 6 ;	150×150 18*, 16, 12, 10	
	7, 8	130×130 12, 10	
	9, 10	110×110 10, 8	
	11, 12, 13, 14	100×100 12, 10, 8, 6	
	15, 16, 17	90×90 10, 8, 6	
	18, 19	80×80 8, 6	
	20, 21, 22	75×75 10, 8, 6	
	23, 24, 25, 26	65×65 10, 8, 6, 5	
	27, 28, 29	50×50 6, 5, 4	
	30, 31	45×45 5, 4	
IV. Unequal Angles	1, 2 ;	150×115×12, 10.	
	3 ;	150× 75×10	
	4 ;	125× 75×10, 8	
	6, 7, 8 ;	100× 75×10, 8, 6	
	9, 10 ;	90× 60, 8, 6	
	11, 12 ;	75×50×10, 8	
	13, 14 ;	6, 5	
15, 16 ;	45× 30×5, 4		
V. Rounds	1	Dia. 6, 8, 10, 12, 16, 20, 22, 25, 28, 32, 36, 40, 50, 63, 80, 100.	
	to 16		
VI. Squares	1	Size 50, 63, 80	Because of insufficient demand only 3 sections have been included. For any other section with adequate demand the matter may be taken up separately with the Producers.
	to 3		

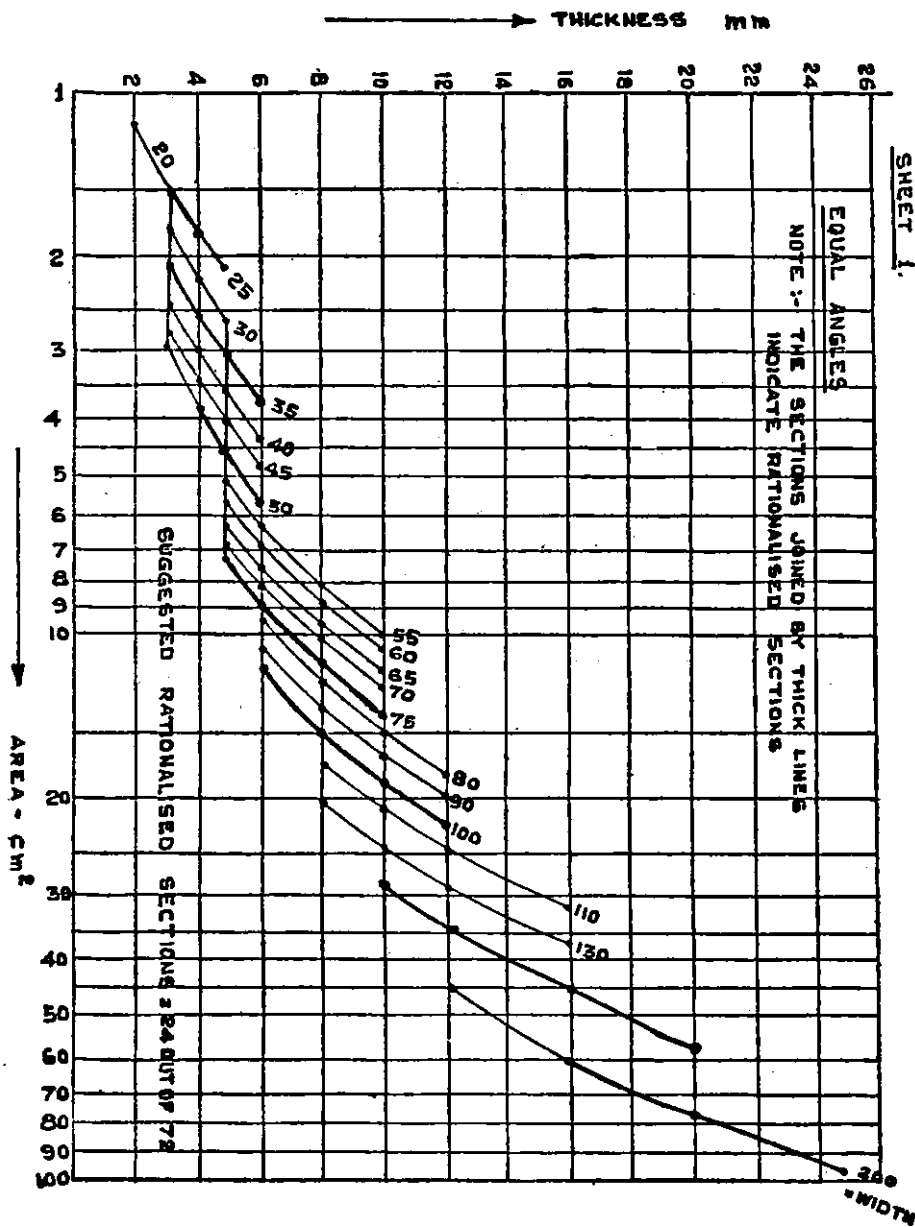
Ref.	Srl.	Sections.		Remarks.
		Width.	Thickness.	
VII. Flats	1, 2, 3	400	25, 20, 16	In view of comparatively small demand for flats it is suggested that non-rationalised flats should be substituted by plates wherever possible.
	4, 5, 6	300	25, 20, 16	
	7, 8, 9, 10	250	25, 20, 16, 12	
	11, 12	200	16, 12	
	13, 14, 15, 16	150	25, 20, 16, 12	
	17, 18, 19, 20	100	20, 16, 12, 10	
	21, 22, 23, 24, 25	75	20, 12, 10, 8, 6	
	26, 27, 28, 29, 30	50	16, 12, 10, 8, 6	

VII. Plates	1 to 15	Thickness—4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 22, 25, 32, 40, 50. Widths—900, 1000, 1100, 1250, 1400, 1600, 1800, 2000, 2200, 2500.
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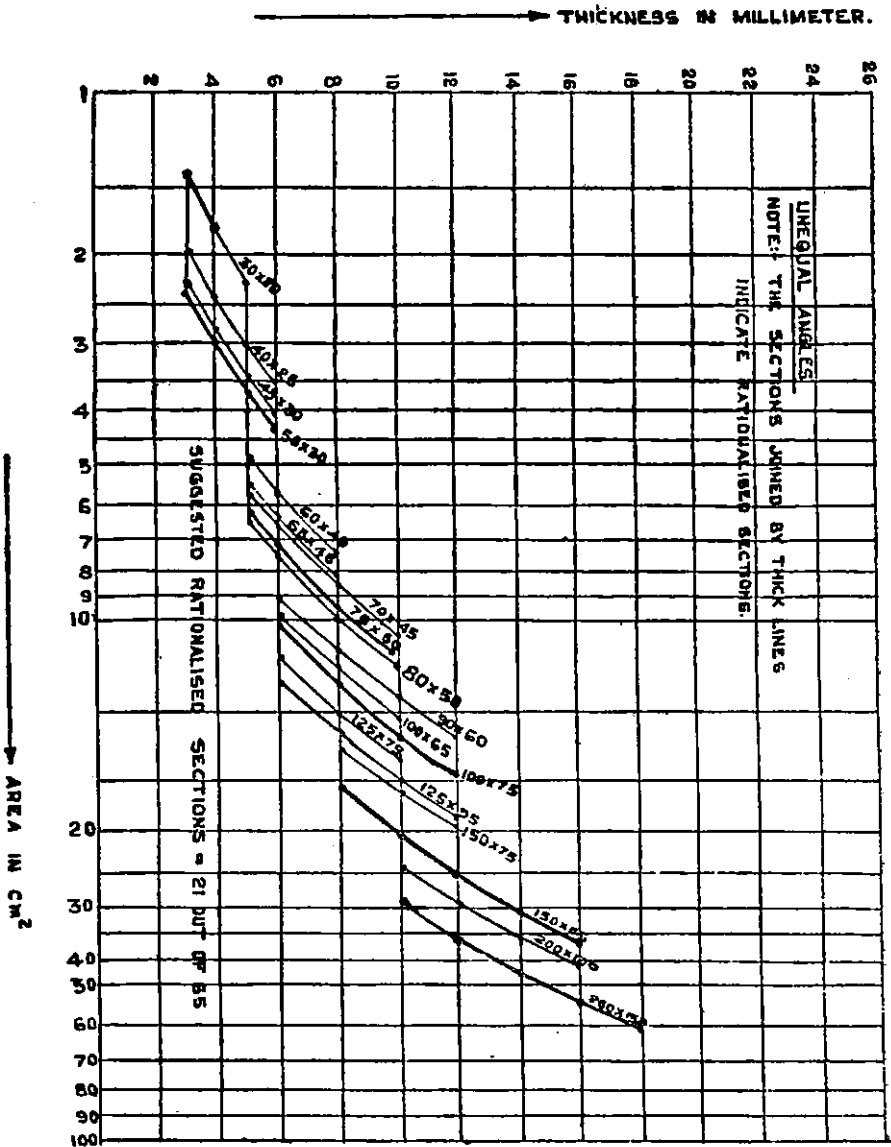
	Metric Sections considered in this report.			Inch sections as per Tata-IISCO. Abridged List of Products, August, 1959.	
	Total Nos. of Sections.	Nos. of Sections demanded as per Annexure D	Nos. of Sections rationalised.	Total Nos. of Sections.	Nos. of rationalised Sections.
1. Beams	65	14	10	26	18
2. Channels	32	16	8	14	13
3. Equal Angles	72	57	31	58	31
4. Unequal Angles	65	45	16	47	26
5. Rounds	32	29	16	41	22
6. Squares	32	17	3	20	11
7. Flats	229	112	30	445	74
8. Plates	26	25	15	16	16*
	553	315	129	667	211

