BUREAU OF INDIAN STANDARDS

AGENDA

Panel for Steel, CED 46:P9 : **Sixth Meeting**

In Joint Session with

Panel for Revision of IS 800, CED 07:2:P1

Friday, 21 June 2024 : **1030 h**

In Hybrid Mode from:

Department of Civil Engineering, Indian Institute of Technology Madras, Chennai 600036

Online Using:

1) Meeting link: https://bismanak.webex.com/bismanak/j.php?MTID=m21952087e536bf9c18a78ff35b56f4e3

2) Meeting number: 2514 522 5565

3) Password: Nbc@2025

****

Convener: Dr V. Kalyanaraman
Dr S. Arul Jayachadran

NBC Officer: Shri Abhishek Pal

Head (NBC Cell): Shri Arunkumar S.

CED 07 Member Secretary: Shri Dheeraj Damachya

****

Item 0 OPENING REMARKS

Item 1 CONFIRMATION OF MINUTES OF THE LAST MEETING

1.1 The Minutes of the fifth meeting of the Panel held on 03 April 2024 in New Delhi, were circulated vide BIS DG letter No. CED 46:P9/A-2.5 dated 06 May 2024. No comments have been received.

The Panel may **CONFIRM** the Minutes.

Item 2 COMPOSITION

2.1 The present composition of the Panel is given at **Annex 1 (P-4)**.

The Panel may **CONSIDER**.

2.2 The Panel may also **NOTE** regarding the Structural Reforms in Standardization established by BIS to bring greater efficiency in standards formulation and revision work in BIS addressing speed, skill and scale. The same relates to aspect like:

a) technical committees of BIS having members with widely acknowledged domain area expertise and experience on the subjects
b) optimum size of the technical committee
c) review of membership with focus on continuity of participation including contribution by every member
d) holding periodic meetings (physical/virtual/hybrid)
e) decide on timelines to enable stage-wise development of the documents (draft standards)
f) resource centre to enable share the information and documents associated with the standardization work

2.3 Further, BIS has established in place systems such as action research projects, R&D for standards development and provision for having short-term Consultants. Also, focus should be made w.r.t developments on the subject happening world-wide including in technical events, literature, research publications, standard bodies, etc. Wherever possible research based inputs be generated including by associating with the various eminent institutions with whom BIS has entered into MoU with.

The Panel may **NOTE**.

Item 3 PROJECT OF REVISION OF NBC

3.1 The contents of the existing Part 6 ‘Structural Design’ /Sec 6 ‘Steel’ as in NBC 2016 are given in **Annex 2 (P-8)**.

The Panel may **NOTE**

3.2 The comments received in Sectional Committee, ‘Structural Engineering and Structural Sections, CED 07’ for IS 800:2007 are given at **Annex 3 (P-11)**.

The Panel may **CONSIDER**.

3.3 The points of discussion on the proposed revision of IS 800:2007 and the chapter Part 6/ Sec 6 ‘ Steel’ of NBC 2016 are given at **Annex 4 (P-17)**.

Item 4 COMMENTS RECEIVED ON / INPUTS RELATED TO PART 6/SEC 6 'STEEL' OF SP 7 : 2016

4.1 The comments by Interarch Building Products Pvt Ltd, Noida on the Working Draft of this Chapter Part 6/Sec 6 'Steel' of SP 7 : 2016 is given at **Annex 5 (P-20)**.

The Panel may **CONSIDER**.

4.2 The comments by Kirby Building Systems India Limited, New Delhi on the Working Draft of this Chapter Part 6/Sec 6 'Steel' of SP 7 : 2016 is given at **Annex 6 (P-24)**.

The Panel may **CONSIDER**.

Item 6 DATE & PLACE OF THE NEXT MEETING

Item 7 ANY OTHER BUSINESS

****

ANNEX 1
(*Item* 2.1)

