



American Concrete Institute
Iran Chapter

آیین نامه مسابقات بین المللی دانشجویی بتن شاخه های منطقه ای (ACI)

ACI Pervious Concrete Competition

مسابقه بتن متخلخل (ساخت و ساز سبز)

۵ و ۶ دی ماه سال ۱۴۰۲



بیست و ششمین همایش سالیانه انجمن بین المللی بتن آمریکا (ACI) – شاخه ایران

American Concrete Institute

۵ و ۶ دی ماه سال ۱۴۰۲
با همکاری وزارت علوم، تحقیقات و فناوری

Iran Chapter

مجری:

وزارت علوم، تحقیقات و فناوری

مرکز تحقیقات بتن (متب)

تحصیلات تکمیلی مهندسی عمران
با مجوز ۵۱۶-۲۲



Concrete Research & Education Center
Affiliated with ACI International Concrete Institute
Advancing Concrete Knowledge

علاقمندان می توانند جهت ثبت نام و کسب اطلاعات بیشتر به پایگاه اینترنتی

www.ConREC.ac.ir و www.aciiranchapter.org مراجعه کرده و یا با شماره تلفن ۸۸۶۶۴۱۵۱ تماس حاصل نمایند.

دانشجویان علاوه بر سایت انجمن می توانند تمامی آیین نامه های مسابقات دانشجویی و فرم ثبت نام را از کانال تلگرام انجمن دانلود نمایند.



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ACI IRAN Chapter Pervious Concrete Cylinder Competition

Objectives

Teams are challenged to apply sustainability concepts and to use their knowledge of concrete mixture design by producing pervious concrete which balances permeability and splitting tensile strength.

Prizes

First, Second, and Third place entries will each be awarded a certificate of recognition, will be recognized in ACI Iran Chapter's newsletter if space allows, and will be recognized on ACI's Iran Chapter website at www.aciiranchapter.org.

Resources

This competition uses a falling-head permeameter method, see Figure 1. A picture of a similar (but not exact) falling-head permeameter test setup may be obtained in ACI 522R-06 "Pervious Concrete." General information on pervious concrete can be obtained from ACI 522R, ACI 522.1, and ACI 211.3, Appendix 6. Note: ACI documents are available to student members at the ACI Iran Chapter Headquarters.

Rules

1. Eligibility

The rules of eligibility have been translated to Persian and attached to this document. See attachment A.

Each competition has separate and different requirements and rules of eligibility, so participants in the student competitions should read each document carefully.

2. Mixture Materials and Curing

All American Society for Testing and Materials (ASTM) specifications listed refer to the most current version available.

- a. Only materials listed in the Official Mixture Design spreadsheet and described below shall be used.

Mixtures shall be proportioned to result in a pervious concrete material meeting the definition of pervious concrete according to ACI 522R

- b. All aggregates shall not exceed 19mm (3/4") in nominal size. A gradation (ASTM C136) shall be performed of the individual aggregates or final combination of aggregates. A report of which is required as part of the report submittal.
- c. Mixes shall use cementitious materials as a binder. Cementitious materials used in the mixtures shall be portland cement meeting ASTM C150, blended cement meeting ASTM C595, C1157, or C1600, or expansive cement meeting ASTM C845. The following supplementary cementitious materials may also be used: fly ash or natural pozzolans meeting ASTM C618, silica fume meeting ASTM C1240 and slag cement meeting ASTM C989. **Epoxies, glues and similar binders shall not be used.** Other binders will be considered by the judges on a case-by-case basis.
- d. Chemical admixtures meeting ASTM C260, C494 or C1017 may also be used. It is important to note that some special packaged "pervious admixtures" are on the market but are not yet accepted as meeting any of the above ASTM standards. As such, their use would not be acceptable in this competition and their use may result in disqualification or a penalty. Manufacturers' technical product data sheets (typically 1 to 2 pages) for each admixture used in the final mixture are required to be presented within the report.
- e. Fibers with a maximum length of 64 millimeters (2.5 inches) and made of glass, synthetic or natural materials may be used. Steel fibers shall not be used. Glass fibers shall meet ASTM C1666. Synthetic and natural fibers shall meet the classifications in ASTM C1116 Section 4.1. Fiber materials may be mixed (i.e. hybrid fibers) and any dosage rate may be used. No other type of reinforcement may be used.
- f. Cylinders shall be cured at atmospheric pressure and curing temperatures shall not exceed the boiling point of water; steam curing shall not be used. Please note that cylinders must be in a dry condition prior to submission at the competition (see Section 3.b.). This may affect the curing methods selected.