*Since no definite indication of rationalised thickness was given, all thickness w assumed as rationalised.

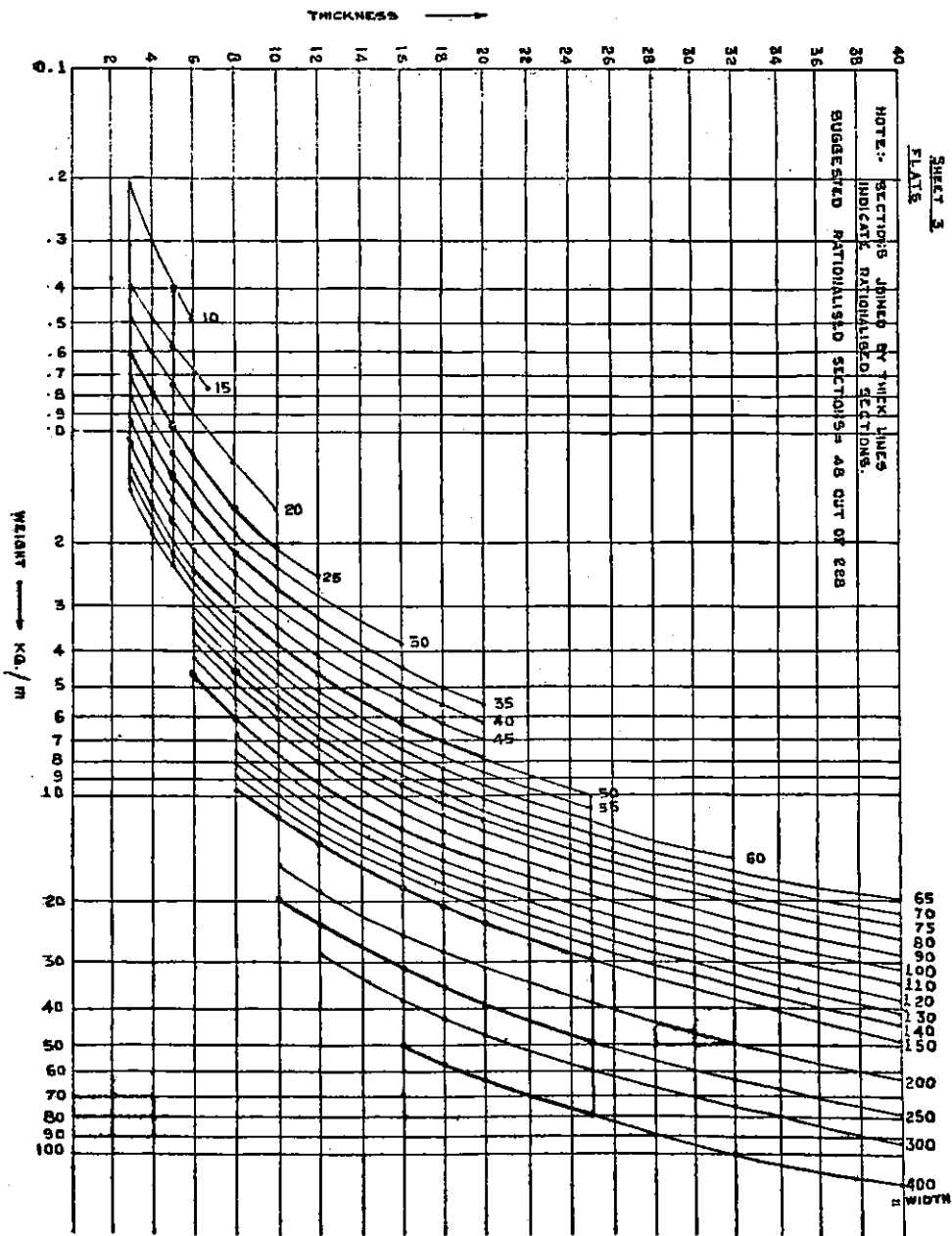
ANNEXURE - C
SHEET 1.



