Student Competitions.
Is this learning?!!

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2016

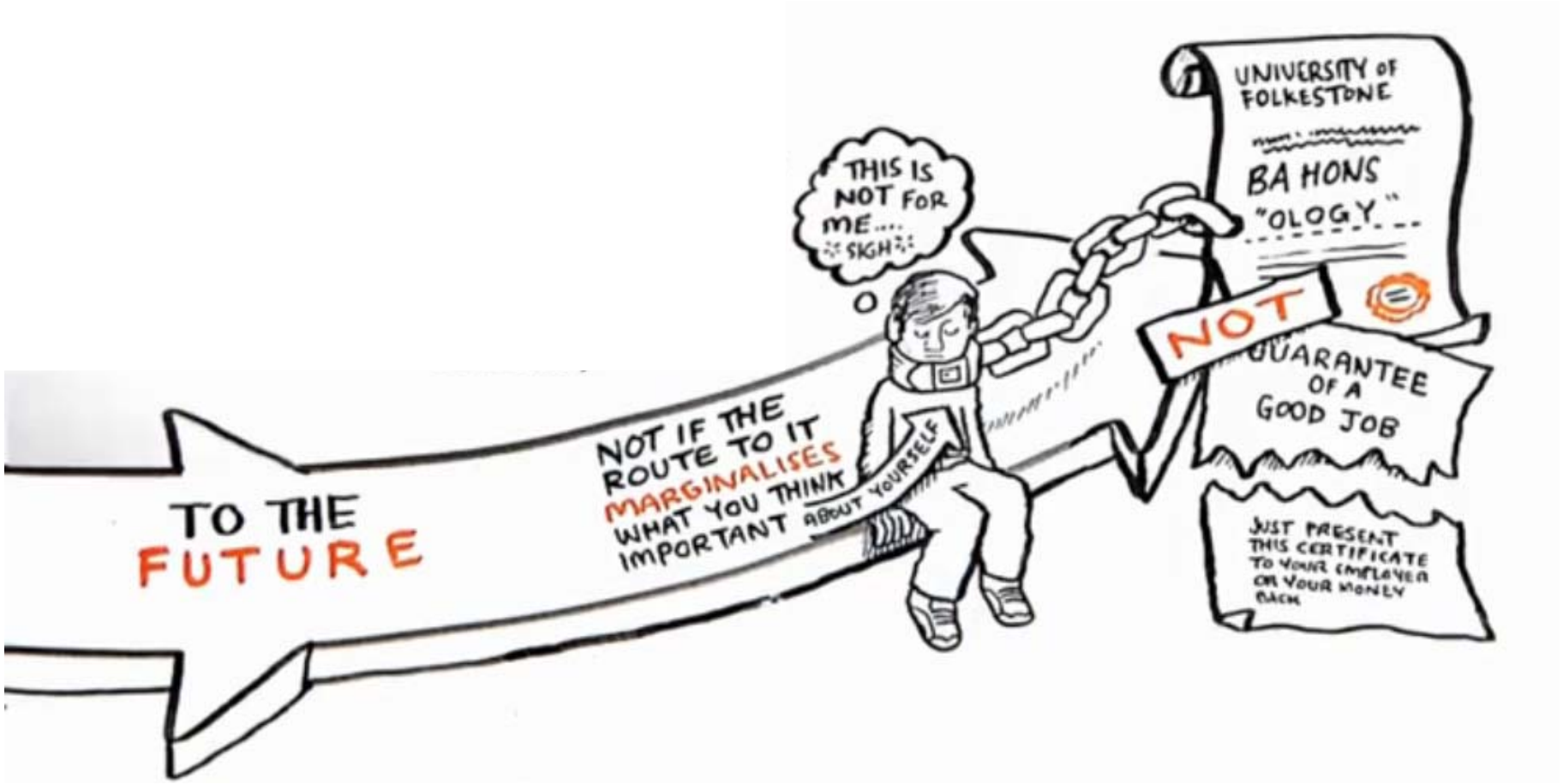
Education

PAST...

(Sir Ken Robinson)

Education

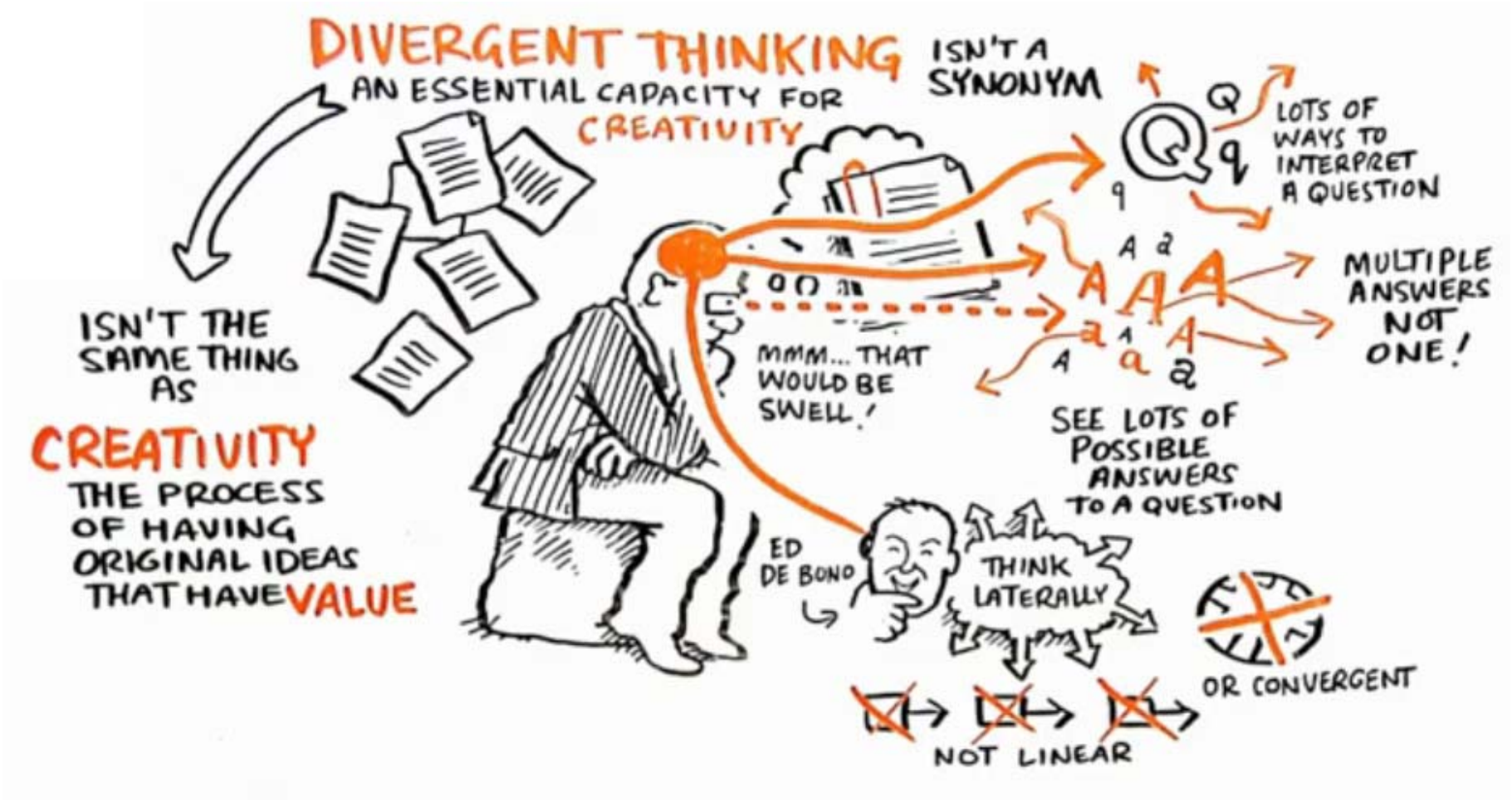
NOW...



