



THE INTERNATIONAL ASSOCIATION FOR
SHELL & SPATIAL STRUCTURES

REPORT ON THE IASS TECHNICAL ACTIVITIES, 2019–2020

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The worldwide impact of the COVID-19 pandemic has forced everyone to adapt to new, unprecedented conditions. In this context, the IASS has been no exception: The IASS Annual Symposium could not be celebrated in 2020 and has been postponed to the Summer of 2021. Many Working Groups proposed sessions that could not take place as initially planned. Fortunately, the local organizers at the University of Surrey are doing an excellent job and the Symposium will be able to count on many sessions and contributions from our WGs.

Despite these circumstances, the 2019-2020 period has been an active one regarding the Technical Activities of the IASS. The most relevant change in this direction has been the approval by the IASS Executive Council of the *Revised IASS Policy on Technical Activities*, that modifies the former one, originally introduced in 2008 with slight modifications in 2011.

The 2011 policy has helped to keep the pulse of our technical activities by asking WGs to organize a session in each year's Symposium and to report their activities using the website. However, after 10 years in force, it felt necessary to improve some aspects and adapt to new possibilities.

The new 2020 policy stresses two fundamental questions: planning of activities and communication to the IASS community and beyond. On one hand, WG chairs will annually plan one or more activities in coordination with the TAC chair. On the other, they will make all WG members aware of the activities and encourage them to participate. In addition, WGs will provide the Communications Committee with relevant information about their annual activities to be uploaded to different social media.

WG activities include those already well established, as the organization of colloquia, the preparation of guidelines and recommendations, the edition of special issues of the IASS Journal, etc. Recently, other activities as exhibitions or online colloquia have been organized or are being proposed. The generalized access to online meeting platforms forced by the pandemic opens new possibilities in the future as well. Of course, WG sessions in Symposia will still be present and need to be organized at least every three years by each WG.

On other note, an effort has been made to achieve a timely uploading of the Symposium proceeding papers to the IASS Ingenta repository. The *Guidelines for IASS Symposia* have been also updated this year to reflect some needed changes in this direction. The way is paved to keep a fast pace for uploading future proceedings.

Some news related to specific WGs need to be mentioned:

- A new study group with the topic "Next Generation Parametric Design" has been created within WG 13 "Computational Methods". It is led by Dr. Jeroen Coenders.
- Dr. Tomohiro Tachi has been appointed co-chair of WG 15 "Structural Morphology".
- The IASS Executive Council approved the re-naming of WG 18 from "Environmentally Compatible Structures" to "Life-cycle Design and Assessment of Shell and Spatial Structures". In addition, co-chair Prof. Corentin Fivet will coordinate the IASS involvement in the Global Consensus on Sustainability in the Built Environment



(GLOBE) initiative.

The following pages include a summary of the main activities of each of the active Working Groups during the yearly period starting from the 2019 Barcelona Symposium. Further details may be found on the corresponding WG websites.

IASS Working Groups are the center of the technical and scientific activities of the association. They evolve and adapt to new fields of interest and action of IASS members. I would like to acknowledge the efforts of all Working Group chairs in coordinating and fostering the WG activities, recruiting members, preparing reports and technical documentation, organizing colloquia and exhibitions and contributing the Organized Sessions at the various recent Symposia. Please, continue like this!

Lastly, I would like to encourage all IASS members to participate in the Working Group activities!

Carlos Lázaro
IASS Vice-President and Chair of the TAC

WG 3 Technical Expert Group on Cooling and Solar Updraft Towers

Prof. Dr. Reinhard HARTE (Chair)

- Continues to expand the objectives of WG 3 to include updraft towers of solar thermal power plants.
- Organized the *International Conference on Industrial Chimneys and Cooling Towers ICCT2019* in Edinburgh, UK, Oct. 9-12, 2019, jointly organized by CICIND, the International Association for Industrial Chimneys, VGB PowerTech, the Technical Association for Power and Heat Generation and IASS WG 3 in co-operation with Zenith SAS, Midlothian, Scotland: www.icct-2019.org
- Publication of new editions of VGB PowerTech guidelines: VGB-S 610: Structural Design of Cooling Towers (English edition eBook published Dec 20, 2019 ISBN 978-3-96284-146-1).
- Organizes the joint *International Conference on Industrial Construction and Cooling Towers ICCT2022* in Shanghai, China, in October 2022.
- Current membership: 10 IASS Members

WG 4 Technical Expert Group on Masts and Towers

Eng. Mogens G. NIELSEN (Chair), Eng. D Sankara GANESH (Secretary)