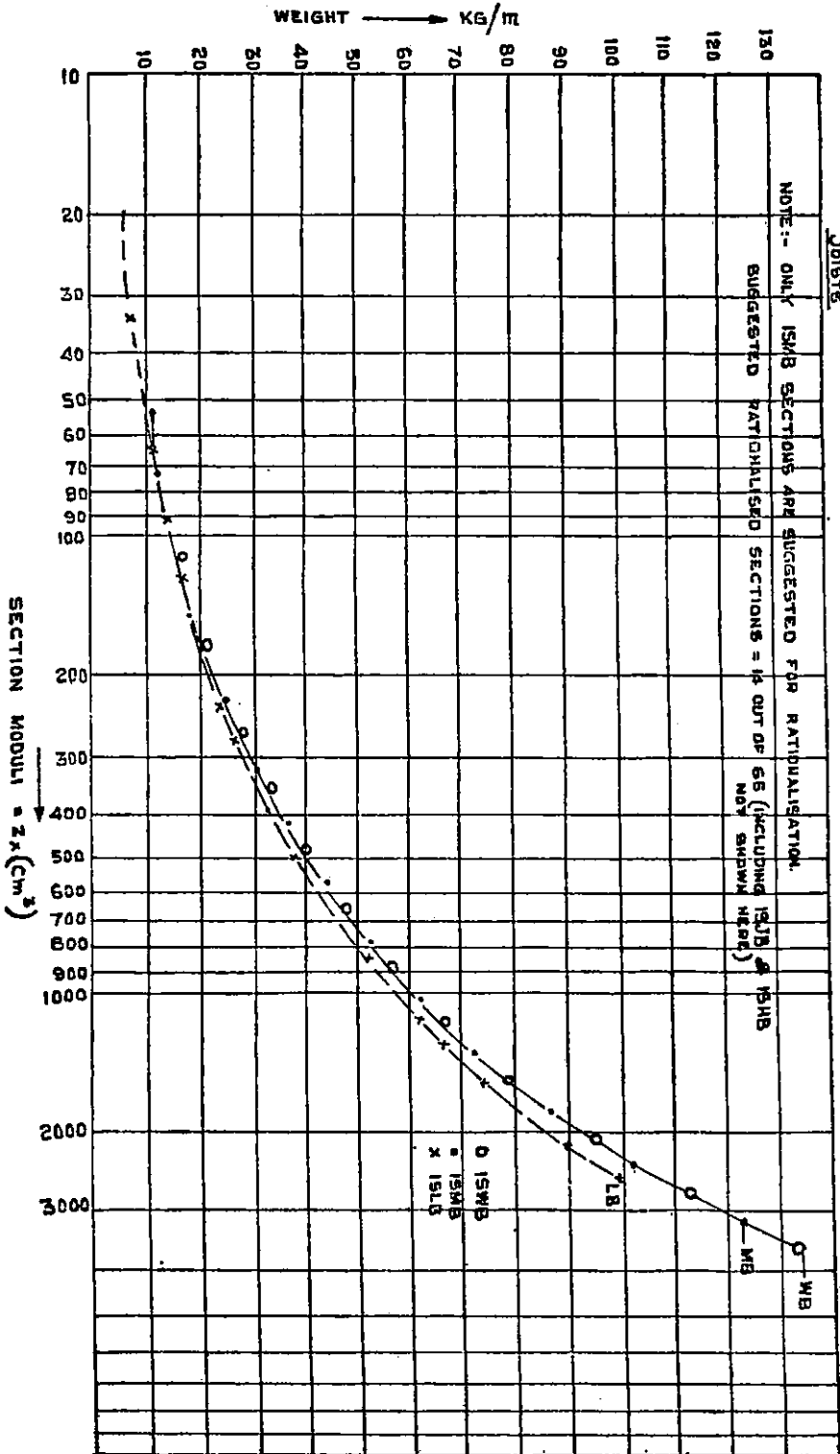
ANNEXURE - C.
SHEET 2.



ANNEXURE C
SHEET 3
FLATS



ANNEXURE - C
SHEET A



ANNEXURE
FOR
STATEMENT
OF
RATIONALISATION OF SECTION

ANNEXURE
Statement
RATIONALISATION
EQUAL.

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	200 × 200 × 25	73.6	290	1		54.0	..
2	18	54.0	2,570	1	200 × 200 × 18	..	2,570
3	16	48.3	1,490	2	× 16	..	1,490
4	12	36.6	500	3		39.9	..
5	150 × 150 × 18	39.9	4,870	3	150 × 150 × 18	..	4,870
6	16	35.7	1,750	4	× 16	..	1,750
7	12	27.2	3,740	5	× 12	..	3,740
8	10	22.8	2,420	6	× 10	..	2,420
9	130 × 130 × 16	30.7	6	4		35.7	..
10	12	23.4	910	6		22.8	..
11	10	19.7	9,935	7	1301 × 30 × 10	..	9,935
12	8	15.9	2,100	8	× 8	..	2,100
13	110 × 110 × 16	27.6	50	5		27.2	..
14	12	19.6	110	7		19.7	..
15	10	16.5	1,720	8		15.9	..
16	8	13.4	3,015	9		14.9	..
17	100 × 100 × 12	17.7	680	7		19.7	..
18	10	14.9	3,400	9	100 × 100 × 10	..	3,400
19	8	12.1	8,150	10	× 8	..	8,150
20	6	9.2	5,225	11	× 6	..	5,225
21	90 × 90 × 12	15.8	2,440	12	90 × 90 × 12	..	2,440
22	10	13.4	50	13	× 10	..	550
23	8	10.8	5,765	14	× 8	..	5,765
24	6	8.2	4,660	15	× 6	..	4,660
25	80 × 80 × 12	14.0	80	9		14.9	..
26	10	11.8	330	6	80 × 80 × 10	..	330
27	8	9.6	720	17	× 8	..	720
28	6	7.3	3,700	8	× 6	..	3,700
29	5 × 5 × 10	11.0	2,490	16		..	..
30	8	8.9	3,020	17		9.6	..
31	6	6.3	3,250	18		7.3	..
32	5	5.7	365	21		5.8	..
33	70 × 70 × 10	10.2	..			..	..
34	8	8.3	..			..	..
35	6	6.3	1,875	20		7.7	..
36	5	5.3	124	21		5.8	..
37	65 × 65 × 10	9.4	1,000	19	65 × 65 × 10	..	1,000

—'D'.
—1.
OF SECTION.
ANGLES.

RATIONALISATION						PRODUCERS							REMARKS	
Additional Demand due to Rationalisation						Yearly Demand	Qrtly. Demand	Tatas	IISCO	Bhilai	Durga-pur	Rour-kela		
T						T	T							
9						10	11	12	13	14	15	16	17	
..
213	..	..	..	..	..	2,783	696	..	..	..	..	..	..	..
..	..	..	..	..	..	1,490	373	..	..	..	..	..	..	..
..
646	..	..	..	..	..	6,416	1,354	..	..	..	..	..	..	..
7	..	..	..	..	..	1,757	439	..	..	..	..	..	..	..
49	..	..	..	..	..	3,789	947	..	..	..	..	..	..	..
885	..	..	..	..	..	3,305	826	..	..	..	..	..	..	..
..
..
111	756	..	..	..	..	10,801	2,700	..	..	..	..	..	..	..
1,656	..	..	..	..	..	3,766	939	..	..	..	..	..	..	..
..
..
..
..
..
3,340	..	85	..	..	..	6,826	1,706	..	..	..	..	..	..	..
..	..	..	..	..	..	8,150	2,013	..	..	..	..	..	..	..
..	..	..	..	..	..	5,226	1,306	..	..	..	..	..	..	..
..	..	..	..	..	..	2,440	610	..	..	..	..	..	..	..
..	..	..	..	..	..	550	138	..	..	..	..	..	..	..
..	..	..	..	..	..	5,765	1,441	..	..	..	..	..	..	..
..	..	..	..	..	..	4,660	1,165	..	..	..	..	..	..	..
..
2,490	..	..	..	..	..	2,820	705	..	..	..	..	..	..	..
3,260	..	..	..	..	..	3,980	995	..	..	..	..	..	..	..
3,490	..	..	..	..	..	7,190	1,798	..	..	..	..	..	..	..
..
..
..
..
..
..
..
..
..
..
126	..	..	..	..	..	1,126	282	..	..	..	..	..	..	..

