

# Structural safety of historic sites



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meeting from ISCARSAH Paris meeting on 27 Nov. 2011*

## Problem Definition

- Historic structures are old
  - generally damaged structure (by earthquakes, wars, floods, dampness, erosion, freeze&thaw, wind, fire), have degraded material properties, support problems, unknown past interventions, cracks, tilts, etc.
- They pose danger for themselves and for people around them.
- Strengthening, repair, restoration work can **also** be risky for during inspection and/or while performing investigation/restoration work on site.

# EXAMPLES

## 1) ORTAHISAR CASTLE, URGUP, TURKEY.

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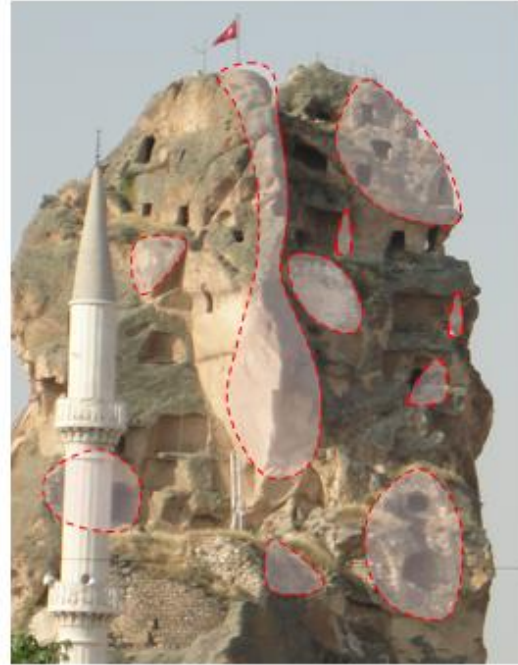




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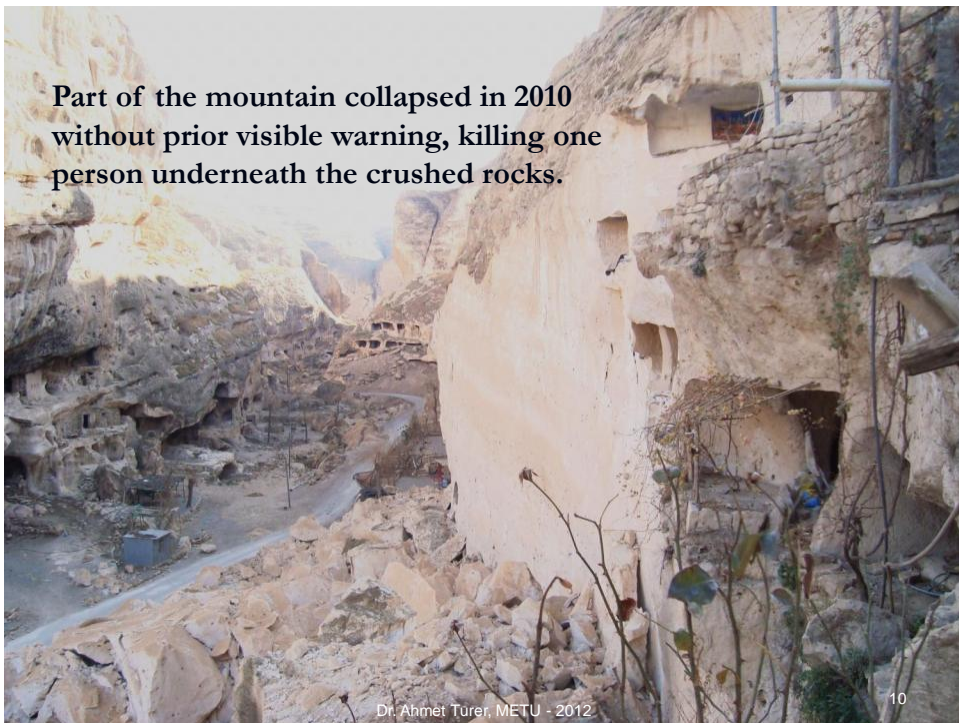
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## EXAMPLES