COMPOSITION OF THE PANEL FOR STEEL, CED 46:P9

Sl No.	NAME OF THE ORGANISATION	REPRESENTED BY	Participation in the last meetings		
			3rd	4th	5th
1)	In personal capacity, Chennai	Dr V. Kalyanaraman (Convener)	P	P	P
2)	Association of Consulting Civil Engineers (India), Bangalore	Shri Manoj Kawalkar Shri Rajkumar Kacharla (Alternate)	A	P	P
3)	Central Public Works Department, New Delhi	Shri Nagendra Prasad Shri Amrendra Kumar Jalan (Alternate)	P	A	P
4)	Creative Consultants & Engineers Pvt Ltd, Ghaziabad	Shri Aman Deep	P	P	P
5)	CSIR – Central Building Research Institute, Roorkee	Dr. Ajay Chourasia Dr. R. Siva Chidambaram (Alternate I) Dr. Chanchal Sonkar (Alternate II)	A	A	P
6)	CSIR-Structural Engineering Research Centre, Chennai	Dr G. S. Palani Dr Napa Prasad Rao (Alternate I) Dr M Sarvanan (Alternate II)	P	A	P
7)	Engineers India Limited, New Delhi	Smt. Papia Mandal Shri Chandra Shekhar Sharma (Alternate) Shri Saptadip Sarkar (Alternate II)	A	P	P
8)	Indian Association of Structural Engineers, New Delhi	Dr. Harshavardhan Subbarao Dr Abhay Gupta (Alternate)	P	P	P
9)	Indian Institute of Technology Madras, Chennai	Dr S. Arul Jayachandran	A	P	P
10)	Institute for Steel Development and Growth, Kolkata	Shri Pydi Lakshmana Rao Shri Arijit Guha (Alternate) Shri M. M. Ghosh	P	P	P
11)	Interarch Building Products Pvt Ltd, Noida	Shri Gautam Suri Shri Sunil Pulikkal (Alternate)	A	P	P
12)	Jindal Steel and Power Limited, New Delhi	Shri Sanjay Nandanwar Shri Biju Mahima (Alternate)	A	P	P
13)	Larsen and Toubro Ltd, Chennai	Shri T. Venkatesh Rao	A	P	A
14)	Kirby Building Systems India Limited, New Delhi	Dr. Padmaja Gokaraju	-	-	C
15)	M. N. Dastur & Co Limited, Kolkata	Shri Satyaki Sen Shri Tapan Kumar Bhaumik (Alternate)	A	A	A
16)	MECON Limited, Ranchi	Shri A. Krishna Rao Shri C. Krishnam Raju (Alternate)	P	A	A
17)	Military Engineer Services, Engineer-in-Chief's Branch, Army HQ, New Delhi	Shri S C Gupta Brig Ravi Reddy (Alternate)	P	P	P
18)	PEB Manufacturers' Association, Navi Mumbai	Shri Manish Garg	A	P	A
19)	Research, Designs and Standards Organization (Ministry of Railways), Lucknow	Shri Rajesh Kumar Srivastava Shri Srijan Tripathi (Alternate)	A	A	P
20)	Tata Consulting Engineers Limited, Mumbai	Shri Pratip Bhattacharya	A	A	A

Sl No.	NAME OF THE ORGANISATION	REPRESENTED BY	Participation in the last meetings		
			3rd	4th	5th
21)	Tata Steel Ltd, Jamshedpur	Shri Hariharaputhiran H.	A	A	P
22)	The Institution of Engineers (India), Kolkata	Dr S Senthil Selvan Dr P R Kannan Rajkumar (Alternate)	A	P	P

ANNEX 2
(*Item* **3.1**)

CONTENTS OF PART 6 SECTION 6 'STEEL' OF NBC

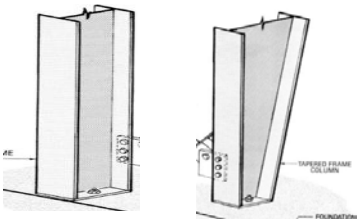
CONTENTS

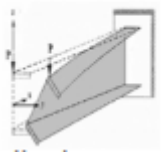
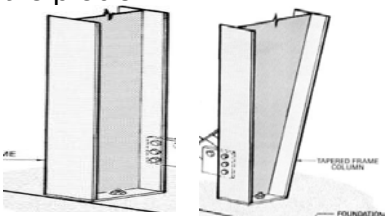
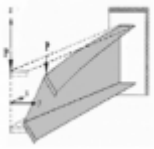
ANNEX 3
(*Item* **3.2**)

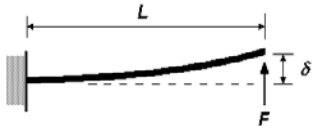
COMMENTS RECEIVED ON IS 800:2007

A-4.1 The following comments were received during the 16th meeting of CED 7:

Sl. No.	IS Code	Commentor	Comments/Modified wordings	Justification
1	IS 800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Inclusion of Fire resistant steel – specification (IS 15103:2002) in the code for general construction for Steel.	Fire resistant steel is crucial for the safety of steel intensive buildings. Currently fire resistance is achieved through expensive intumescent paint. Inclusion in IS 800 will increase awareness and encourage more usage amongst designers and builders. Fire resistant steel is available in the Indian market.
2	IS 800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Inclusion of Structural weather resistant steel - specification (IS 11587:1986) in the code for general construction for Steel.	Structural weather resistant steel is essential for rust and corrosion resistance. Inclusion in IS 800 will increase its awareness and encourage usage amongst designers and builders, especially in coastal areas Structural weather resistant steel is available in the Indian market.
3	IS 800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Inclusion of Structural Steel for buildings and structures with improved seismic resistance - specification (IS 15962:2012) in the code for general construction for Steel.	Structural steel with improved seismic resistance will be required for earthquake resistant buildings, especially in seismic zone 4 and 5. Inclusion in IS 800 will raise awareness and encourage usage amongst builders and designers. Structural steel with improved seismic resistance is available in the Indian market.
4	IS:800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Methods for determining effective length of columns of tapered sections (continuously varying non prismatic sections) need to be added. Prismatic	This would allow us to calculate the load bearing capacity of non-prismatic sections and enable their use in steel intensive construction, potentially

			sections have constant cross section areas as opposed to non-prismatic sections which have carrying cross section areas as depicted in the figure 1.  <u>Prismatic, Non Prismatic Figure 1</u> 2) Method to find out max slenderness ratio which is used to determine design load (λ) = $\frac{l_{eff}(effective\ length)}{r_x\ (radius\ of\ gyration)}$ as given in Cl. 7.2.2, page 35 and Table-11, page 45 of IS:800 needs to be modified along with mentioning the specific radius of gyration (rr_{xx}) to be taken into account. Design load defines the maximum load that a structural section can bear. Currently formulae exist for prismatic sections only	reducing cost. 1) Effective length (ll_{eeeeee}) for a buckled steel structural is the distance between points of flexure (buckling). It is required to calculate axial compression and slenderness ratio to determine the load bearing capacity of the sections. Non prismatic sections have varying cross sections and thus have continuous variation in the radius of gyration. The current formulae are for calculation of slenderness ratio (used to determine design loads) only for prismatic (constant cross
5	IS:800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Methods for determining Elastic Critical moment (M_{cr}) for Lateral Torsional buckling (lateral displacement as well as twisting – depicted in Figure 3) for non-symmetric sections about minor axis (eg. Channels, depicted in Figure 2) need to be modified in Annexure-E, page 128 of IS:800 Currently formulae exist for symmetric sections only	The modified formula would allow determination of Elastic Critical moment for identifying maximum load bearing capacity to prevent lateral torsional bucking for non-symmetric sections. This would enable us to use these sections in steel intensive construction and prevent miscalculations resulting in reduced structural integrity. 

				This steel section is symmetric about z axis (major) and non- symmetric about y axis (minor) Figure 2  Lateral Torsional bucking –displacement along with twisting Figure 3
6	IS:800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Methods for determining Elastic Critical moment (M_{cr}) for Lateral Torsional buckling (lateral displacement as well as twisting, depicted in Figure 5) for non- prismatic sections (varying cross section area, depicted in Figure 4) need to be modified in Annexure-E, page 128 of IS:800 Currently formulae exist for prismatic sections only	Calculating Elastic critical moment (M_{cr}) allows us to determine maximum load bearing capacity to prevent lateral torsional bucking (Displacement along with twisting). At present, non-prismatic sections are designed as per formula given for prismatic doubly symmetric sections (constant cross section area). This can lead to design errors leading to lateral torsional buckling – displacement as well as twisting resulting in reduced structure durability. The proposed change will rectify the problem.  Prismatic, Non Prismatic Figure 4  Lateral Torsional bucking – displacement along with twisting Figure 5