ANNEXURE
Statement
RATIONALISATION
EQUAL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
38	8	7.7	1,990	20	8	..	1,990
39	6	5.8	3,830	21	6	..	3,830
40	5	4.9	5,130	22	5	..	5,130
41	60x 60x 10	8.6	115	19		9.4	..
42	8	7.0	80	20		7.7	84
43	6	5.4	3,100	21		5.8	..
44	5	4.5	6,040	22		4.9	..
45	55x 55x 10	7.9				..	..
46	8	6.4	660	21		5.8	..
47	6	4.9	2,335	22		4.9	2,335
48	5	4.1	5,300	23		4.5	..
49	50x 50x 6	4.5	3,000	23	50x 50x 6	..	3,000
50	5	3.8	6,850	24	x 5	..	6,850
51	4	3.0	1,600	25	x 4	..	1,600
52	3	2.3	..			..	..
53	45x 45x 6	4.0	1,000	24		3.8	..
54	5	3.4	8,935	24		3.8	..
55	4	2.7	4,080	25		3.0	..
56	3	2.1	..			..	..
57	40x 40x 6	3.5	60	24		3.8	..
58	5	3.0	90	25		3.0	..
59	4	2.4	..			..	..
60	3	1.8	..			..	..
61	35x 35x 6	3.0	..			..	..
62	5	2.6	30	25		3.0	..
63	4	2.1	..			..	..
64	3	1.6	..			..	..
65	30x 30x 6	2.2	20	25		3.0	..
66	4	1.8	..			..	..
67	3	1.4	..			..	..
68	25x 25x 5	1.8	15	25		3.0	..
69	4	1.4	..			..	..
70	3	1.1	7	25		3.0	..
71	20x 20x 4	1.1	..			..	..
72	3	0.9	..			..	..
			137,667				

Notes :— (1) Producers are requested to recommend changes in Column 6 if necessary for assured supply.
(2) Subject to above Producers are requested to indicate assurance of supply as per Column 6 and 11 by putting ticks in Columns 12 to 16 as applicable

ANNEXURE
Statement
RATIONALISATION
UNEQUAL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	200×150×18	46.9	3				
2	16	42.0	25		200×200×16	..	..
3	12	31.8	127		150×150×16	35.7	..
4	10	26.7				..	..
5	200×100×16	35.7	56		150×150×16	35.7	..
6	12	27.2	130		×12	27.2	..
7	10	22.8	40		×10	22.8	..
8	150×115×16	31.3	300		150×150×16	35.7	..
9	12	23.8	2,045	1	150×115×12	..	2,045
10	10	20.0	1,930	2	×10	..	1,930
11	8	16.2	110	3		16.9	..
12	150×75×12	20.1	180	2		20.0	..
13	10	16.9	900	3	150×75×10	..	900
14	8	13.7	30	3		16.2	..
15	125×95×12	19.6	395	2		20.0	..
16	10	16.5	80	3		16.2	..
17	8	13.3	..			..	..
18	6	10.1	..			..	..
19	125×75×10	14.9	2,160	4	125×75×10	..	2,160
20	8	12.1	460	5		13.0	..
21	6	9.2	295	6		10.5	..
22	100×75×12	15.4	65	4		14.9	..
23	10	13.0	1,600	5	100×75×10	..	1,600
24	8	10.5	2,660	6	×8	..	2,660
25	6	8.0	895	7	×6	..	895
26	100×65×10	12.2	5	6		13.0	..
27	8	9.9	10	6		10.5	..
28	6	7.5	..			..	..
29	90×60×12	13.0	..			..	..
30	10	11.0	25	6		10.5	..
31	8	8.9	640	8	90×60×8	..	640
32	6	6.8	1,745	9	×6	..	1,745
33	80×50×10	9.4	..			..	..
34	8	7.7	50	11		7.4	..
35	6	5.9	10	12		5.6	..
36	5	4.9	665	12		5.6	..

ANNEXURE
Statement
RATIONALISATION
UNEQUAL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
37	75 x 50 x 10	9.0	555	10	75 x 50 x 10	..	555
38	8	7.4	355	11	" x 8	..	355
39	6	5.6	715	12	" x 6	..	715
40	5	4.7	15	13	" x 5	..	15
41	70 x 50 x 10	8.3				..	..
42	8	6.7	10	11		7.4	..
43	6	5.2	8	12		5.6	..
44	5	4.8				..	..
45	65 x 45 x 8	6.4	190	11		7.4	..
46	6	4.9	360	13		4.7	..
47	5	4.1	175	13		4.7	..
48	60 x 40 x 8	5.8	..			"	"
49	6	4.4	..			"	"
50	5	3.7	10	13		4.7	..
51	50 x 30 x 6	3.5	..			"	"
52	5	3.0	..			"	"
53	4	2.4	240	15		2.2	..
54	3	1.8	..			"	"
55	45 x 30 x 6	3.3	160	14		2.8	..
56	5	2.8	5,455	14	45 x 30 x 5	..	5,455
57	4	2.2	3,695	15	" x 4	..	3,695
58	3	1.7	..			"	"
59	40 x 25 x 6	2.8	10	14		2.8	11
60	5	2.4	..			"	"
61	4	1.9	..			"	"
62	3	1.5	..			"	"
63	30 x 20 x 5	1.8	..			"	"
64	4	1.4	..			"	"
65	3	1.1	..			"	"
			29,589				
			— 681				
			= 28,908				

- Notes: — (1) Producers are requested to recommend changes in Column 6 if necessary for assured supply.
(2) Subject to above producers are requested to indicate assurance of supply as per columns 6 and 11 by putting ticks in Columns 12 to 16 as applicable.

ANNEXURE
Statement
RATIONALISATION
J o i

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	ISMB 100	11.6	10	1		13.0	..
2	125	13.0	4,180	1	ISMB 125	..	4,180
3	150	14.9	3,645	2	150	..	3,645
4	175	19.3	980	3	175	..	980
5	200	25.4	7,060	4	200	..	7,060
6	225	31.2	225	5	225	..	225
7	250	37.3	985	6	250	..	985
8	300	44.2	1,860	7	300	..	1,860
9	350	52.4	1,250	8		61.6	..
10	400	61.6	1,710	8	400	..	1,710
11	450	72.4	2,610	9	450	86.9	2,610
12	500	86.9	420	10		..	430
13	550	103.7	40	10		122.6	48
14	600	122.6	2,545	10	600	..	2,545
			27,520				

NOTE :- (1) Producers are requested to recommend changes in Column 6 if necessary for assured supply.
(2) Subject to above, producers are requested to indicate assurance of supply as per Columns 6 and 11 by putting ticks in Columns 12 to 16 as applicable.

—'D'—contd.

—3.

OF SECTIONS.

S T S.

RATIONALISATION						PRODUCERS					REMARKS		
Additional Demand due to Rationalisation						Yearly Demand	Qrtly. Demand	Tatas	IISCO	Bhilaj		Durga-pur	Rour-kela
T						T	T						
9						10	11	12	13	14	15	16	17
..	
11	..	..	..	..	..	4,191	1,048	..	..	..	..	..
..	..	..	..	..	..	3,645	916	..	..	..	..	..
..	..	..	..	..	..	980	246	..	..	..	..	..
..	..	..	..	..	..	7,060	1,765	..	..	..	..	..
..	..	..	..	..	..	226	66	..	..	..	..	..
..	..	..	..	..	..	985	249	..	..	..	..	..
..	..	..	..	..	..	1,860	466	..	..	..	..	..
..	
1,470	..	..	..	..	..	3,180	795	..	..	..	..	..
..	..	..	..	..	..	2,691	..	..	..	..	..	..
..	
..	
48	420	..	..	..	..	3,013	754	..	..	..	..	..
						27,834							
						1.2 percent extra.							

(3) Fabricator committee members are requested to record in Column 17 Design difficulties apprehended as a result of Rationalisation as per Column 6.

(4) Equivalent moduli from the basis of sectional substitution.

