BUREAU OF INDIAN STANDARDS

Draft Minutes

Panel for Timber and Bamboo, CED 46:P6 : Sixth Meeting

Tuesday, 06 August 2024 : 1030 h – 1500 h

Board Room, Forest Research Institute, Kaulagarh Road, Dehradun Uttarakhand, PO. I.P.E. 248195

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Convener: Shri K.S. Pruthi **Member Secretary:** Shri S. Arun Kumar

NBC Officer: Shri Abhishek Sharma

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MEMBERS PRESENT

Physically:

1) Shri Rajesh Bhandari (Forest Research Institute, Dehradun)
2) Shri Ajmal Samani (*Rep.* Forest Research Institute, Dehradun)
3) Shri Prakash N. Suthar (Windsor Wood (India) Pvt. Ltd., Mumbai)

In Online Mode:

1) Shri Parthasarathi Mukhopadhyay (Forum of Scientists, Engineers and Technologists, Kolkata)
2) Dr. Deepak Bansal (Housing and Urban Development Corporation Ltd. New Delhi)
3) Prof. Visalakshi Talakokula (Indian Association of Structural Engineers, New Delhi)
4) Shri Anand Nandanwar (Indian Wood Science and Technology, Bengaluru)
5) Shri Amitava Sil (Indian Wood Science and Technology, Bengaluru)
6) Smt. Neelam Manjunath (Manasaram Architects, Bengaluru)
7) Shri Anil Mutha (Mutha Industries Pvt. Ltd., Maharashtra)
8) Shri Sanjay Singh (Mutha Industries Pvt. Ltd., Maharashtra)
9) Dr Krishna Kumar (North East Centre for Technology Application and Research, Shillong)
10) Ms. Lyngksiar N. Khongwir (North East Centre for Technology Application and Research, Shillong)
11) Shri Manoj Kumar Singh (The Institution of Engineers (India), Kolkata)

12) Shri Kumar Arvind (The Institution of Engineers (India), Kolkata)
13) Shri Prakash N. Suthar (Windsor Wood (India) Pvt. Ltd., Mumbai)
14) Shri Punati Sridhar (Bamboo Society of India, Bengaluru)
15) Shri C. N. Jha (Building Materials and Technology Promotion Council, New Delhi)
16) Shri Prasanta Kar (CSIR – Central Building Research Institute, Roorkee)
17) Shri Aman Deep (Creative Consultants & Engineers Pvt. Ltd., Ghaziabad)

From BIS:

18) Shri Abhishek Pal, Scientist D (Civil Engg)
19) Shri Shubham Chaudhary, Scientist B (Civil Engg)
20) Shri Prashant Yadav, Scientist B (Civil Engg)

Invitees:

21) Shri R. S. Topwal (Forest Research Institute, Dehradun)
22) Shri Ashwath Hegde (Forest Research Institute, Dehradun)
23) Shri S. R. Shukla (Forest Research Institute, Dehradun)
24) Shri Purushottam Kumar (Forest Research Institute, Dehradun)
25) Shri Mewada Thamoung (Forest Research Institute, Dehradun)
26) Shri Praveen Kumar Gupta (Forest Research Institute, Dehradun)
27) Shri D. P. Khali (Forest Research Institute, Dehradun)
28) Shri Shikhar Shukla (Forest Research Institute, Dehradun)
29) Dr. Ranjana Yadav (Forest Research Institute, Dehradun)
30) Shri Pranesh Chhibber (Canadian Wood, Mumbai)
31) Dr Jimmy Thomas (Canadian Wood, Mumbai)
32) Shri Rahul Ralegaonkar [Visvesvaraya National Institute of Technology (VNIT), Nagpur]
33) Shri Kiran Hatyal (Maharashtra Fire Services, Mumbai)
34) Dr Dhara Shah (CEPT University, Ahmedabad)
35) Shri Arijit Sinha (Oregon State University)
36) Shri Indroneil Ganguly (University of Washington)
37) Ms. Anindita Bhattacharyya (U. S. Softwood Export Council)

Item 0 OPENING REMARKS

The Convener, Shri K.S. Pruthi warmly welcomed all the members and invitees to this sixth meeting of the Panel for Timber, CED 46:P6. He informed that important items have been listed in the Agenda including a proposal on mass timber buildings and the suggestion through the Civil Engineering Division Council, CEDC of BIS on the topic. Shri K. S. Pruthi requested the active participation of both members and invitees in sharing their suggestions and thoughts during this meeting and importantly introduce the modifications in the Code.