7	IS:800: 2007 (Code for general construction in steel)	Bureau of Indian Standards (BIS)	Changes to be done table-6, page 31 of IS 800 2007- 1. Serviceability criteria (maximum permissible deflection, vibration etc, limits for human occupation) for lateral deflection (bending due to loads) in the code given in table 6 of IS:800 shall be categorized for building heights- low height building (0-10M), medium height building (10-30M) and high rise building (30-100M). 2. Floor beams vertical deflections (depicted in Figure 6) for longer span beam greater than 9 meter should be made more stringent to avoid floor vibrations.  <u>Figure 6</u> Lateral deflection check at rail levels should be provided for two cases – all loads, only surge loads (horizontal transverse load, depicted in Figure 7) <u>Figure 7</u> 4. The 10 mm relative displacement between rails for crane and wind load need to be reviewed, for crane moving at higher than 20M level. Relative displacement should be categorized for capacity and types of cranes.	1. Serviceability criteria (maximum permissible deflection, vibration etc, limits for human occupation) are currently not separately defined for different building heights. This creates difficulties in designing steel intensive buildings and needs to be rectified to construct safe steel intensive buildings. 2. The current deflection criteria for longer spam beams greater than 9 m can potentially result in floor vibrations. This needs to be rectified to construct safe steel intensive buildings. 3. Lateral deflection check at rail levels are currently not provided for both the cases. This creates difficulties in designing steel intensive buildings. The current standards for displacement are too stringent and cause delays during steel intensive construction.
8	IS: 4000: 1998 (Code for High Strength Bolt use in steel structure)	Bureau of Indian Standards (BIS)	Reference to IS 800- 1984 needs to be changed to latest revision IS 800-2007	This will prevent errors with respect to outdated formulae and design criteria in IS 800-1984 and will encourage use of high strength steel bolts in steel intensive construction.

A-4.2 for the above-mentioned comments, the committee gave its recommendations as follows:

a) Sl No. 1, 2, and 3; the committee agreed and decided to consider the inclusion in next revision of IS 800.
b) Sl No. 4, 5, and 6; the committee discussed that in case of non-prismatic sections and non-symmetrical sections, specialist literatures or an appropriate computer programme may be used for calculation of effective length, elastic critical movement for lateral torsional buckling, etc. However, the committee requested the newly formed panel responsible for revision of IS 800 to consider all the comments.
c) Sl No. 7; the committee requested the newly formed panel responsible for revision of IS 800 to consider all the comments.

A-4.3 Following comments were received during the 19th meeting of CED 7,

a) Comments Received on IS 800 5.2.1 The comment on IS 800 received from Shri Gautam Mitra, SAIL and similar comment from Shri P. L. Rao, INSDAG as follows:

There is need and demand for fire protection steel in steel-construction industry in the country. At present, fire protection of such structure is being done through, fire protection coating, or fire resistant packing, etc. As we understand, many countries have made fire resistant steel as kind of mandatory for high rise residential buildings and commercial complexes. BIS has developed specifications for Fire resistant steel. i.e. IS 15103 : 2002. At present, IS 800 : 2007 standard specifies IS 2062 grade steel in the material section. In absence of any specific mention in IS 800:2007 in the material section, Indian designers/consultants are either reluctant or find it difficult to use/specify fire resistant steel material as per IS15103:2002. SAIL has developed fire resistant steel as per BIS 15103:2002 standard. Usage of this grade of steel will be beneficial from fire safety point of view. Fire resistant steel, as per IS15103 : 2002, needs to be inserted in IS 800 : 2007 in the material section along with IS 2062 grade steel so as to encourage designers/consultants to use/specify fire resistant steel wherever or whenever there is such a requirement in any project.. May please note that IS 800 : 2007 has a chapter (16) on Fire Resistance.

b) The similar comment on IS 800 received from Shri P. L. Rao, INSDAG as follows:

Sl. No.	**Clause/Para/Table/Figure No.**	**Commented Comments/ Modified Wordings**	**Justification of the Proposed Clause**
1	SECTION 2 MATERIALS 2.2.2 All the structural steel used in general construction, coming under the purview of this standard shall before fabrication conform to IS 2062	SECTION 2 MATERIALS 2.2.2 All the structural steel used in general construction, coming under the purview of this standard shall before fabrication conform to IS 2062 (Hot Rolled Medium and High Tensile Structural Steel), IS:	Weather resistance steels confirming to IS 11587 and Fire resistance steels confirming to IS 15103 are now produced from major steel producers. In order to facilitate the use of these special steels the clause 2.2.2

		11587 (Structural Weather Resistant Steels) and IS:15103 (Fire Resistance Steels).	needs to be modified. The committee may kindly consider the same.