ANNEXURE
Statement
RATIONALISATION
PLA

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	4	..	3,450	1	Thickness 4	..	3,450
2	5	..	13,380	2	5	..	13,380
3	5-5	..	..			..	..
4	6-0	..	25,300	3	6	..	25,300
5	7-0	..	1,625	4		..	..
6	8-0	..	18,335	4	8	..	18,335
7	9	..	82	5		..	..
8	10	..	4,410	5	10	..	4,410
9	11	..	327	6		..	..
10	12	..	12,145	6	12	..	12,145
11	14	..	2,510	7	14	..	2,510
12	16	..	5,160	8	16	..	5,160
13	18	..	1,430	9	18	..	1,430
14	20	..	4,060	10	20	..	4,060
15	22	..	1,980	11	22	..	1,980
16	25	..	5,055	12	25	..	5,055
17	28	..	1	13		..	..
18	32	..	2,780	13	32	..	2,780
19	36	..	840	14		..	..
20	40	..	1,315	14	40	..	1,315
21	45	..	345	15		..	..
22	50	..	520	15	50	..	520
23	56	..	245				
24	63	..	147			..	..
25	71	..	88				
26	80	..	184				
			105,714				
			- 664				
			105,050				

NOTE :- (1) Producers are requested to recommend changes in Column 6 if necessary for assured supply.
(2) Subject to above Producers are requested to indicate assurance of supply as per Columns 6 and 11 by putting ticks in Columns 12 to 16 as applicable.

—D—contd.

—5.

OF SECTIONS

TES

RATIONALISATION						PRODUCTS					REMARKS		
Additional Demand due to Rationalisation						Yearly Demand	Ortly. Demand	Tatas	IISCO	Bhilai		Durga-pur	Rourkela
T						T	T						
9						10	11	12	13	14		15	16	17
..	..	..	..	..	..	3,450	863	..	..	..	..	..	..
..	..	..	..	..	..	13,380	3,345	..	..	..	..	..	..
..
..	..	..	..	..	..	25,300	6,325	..	..	..	..	..	..
..
1,860	..	..	..	..	..	20,195	5,049	..	..	..	..	..	..
..
91	..	..	..	..	..	4,501	1,123	..	..	..	..	..	..
..
356	..	..	..	..	..	12,501	3,123	..	..	..	..	..	..
..	..	..	..	..	..	2,510	627	..	..	..	..	..	..
..	..	..	..	..	..	6,160	1,290	..	..	..	..	..	..
..	..	..	..	..	..	1,430	368	..	..	..	..	..	..
..	..	..	..	..	..	4,060	1,016	..	..	..	..	..	..
..	..	..	..	..	..	1,980	495	..	..	..	..	..	..
..	..	..	..	..	..	5,055	1,264	..	..	..	..	..	..
..
1	..	..	..	..	..	2,781	695	..	..	..	..	..	..
..
935	..	..	..	..	..	2,250	643	..	..	..	..	..	..
..
384	..	..	..	..	..	904	226	..	..	..	..	..	..
..
						105,457							
						0.39 per cent.							

(3) Fabricator committee members are requested to record in Column 17 Design difficulties apprehended as a result of Rationalisation as per Column 6.

(4) Equivalent thickness form the basis of above sectional substitution.

ANNEXURE
Statement
RATIONALISATION
Rou

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	Diameter 5	0-20	1	1		0-28	..
2	6	0-28	1,320	1	Diameter 6	..	1,320
3	7	0-38	..	2		0-50	..
4	8	0-50	500	2	8	..	500
5	9	0-64	..	3		0-78	..
6	10	0-78	2,270	3	10	..	2,270
7	11	0-95	..	4		1-13	..
8	12	1-13	2,740	4	12	..	2,740
9	14	1-54	6	5		2-01	..
10	16	2-01	2,680	5	16	..	2,680
11	18	2-54	27	6		3-14	..
12	20	3-14	4,730	6	20	..	4,730
13	22	3-80	3,200	7	22	..	3,200
14	25	4-91	3,310	8	25	..	3,310
15	28	6-15	4,330	9	28	..	4,330
16	32	8-04	1,330	10	32	..	1,330
17	36	10-17	3,135	11	36	..	3,135
18	40	12-56	312	12	40	..	312
19	45	15-90	562	13		19-62	..
20	50	19-62	646	13	50	..	646
21	56	24-62	350	14		31-16	..
22	63	31-16	570	14	63	..	570
23	71	39-57	260	15		60-24	..
24	80	50-24	1,780	15	80	..	1,780
25	90	63-58	250	16		78-50	..
26	100	78-50	850	16	100	..	850
27	110	94-98	95				
28	125	122-66	85				
29	140	153-86	10				
30	160	200-96	60				
31	180	254-34	10				
32	200	314-00	50				
			35,468				
			310				
			35,158				

NOTES :—(1) Producers are requested to recommend changes in Column 6 if necessary for assured supply.
(2) Subject to above Producers are requested to indicate assurance of supply as per Columns 6 and 11 by putting ticks in Columns 12 to 16 as applicable.

ANNEXURE
Statement
RATIONALISATION
Squ

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	Size	5	..	..	..	..	..
2		6	..	..	..	..	..
3		7	..	..	..	..	..
4		8	..	..	..	..	..
5		9	..	..	..	..	..
6		10	..	..	..	..	..
7		11	..	..	..	..	..
8		12	..	1	..	..	..
9		14	..	..	..	..	..
10		16	..	1	..	..	..
11		18	..	..	..	..	..
12		20	..	1	..	..	..
13		22	..	..	..	..	..
14		25	..	9	..	..	..
15		28	..	..	..	..	..
16		32	..	2	..	..	..
17		36	..	13	..	..	..
18		40	..	..	..	..	..
19		45	..	..	..	..	..
20		60	..	223	1	60	..
21		66	..	42	..	..	..
22		63	..	915	2	63	..
23		71	..	38	..	..	..
24		80	..	280	3	80	..
25		90	..	..	..	..	..
26		100	..	368	..	..	..
27		110	..	43	..	..	..
28		125	..	86	..	..	..
29		140	..	..	..	..	..
30		160	..	22	..	..	..
31		180	..	157	..	..	..
32		200	..	82	..	..	..
				2,283			

NOTES—(1) Producers are requested to recommend changes in Col. 6 if necessary for assured supply.
(2) Subject to above Producers are requested to indicate assurance of supply as per Cols. 6 & 11 by putting ticks in Cols. 12 to 16 as applicable.

ANNEXURE
Statement
RATIONALISATION
FL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
1	400 x 40	160	..	..	..	..	..
2	32	128	30	..	..	..	..
3	25	100	400	1	400 x 25	..	..
4	20	80	60	..	..	..	..
5	18	72	..	..	..	..	..
6	16	64	95	..	..	..	..
7	300 x 40	120	2	..	..	..	..
8	32	96	..	..	..	..	..
9	25	75	100	..	..	..	..
10	20	60	110	2	300 x 20	..	..
11	18	54	..	..	..	..	..
12	16	48	165	3	300 x 16	..	..
13	12	36	210	..	..	..	..
14	250 x 40	100	1	..	..	..	..
15	32	80	..	..	..	..	..
16	25	62.5	42	..	..	..	..
17	20	50	125	4	250 x 20	..	..
18	18	45	..	..	..	..	..
19	16	40	170	..	..	..	..
20	12	30	210	5	250 x 12	..	..
21	10	25	160	..	..	..	..
22	200 x 40	80	14	..	..	..	..
23	32	64	7	..	..	..	..
24	25	50	115	..	..	..	..
25	20	40	150	..	..	..	..
26	18	36	22	..	..	..	..
27	16	32	760	6	200 x 16	..	..
28	12	24	1,020	7	200 x 12	..	..
29	10	20	60	..	..	..	..
30	150 x 45	67.5	483	8	150 x 45	..	..
31	40	60	..	..	..	..	..
32	32	48	1,375	9	150 x 32	..	..
33	25	37.5	170	..	..	..	..
34	20	30	170	..	..	..	..
35	18	27	70	..	..	..	..
36	150 x 16	..	440	10	150 x 16	..	..

