Concrete Modularity Competition

Competition rules

Organized by the Institute of Concrete Structures of TU Dresden and
TUDIAS TU Dresden Institute of Advanced Studies GmbH

The Concrete Modularity Competition challenges student teams to design, fabricate, and assemble a concrete structure from separate modules connected by dry, demountable joints. Each entry is tested under the same four-point bending arrangement. Four aspects are evaluated: accuracy of the target load, energy absorption, mass efficiency, and ease of assembly. The team achieving the highest score out of 100 points wins the competition.

The challenge at a glance

Requirement	Competition basis
Assembled envelope	Maximum 800 × 300 × 300 mm
Modularity	Modules shorter than 500 mm and at least two dry joints
Structural system	Concrete primary structure with discrete reinforcement (use a concrete mixture without short fibers)
Test arrangement	Four-point bending with 700 mm support span
Target and scoring	30 kN total load, four criteria, in total a maximum of 100 points
Design freedom	Type of structural system/bearing mechanism is unrestricted

Purpose and learning outcomes

The competition connects structural mechanics with joint detailing, fabrication tolerances, and assembly. It encourages efficient use of concrete and connections that allow modules to be separated and replaced. Comparable test results provide a basis for discussing both successful concepts and observed failure mechanisms.

Event information

The *fib* Symposium 2027 takes place at the International Congress Center Dresden, Ostra-Ufer 2, 01067 Dresden, Germany.

The competition testing location is: Otto Mohr Laboratory (OML) of TU Dresden
Zellescher Weg 22a
01217 Dresden, Germany

Symposium information: fib-2027.org

Rules issue date: *November 02, 2026*
(update from version October 23, 2026)

1 Participation and key dates

Teams register with the competition organizers via email to:

> office@fib-2027.org and CC steffen.marx@tu-dresden.de+ skerdilajt.cengu@tu-dresden.de
> *subject line:*
> *"Concrete Modularity Competition – xy {name of team or the corresponding person}"*

and nominate a representative for correspondence. The entry must identify the participating institution, team members, and the person responsible for the technical submission. Use the Team registration form available on the website. We accept a maximum of 20 teams.

Entry conditions

Item	Requirement
Eligible to participate	Students and doctoral researchers
Number of persons per team	Up to 4
Academic advisor	1 person required
Required attendance at the symposium	At least 1 of the teammates who is not the advisor (take into account that you have to assemble and disassemble your structure on site; the advisor can assist)
Registration	Acc. to the official fees for *fib* 2027 (If no member of a team is registered as a presenting author, one designated team representative will receive a €50 discount on the registration fee)

Competition schedule

Milestone	Date and time
Registration deadline for the competition	November 25, 2026
Confirmation of accepted teams	November 30, 2026
Technical briefing and team presentation (online)	December 3, 2026 (Additional meetings will be scheduled as required, expected later in December 2026 and in February/March 2027)
Technical submission (digital documents)	April 21, 2027
Delivery of modules (latest)	June 7, 2027; 10 a.m. (in person in the OML) June 1, 2027 (in advance via parcel)
Structural testing	June 8, 2027
Announcement of results and awards during *fib* Symposium 2027	June 9, 2027

All competition deadlines use the local time in Dresden, Germany (Central European Time). The symposium dates do not define a submission or delivery deadline for the competition.

2 Structural design and materials

Geometry and modularity

The assembled entry must fit within an 800 mm long, 300 mm wide and 300 mm high envelope. Single concrete modules and also all connection elements must be shorter than 500 mm in length. At least two of the structural joints must be designed as dry, demountable connections. Teams are free to choose any design, provided that it can be supported and loaded using the standard test setup explained in Section 3. Please consider your transport options. You can send the items by parcel (see address in Section 5) or bring them with you when you arrive in Dresden.

Show all modules, reinforcement, connectors, and anchorages on the assembly drawings. The complete system must provide suitable contact surfaces at both support lines and both loading lines.

Dimensional tolerances[*)]*:* ± 10 mm

[*)] Permissible deviations between the actual dimensions of the manufactured specimens and the dimensions specified in the submitted technical drawings, including the overall geometry, individual elements, and joints.