(Sir Ken Robinson)

Education

THINKING…



(Sir Ken Robinson)

Student Competitions

Why???

Competitions + Rules

- → **Specialist**
- → **Creativity**
- → **Additional work**
- → **Contact with non-academic workplaces/situations**

Student Competitions

Classification

-intended objectives, accomplished effect
-part of the curriculum versus outside the curriculum
-fun-oriented versus serious
-artificial context versus realistic context
-educational value versus public-relations value
-spectator event versus participatory event
-teacher participation, parent participation
-organized by students versus organization involves no students
-for individuals or teams
-inter- versus intra-school
-national versus international
-compete against others versus compete against ``oneself''
-skill-oriented versus knowledge-oriented versus luck-oriented
-gender neutrality
-cultural and language dependence
-limited rewards versus abundant prizes, awards, certificates
-one-time versus periodic
-single-day event versus multiple-day event
-fixed format versus free format

- instant feedback versus delayed feedback
- single-round versus multi-round tournament
-criteria for participation (e.g. limited age group),
-variety in knowledge and skills of competitors,
- aimed at everyone versus aimed at talented students,
-diversified difficulty levels (depending on age or school grade),
-handicapping to compensate for differences between competitors,
-special training versus spontaneous participation,
- larger event including non-competitive elements versus isolated contest,
-degree of institutionalization (official rules, supervising body),
-follow-up to participants (defined improvement process),
-bound to school topics or not,
-single-discipline versus multi-disciplinary,
- (commercially) sponsored, government funded, self-supporting
- **…**

ACI FRC Bowling Ball Competition

Objectives

-to **demonstrate the effect of fibers** in reinforcing concrete, to **gain experience** in forming and fabricating a concrete element, to **encourage creativity** in engineering design and analysis.

The Challenge

- To **design** and **construct** a fiber-reinforced concrete bowling ball to achieve **optimal performance** under specified failure criteria.
- To **develop** a **fabrication process** that produces a radial uniform density while maximizing volume.

ACI FRC Bowling Ball Competition

Specimen

-mass shall not exceed 5.5 kg.

- shall measure 215 mm +/- 15 mm diameter.

- shall be cast or formed monolithically.

- may be homogeneous or core filled

ACI FRC Bowling Ball Competition

Test Evaluation

Final Performance Score =

= Average Load x Diameter x Roll Test Multiplier

Final Prediction Score =

= abs. value [1 – (Predicted value/measured value)]

ACI Concrete Cylinder Competition

Objectives

-To produce **concrete cylinders** with an average **compressive strength** of 48.3 MPa and a saturated surface-dry **density of 2.39 kg/l** with the **highest cementitious efficiency** and the **lowest cost**.

Materials

- must use **cementitious materials** as binder, **supplementary cementitious materials** (such as fly ash, natural pozzolan, silica fume, slag). The coarse aggregate and fine aggregate should comply codes.

ACI Concrete Cylinder Competition

Specimen Preparation

- The plastic concrete shall exhibit a slump of (150 mm) ± (50 mm)
- The plastic concrete shall exhibit an air content of 6% ± 1.5%.
-The standard specimen

Specimen Testing

- The **compressive strength** will be computed as the **average of two test** cylinders. The compressive strength of each cylinder shall **not deviate** from the strength of the other cylinder by **more than 4.85 Mpa**.

ACI Concrete Cylinder Competition

Scoring

$$FinalScore = (20 - 0.02|\Delta f'_c|) + (20 - 4|\Delta_D|) + (20 - |\Delta_\$|) + (20 - |\Delta_{Eff}|) + 4R_S$$

Where:

$\Delta f'c$ = f'c - 7000 psi; f'c is the measured average of two cylinders
$|\Delta f'|$ is limited to 1000 psi

Δ_D = D - 150 pcf; D is the measured average density of two cylinders
$|\Delta_D|$ is limited to 5 pcf

$\Delta_\$$ is the deviation from the lowest cost design
$|\Delta_\$|$ is limited to $20

Δ_{Eff} is the deviation from the most efficient design;
efficiency = f'c/lb cement per cubic yard
$|\Delta_{Eff}|$ is limited to 5 psi/lb

R is report score; 5(excellent), 4(very good), 3(good), 2(fair), 1(poor), 0(none)

ACI Concrete Cube Competition

Objectives

-To **produce a concrete cube** that achieves, as closely as possible, a target design strength of **50 MPa** and a target mass of **270 grams per cube** (50.8 x 50.8 x 50.8 mm)

Material

-must use **cementitious materials** as binder, **chemical admixtures**, **supplementary cementituous materials**. **Epoxies** and other **polymers**, **glue**, and similar binders are **not allowed**. **Fibers** or other types of reinforcement are **not allowed**. Any type of **non-metallic aggregate may be used**.

ACI Concrete Cube Competition

Testing Evaluation

-**Two cubes** from each entry will be tested in direct compression **for strength determination** and **all three** cubes will be used **for mass determination.**

$$Final\ Score = 50 \cdot \left[1 - \left|\frac{\sigma_c - 50}{50}\right|\right] + 20 \cdot \left[1 - \left|\frac{m - 270}{270}\right|\right] + 30 \cdot \left[1 - \left|\frac{\sigma_{c1} - \sigma_{c2}}{50}\right|\right]$$

σ_c - he average strength of the two tested cubes in MPa.