A-4.4 For the comments received during the 19th meeting of CED 7, the Committee noted the comments from Shri Gautam Mitra, SAIL-CET Ranchi and Shri P. L. Rao, INSDAG. The Committee agreed with the comments received on the above subject regarding addition of IS 11587 and IS 15103 in the material section of IS 800. The Committee, then, decided to forward this to the panel for revision of IS 800, CED07:2/P1 under the convenership of Dr S. Arul Jayachandran for further consideration and authorized the Subcommittee, CED 7:2/P1, for issuing the amendments to IS 800, based on the requirements.

ANNEX 4
(*Item* **3.3**)

The points for discussion on the proposed revision in IS:800 (2007) and the NBC 2016 are as follows:

1) IS:800 - To be decongested.

2) Clause 1.4. Symbols. (Pages 5 to 11): IS:456 (Concrete is a more complex material) has only 1-1/2 Pages.

3) Relook at the obsolete clauses, e.g. Riveting - WSR - Annexe G - Fabrication and Erection.

4) Chapter - 12 - Simplify the provisions or provide very basic information in IS:800 and the detailed design to appear in IS:1893 new part.

5) Load Combination – there are many permutations/ combinations. There is a proposal to aggregate all the provisions concerning the loads in IS:800 to be moved to IS:875 as a new part.

Table 23 Response Reduction Factor, *R*, for Building System

(*Clause* 18.3)

Sl No. (1)	Lateral Load Resisting System (2)	*R* (3)
i)	Braced frame systems:	
	a) Ordinary concentrically braced frame (OCBF)	4.0
	b) Special concentrically braced frame (SCBF)	4.5
	c) Ordinary eccentrically braced frame (OEBF)	4.5
	d) Special eccentrically braced frame (SEBF)	5.0
ii)	Moment frame system:	
	a) Ordinary moment resisting frame (OMRF)	4.0
	b) Special moment resisting frame (SMRF)	5.0
iii)	Non-ductile frames	1.5

The braced and moment resisting frames can be designed as non-ductile frames, if their overall height to overall width ratio does not exceed 1.0, such as in industrial buildings. Such frames need not meet the ductility requirements of other types of frames as specified in **18.4** to **18.11** and **18.13**.

6) Ultra lightly loaded structures like warehouses, which have abandoned IS:800, and the majority of PEB Vendors and large operators use M.B.M.A. Address their specific concerns on
   a) Temp Stresses
   b) Fire Protection
   c) Chapter – 12 and slenderness ratio.

7) High-rise all steel buildings which have less than 5% of today's market. We need to address the specific points.
   a) Chapter – 12
   b) Fire Protection
   c) Necessity for second-order analysis
   d) Connections
   e) Effective length.

8) All the Amendments will be integrated into the First revision of IS:800 (2007).

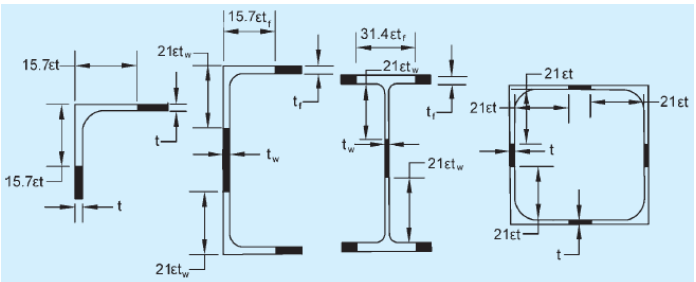
9) All changes we incorporated in Section 6-6 of NBC will be updated in the First revision.

10) NBC corrections are majorly on (i) slender webs (ii) complete of Fatigue Chapter and (iii) non-ductile frames.

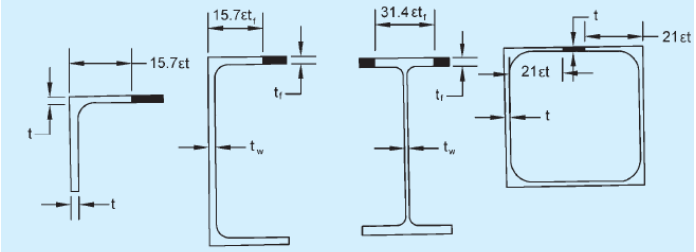
11) Update Clause 3.7.2 about slender elements in tune with Section 6 of NBC.

d) *Class 4 (Slender)* — Cross-sections in which the elements buckle locally even before reaching yield stress. The width to thickness ratio of plate elements shall be greater than that specified under Class 3 (Semi-compact), in Table 2. In such cases, the effective sections for design shall be calculated either by following the provisions of good practice [6-6(34)] to account for the post-local-buckling strength or by conservatively deducting width of the compression plate element in excess of the semi-compact section limit (*see* Fig. 2B and Fig. 2C).