3. Cylinder Configuration

- a. Each entry for the competition shall consist of two cylinders. One cylinder will be tested during the competition and both will be kept for verification of compliance with the competition rules if needed. See Section 10.
- b. Cylinders shall be submitted by post or in person in a dry condition (i.e. as close to oven dry as reasonable). Teams are cautioned that submitting wet cylinders is disadvantageous. Cylinders will be submerged in water for a minimum of 30 minutes prior to testing once their dry weight is obtained. The dry weight may be used as a tool for mixture design verification.
- c. Cylinders shall be 102 mm (4 inches) in diameter with a tolerance of plus or minus 3 mm (0.1 inches) and 152 mm (6 inches) in length with a tolerance of plus or minus 5 mm (0.2 inches). It is recommended that the 152 mm length be obtained by cutting approximately 25 mm (1 inch) from each end of a standard 200 mm long cylinder (i.e. a standard 4x8 inch cylinder), thus removing less permeable portions of the standard cylinder. The cylinders shall have flat and parallel surfaces at right angles with perpendicular sides and no indentations, cupped edges, fins or other features to bias water flow over the specimen.
- d. Cylinders shall be homogeneous (i.e. have the same composition and porosity throughout the cylinder) and shall not have been cut from larger sections except as required in Section 3.c. or modified in any other way.
- e. Each cylinder shall be marked on the top surface in permanent marker with the team's name and a five character entry identification marking (same marking for both cylinders in each entry). The marked surface will be considered the top of the cylinder and placed upwards during permeability testing. Painting or otherwise coating the cylinders is not permitted.
- f. Modifications to cylinders are not permitted once submitted for the competition.

4. Report

- a. Teams shall electronically submit a report meeting the requirements listed in this section for the judges to review and score in advance of the competition. The electronic version of the report shall be submitted prior to the competition as described below in standard PDF format. Failure to follow these rules may result in penalties or disqualification at the judges' discretion. The electronic report due date is December 19, 2023. Teams should send a hard copy version of the report along with the samples to the competition committee. Teams failing to submit the electronic version of the report (including the mix design) as required shall receive a score of 0 in the Performance Score equation given in Section 7.a.
The electronic report should be emailed to convention@aciiranchapter.org.
- b. Each report shall be in the Persian language and contain the following. The judges will score the report using the indicated scoring percentages (based on a total of 100%).
- i. Include a cover page containing the following: – 5%
 1. University name and Team name (i.e. University of Concrete, Team Holey)
 2. Team members and faculty advisor names
 3. Entry Identification Marking matching the specimen marking mentioned in 3.e.
 - ii. Provide a maximum of two pages of pictures (with proper safety equipment being used) and captions showing the methods of the following: – 20%
 1. Batching and placing procedures
 2. Compaction and Finishing procedures
 3. Curing procedures
 4. Preliminary testing of cylinders, if applicable
 - iii. Provide a maximum of two pages of narrative, graphs or flow charts showing the team's decision process in selecting the final mixture design and compaction methods for the pervious specimens – 25%
 - iv. Materials Selection – 20%
 1. Provide a single picture showing all materials used in the submitted cylinder's mixture grouped together prior to mixing (i.e. measured materials in separate containers showing relative proportions used).
 2. Include a copy of the gradation test results (ASTM C136) for the

individual aggregates or combined aggregates as mentioned in 2.b.

3. Attach a submittal sheet for each chemical admixture used in the mixture – these are easily obtained from the manufacturer and will confirm compliance with rule 2.d.

- v. Include a copy of the Official Mixture Design spreadsheet in SI units. It is highly recommended to have an industry mentor from your local sponsoring group review your mix design for accuracy – 30%
- c. All reports will be scored between zero and 100 percent using the indicated scoring percentages, with

100% being the best. The entry with the highest score shall receive the top ranking for the report section in the Cylinder Performance prize category.