σ_{c1} and σ_{c2} - are the respective strengths of the two individual tested cubes.

m - the average masses of all three cubes

ACI FRP Composites Competition

Objective

- Design, construct, and test a concrete structure reinforced with FRP reinforcement to achieve the largest load-to-cost ratio.
- Predict the ultimate load.
- Predict the load that will result in a piston deflection of 2.5 mm.

ACI FRP Composites Competition

The materials and the specimen geometry

-The **structure must fit** into a 200 mm x 200 mm x 1000 mm long **box**. The cross section may vary over the length. The structure's overall length may not be less than 950 mm nor more than 1000 mm.

-Total structure **weight** must be **between 5 kg** and **15 kg**.

-The cementitious materials, supplementary cementitious materials which may also be used

- Any type of **nonmetallic aggregate** may be used.

- **Chemical admixtures** are allowed. Epoxies and other polymers, glue, and binders may NOT be used.

ACI FRP Composites Competition

The testing process

- Entries will be weighed and measured, and will apply a midspan concentrated load .

The evaluation process

Load-to-Cost ratios =

Ultimate load / Final Cost of the structure

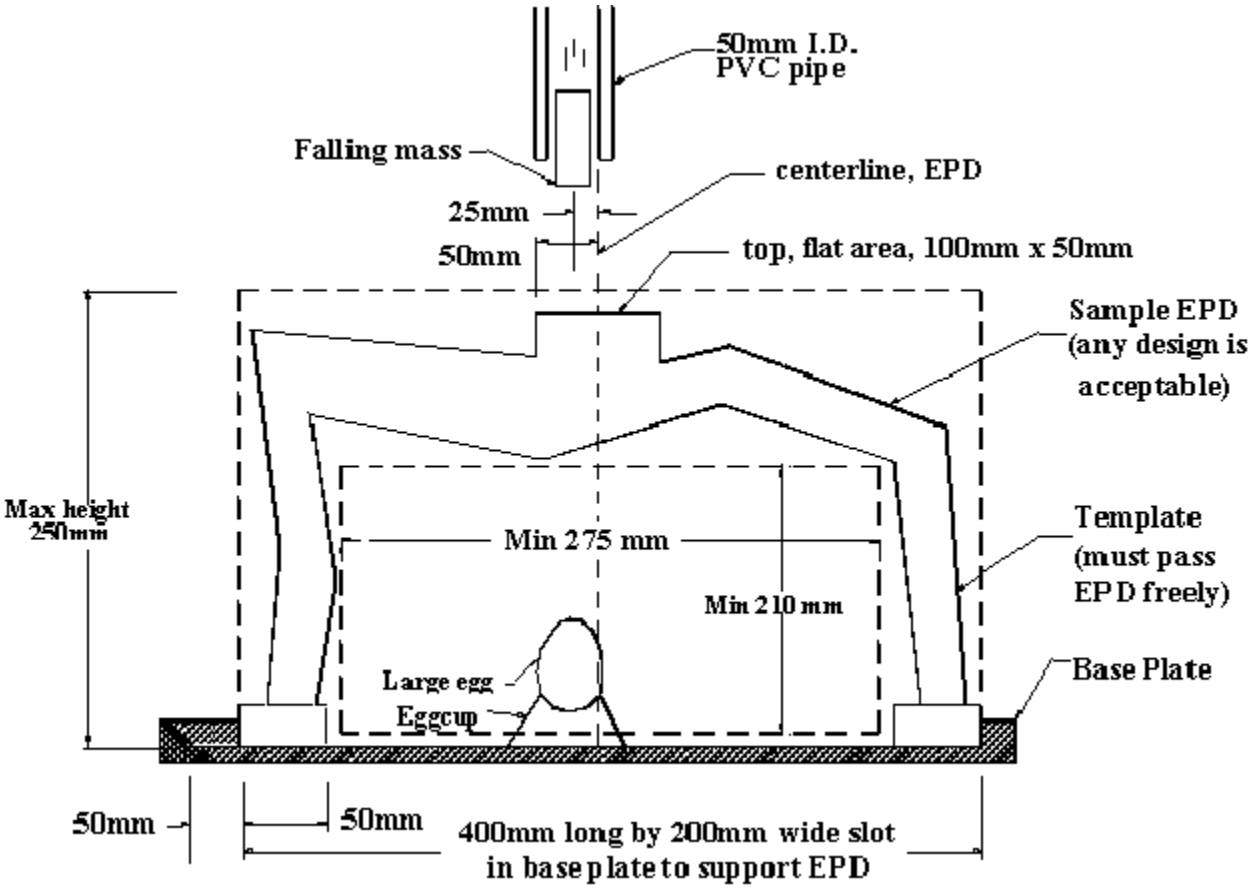
Prediction accuracy

$$D = 50\{DP_{2.5}/P_{2.5} + DP_{ult}/P_{ult}\}$$

ACI Egg Protection Device Competition

Objectives

- Design and build the highest-impact, load-resistant plain or reinforced concrete Egg Protection Device (EPD)



ACI Egg Protection Device Competition

Materials

- The binder shall be **cementitious** material. **Chemical admixtures** are allowed.
- **Epoxies** and other polymers, glue, and similar binders shall **not be used**.
-All **reinforcement** shall not be greater than **1.6 mm** diameter. No more than **15 stirrups** may be used in the EPD. Longitudinal reinforcement shall be limited to **8 bars/wires in a cross section**.
-**No wire meshes**, soldering, or **welding of cages** is **permitted**. **Fibers** are **not permitted**.