The design of slender web elements in flexural members may be done as given in **14.2.1.1** for flexure and **14.4.2.2** for shear.



2B EFFECTIVE SECTION OF SLENDER MEMBERS UNDER COMPRESSION, PURE



2C EFFECTIVE SECTION OF SLENDER MEMBERS UNDER COMPRESSION, FLEXURAL

FIG. 2 CLASSIFICATION OF SECTIONS

12) Table 1, The material's properties will be reviewed and updated. There is a lot of push for the use of high-strength steel in steel construction worldwide.

13) Table 2 section classification. A mention of combined axial and bending classification – using r1 and r2. Usually, the combined classification is helpful if a slender member may be upgraded to Semi-Compact. However, it is usually not useful in the plastic and compact sections.

14) The clause on expansion joints should be relooked. Many PEB industries people have an issue with this.

15) Classification of sway frames 4.1.2, 4.3.6 on notional horizontal loads and 4.6.2.2 Regular sway frames – will be made contiguous.

16) For the second-order analysis, the frame stability parameter used is from Prof Baker, as in 4.5.4. There is new literature from Prof. Leroy on changing these limits based on the inelastic frame behaviour. This needs a discussion for incorporation.

17) Table 4 on Partial safety factors

18) A relook at Table 6 on deflection – Bringing in more clarity. This is necessitated by the fact that this code is referred to in IS:11384, The limited state code of practice for composite construction using steel and concrete.

19) The tension member design is adequate, but Clause 6.3.4, in other sections, needs an in-depth study.

20) The alpha method in tension members may be removed.

21) Can we use the direct analysis method given in AISC 360? This requires performing a second-order elastic analysis with some correction to axial and flexural rigidities to arrive at the inelastic loads of stability of the frame. The second-order analysis software must be calibrated with benchmark problems. I have contributed to the benchmark problem as a member of Technical Committee 3 on the stability of frames.

22) The advantage is that we can use simple unity checks rather than complicated expressions in Chapter 9 if we follow the Direct Analysis method. Also, the effective length of the column factor k is assumed to be 1, irrespective of the end condition of the column.

23) Clause 7.5.1.2 for the compression member design of angles loaded through the gusset will be merged as per NBC.

24) Clause 8.2.2 on LTB capacity prediction is very conservative. Hence, Annex E needs to be included in the main code, at least for the I sections. The moment gradient factor brings in the economy. We can present the C1, C2, C3 methods for I beams.

25) There is a need to introduce a preliminary estimation of Fcrb using the expression published in older codes, which needs only geometric parameters, not torsional constants.

26) Complete relook of the end panels of plate girders designed using the tension field method.

27) 8.9 and 8.10, the purlins and sheeting rails, the secondary system, contribute 40% of the PEBs. We can bring in more clauses regarding the moment that can be considered regarding the overlap.

28) There is literature available for the design of gusset plates. Can we bring in Section 10 on connections? This has been incorporated in IRC 24.

29) Chapter 11 will be deleted.

30) Relook at Chapter 12. We will get it corrected. New research has been reported in FEMA. We also can consider that. Possibly rewritten by a subgroup.

31) Chapter 13 on fatigue will be merged with Section 6 of NBC (2016).

32) Checking the chapter on design assisted by testing, which is by far the least used chapter. However, we need to make design prequalification pointing towards this chapter.

33) In Chapter 15 on durability, there are new developments in corrosion protection. We will enable that also.

34) We will have a relook at Chapter 16 on fire. One of the reasons people hesitate to use steel is the cost of fire protection. We will categorize and elaborate on this for wider use.

35) The fabrication erection chapter must also be checked to update any new developments.

36) Annex B Analysis and Design Methods We have covered the basics of the analysis chapter. Some of the frame stability clauses are repeated, except for partial shear buckling.

37) Design against floor vibration; we may elaborate. There are enabling clauses in the literature.

38) With the 808 codes being published, we can delete Annex H plastic properties.

39) Upgradation of angle members to Class B.