5. Cylinder Performance Prize Category

- a. The judges will inspect both pervious concrete cylinders prior to testing to verify compliance with the rules including dimensional and material requirements. Both cylinders shall comply with the rules and be made from the same batch of concrete, see Section 10.
- b. The judges will randomly select one of the cylinders for testing. All tests shall use the same cylinder.

c. Permeability Test

- i. All cylinders will be submerged in water once dry weight has been obtained for a minimum of 30 minutes. The cylinder selected for testing shall be removed from the water when prepared for testing.
- ii. The cylinder shall be prepared for testing by the judges. Cylinders will be wrapped with a pvc shrinkwrap for testing. Specimens awaiting testing will be returned to the water bath until being placed in the testing apparatus.
- iii. Each entry will be tested for permeability using a falling-head permeameter test setup, see

Figure 1. A similar (but not exact) example of a falling-head permeability test can be found in ACI 522R-06 Figure 4.7. With the valve closed, water shall be poured into the graduated

cylinder above the cylinder until the water level remains steady at 230 mm (9 inches) above the cylinder and air pockets are minimized. Time begins when the valve is opened. The test is complete and time is stopped when the water level in the graduated cylinder reaches 25 mm (1 inch). The maximum time limit for the test shall be 120 seconds, after which the water level above the cylinder is recorded. Teams failing to meet the maximum time limit shall be placed in

descending order based on the lowest water level and ranked below the entries completing the test within the time limit.

- iv. The entry with the highest measured permeability shall receive the top ranking for the permeability test section of the Cylinder Performance prize category.

d. **Splitting Tensile Strength Test**

- i. Each entry shall be tested for splitting tensile strength using ASTM C496, “Standard Test

Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.”

- ii. The entry with the highest splitting tensile strength shall receive the top ranking for the splitting tensile strength test section of the Cylinder Performance prize category.

6. **Cementitious Efficiency Prize Category**

This part of the competition will not take place this year.

7. **Scoring**

- a. **Cylinder Performance Prize Category** - Entries in the Cylinder Performance prize category shall be ranked in the permeability test, splitting tensile test and report sections as indicated above. The entry with the lowest Performance Score as calculated below shall be declared the winner of the Cylinder Performance prize category. In the case of a tie, the winner shall be the team with the better report ranking; if still tied, the team with the better permeability ranking shall be the winner.

$$\text{Performance Score} = (0.540)(P) + (0.430)(S) + (0.20)(R)$$

Where: P = Overall ranking of entry in the permeability test

S = Overall ranking of entry in the splitting tensile test

R = Overall ranking of entry in the report

8. **Judging**

- a. The judges shall be appointed by the ACI Iran Chapter competitions committee. The lead

judge will be identified and will act as the main point of contact for students will rules-related questions and issues. The lead judge will act as the final decision maker for all rules and penalties associated with the competition.

- b. The judges will make the final determination on compliance with the rules and penalties for rule violations up to and including the disqualification of entries if required. Disqualified entries shall not be included in the scoring or considered for awards but may be tested if time permits. See Section 10.
- c. Teams are reminded that results in competition may not match those as measured in the university lab with a different testing setup.
- d. The decision of the judges shall be final, and appeals will not be considered - this includes additional review of competition results following the student lunch. Suggestions for improvement may be submitted to the ACI Iran Chapter Competitions Committee. Student teams and advisors are reminded that the competition judges and personnel are volunteers and the competition is meant to provide a fun learning experience.

9. Registration and Submission Requirements

- a. Registration is required to participate in the competition. Teams shall download and complete the registration form for their entry – the link to which is on the ACI student competition website at www.aciiranchapter.org . This process shall be completed and submitted to ACI, no later than 5:00 p.m. 15 December 2023. It indicates the team's intent to compete and includes all necessary submissions. The pervious concrete cylinders themselves and a hard copy of the report should be submitted In Person at 8:00am on 26 December 2023 on the first day of the competitions. The filled in registration form should be emailed to convention@aciiranchapter.org before 15 December, 2022 .
- b. Questions regarding the rules and competition shall be submitted to the ACI contact listed below.

Competition volunteers will respond as promptly as possible, but please remember that the competition is run by volunteers.

- c. The electronic Report and Official Mixture Design, as described above, shall be submitted through email: convention@aciiranchapter.org , no later than 5:00 p.m. on 19 December 2023. Teams shall be responsible for ensuring their submission is completed and received (i.e. email not bounced or returned due to file size restrictions or other problems) and are strongly encouraged to allow sufficient time for verification prior to the deadline. Late submissions will be accepted on a case-by-case basis and will be penalized a minimum of 10%, if allowed to compete at all.
- d. Both pervious concrete cylinders, with the identifying markings clearly displayed on the

cylinders, shall be submitted to the competition along with a hard copy of the report. Cylinders arriving past their established check-in times will not be accepted for entry into the competition.