Concrete and fabrication

Each team may develop its own concrete mixture. Concrete must form the primary compression or flexural system. Modules may be cast, printed, or laminated. Dispersed fibers in the concrete mix are not permitted. Teams must record the mix composition, batch quantities, fabrication process, and curing history.

Reinforcement

Discrete reinforcement may include bars, meshes or textiles made from steel, carbon, glass, basalt or other fiber-reinforced polymers. Dispersed fibers in the concrete mix are not permitted.

Dry joints, assembly and disassembly

Permitted approaches include dry bearing interfaces, keyed or interlocking joints, removable bolts and pins, and tensioning elements. Joint detailing must allow assembly and disassembly sequence. This should be demonstrated in a video clip that is to be submitted. Assembly is also necessary by the team in the lab before testing. If you're not sure whether your idea complies with the rules, please contact us in advance.

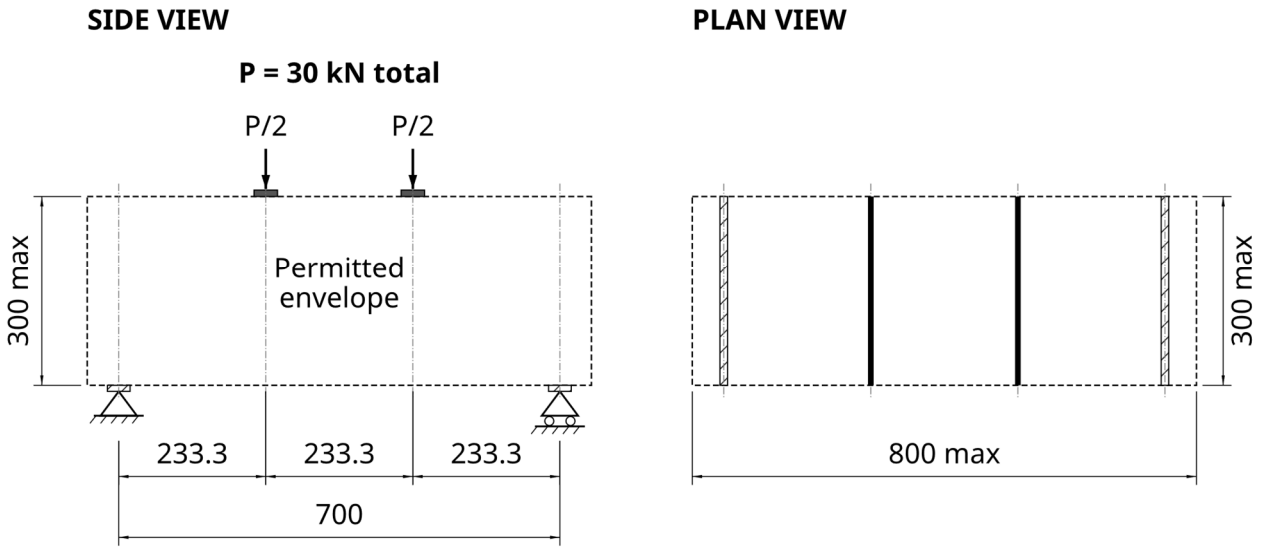
Grout and adhesive must not be applied at joints during assembly. Grouted sleeves and bonded interfaces do not satisfy the dry-joint requirement. Material for the joints can be chosen freely. The volume of the joint elements has to be less than 10 % of the volume of the whole possible envelope.

Compliance

Compliance with geometry, materials, joint requirements and the test arrangement is assessed on a pass or fail basis. Only appropriate entries enter the ranking. Teams should contact the organizers in case of unclear details before fabrication. An appropriate online clarification meeting will be scheduled by the organizers in February/March 2027.

3 Test arrangement and measurements

The assembled structure should be simply supported on two full-width linear bearings with a center-to-center span of 700 mm. Two equally distributed loads act at the third-points of this span. The reported load *P* is the total actuator load; each loading line carries *P*/2.