- The 29th Biennial Meeting of the Working Group for Masts and Towers was held successfully in Winchester, UK, in September 8th - 12th, 2019. The meeting was arranged by Arqiva, who owns the broadcast antenna masts and towers in the UK.
 - 55 Participants
 - 19 different countries
 - New members (8 participating for the first time)
 - 2 new countries (Estonia and Romania) represented.
 - 32 different presentations
 - 3 full days with technical sessions and 1 day technical excursion
- The next (30th) Meeting of the Working Group is to be held in Toronto, ON, Canada, September 2021.
- Current membership: 31 IASS Members

WG 5 Concrete Shell Roofs

Prof. Sigrid ADRIAENSENS, Prof. Philippe BLOCK (Chairs)

- Organized a session titled "Actual structural behavior of thin shells" and contributed to the session "Preservation and reuse of reinforced concrete shells" (organized by Prof. Chilton) at IASS 2019, Barcelona.
- Organizes a session for IASS 2020: Inspiring the next generation, Surrey "21st century Design and Construction of Shells". This session and the symposium were postponed to 2021 due to COVID-19.
- The WG was involved in the co-sponsoring of the 1st Italian Workshop on Shells and Spatial Structures, IWSS2020, on-line.
- The group continues to seek opportunities to organize sessions on concrete shell roofs for IASS Symposia and Colloquia and to assemble resources of interest including these in the listings of Resources on the WG 5 web page.
- Current membership: 30 IASS Members

WG 6 Tension and Membrane Structures

Prof. Ken'ichi KAWAGUCHI (Chair), Prof. Marijke MOLLAERT (Co-chair)

- Organized two special sessions titled “Contemporary tensile structures of Europe” and “Reliability analysis of membrane structures” at IASS 2019, Barcelona.
- Organized a special plenary session at IASS 2019 titled “State-of-the-art and future on membrane structures” –with presentations by Profs. Bletzinger and Mollaert– as a starting point to re-define the objectives of the group.
- Has started to find out possible reconsideration of activity of the WG, getting guidance from the state of the art given in the plenary lecture at IASS2019.
- Organizes the WG6 session for IASS2020, which has been postponed to 2021
- Ronal Shaeffer, past co-chair of the WG, passed away on Nov. 17, 2019. He actively served the WG and is a big loss for the group.
- Current membership: 24 IASS Members

WG 8 Metal Spatial Structures

Prof. Toru TAKEUCHI (Chair), Prof. Su-Duo XUE (Co-chair), Prof. Shiro KATO, (Co-chair)

- Following the past organized sessions at IASS2010 to IASS2018, four organized sessions were held in IASS2019 in Barcelona, discussing on buckling & dynamic behaviors, connection designs and detailed projects of metal roofs and grid-shells.
- Organizes two sessions in IASS2021 in Surrey, with focus on "Stability, Connections and Dynamic responses" of metal spatial structures and grid-shells.
- After the publication of the "Guide to Buckling Load Evaluation of Metal Reticulated Roof Structures" in 2014, a special committee of the WG completed the "(Draft) Guide to Earthquake Response Evaluation of Metal Reticulated Roof Structures". The document has been approved at the EC meeting held during IASS 2019 in Barcelona and is now available to IASS members as item 2. of the “Publications” section in the members-only part of the WG 8 site. IASS members are welcome to review the manuscript and submit their opinions.
- Current membership: 24 IASS members.

WG 12 Timber and Bio-based Spatial Structures

Dr. Andreas FALK (Chair), Prof. Minjuan HE (Co-chair)

- Organised three special sessions on "Form and Force in Bio-Based Structures and Architecture for the IASS Symposium 2019 in Barcelona
- The organised special sessions on "Bio-based concepts inspiring the Spatial Structures and Architecture of the next generation" planned for the IASS Symposium 2020 in Surrey have been postponed due to the on-going Covid-19 pandemic
- Plans to increase the network activities within the WG between the annual symposia, by arranging an internal WG workshop for planning of increased interactions and collaboration.
- Plans to produce a special issue of the Journal of the IASS on “Bio-based and Bio-Inspired Environmentally Compatible Structures”.
- Plans to co-organize a second joint colloquium of WG12 and WG18 on “Bio-based and Bio-Inspired Environmentally Compatible Structures”
- Plans to collect information on and links to projects on timber spatial structures in an online database.
- Current membership: 13 IASS members.