10. Compliance with Previous Concrete Cylinder Competition Rules

ACI reserves the right to perform a detailed examination and check all entries for compliance with the competition rules, errors (intentional or unintentional) in the Official Mixture Design spreadsheet, and for plagiarism in the report. Due to the complexity of this task, the examination may be done after the competition if needed. If the examination shows that a team did not follow the rules or plagiarized, the team, their advisor, and all of their school teams may be disqualified. ACI Iran Chapter will further document recommendations to disallow the team, their advisor, and/or school/university from participation in future

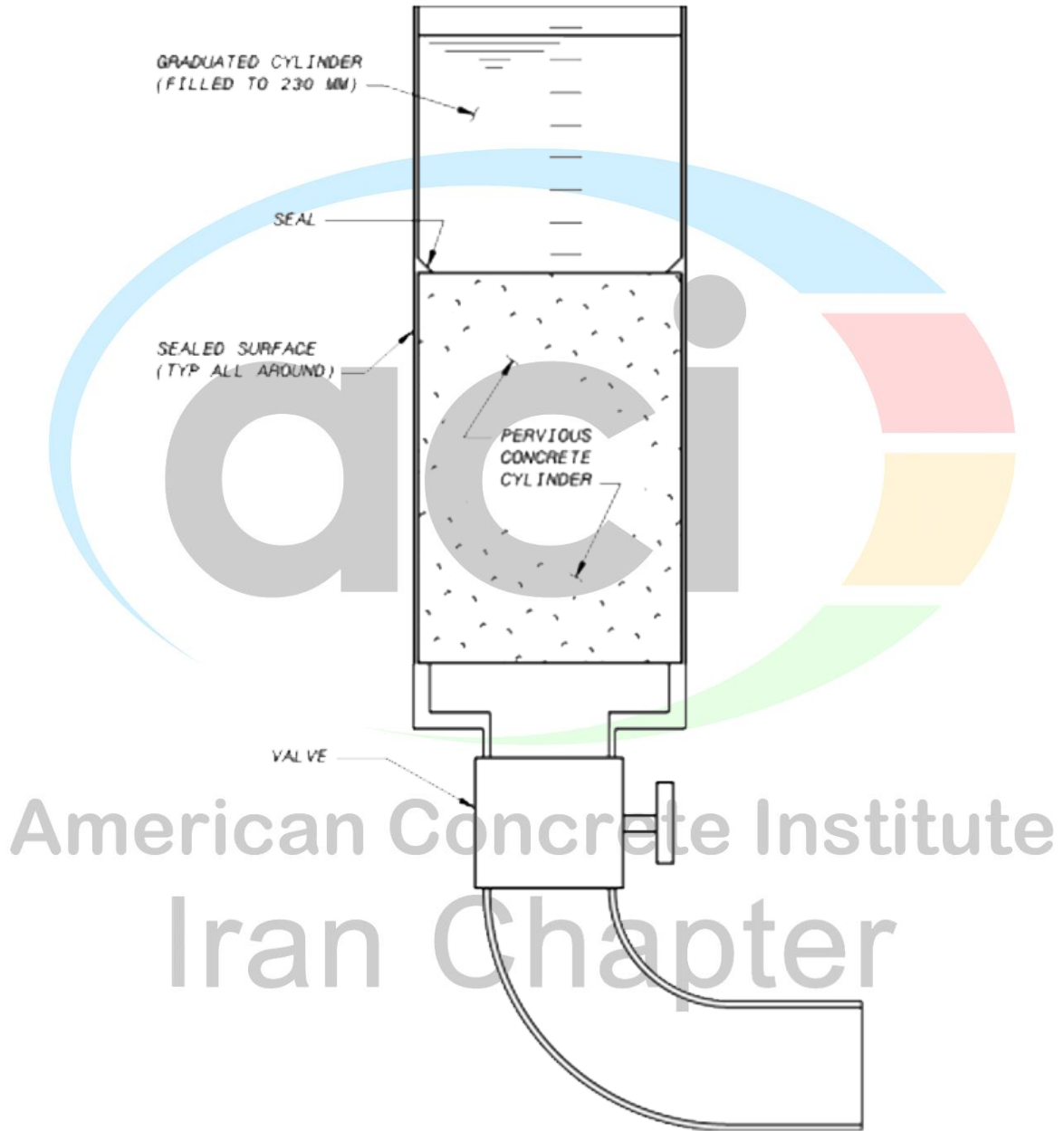
ACI competitions and submit this to the Student and Young Professional Activities Committee for possible action. By participating in the competition, use of student reports and competition results for future competitions, presentations, or data analysis by ACI committees and members is expressly permitted.