40) Introduction of a 5th column curve a0 to bring in an economy in parallel flange sections. This is already in vogue in EC3.

41) Provisions regarding robustness and progressive collapse need to be looked into in the latest revision.

42) NBC will have a separate section of steel concrete composite sections, probably 6.6.(a) Steel, 6,6(b) Steel-concrete composite structures.

ANNEX 5
(*Item* **4.1**)

COMMENTS BY INTERARCH BUILDING PRODUCTS PVT LTD, NOIDA

Sl. No.	**Clause No.** with **Para No.** or **Table No.** or **Figure No.** commented *(as applicable)*	**Type of comment – Technical OR Editorial**	**Abbreviation of the commentator**	**Comments/Modified Wordings**	**Justification for the Proposed Change**
1)	1) Table-6 of IS-800-2007, Relative Displacement between rails supporting crane : 10mm (Page 31) 2) Table-6 of NBC-2016 Part-6, Section-6, Relative Displacement between rails supporting crane : 10mm (Page 38)\ **Attachments:** Page – 31 from IS-800-2007 Page – 38 from NBC 2016	Technical	Interarch	We suggest removing the relative displacement requirement of 10mm between the crane rails from the code	1) Relative displacement requirement of 10mm or such requirement is not mentioned in any international codes as attached Annexure-1 (extracted pages from AISE Technical paper # 13, Canadian code S16-01, Design Guide for Crane supporting structures by Canadian Institute of Steel Structures) 2) From our experience, it is impractical to achieve the 10mm relative displacement for most of the crane buildings. Accordingly, this clause is deviated in agreement with owners and consultants of

					the project in almost all cases.
2)	Section – 12 of IS-800-2007 DESIGN & DETAILING FOR EARTHQUAKE LOADS (page 87) **<u>Attachments:</u>** None	Technical	Interarch	For low-rise buildings, considering the less severity, non-ductile design & detailing could be permitted.	The Indian steel designers is finding it very difficult to follow the Section-12 requirements of IS-800-2007 and these provisions are highly uneconomical for steel structures hence most of the projects are being designed without the considerations of Section-12. As this clause adds to considerable increase in weights, almost every major consultant accepts the deviation of not considering Section 12 provisions. This in turn also proves the practical difficulty and wide acceptance accordingly.
3)	IS 800 -2007 Table 23 1893 (Part 1) NBC-2016 IS 1893 (Part 1) -2016 Table is 9 NBC-1026 - Clause 18.3 Part-6, Section-6, DESIGN & DETAILING	Technical	Interarch	The Response Reduction Factor is **4** for OMF as per IS 800 -2007 Table 23 1893 (Part 1) -2016 is 4 (Page 87)	Usage of lower value of R = 1.5 makes the design considerably heavy. We request code committee to re-look into above clauses and define response reduction factor as **4** for low rise

	FOR EARTHQUAKE LOADS (page 85) for Response Reduction Factor **<u>Attachments:</u>** Page 87 -IS 800 2007 Page 20 IS 1893 2016 Page 85 - NBC 2016			The Response Reduction Factor is **3** for OMF as per IS 1893 (Part 1) -2016 Table is 9 (Page 20) The response reduction factor is **4.0** for OMF as per NBC-2016. However, there is also a mention about non-ductile frames for low rise buildings of height to width ratio which does not exceed 1.0 All the 3 cases are hard to correlate and very confusing. Hence we suggest to have the R to be uniformly defined as 4.0 across all the codes.	buildings with an exemption for Section 12 – IS 800 2007

4)	Incorporation of NBC in IS-800-2007 or guide line from BIS to inform that NBC-2016 onwards supersedes IS-800-2007 **<u>Attachments:</u>** None			IS-800-2007 should be corrected with latest clauses in NBC	IS-800-2007 is considered as steel design code even though the same clauses has repeated in NBC. Many additional provisions for the design which is present in NBC which is not updated in IS-800-2007 Unless the IS-800-2007 is not updated in accordance with latest NBC, there will be confusion among steel designers hence BIS shall take appropriate measure to upgrade IS-800-2007 inline with latest NBC whenever NBC is revised.
5)	IS-800-2007 Table-4 There is no clarity on the Partial Safety Factor for Temperature Load	Technical	Interarch	Appropriate Partial Safety Factor for Temperature Load shall be incorporated in Table-4	

ANNEX 6
(*Item* **4.2**)