### 2) MIDDLEGATE HASANKEYF, BATMAN, TURKEY.

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# Middle Gate



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# Middle Gate



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## EXAMPLES

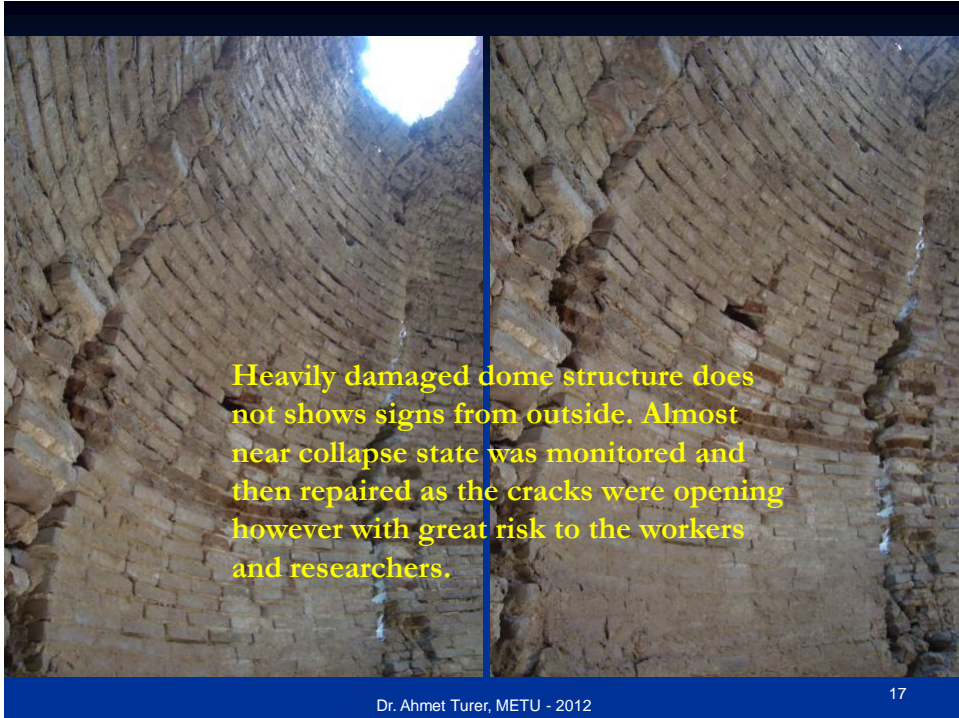