11. Contact Information

American Concrete Institute – Iran Chapter
Unit 1, No.1, Layli St., Vanak Ave., Vanak Sq., Tehran, Iran
Phone +9821 88664151 +9821 88664152
E-mail: Convention@aciiranchapter.org

American Concrete Institute
Iran Chapter

(Figure 1)



Attachment A: Eligibility Rules

۱- قوانین مسابقه:

تیم های شرکت کننده در مسابقه :

۱-۱ اعضای تیم ها، دانش آموزان دبیرستانها، هنرجویان هنرستانهای فنی و حرفه ای، دانشجویان دانشگاه های سراسری، آزاد و موسسات آموزش عالی (مقطع کارشناسی مهندسی عمران، معماری، مکانیک، معدن، مهندسی شیمی و ... در تمامی گرایش ها)، مراکز آموزش عالی، مراکز تحقیقاتی پژوهشی دولتی و غیر دولتی می باشند. لازم به ذکر است تعداد تیم های شرکت کننده از هر دانشگاه، موسسه آموزش عالی، دبیرستان، هنرستان و ... نامحدود و در هر گرایش می توانند حداکثر دو تیم داشته باشند که باید اعضای تیم ها متفاوت باشند.

مثال:

تیم A از دانشگاه A جهت مسابقه Epd و Cube (استاد راهنما: A و اعضای گروه: ۲ و ۳ و ۴ و ۵ و ۶ و ۷ و ۸)
تیم B از دانشگاه A جهت مسابقه Epd و Cube (استاد راهنما: A و اعضای گروه: ۹ و ۱۰ و ۱۱ و ۱۲ و ۱۳ و ۱۴ و ۱۵ و ۱۶)
تیم C از دانشگاه A جهت مسابقه Bowling و پل کاغذی (استاد راهنما: B و اعضای گروه: ۱۷ و ۱۸ و ۱۹ و ۲۰ و ۲۱ و ۲۲ و ۲۳ و ۲۴)
توجه: تیم C از دانشگاه A اجازه شرکت در مسابقات Epd و Cube را نخواهد داشت.

۲-۱ شرایط مذکور (بند ۱-۱) برای تمامی مسابقات غیر از مسابقه کانو بتنی صادق می باشد.

۳-۱ چنانچه تعداد تیم های شرکت کننده در هر گرایش به حداقل ۴ تیم برسد مسابقه برگزار می شود در غیر اینصورت مسابقه آن گرایش برگزار نخواهد شد و نمونه تحویل گرفته شده به تیم های ثبت نام کننده عودت داده نمی شود.

۴-۱ هر تیم شامل حداقل ۲ نفر و حداکثر ۸ نفر عضو به همراه ۱ نفر استاد راهنما از همان موسسه آموزش عالی، دبیرستان، هنرستان و ... می باشد. **همه اعضای تیم باید از یک مقطع تحصیلی باشند.**

۵-۱ هر شخص تنها می تواند در یک تیم عضویت داشته باشد.

۶-۱ هر موسسه آموزش عالی، دبیرستان، هنرستان و... برنده حداکثر یک رتبه (مقام) خواهد بود.

۷-۱ استاد راهنما فقط مسئولیت هدایت اعضای تیم و رعایت قوانین مسابقه از طرف تیم را بر عهده دارد.

۸-۱ هر استاد راهنما نمی تواند سرپرستی بیش از دو تیم از یک دبیرستان، هنرستان، موسسه آموزش عالی و ... بر عهده بگیرد.

۹-۱ آخرین مهلت ثبت نام برای شرکت در مسابقه بتن متخلخل ۲۴ آذر ماه سال ۱۴۰۲ می باشد.

۱۰-۱ فرم های ثبت نام از طریق ایمیل یا فکس می بایست ارسال شود. شرکت کنندگان فرم ثبت نام را می بایست از وب سایت www.aciiranchnpter.org دانلود و تکمیل نموده، به همراه مدارک خواسته شده شامل (معرفی نامه بروی سربرگ

دانشگاه یا گواهی اشتغال به تحصیل، کپی کارت دانشجویی معتبر، کپی کارت ملی، فیش واریزی ثبت نام) به دبیرخانه همایش از طریق ایمیل به آدرس convention@aciiranchapter.org و یا از طریق فکس به شماره ۸۸۷۹۷۴۵۴ ارسال نمایند.