ANNEXURE
Statement
RATIONALISATION
FL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
37	12	..	290	11	160 x 12	..	..
38	10	36	76	..	..	..	..
39	140 x 40	..	..	..	..	..	..
40	32	..	..	..	..	..	..
41	25	..	..	..	..	..	..
42	20	..	..	..	..	..	..
43	18	..	..	..	..	..	..
44	16	..	..	..	..	..	..
45	12	..	..	..	..	..	..
46	10	..	..	..	..	..	..
47	8	..	..	..	..	..	..
48	130 x 40	..	..	..	..	..	..
49	32	..	..	..	..	..	..
50	25	33	1,365	12	130 x 25	..	..
51	20	35	434	13	130 x 20	..	..
52	18	35	2	..	..	..	..
53	16	35	30	..	..	..	..
54	12	36	240	14	130 x 12	..	..
55	10	79	100	..	..	..	..
56	8	80	370	15	130 x 8	..	..
57	120 x 40	..	..	..	..	..	..
58	32	..	..	..	..	..	..
59	25	33	25	..	..	..	..
60	20	35	185	..	..	..	..
61	18	..	..	..	..	..	..
62	16	36	75	..	..	..	..
63	12	36	60	..	..	..	..
64	10	..	..	..	..	..	..
65	8	..	..	..	..	..	..
66	110 x 40	..	..	..	..	..	..
67	32	..	..	..	..	..	..
68	25	..	..	..	..	..	..
69	20	..	..	..	..	..	..
70	18	..	..	..	..	..	..
71	16	..	..	..	..	..	..
72	12	..	..	..	..	..	..

ANNEXURE
Statement
RATIONALISATION
FL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
73	10	..	..	..	..	..	..
74	8	..	..	..	..	..	..
75	100 x 40	31	45	..	..	..	..
76	32	..	..	..	..	..	..
77	100 x 25	..	84	..	..	..	..
78	20	..	665	16	100 x 20	..	..
79	18	77	20	..	..	..	..
80	16	..	230	..	..	..	..
81	12	..	255	17	100 x 12	..	..
82	10	..	326	18	100 x 10	..	..
83	8	..	115	..	..	..	..
84	6	82	63	..	..	..	..
85	90 x 40	..	..	..	..	..	..
86	32	..	..	..	..	..	..
87	25	..	..	..	..	..	..
88	20	77	6	..	..	..	..
89	18	77	1	..	..	..	..
90	16	..	..	..	..	..	..
91	12	..	..	..	..	..	..
92	10	81	50	..	..	..	..
93	8	..	..	..	..	..	..
94	6	..	..	..	..	..	..
95	80 x 40	..	..	..	..	..	..
96	32	..	..	..	..	..	..
97	28	76	480	..	..	..	..
98	25	..	..	19	80 x 25	..	..
99	20	79	45	..	..	..	..
100	18	79	20	..	..	..	..
101	16	80	100	..	..	..	..
102	12	81	170	20	80 x 12	..	..
103	10	110	85	..	..	..	..
104	8	110	80	..	..	..	..
105	6	162	30	..	..	..	..
106	75 x 40	..	..	..	..	..	..
107	32	..	..	..	..	..	..
108	25	77	10	..	..	..	..

ANNEXURE
Statement
RATIONALISATION
Fl

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
109	20	..	170	..	..	..	..
110	18	107	22	..	..	..	..
111	16	..	72	..	..	..	..
112	12	..	140	..	..	..	..
113	10	..	55	..	..	..	..
114	8	..	9	..	..	..	..
115	6	162	82	..	..	..	..
116	70 x 40	..	..	..	..	..	..
117	32	..	..	..	..	..	..
118	25	..	..	..	..	..	..
119	20	..	..	..	..	..	..
120	18	..	..	..	..	..	..
121	16	..	..	..	..	..	..
122	12	..	..	..	..	..	..
123	10	..	110	..	..	..	..
124	8	..	..	..	..	..	..
125	6	..	..	..	..	..	..
126	65 x 40	..	..	..	..	..	..
127	32	..	..	..	..	..	..
128	25	107	50	..	..	..	..
129	20	109	275	..	..	..	..
130	18	109	30	..	..	..	..
131	16	109	60	..	..	..	..
132	12	111	110	..	..	..	..
133	10	160	455	21	65 x 10	..	..
134	8	162	42	..	..	..	..
135	6	163	26	22	65 x 6	..	..
136	60 x 32	..	..	..	..	..	..
137	25	107	220	..	..	..	..
138	20	109	110	..	..	..	..
139	18	..	..	..	..	..	..
140	16	109	5	..	..	..	..
141	12	..	..	..	..	..	..
142	10	..	..	..	..	..	..
143	8	..	..	..	..	..	..
144	6	..	..	..	..	..	..

ANNEXURE
Statement
RATIONALISATION
FL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
145	6	..	..	..	..	..	..
146	4	..	..	..	..	..	..
147	3	..	..	..	..	..	..
148	55 x 25	107	3	..	..	..	..
149	20	158	7	..	..	..	..
150	18	..	..	..	..	..	..
151	16	..	..	..	..	..	..
152	12	..	..	..	..	..	..
153	10	162	30	..	..	..	..
154	8	..	..	..	..	..	..
155	6	..	..	..	..	..	..
156	5	..	..	..	..	..	..
157	4	..	..	..	..	..	..
158	3	..	..	..	..	..	..
159	2	..	..	..	..	..	..
160	80 x 25	109	46	..	..	..	..
161	20	..	110	..	..	..	..
162	18	..	..	..	..	..	..
163	16	..	535	23	50 x 16	..	..
164	12	..	350	24	x 12	..	..
165	10	..	350	25	x 10	..	..
166	8	..	130	26	x 8	..	..
167	6	..	716	27	x 6	..	..
168	5	..	227	..	..	..	..
169	4	..	30	..	..	..	..
170	3	..	..	..	..	..	..
171	45 x 20	..	..	..	..	..	..
172	18	..	..	..	..	..	..
173	16	..	..	..	..	..	..
174	12	161	775	..	..	..	..
175	10	162	17	..	..	..	..
176	8	..	..	..	..	..	..
177	6	..	..	..	..	..	..
178	5	..	..	..	..	..	..
179	4	..	..	..	..	..	..
180	3	..	..	..	..	..	..
180	40 x 20	160	160	..	..	..	..

ANNEXURE
Statement
RATIONALISATION
FL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
181	18	160	125	..	..	..	..
182	16	161	40	..	..	..	..
183	12	162	45	..	..	..	..
184	10	163	8	..	..	..	..
185	8	164	5	..	..	..	..
186	6	165	225	..	..	..	..
187	5	166	140	..	..	..	..
188	4	..	..	..	..	..	..
189	3	..	..	..	..	..	..
190	35 × 20	..	..	..	..	..	..
191	18	..	..	..	..	..	..
192	16	161	35	..	..	..	..
193	12	..	..	..	..	..	..
194	10	..	..	..	..	..	..
195	8	164	90	..	..	..	..
196	6	165	105	..	..	..	..
197	5	..	..	..	..	..	..
198	4	..	..	..	..	..	..
199	3	..	..	..	..	..	..
200	30 × 16	..	..	..	..	..	..
201	12	..	..	..	..	..	..
202	10	..	..	..	..	..	..
203	8	..	..	..	..	..	..
204	6	166	2	..	..	..	..
205	5	..	..	..	..	..	..
206	4	..	..	..	..	..	..
207	3	..	..	..	..	..	..
208	2.5 × 12	164	7	..	..	..	..
209	10	..	..	..	..	..	..
210	8	..	..	..	..	..	..
211	6	166	34	..	..	..	..
212	5	..	..	..	..	..	..
213	4	166	1	..	..	..	..
214	3	..	..	..	..	..	..
215	20 × 10	166	24	..	..	..	..
216	8	..	..	..	..	..	..