### 3) ZEYNELBEY MAUSOLEUM





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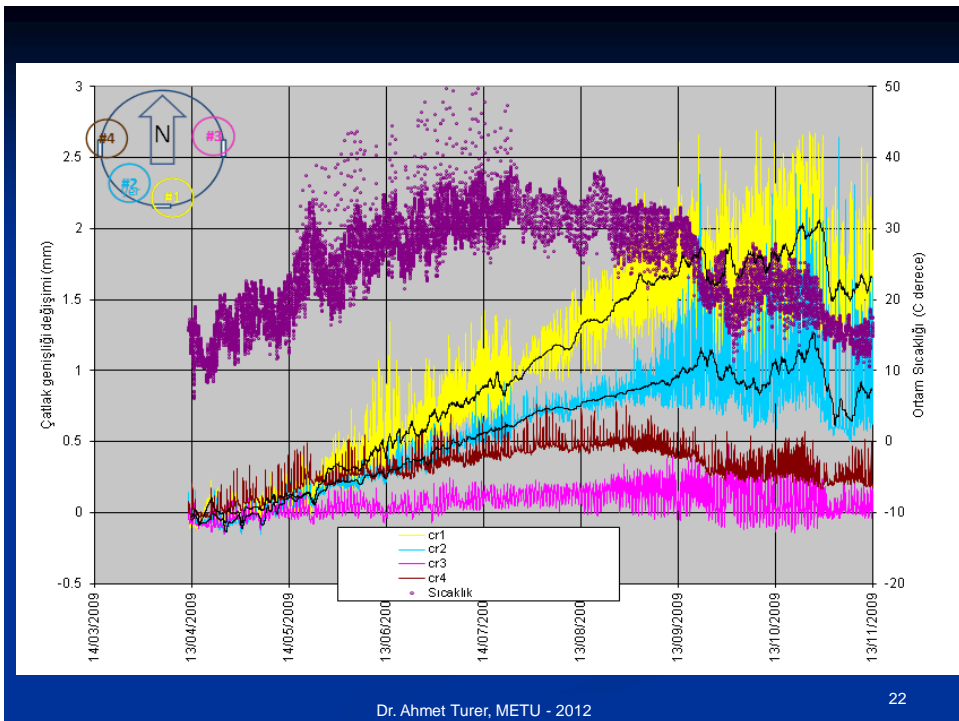
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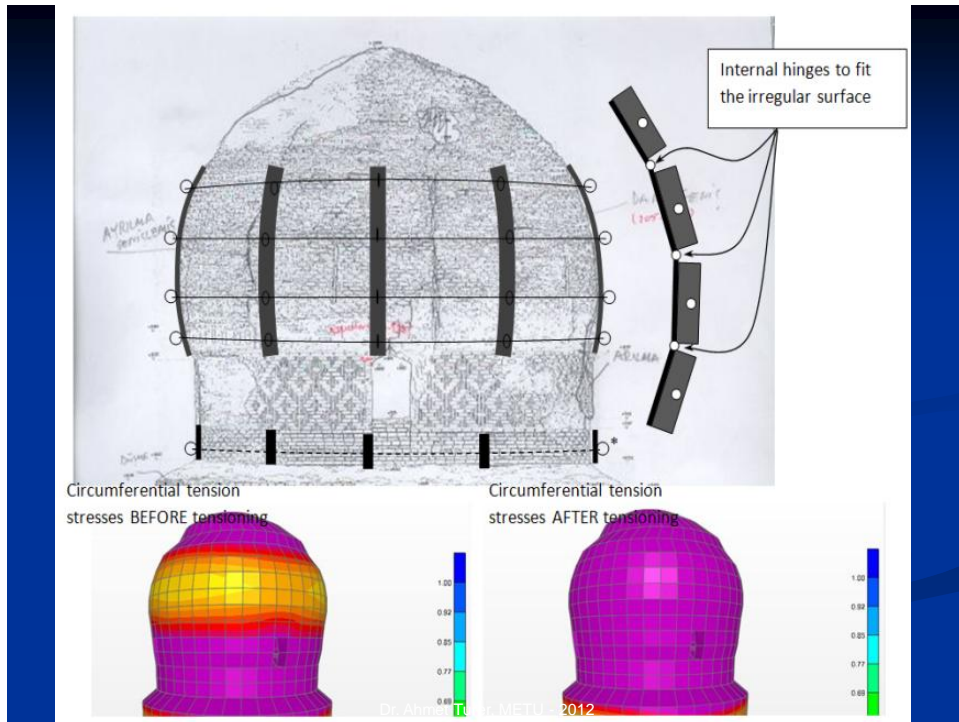
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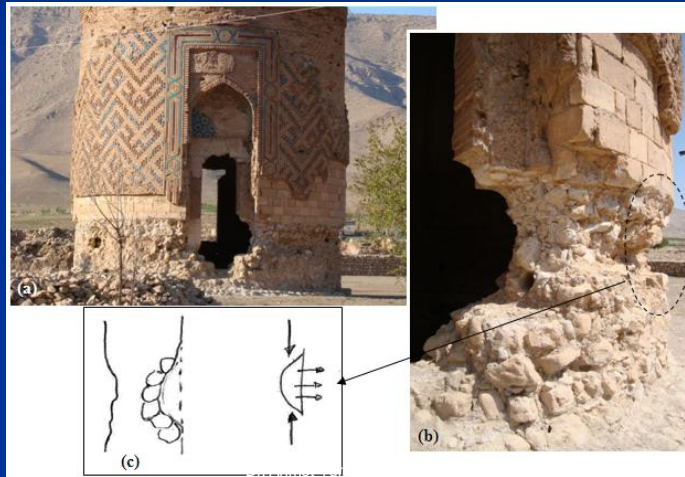
## Suggested emergency measure (reversible)