All dimensions in mm. Scale 1:12 at the specified figure size.
End offsets: 50. Hatched lines: bearings. Solid lines: loading.

Fig. 1. Four-point bending arrangement; schematic only; no structural shape is prescribed; dimensions in millimeters.

For an 800 mm long specimen centered over the test span, the support centerlines are 50 mm from its ends. The load lines are 233.3 mm from the adjacent supports. The support width is 300 mm, equal to the maximum allowable specimen width. The support plates cover the whole bearing width, their exact length will be specified soon (between 5 and 10 cm).

Parameter	Value or specification
Total target load	Total 30 kN, equivalent to 15 kN at each loading line
Control mode and rate	Displacement controlled at 2...3 mm/min (to be specified before testing)
Displacement limit for calculation of the energy (see section 4)	10 mm
Vertical displacement measurement location	At midspan

The total load and the vertical displacement are continuously recorded. The global specimen behavior including the failure and joint behavior are recorded by a stereo-camera system.

4 Evaluation and ranking

Eligible entries can earn up to 100 points. The final score is the sum of the four criteria listed below, and the highest score ranks first. The reference maximum and minimum values are calculated from the eligible entries in the competition.

Criterion	Points	Score for entry i
Target load accuracy	30	$30 \cdot max\begin{Bmatrix} 0 \\ \square \\ 1 - \frac{\lvert P_{max,i} - 30 \rvert}{15} \end{Bmatrix}$
Energy absorption	25	$25 \cdot \frac{E_i}{E_{max}}$
Mass efficiency	20	$20 \cdot \frac{m_{min}}{m_i}$
Assembly and ease	25	$15 \cdot \frac{t_{min}}{t_i} + q_i$

Definitions

$P_{max,i}$ is the total peak load in kN. The load score is zero at loads of 15 kN or below and 45 kN or above. Equal deviations above and below 30 kN receive the same penalty (intermediate values are interpolated linearly).

E_i is the energy under the load–displacement curve in kN · mm (see below), and E_{max} is the largest eligible value achieved by an entry. 1 kN · mm equals 1 Joule.

m_i is the total entry mass in kg, including all reinforcement and hardware, e.g., for the joints; m_{min} is the lowest eligible mass achieved by an entry.

t_i is assembly time, and t_{min} is the shortest eligible time achieved by an entry.

q_i is the jury's rating for ease of assembly from 1 to 10. Assembly time contributes up to 15 points, and ease contributes up to 10 points.

Load accuracy examples

Peak load kN	15	20	25	30	35	40	45
Points out of 30	0	10	20	30	20	10	0

Assembly assessment

To demonstrate ease and required time of assembling and disassembling, the teams have to provide an appropriate video until the deadline given in Section 5. A timestamp must be displayed in the video. The following time intervals must be clearly visible in the video:

Protocol item	Specification
Assembly – start and finish of timing	Starting with a command, lifting the structure after assembling at its ends by the team
Disassembly – start and finish of timing	Starting with a command, and ending by complete dissembling of the single modules
Assembly time limit	15 min

The assembly score is zero at assembly times of more than 15 min, based on the video.

For assembling in Dresden, we need information about the required tools for the assembly process by May 15, 2027. On the test day, teams must assemble the modules in the lab before testing using the dry-joint declared in the submitted technical documents.

The assembly score is based on the following parts:

- Time needed for assembly (based on the video): 40 %
- Time needed for disassembly (based on the video): 20 %
- Observed work flow in the lab in Dresden (rated by the jury based on a scale from 0 to 10): 30 %
- Accordance with the submitted technical information (scale from 0 to 5, rated by the jury): 10 %

Energy absorption

For each entry, the recorded load–displacement curve will be integrated from 0 to the smaller of the failure displacement and 10 mm. Energy absorbed beyond 10 mm will not contribute to the score.

Test completion

The test will be stopped if one of the following points is reached:

- Specimen failure or
- A total load of 50 kN or
- A total mid-span displacement of 20 mm.

The details of scoring and of the test procedure will be explained in our first online meeting.