۱۱-۱ تاریخ ارسال و تحویل نمونه های بتن متخلخل:

شرکت کنندگان می بایست یک نسخه گزارش چاپ شده (Hard copy) و CD گزارش را طبق فرمت آورده شده در بخش ۴ آیین نامه به همراه نمونه های بتنی خود و اصل مدارک (شامل اصل فرم ثبت نام و معرفی نامه بروی سربرگ دانشگاه یا گواهی اشتغال به تحصیل) را به صورت حضوری در روز اول همایش روز سه شنبه مورخ ۵ دی ساعت ۸:۰۰ صبح به محل دریافت نمونه های دانشجویی ارایه نمایند.

تحویل نمونه ها و مدارک لازم توسط یک نفر (سرپرست و یا نماینده تیم) انجام می شود. نماینده تیم پس از تحویل نمونه ها به کمیته تحویل نمونه مسابقات دانشجویی، رسید تحویل نمونه دریافت می کند که می بایست آن را تا پایان مسابقات و اعلام نتایج نزد خود نگاه دارد.

۱۲-۱ آخرین مهلت ارسال گزارش الکترونیکی (بصورت فایل PDF) ساعت ۱۷:۰۰ روز ۲۸ آذر ماه سال ۱۴۰۲ می باشد.

۱۳-۱ گزارش های الکترونیکی می بایست به آدرس convention@aciiranchapter.org در تاریخ مشخص شده و طبق بخش ۴ آیین نامه ارسال شوند.

۱۴-۱ نمونه های تحویل داده شده به کمیته مسابقات برای شرکت در مسابقات توسط تیم های شرکت کننده عودت داده نمی شود.

۱۵-۱ هزینه واریزی جهت ثبت نام به هیچ عنوان عودت داده نمی شود.

۱۶-۱ استاد راهنما باید از اعضای هیات علمی و یا مدرسین دانشگاه تیم دانشجویی مربوطه باشد.

- ✓ حضور استاد راهنما در روز مسابقه و زمان برگزاری مسابقه تیم خود الزامی است و عدم حضور باعث حذف تیم دانشجویی می شود.
- ✓ همراه داشتن معرفی نامه از دانشگاه و اصل کارت دانشجویی در روز همایش الزامی است.

۱۷-۱ گزیده هایی از مسابقات ملی بتن مورخ ۵ و ۶ دی ماه سال ۱۴۰۲ به صورت زنده (Live) از وب سایت مرکز تحقیقات بتن www.ConREC.ac.ir پخش می شود. جهت اطلاع از جزئیات پخش مسابقات بتن به وب سایت مراجعه نمایید.

۱۸-۱ نتایج بیست و ششمین دوره مسابقات دانشجویی ملی بتن، مورخ ۶ دی ماه سال ۱۴۰۲ در مراسم اختتامیه جشنواره و کنفرانس بتن و زلزله مرکز تحقیقات بتن (متب) اعلام می شود.

برای کسب اطلاعات بیشتر جهت نحوه ثبت نام و شرکت در همایش به وب سایت انجمن مراجعه نمایید.

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قابل توجه شرکت کنندگان بیست و ششمین دوره مسابقات سالیانه ملی دانشجویی

انجمن علمی بین المللی بتن آمریکا (ACI) – شاخه ایران:

به مناسبت بیست و ششمین سال مسابقات سالیانه ملی دانشجویی انجمن علمی بین المللی بتن آمریکا (ACI) - شاخه ایران به اطلاع می رساند: با مجوز **بنیاد ملی نخبگان** به شماره ۸۹۷۱/۱۵، این مسابقات به مشابه مسابقات مهارتی دانشجویی مورد تایید و حمایت **بنیاد ملی نخبگان** قرار گرفته است و برترین های این مسابقات از امتیازهایی که برای این قبیل مسابقات در شیوه نامه های بنیاد تعیین شده است، بهره مند می شوند.

American Concrete Institute Iran Chapter

❖ قابل توجه کلیه دانشجویان و شرکت کنندگان در بیست و ششمین همایش ملی سالیانه بتن و زلزله و مسابقات سالیانه

دانشجویی انجمن بین المللی بتن آمریکا (ACI) – شاخه ایران :

همایش ملی سالیانه بتن و زلزله و آیین نامه مسابقات دانشجویی مرکز تحقیقات بتن (متب) طبق مصوبه وزارت علوم، تحقیقات

و فناوری متعلق و خاص این مرکز بوده و استفاده از آنها خارج از مسابقات فوق پیگرد قانونی خواهد داشت.