COMMENTS BY KIRBY BUILDING SYSTEMS INDIA LIMITED

Sl. No.	Clause No. with Para No. or Table No. or Figure No. commented *(as applicable)*	Type of comment – Technical OR Editorial	Abbreviation of the commentator	Comments/Modified Wordings	Justification for the Proposed Change
1	IS 800-2007, Cl. 3.4: Temperature effects & Combinations with WL & EQL.	Technical	Kirby	Request clarity on temperature loads and load combinations	Combination of TL with WL & EQL governs design and if not taken correctly, structure weight increases. Temperature load to consider in serviceability check.
2	Section 3 of IS 800-2007 Section 6 (c) of NBC 2016 Table 3: Tension members, such as bracings, pre-tensioned to avoid sag, need not satisfy the maximum slenderness ratio limits.	Technical	Kirby	Suggestion: Include in Chapter 12 of IS 800-2007.	Slenderness ratio limited to 120 for Pipe/Angle Bracings as per Chapter 12. Which are heavy and uneconomical. Introducing tension rod/cable bracings with turn buckle arrangements optimize the weights.
3	Section 3, Cl 3.4 of IS 800-2007 Section 6 (c) of NBC 2016 Expansion Joints	Technical	Kirby	Suggestion: Mention of Expansion joints without additional frames with limitations on length and width of buildings is required.	At expansion joints of warehouses, additional frames give heavier weights. More details are required for clarity and optimization.
4	Cl 3.7.2 & 3.7.4 of IS 800-2007 Section 6 (c) of NBC 2016 Compound elements in built up sections	Technical	Kirby	Suggestion: Include Tapered built-up sections	Tapered built-up sections commonly used in PEB frame, rafters and columns. Inclusion of the same in design is required for structure optimization.

Sl. No.	Clause No. with Para No. or Table No. or Figure No. commented *(as applicable)*	Type of comment – Technical OR Editorial	Abbreviation of the commentator	Comments/Modified Wordings	Justification for the Proposed Change
5	Table 2 of IS 800-2007 Section Classification Section 6 (c) of NBC 2016 Section 8 of IS 800: 2007 Cluse 8.6, Page No. 63 Section 6, Clause 14.61 of NBC 2016	Technical Technical	Kirby Kirby	Suggestion: Include slender sections for built-up sections To suit PEB manufacturing. d/tw <=200e	Slender web sections are the concept of PEB for optimization. Slender web sections allowed to consider in PEB. Fy 350 MPa, d/tw = 169 which is beyond semi-compact for which d/tw =107
6	IS 800-2007	Technical	Kirby	Request clarity on damping ratio of steel	Damping ratio 0.02 or 0.05 for steel.
7	Section 11 of IS 800-2007 Section 6, Section 6(m)of NBC 2016	Technical	Kirby	Suggestion: Removing Section WSD from both codes.	As LSD method is adopted by all, including WSD may lead to confusion in adopting load combinations.
8	Guidelines for Low Rise Metal Buildings in Annexure	General (for national interest)	Kirby	Request to introduce guidelines for Low rise Metal Buildings (Pre-Engineered Buildings) in Annexure with mention of limitations in width, length, and height.	As the consumption of steel is increased for PEB buildings, newly evolved PEB manufacturers taking advantage of the gaps of codal provisions, deviating the code requirements, and mixing up BIS and international codes to reduce the weights, which is very harmful for stability of steel buildings in sever seismic zones. These guidelines abide to use BIS codes, keeping all manufactures on same

Sl. No.	Clause No. with Para No. or Table No. or Figure No. commented *(as applicable)*	Type of comment – Technical OR Editorial	Abbreviation of the commentator	Comments/Modified Wordings	Justification for the Proposed Change
					platform providing healthy competition resulting to safe/stable and sustainable buildings and better economic growth.
9	ANNEX F Connections, Fig 31 Column Splice (Typical)	GENERAL	Kirby	Request to introduce Horizontal Column splice connection.	Column splice Horizontal connection is simple and faster in production and construction.
10	Section 12 of IS 800-2007, Clause 12.2.3 a) & b)	Technical	Kirby	Request to introduce guidelines for Connections design	Load combinations in Clause 12.2.3 a) & b) to be considered for Connection designs alone. a) 1.2 Dead Load (DL) +0.5 Live Load (LL) +/- 2.5 (EL) and 0.90 Dead Load (DL) +/- 2.5 Earthquake Load (EL).