ACI Egg Protection Device Competition

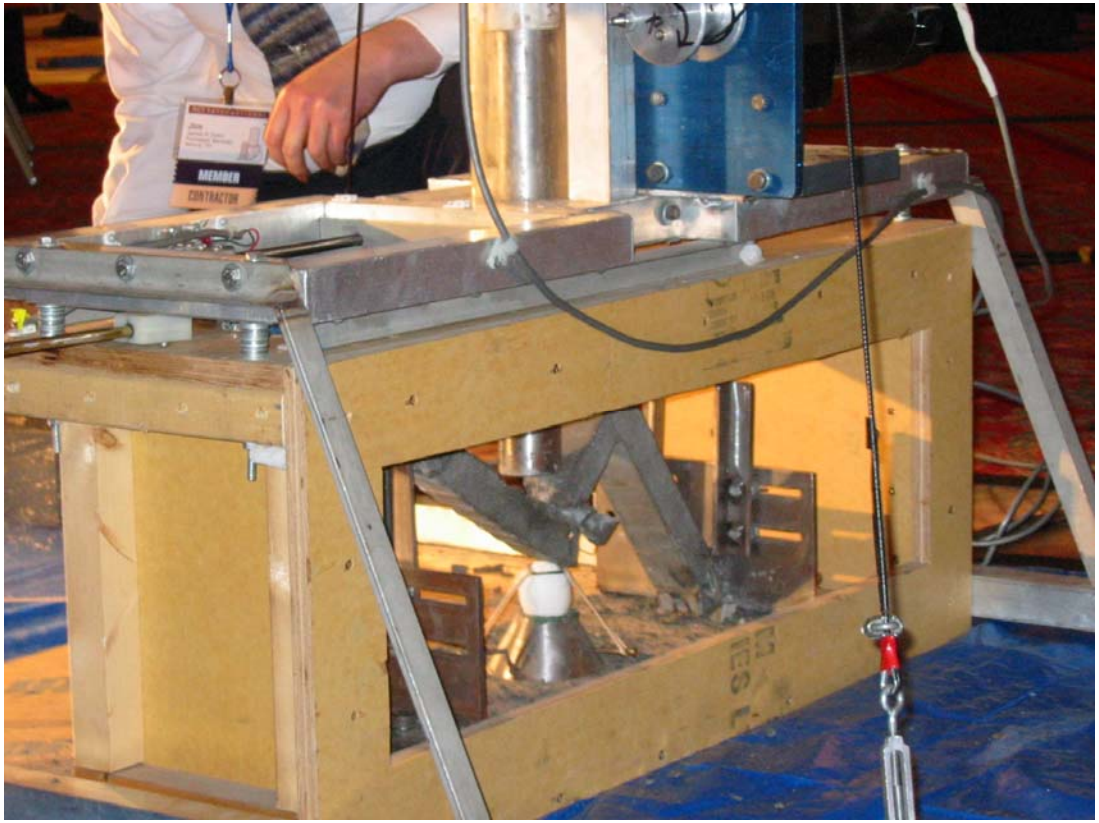
Qualification and Testing Procedures

-**Qualification Test**: every EPD entry is **individually** weighed and **checked** for **size** and **clearances** and compliance with the requirements.

-**Impact Test**: each EPD will be subjected to an **impact load** of **8.39 kg falling**, from each of the following increasing heights of **0.5 m**, **1.0 m**, **1.5 m**, **2.0 m**, **2.5 m**, and up to **five times** from the maximum height of **3.0 m**.

- Failure Criteria: Cracking of the egg constitutes failure of the EPD.

ACI Egg Protection Device Competition



National Center for Research on Earthquake Engineering (NCREE) Competition

→Introducing and Demonstrating Earthquake Engineering Research in Schools (IDEERS)

Objectives

-to **design** and **make** a model of a building that can stand up to artificial **earthquakes** generated on the shaking-table.

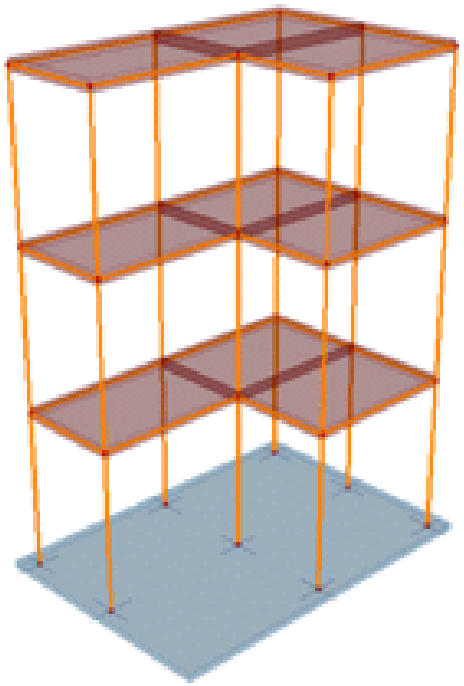
-to make an A4-size **poster** presenting the **designing concepts** and ideas before the competition.

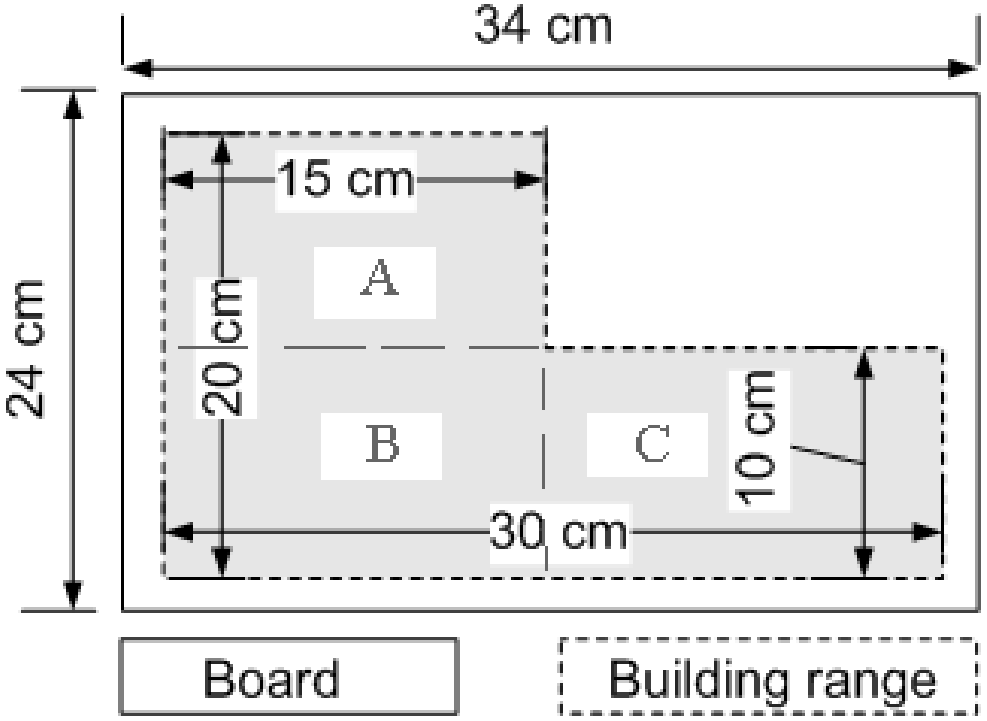
National Center for Research on Earthquake Engineering (NCREE) Competition

Materials and structures

-be made only from **wood**, **paper**, **glue**, **string**, and **rubber bands**

- have at least **4 floors** and be no more than **75 cm** high.