ANNEXURE
Statement
RATIONALISATION
FL

CURRENT DEMAND				SUGGESTED			
Serial No.	Section	Unit Wt.	Demand	Serial No.	Section	Unit Wt.	Demand
		Kg/m	T			Kg/m	T
1	2	3	4	5	6	7	8
217	6	..	..	..	..	..	..
218	5	..	..	..	..	..	..
219	4	..	..	..	..	..	..
220	3	..	..	..	..	..	..
221	15 × 8	..	..	..	..	..	..
222	6	..	..	..	..	..	..
223	6	..	..	..	..	..	..
224	4	..	..	..	..	..	..
225	3	..	..	..	..	..	..
226	10 × 6	..	..	..	..	..	..
227	5	..	..	..	..	..	..
228	4	..	..	..	..	..	..
229	3	..	..	..	..	..	..
			19,172				

No 165—(1) Producers are requested to recommend changes in Col. 6 if necessary for assured supply. ■
(2) Subject to above Producers are requested to indicate assurance of supply as per Cols. 6 and 11 by putting ticks in Cols. 12 to 16 as applicable.

ANNEXURE 'E'

INDIAN ENGINEERING ASSOCIATION.

Effect of suggested rationalisation on selected projects.

Serial No.	Project	Estimated by	Increase in Weight	Remarks	
1.	Alloy Steel Project—Bar Finishing Shop Building (No. 12).	Jessops . .	0.55 per cent	On overall tonnage	
2.	Alloy Steel Project—Maintenance Shop Building (No. 13).	Jessops . .	0.07 ..	Ditto	
3.	Heavy Electricals Ltd.—Maintenance Work Shop.	Braithwaites . .	1.22 ..	On Sections only	
4.	250 Ft.—Span B. G. M. L. Girder.	Burns . .	2.61 ..	} On overall tonnage	
5.	150 Ft.—Span B. G. M. L. Girder.	Burn . .	0.01 ..		
6.	60 Ft.—Span B. G. M. L. Girder.	Burns . .	0.25 ..		
7.	Foundry Forge Project Building No. 05.	Bridge and Roof	8.56 ..	On Sections only	} As estimated
			4.28 ..	On overall tonnage	
			3.7 ..	On sections only	
			1.85 ..	On overall tonnage	
8.	Chittaranjan Main Shed .	Bridge and Roof	2.44 ..	On Sections only	} As above except no replacement for ISLC 125.
9.	Transmission Line Industry	Kamani Engineering Corporation Ltd.	3 ..		

N.B.—The above figures have been estimated without redesigning. Redesign would bring down the percentage increases, specially in the case of Serial No. 7.

APPENDIX 4

No. SC(C)-4(1)/63

GOVERNMENT OF INDIA
MINISTRY OF STEEL AND MINES
DEPARTMENT OF IRON AND STEEL

New Delhi, the 24th July, 1964.

OFFICE MEMORANDUM

Subjects—Iron and Steel—Rationalisation of Steel sections rolled by Main Producers in the country—orders issued.

The undersigned is directed to say that an *ad hoc* Committee was constituted to examine and rationalise the sections at present rolled by the Main Producers; thereby providing economic rolling tonnages for the Main Producers of steel consistent with the broad requirements of customers. The terms of reference were—

- (i) Recommending modification, if necessary, of certain ISI sections for acceptance by the Indian Standards Institution,
- (ii) Selection of sections to be rationalised, and
- (iii) Allocation of the proposed rationalised sections among different producers.

2. The recommendations of the Committee have been considered by this Department in consultation with the Directorate General, Technical Development and Planning Commission.

3. Regarding (i),—modification of certain ISI Sections—the Indian Standards Institution have tentatively agreed to allow the relaxations recommended for a period of two years and the detailed specifications of the new sections are being laid down by them officially.

4. Regarding (ii), the Committee have recommended the sections to be rationalised. The adoption of these rationalised sections has been accepted by Government. The list of sections is appended as an Annexure.

In addition to these rationalised sections, the following special sections will also have to be rolled to meet certain specific important demands :—

1. Crossing sleepers—BG and MG.
2. Bearing Plate bars.
3. Telegraph channels.
4. Bulb angles.
5. Z section.
6. Sheet piling sections.
7. Crane and bridge rails.
8. Electric Transmission Pole Section (116 mm × 110 mm).

It will be seen that the Committee have suggested rationalisation of 153 sections. With regard to Tee sections, the recommendation of the Committee that the possibility of producing them by slitting Beam Sections should be explored by the Producers, has been accepted.

5. All Departments under the Central and State Governments are requested to give wide publicity to the rationalised list of sections (*vide* Annexure) and also to impress on their Design Organisation(s) and designers the need for basing their designs on these sections only. As it will take sometime for the rolls to wear out, and for the designs to be changed, it has been decided that the change over to the rationalised sections will take place from *1st January, 1965*. This would give sufficient time to all consumers of steel to make any adjustments that may be necessary.

6. All consumers of steel should, in future, *i.e.*, from *1st January, 1965*,—place indents on the Producers on the basis of the rationalised steel sections only. It is also made clear that import of non-rationalised steel sections will not be allowed only on the ground that the structures were designed by the Projects, etc., on the basis of non-rationalised sections.

7. The Main Producers of steel are requested to take all possible steps to ensure that all the rationalised steel sections are available to consumers in sufficient quantities. They are also requested to explore the possibility of producing Tee sections by slitting the beam sections. They are also informed that production of any non-rationalised section should not be undertaken without the *prior* approval of the Joint Plant Committee. The Iron and Steel Controller is requested to issue the necessary directive under Clause 13 of the Iron and Steel (Control) Order, 1956, restricting production to only those sections which have been recommended by the Committee and accepted by Government.

8. As regards the Re-rolling industry, they are free to roll any other section if sufficient demands are received.

9. As regards (iii),—*inter se* allocation of the rationalised steel sections among the Main Producers,—the Committee could not come to any unanimous decision and have suggested that the matter should be dealt with by the Joint Plant Committee. Government have accepted this suggestion and decided that the Joint Plant Committee should consider and decide this problem, as early as possible.

M. PRASAD,
Deputy Secretary to the Government of India.

To

All Ministries.
All State Governments and Union Territories.
All Main Producers of Steel.
Iron and Steel Controller, Calcutta.
Chairman, Joint Plant Committee, Calcutta.

ANNEXURE

I. Beams

1. ISMB	600
2. „	500
3. „	450
4. „	400
5. „	350
6. „	300
7. „	250
8. „	225
9. „	200
10. „	175
11. „	150
12. „	125
13. „	100
14. ISHB	200
15. „	150

II. Channels

1. ISMC	400
2. „	300
3. „	250
4. „	225
5. „	200
6. „	175
7. „	150
8. „	125
9. „	100
10. „	75

III. Unequal Angles

1. 150×115×10
2. ×12

III. Unequal Angles—contd.

3. 150×115×16
4. 150× 75×10
5. 125× 75× 8
6. ×10
7. 100× 75× 8
8. ×10
9. 90× 60× 6
10. 90× 60×10
11. 75× 50× 6
12. × 8
13. 45× 30× 5
14. × 6

IV. Equal Angles

1. 200×200×16
2. ×20
3. 150×150×12
4. ×16
5. ×20
6. 130×130×10
7. ×12
8. 110×110× 8
9. ×10
10. 100×100× 6
11. × 8
12. ×10
13. ×12
14. 90× 90× 6
15. × 8
16. ×10