With these remarks and after a formal introduction of the members present, the Convener suggested to take up the Agenda item-wise.

Item 1 CONFIRMATION OF MINUTES OF THE LAST MEETING

1.1 There being no comments on the Minutes of the fifth meeting of the Panel held on 29 February 2024 in Dehradun and circulated vide BIS DG letter No. CED 46:P6/A-2.5 dated 01 May 2024, the Panel confirmed the same, as circulated.

Item 2 COMPOSITION

2.1 The Panel noted its composition as given at Annex 1 to the Agenda, reviewed the same and decided to co-opt CEPT, Ahmedabad based on their interest shown including by participation in the Subgroups meetings. Considering the core area of structural engineering of the representative, CEPT was requested to proactively contribute in the revision of the two chapters.

Item 3 PROJECT OF REVISION OF NBC

3.1 The Panel noted the information listing the chapters of NBC 2016 as given at Annex 2 to the Agenda and the need for ensuring this revision with coherence among various chapters of Code.

3.2 The Panel noted the contents of existing chapters namely Part 6, Section 3A & 3B as in Annexes 3 and 4 of the Agenda to which necessary improvements and changes have to be brought out in this revision exercise as decided in the previous meeting

3.3 The Panel noted the list of decisions arrived in the last meeting of the Panel as given under the item of the Agenda. Also, the Panel noted that meetings of the four Subgroups as constituted in the last meeting were held that arrived at the actionable items mentioned under the item of the Agenda.

3.4 The Panel noted the recommendations listed in the item of the Agenda regarding the matter on the use of mass timber construction in buildings arrived in the meeting of the Advisory Group comprising Chairpersons of the Committees under CEDC held on 30 May 2024. The Panel welcomed the participation and expert opinion of the invitees representing academia/research and firefighting industry.

3.5 The Panel noted the proposal from Prof Arijit Sinha (Oregon State University) and the attachments referred in the item of the Agenda. The Panel also noted the detailed presentation made by Prof Sinha with Prof Indroneil Ganguly (Professor at the University of Washington) and Ms. Anindita Bhattacharyya (U. S. Softwood Export Council) who explained the implementation and benefits of mass timber construction. The Panel noted the work on mass timber, its development and adoption in the US building codes, and understanding its sustainability attributes made by Prof Sinha and Prof Ganguly.

The presentation covered the following major points relating to various aspects towards adoption of Mass Timber in buildings:

a) Mass timber construction was defined as category of wood construction that uses large prefabricated wood panels in wall, floor and roof construction.
b) The types of Main Structural System of timber construction:
    i) Light wood framing – Essentially a stick frame, where the plywood on the side for the shear wall, or Oriented Strand Board (OSB) on the side were nailed together.
    ii) Heavy timber – Involves a lot of carpentry and joinery but not many mechanical or not many fasteners or steel connections are used.
    iii) Mass timber – The panel products, especially cross laminated timber, or mass ply panels are used in the timber construction.
c) The types of engineered Wood Products used:
    i) Glued Laminated Timber (GLT) – Glulam
    ii) Cross Laminated Timber (CLT)
    iii) Laminated Veneer Lumber (LVL)
d) The types of Mass timber
    i) Mass Plywood Panels – These are made out of veneers. Essentially, the plywood is laminated thick and wide to make panels which are 3 m wide versus up to 22 m long.
    ii) Nail Laminated Timber – In this the timber is stacked edgewise, and then nailed together. These are not classified as CLT because they are mechanically fastened together and not adhesively bonded.
    iii) Dowel Laminated Timber – in this the timber is bonded together mechanically using dowels.
e) Cross Laminated Timber (CLT) was defined as small pieces of timber of similar sizes being stacked in one way, then the adhesive is put on top of it, and then the next layer stacked the other way. Multiple layers can be done to create thick panels.
f) Common ways of CLT Layups were mentioned, that are, 3-ply 3-layers, 5-ply 5-layers, 7-ply 7-layers, 9-ply 9-layers, 7-ply 5-layers, 9-ply 7-layers. Dr. Sinha mentioned that these layups are defined in Document PRG 320 by ANSI and APA together.
g) Key aspects of the following foreign publications/ standards:
    i) ANSI/AWC 2021 Special Design Provisions for Wind and Seismic (SDPWS)
    ii) ANSI/APA PRG 320 – Standard for Performance rated CLT
    iii) FEMA P-695, Quantification of Building Seismic Performance Factors.
h) Importance of third-party certification for flexural and shear strength of CLT (as in the case of the Engineered Wood Association-APA)
k) Timeline indicating the use of CLT and its adoption in the building code of USA (IBC).
m) The periodic updates in IBC 2021 and IBC 2024 regarding number of stories permitted to use CLT in buildings from the six-storied mass timber permitted in IBC 2018.
n) Key aspects of National Design Specification (NDS) for Wood Construction 2015.
p) Research work done/ funded by central government in the U.S. or the federal government, the state agencies and private foundations for the manufacturing process, mechanical properties, seismic properties and testing, fire properties and testing, connections and connection durability of mass timber construction.

p) The role of adhesives, fillers and sealants in ensuring no transfer of smoke/heat/fire in the event of a scenario.
q) The durability aspects of CLT including the effects of moisture, biological growth and elevated temperature on the load carrying capacity & performance of the mass timber buildings.
r) Advantage in the overall environmental impact and sustainability in the use of CLT in buildings.
s) Other advantages of using CLT in buildings such as inherent possibilities to hold and conceal the MEP ducts/services.

The Panel noted the presentation, and the discussion was held during which the queries raised by the members and other invitees were addressed by Prof. Sinha and Prof. Ganguly.

3.6 The Panel briefly noted the presentation (attached as a separate PDF to these Minutes) by Shri Prakash Suthar which included his suggestions on the addition of new provisions and modifications on mass timber and mass timber construction to the current NBC 2016.

Item 4 COMMENTS RECEIVED ON PART 6 'STRUCTURAL DESIGN'/ SECTION 3A 'TIMBER' & SECTION 3B 'BAMBOO'

4.1 The Panel noted that no comments have been received on Part 6 'Structural Design'/ Section 3A 'Timber' & Section 3B 'Bamboo'.

4.2 The four sub-groups under the Panel were authorized to proposed the changes in the respective clause of the chapters (3A & 3B), based on which BIS was authorized to circulate the preliminary draft for a period of three weeks.

4.3 The Sub-group on Engineered Timber was authorized to include a detailed clause on mass timber buildings in this revision of NBC in the Section 3A; while a separate Indian Standard can be developed by CED 13 of BIS.

4.4 Shri Pranesh Chhibber and Shri Jimmy Thomas from Canadian Wood were included as experts in the Subgroup on Engineered Timber.

Item 5 DATE AND PLACE OF NEXT MEETING

5.1 The Panel decided to hold the next meeting in September 2024.

Item 6 ANY OTHER BUSINESS

6.1 BIS thanked the Convener, Shri K. S. Pruthi for his guidance, and insights and ably conducting the meeting. Also, BIS thanked all the members and invitees for their valuable inputs and suggestions during the meeting.

6.2 The contribution and support from FRI and its management were also appreciated particularly in sparing their venue revered for its legacy and importance to the nation.

6.3 There being no other items, the meeting ended with a thanks to one and all.

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