5 Submission and delivery

Technical submission

Describe the entry sufficiently for the organizers and jury to assess compliance and understand the intended assembly/disassembly method and the bearing behavior. Use the fib Symposium 2027 template for full papers (maximum 8 pages) for a clearly organized technical report. The report will be reviewed within 14 days; the revised final version will be published in the proceedings. In addition, prepare attachments which can't be included in the report, e.g., detailed drawings. The documents must include at least the following information:

- Structural concept and load path, supported by dimensioned module and assembly drawings,
- Details of the joints,
- Description of assembly and disassembly,
- Concrete mix and batch data, fabrication and curing records, reinforcement.

Of course, your documents are welcome to contain additional information like:

- Structural analysis or finite element simulation,
- Predicted load–displacement curve,
- Expected failure mechanism, etc.

The organizers will prepare a summary with details about the competition rules, the overall settings and an overview of all entries, which will also be published in the proceedings. Therefore, these aspects can be kept very brief in the papers of the teams.

It is also mandatory to submit a video showing the assembly and disassembly including a timestamp (see Section 4).

After the competition, every team has the possibility to add up to two more pages to the previously submitted and peer-reviewed paper with the results of the test within one week.

Submission details and deadlines

Item	Format or limit		Deadline
Technical report	Docx + pdf; up to 8 pages acc. to the full paper template, for details see *fib* 2027 website (https://fib-2027.org/full-paper-submission/)	ConfTool (make one cross in the "Main conference topics" list and one at "Concrete modularity competition")	April 21, 2027
	Up to two additional pages after the competition		June 15, 2027
Detailed drawings, additional data	pdf, docx, image files (e.g. png, jpeg)	Per download link or e-mail to office@fib-2027.org and skerdilajt.cengu@tu-dresden.de	April 21, 2027
Video showing assembly and disassembly including timestamp	mp4		
Presentation in the lab	3–4 min		June 8, 2027

Delivery of the elements

Label each module and package with the team's name. Include an inventory of modules, connectors, and tools, together with handling instructions and the declared assembly sequence. Protect bearing surfaces and joint interfaces during transportation.

*Delivery **in advance via parcel***

Deadline:	June 1, 2027
Delivery address:	Technische Universität Dresden Otto-Mohr-Laboratorium (OML) 01062 Dresden, Germany

*Delivery **in person in the OML***

Deadline:	June 7, 2027; 10 a.m.
Delivery address:	Otto Mohr Laboratory (OML) Zellescher Weg 22a 01217 Dresden, Germany
Contact person in the lab:	To be specified until May 1, 2027 latest

The procedures for returning or disposing of items must be agreed upon in advance with the organizers. Any items that teams do not wish to have returned will be disposed of. Teams are responsible for the cost of return shipping.

6 Organization, prizes and communication

Competition organization

Organizing institutions: TU Dresden, Institute of Concrete Structures
TUDIAS TU Dresden Institute of Advanced Studies GmbH

Competition contact e-mail: office@fib-2027.org and
CC (always) steffen.marx@tu-dresden.de
skerdilajt.cengu@tu-dresden.de

E-mail subject line: *Concrete Modularity Competition – xy {name of team or the corresponding person}*

Testing venue and address: Otto Mohr Laboratory (OML) of TU Dresden
Zellescher Weg 22a
01217 Dresden, Germany

Cash prizes

Award	Prize per team
First place	€1500
Second place	€750
Third place	€300

Awards presentation date and venue: Closing ceremony of *fib* Symposium 2027 on June 9, 2027

Certificate: Certificate of Participation for each eligible attendee following the symposium

Questions and results

Direct questions about specimen design, joints and testing to the competition contact.

General symposium enquiries can be sent to office@fib-2027.org.

The competition aims to share comparable test results of modular concrete concepts. The arrangements for publication and use of submitted material are specified below.

Use of submitted material: The technical reports of the teams and an overview of the tests (as described before) will be published in the conference proceedings. Any additional material submitted will not be further used by the organizers.

Event information sources

Symposium website | Venue | General contact | Competitions