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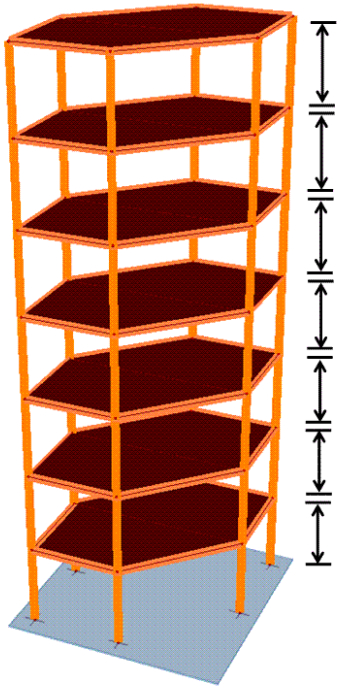

National Center for Research on Earthquake Engineering (NCREE) Competition

Test

-all models will be tested on a shaking-table with different sized earthquakes (up to 1cm/s^2 acceleration)

- For every model, a note will be made of the **number of blocks** (W) it is carrying, its **mass** (M) and the **maximal intensity** of earthquake the model can survive (I)

Evaluation

$$\text{Efficiency ratio} = \frac{I \times W}{M_M - M_B + M_P}$$

W - Weights fixed on the floors.

M_M - Total mass of the model system (excluding steel blocks)

M_B - Mass of the base board

M_P - Weight penalty

Undergraduate Seismic Design Competition (EERI)

Problem

-to submit a design for a multi-story cost-effective structure designed for seismic loading

-should be designed to allow as much light as possible inside

-a scaled balsa wood model will be constructed and will be subjected to three ground motions

-for each ground motion will be estimate the monetary loss in the structural and non-structural components

The winner of the competition will be the team whose building survives the shaking with the highest cost-benefit balance

Undergraduate Seismic Design Competition (EERI)

2013

http://slc.eeri.org/SDC2012.htm
http://www.youtube.com/watch?feature=player_detailpage&v=oNxJfibMpI0
http://prezi.com/yhzfaerojldg/copy-of-2012-eeri-sdc-pres/
http://www.facebook.com/UtcnSdc2013
http://www.youtube.com/watch?v=Yulv0-c2IRY
http://zst.ro/?p=1293

Undergraduate Seismic Design Competition (EERI)

2013

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http://www.youtube.com/watch?feature=player_detailpage&v=oNxJfibMpI0
http://prezi.com/yhzfaerojldg/copy-of-2012-eeri-sdc-pres/
http://www.facebook.com/UtcnSdc2013
http://www.youtube.com/watch?v=Yulv0-c2IRY
http://zst.ro/?p=1293

Undergraduate Seismic Design Competition (EERI)

2014

Ranking	Team Name
1	Technical University of Cluj-Napoca
2	University of California, Berkeley
3	California State University, Los Angeles

Undergraduate Seismic Design Competition (EERI)

2015

2015 SDC Champions: Technical University of Cluj - Napoca

Rank	Team Name
1	Technical University of Cluj-Napoca
2	University of California, Los Angeles
3	University of California, Berkeley

RECCS 2011
World Championship in Spaghetti Bridge Building

Objectives

-Build a bridge from spaghetti

Materials

-**pasta**: commercially available

-**adhesive**: any appropriate glue

-**loading platform**: an M8 eye bolt, placed in the 9 mm, centrally drilled bore of a 100 x 50 x 10 mm laminated wooden plate

RECCS 2011
World Championship in Spaghetti Bridge Building

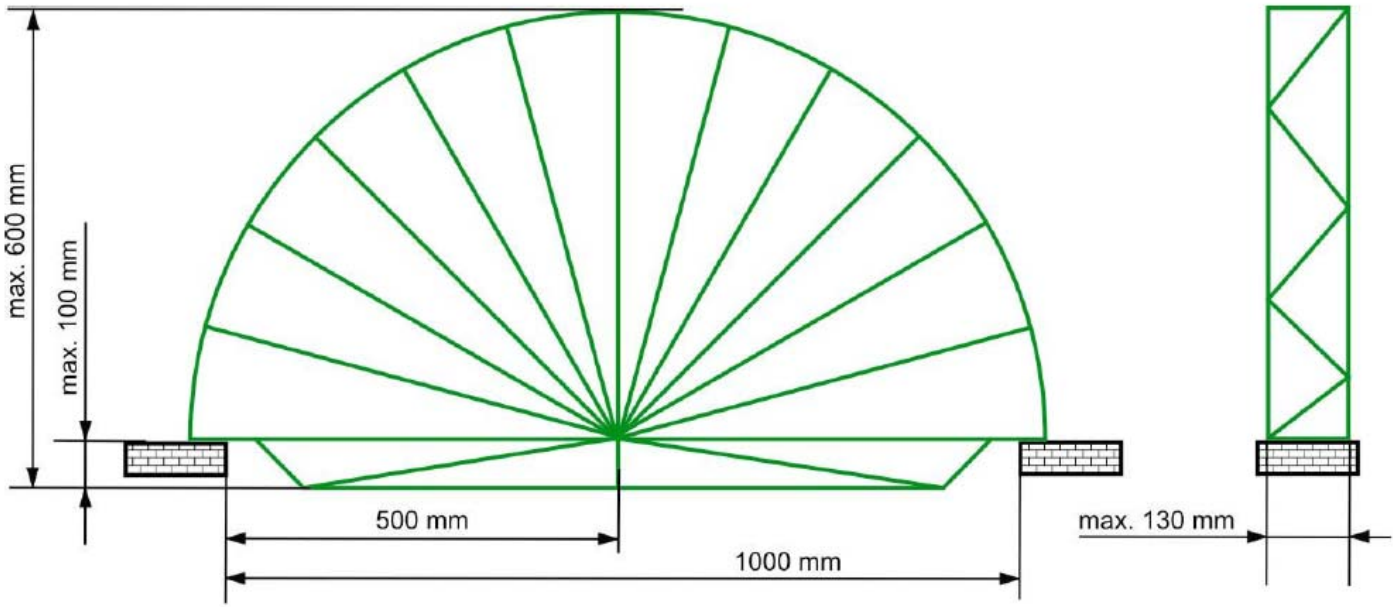
Dimensions

-Height: max **600 mm**

-the bottom point must not be lower than 100 mm of the level defined by the points of the supports