WG 13 Computational Methods

Prof. Makoto OHSAKI, Prof. Kai-Uwe BLETZINGER, Dr. Carlos LÁZARO (Co- chairs)

- Organized a special session titled "Form-finding/force-finding of tension structures using novel computational methods" and co-organized a special session titled "Wind engineering and fluid-structure interaction" at IASS 2019, Barcelona. The symposium was organized by C. Lázaro and K.-U. Bletzinger together with E. Oñate and CIMNE (UPC, Spain).
- A new study group with the topic "Next generation of parametric design" promoted by Dr. Jeroen Coenders has been established within the group.
- Organizes two sessions titled "Optimization methods for analysis and design of roof structures" and "Next generation of parametric design" for the IASS 2020 - Surrey 7 Symposium. The conference has been postponed due to the covid-19 to 2021 and the sessions will be held then. The second session has been promoted by the newly established study group within WG 13.
- Is editing a special issue of the IASS Journal on "Computation of Shell and Spatial Structures" to be published in 2021.
- Current membership: 19 IASS Members.

WG 15 Structural Morphology

Prof. Niels DE TEMMERMAN (Chair), Dr. Tomohiro TACHI (Co-chair)

- The Structural Origami Gathering 2020 was held in San Francisco (USA), from January 25th to January 29th, 2020.
- Additionally, the Structural Origami Gathering 2020 + ½ was held on-line from August 19 to August 21, 2020.
- Organized special sessions on "Structural origami", "Design and analysis of bending-active structures", "Graphic statics / Reciprocal diagrams", "Transformable structures" and "Constructive geometry for structural design" at IASS 2019, Barcelona.
- Is organizing a session on Transformable Structures at IASS 2021 – Surrey 7
- Current membership: 53 IASS Members.

WG 17 Historical Spatial Structures

Prof. Edmond SALIKLIS (Chair), Dr. Romuald TARCZEWSKI (Co- chair)

- Contributed to the session "Preservation and reuse of reinforced concrete shells" (organized by John Chilton) at IASS 2019, Barcelona.
- Current membership: 24 IASS Members.

WG 18 Life-cycle Design and Assessment of Shell and Spatial Structures

Prof. Olivier BAVEREL, Prof. Corentin FIVET (Co- chairs)

- Prepared a joint IASS WG 18 + Tensinet WG Sustainability and Comfort session, named "Softening the environment", in the 6th Tensinet Symposium 2019 organized by Tensinet Association and helped at Polytechnic of Milan, as host institution
- Organized a special session titled "Improving and assessing the life cycle of structures" at IASS 2019, Barcelona.
- Organizes a session on "Lifecycle design and assessment of structures" at IASS 2020, postponed to IASS2021.
- Is redefining the mission of the Working Group and preparing a roadmap for future activities.
- Plans a special issue of the International Journal of Space Structures on the life-cycle design of shell and spatial structures.
- Plans to build a list of links to relevant publications on the life-cycle design and assessment of structures.
- Current membership: 8 IASS Members.

WG 20 Teaching of Shell and Spatial Structures

Prof. Olga POPOVIC LARSEN (Chair), Dr. Alireza BEHNEJAD (Co-chair)

- Organized a two-part session at IASS 2019 Barcelona
- Organized seven workshops in UK, China and Iran ranging from 6-10 hours focusing on the design and construction of membrane structures from finding techniques, the production of cutting patterns and making miniature study models, in collaboration with the local hosting universities
- Published the book Physical Modeling for Architecture and Building design, ICE Publishers London, by Olga Popovic Larsen.
- Initiated a closer collaboration within the Nordic region between Aalto University in Finland, KTH in Sweden, NTNU in Norway and KADK in Denmark that during 2020/21 through a series of workshops will investigate the building potential of waste materials with focus on wood.
- Is investigating potential collaborative activities with other IASS WGs
- Is participating in the organization of IASS 2021 at the University of Surrey
- Current membership: 27 IASS Members.

WG 21 Advanced Manufacturing and Materials

Dr. Arno PRONK (Chair), Dr. John ORR (Co-chair)

- Organized a very successful competition for innovative pavilions at the IASS 2019 Barcelona Symposium, that included presentations of the pavilion design and conception by each team in a dedicated track. More than 30 teams from many countries participated in the contest.
- Organized the 2019 Ice Design Competition at the Harbin Institute of Technology (China).
- Is organizing the 3rd Competition and Exhibition of Innovative Lightweight Structures at the IASS 2021 - Surrey 7 Conference.
- Current membership: 21 IASS Members.