IV. *Equal Angles*—contd.

17.	90×90×12
18.	80×80×6
19.	×8
20.	80×80×12
21.	75×75×6
22.	×8
23.	×10
24.	65×65×6
25.	×8
26.	50×50×5
27.	×6
28.	45×45×5
29.	×6
30.	40×40×5
31.	40×40×6
32.	35×35×5

V. *Rounds*

1.	6 mm
2.	8 mm
3.	10 mm
4.	12 mm
5.	16 mm
6.	18 mm
7.	20 mm
8.	22 mm
9.	25 mm
10.	28 mm
11.	32 mm
12.	36 mm
13.	40 mm
14.	50 mm

V. *Rounds*—contd.

15.	63 mm
16.	80 mm
17.	100 mm
18.	125 mm
19.	160 mm
20.	200 mm

VI. *Tees*

1.	50×50×6
2.	65×65×6
3.	60×60×6
4.	75×75×10

VII. *Squares*

1.	12 mm
2.	16 mm
3.	20 mm
4.	25 mm
5.	40 mm
6.	45 mm
7.	50 mm
8.	63 mm

VIII. *Flats**

1.	400 mm × 12, 25
2.	300 mm × 12
3.	250 mm × 12, 20, 25
4.	200 mm × 10, 12, 25
5.	180 mm × 18
6.	150 mm × 12, 16, 25
7.	100 mm × 10, 12, 16, 20
8.	75 mm × 8, 10, 12, 20

*Thickness of flats may be changed by the Producers if they get substantial order for any non-standard thickness.

VIII. *Flats*—contd.

- | | | |
|-----|---------|------------------|
| 9. | 65 mm × | 8, 10, 12 |
| 10. | 50 mm × | 6, 8, 10, 12, 16 |
| 11. | 45 mm × | 6, 10 |
| 12. | 40 mm × | 6, 8, 10 |
| 13. | 35 mm × | 6, 10 |
| 14. | 25 mm × | 6, 10 |

IX. *Light Rails*

- | |
|--------|
| 20 lb. |
| 24 lb. |
| 30 lb. |

X. *Heavy Rails*

- | |
|---------|
| 50 lb. |
| 60 lb. |
| 75 lb. |
| 90 lb. |
| 105 lb. |

APPENDIX 5

No. C/33(2)/64

GOVERNMENT OF INDIA
MINISTRY OF STEEL & MINES

DEPARTMENT OF IRON AND STEEL
IRON & STEEL CONTROL

33, NETAJI SUBHAS ROAD,
Calcutta, the 26th August, 1964.

ORDER

WHEREAS

I, S. C. Mukherjee, Iron and Steel Controller, am satisfied that it is necessary to regulate the production of steel sections in the country in order to co-ordinate the production thereof with the demands which have arisen or are likely to arise.

NOW THEREFORE,

In exercise of the powers conferred on me by Clause 13 of the Iron & Steel (Control) Order, 1956, I hereby issue the following order :—

(a) That the Producers mentioned in Schedule I to this Order shall, with effect from 1st January, 1965, restrict the production of their Structural and Merchant Product Mills, to the sections included in schedule II to this Order ;

(b) That the Producers mentioned in schedule I to this Order shall not take any steps for the development or production of any section other than those included in schedule II to this Order without the prior approval of the Iron & Steel Controller.

Provided that Order shall not apply to the production of any section other than the permissible ones if it is undertaken in accordance with a rolling programme duly approved in writing by the Iron & Steel Controller.

S. C. MUKHERJEE,
Iron and Steel Controller.

To

The Manager,
Govt. of India Press,
FARIDABAD.

Copy to : All concerned.

SCHEDULE I

1. Tata Iron & Steel Co. Ltd.,
Jamshedpur.
2. Indian Iron & Steel Co. Ltd.,
Burnpur.
3. Hindustan Steel Ltd.,
Bhilai Steel Plant,
Bhilai.
4. Hindustan Steel Ltd.,
Durgapur Steel Plant,
Durgapur.

SCHEDULE II

<i>I. Beams</i>		<i>II. Channels—contd.</i>	
1. ISMB	600	8. ISMC	125
2. „	500	9. „	100
3. „	450	10. „	75
4. „	400		
5. „	350	<i>III. Unequal Angles</i>	
6. „	300	1. 150×115×10	
7. „	250	2. „ ×12	
8. „	225	3. „ ×16	
9. „	200	4. 150×75×10	
10. „	175	5. 125×75×8	
11. „	150	6. „ ×10	
12. „	125	7. 100×75×8	
13. „	100	8. „ ×10	
14. ISHB	200	9. 90×60×6	
15. „	150	10. 90×60×10	
		11. 75×50×6	
		12. „ ×8	
<i>II. Channels</i>		13. 45×30×5	
1. ISMC	400	14. „ ×6	
2. „	300		
3. „	250	<i>IV. Equal Angles</i>	
4. „	225	1. 200×200×16	
5. „	200	2. „ ×20	
6. „	175	3. 150×150×12	
7. „	150	4. „ ×16	

IV. *Equal Angles*—contd.

5. 150×150×20
6. 130×130×10
7. ×12
8. 110×110× 8
9. ×10
10. 100×100× 6
11. × 8
12. ×10
13. ×12
14. 90× 90× 6
15. × 8
16. ×10
17. ×12
18. 80× 80× 6
19. × 8
20. 80× 80×12
21. 75× 75× 6
22. × 8
23. ×10
24. 65× 65× 6
25. × 8
26. 50× 50× 5
27. × 6
28. 45× 45× 5
29. × 6
30. 40× 40× 5
31. 40× 40× 6
32. 35× 35× 5

V. *Rounds*

1. 6 mm
2. 8 mm
3. 10 mm
4. 12 mm

V. *Rounds*—contd.

5. 16 mm
6. 18 mm
7. 20 mm
8. 22 mm
9. 25 mm
10. 28 mm
11. 32 mm
12. 36 mm
13. 40 mm
14. 50 mm
15. 63 mm
16. 80 mm
17. 100 mm
18. 125 mm
19. 160 mm
20. 200 mm

VI. *Tees*

1. 50×50× 6
2. 65×65× 6
3. 60×60× 6
4. 75×75×10

VII. *Squares*

1. 12 mm
2. 16 mm
3. 20 mm
4. 25 mm
5. 40 mm
6. 45 mm
7. 50 mm
8. 63 mm

VIII. *Special Steel*

1. Crossing sleepers—BG and MG
2. Bearing Plate bars.

VIII. *Special Steel*—contd.

3. Telegraph channels.
4. Bulb Angles.
5. Z Section.
6. Sheet piling sections.
7. Crane and bridge rails.
8. Electric Transmission Pole Sec.
(116 mm × 100 mm).
9. Fish Plate Bars.
10. Ribbed Bars & Octagonals.

IX. *Flats**

1. 400 mm × 12, 25
2. 300 mm × 12
3. 250 mm × 12, 20, 25
4. 200 mm × 10, 12, 25
5. 180 mm × 18
6. 150 mm × 12, 16, 25
7. 100 mm × 10, 12, 16, 20
8. 75 mm × 8, 10, 12, 20

IX. *Flats*—contd.

9. 65 mm × 8, 10, 12
10. 50 mm × 6, 8, 10, 12, 16
11. 45 mm × 6, 10
12. 40 mm × 6, 8, 10
13. 35 mm × 6, 10
14. 25 mm × 6, 10

X. *Light Rails*

- 20 lb.
24 lb.
30 lb.

XI. *Heavy Rails*

- 50 lb.
60 lb.
75 lb.
90 lb.
105 lb.

*Thickness of flats may be changed by the Producers if they get substantial order for any non-standard thickness.