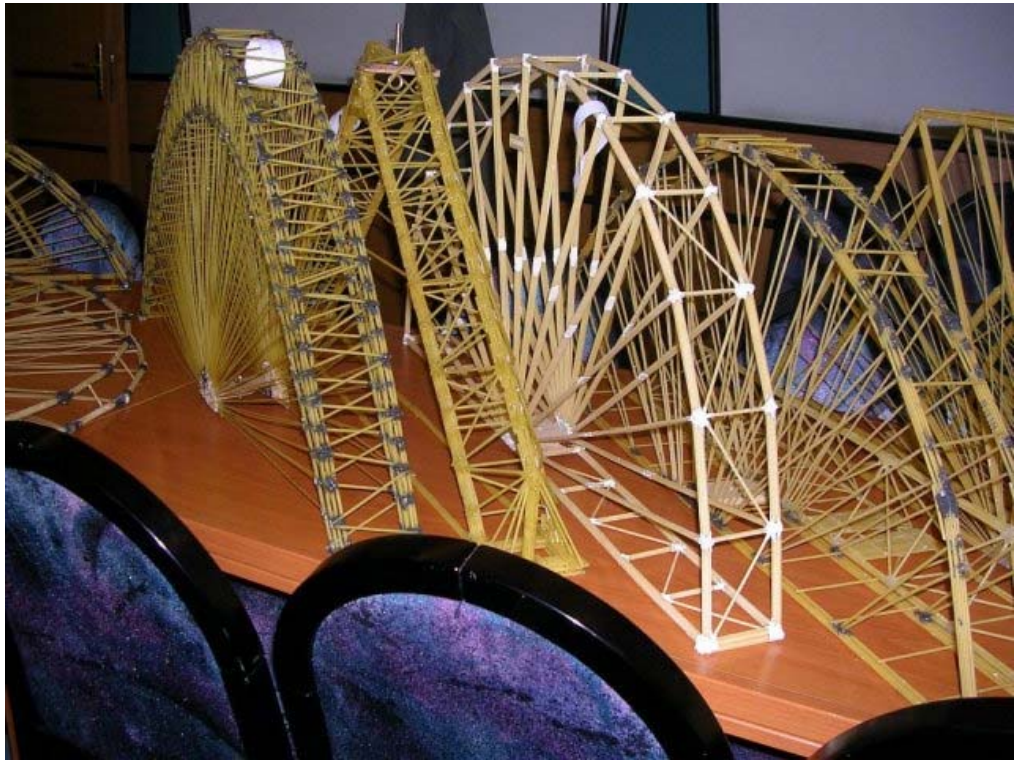
-the distance between the **supports** is **1000 mm**

- the total **weight** of the bridge must not exceed **1000 g**.



RECCS 2011
World Championship in Spaghetti Bridge Building

The evaluation process → *Maximum load*



Bridge Builder Competition - BME

Objective

-To build a reduced scale bridge in conformity of current codes

Categories

-I. → Bridge of 1.0kg, length 1.0m, width max 250 mm

-II. →Bridge of 1.5kg, length 2.0m, width max 250 mm

Materials – Optional

Structure – Arbitrary

Bridge Builder Competition - BME

Scoring system

-Deflection

-Self weight

-Creativity

-Material use

-Model/design/computation

-Execution

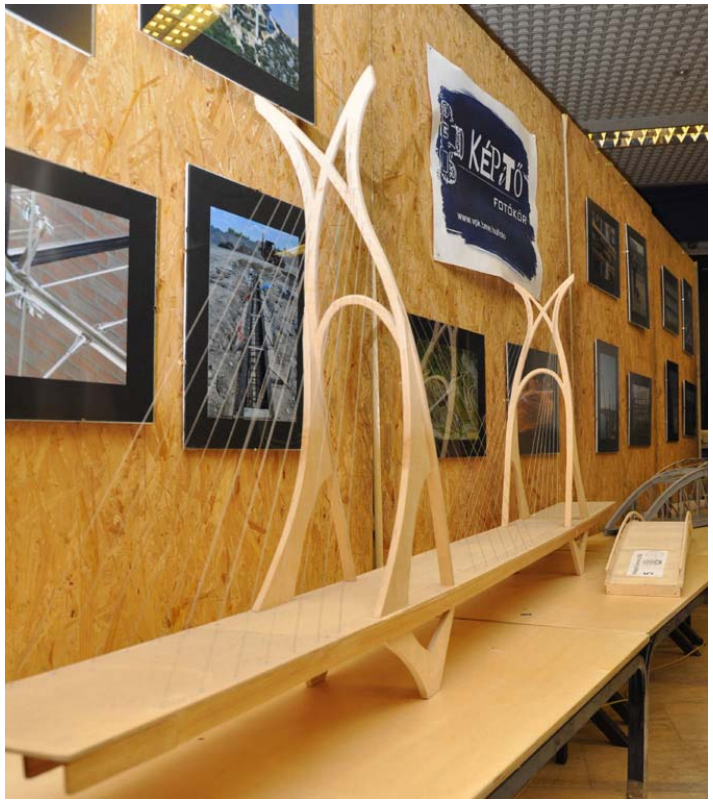
-Details (quality)

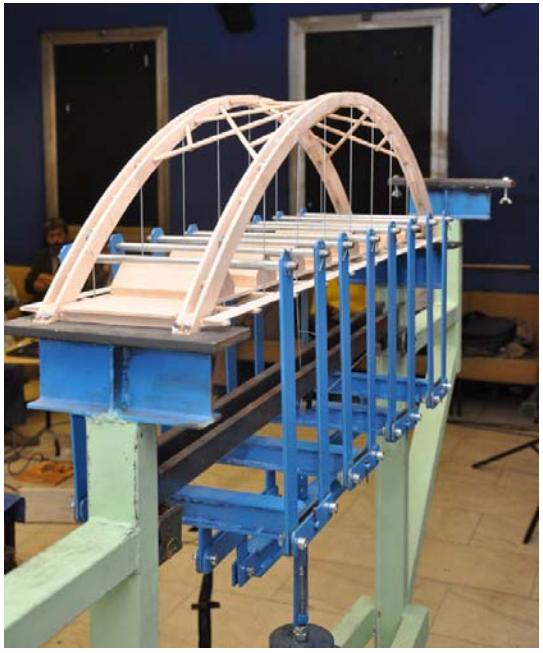
-Presentation

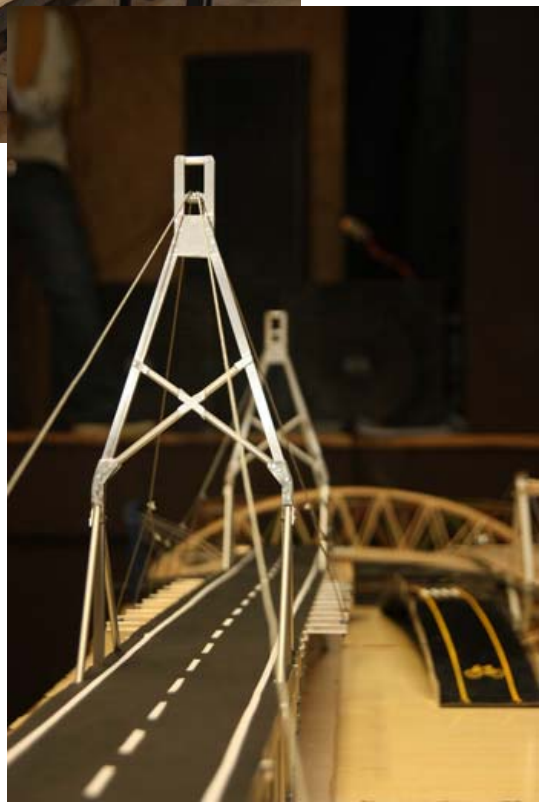
-Failure load

http://www.sz7.epito.bme.hu/hidepito.php

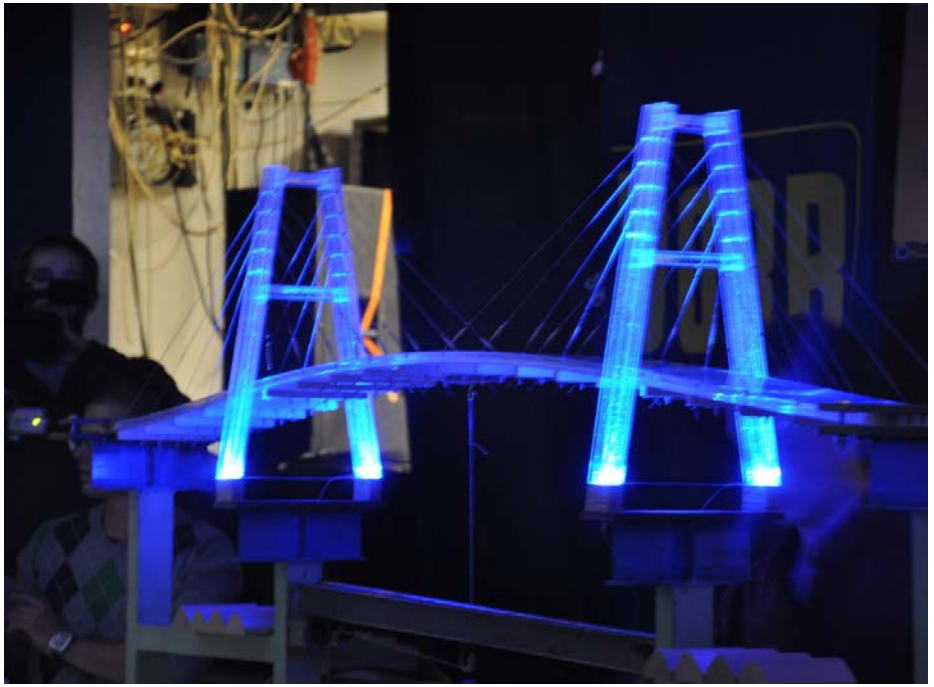
Bridge Builder Competition - BME

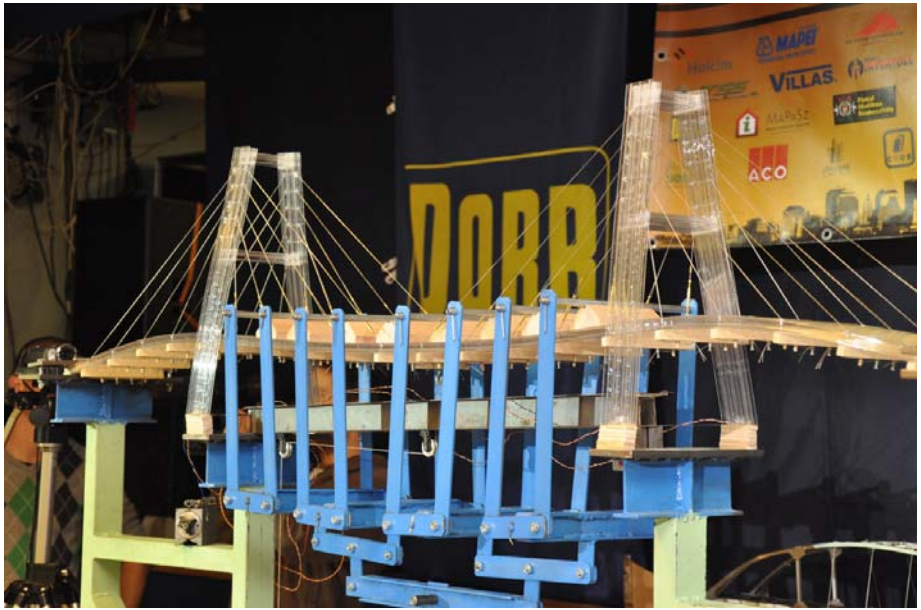






Bridge Builder Competition - BME





STRENGTHENING CFRP CHALLENGE at UM (2013)

→Competition for the prediction of the behaviour of a CFRP strengthened reinforced concrete beam

- initial loading corresponding to a deflection at mid-span of L/350 of the T-shaped RC beam
- shear and flexural strengthening with CFRP – NSM technique

→ **predict the load-deflection response**

-The final classification **C**

$$C = 0.15f_{Model} + 0.1f_{L/250} + 0.20f_{\delta,ult} + 0.10f_{P,ult} + 0.35f_{P-\delta}$$

STRENGTHENING CFRP CHALLENGE at UM (2013)

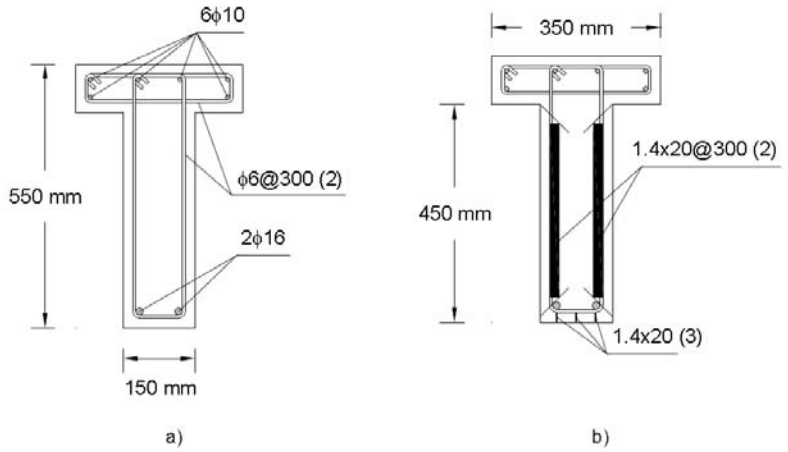


Figure 1. T-beam cross section geometry, a) before and b) after CFRP laminate strengthening.

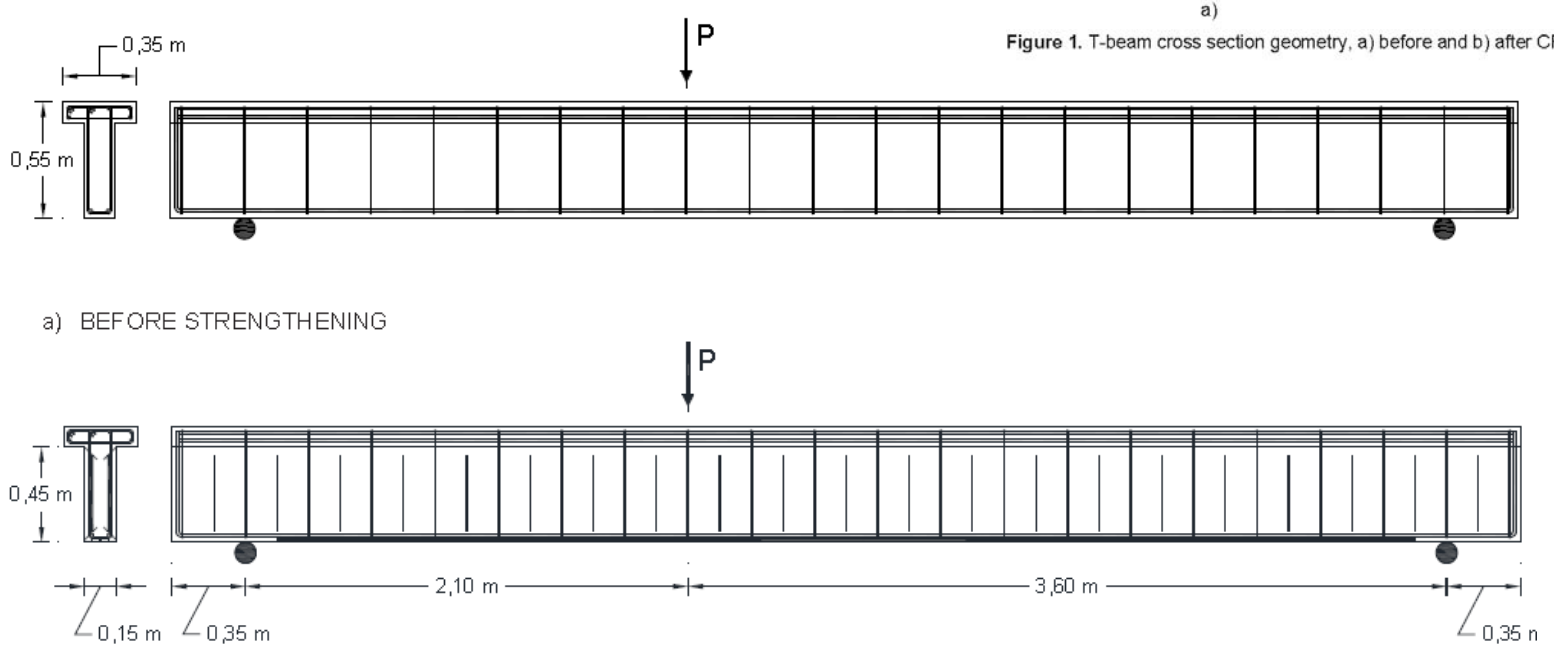


Figure 2. T-beam geometry, steel reinforcement and CFRP strengthening system: a) before and b) after strengthening.

IMC STUDENTS' CHALLENGE at UM (2014)

→Competition for the prediction the maximum compressive load of two masonry prisms (solid & hollow bricks)

→The team with the closest prediction of the failure load with a sound report (10 pg) wins the competition.

→Team: 3 students (MSc or PhD) from the same institution + 1 advisor from the teaching staff

Evaluation:

A) = 20 x [1 – abs (1 – Estimated force / Experimental Force)]

B) = evaluation report of the Committee

Final = 2 x grade A + 1 x grade B

IMC STUDENTS' CHALLENGE at UM (2014)

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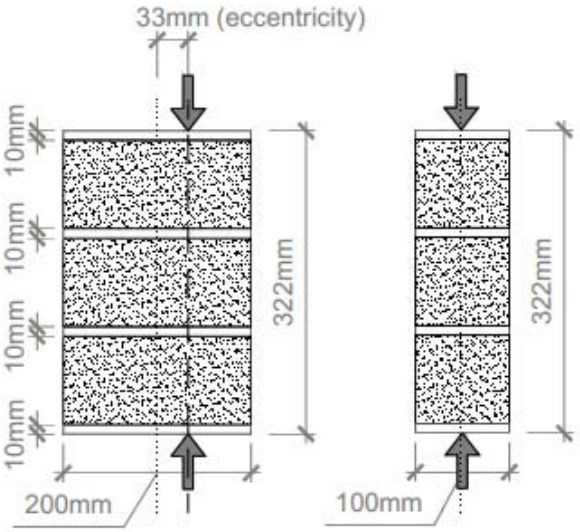

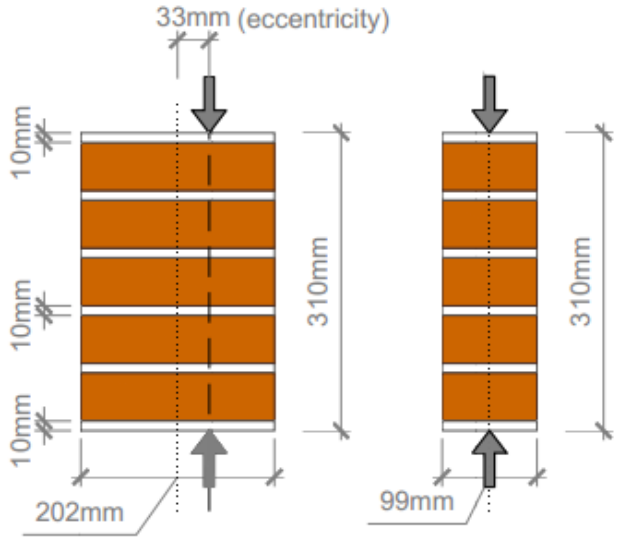

Scientific Conference of Hungarian Students - TMD

Objectives

- To make a scientific work in the field of civil engineering

Reason

- The challenge, experience, friendship
- Learn to use the Hungarian scientific language

→ 17th edition in Timisoara (2016)!!!

Scientific Conference of Hungarian Students - TMD

→ Subjects of the past edition

- passive houses; straw-houses
- structural modelling
- new materials
- concrete and steel structures
- railways
- ecological constructions
- building services
- ...

CONCLUSIONS

1. **Must start similar competition in UPT**
2. **Have to encourage the students for participation**
3. **Must to recognize the efforts of the students**
    - **Summer exercise**
    - **Plus in grades**

→ EVERYONE WILL BENEFIT

Thank you for your attention!