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**Second major problem:**  
section loss at the lower 2m height of the  
cylindrical shaped main body

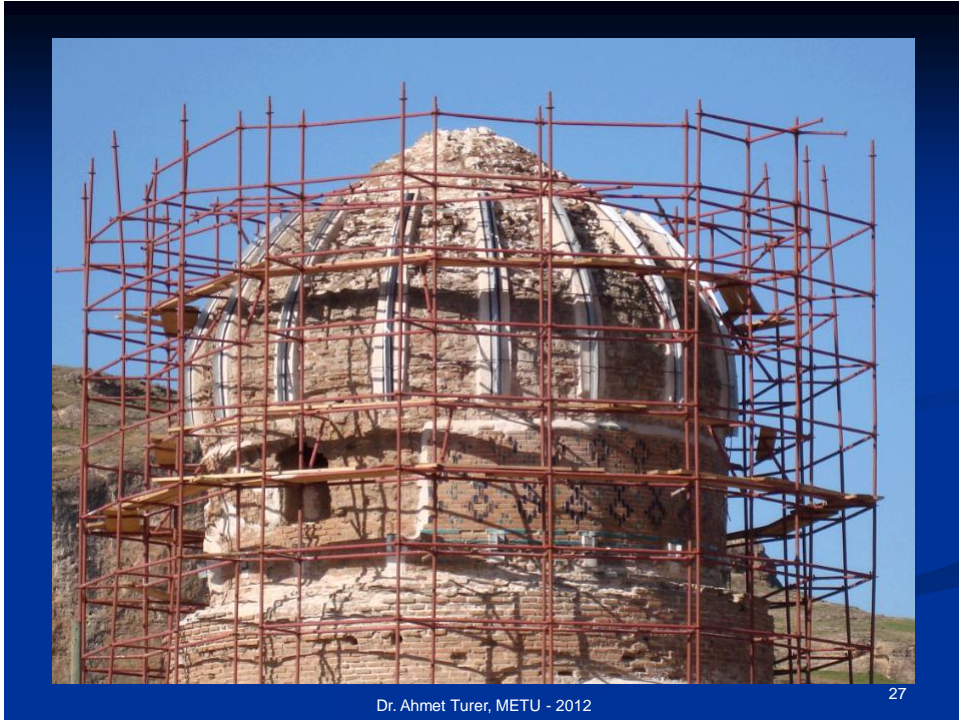


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# Will it be flooded by the Ilisu dam reservoir?

## Relocation?

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**Fort Washington, PA**  
A 40' x 64' three story, stone house with 20" thick walls and a total weight of 840 tons. We moved the house back on the property while the new 12' foundation was blasted and excavated. The new location -

**Schenectady, NY**  
A 45' x 50' three story, quad brick house with a 12' concrete front porch and a total weight of 608 tons. We moved this house 250' on the property to incorporate it into a new commercial development.

**WOLFE**  
House & Building Movers, LLC.  
"For all your structural moving needs"



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## Safety?

What if the structure is tipped over  
or damaged during relocation?

Is it possible to insure a irreplaceable  
and invaluable structure? If yes for  
how much?

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# A few more pictures...

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## Small Palace



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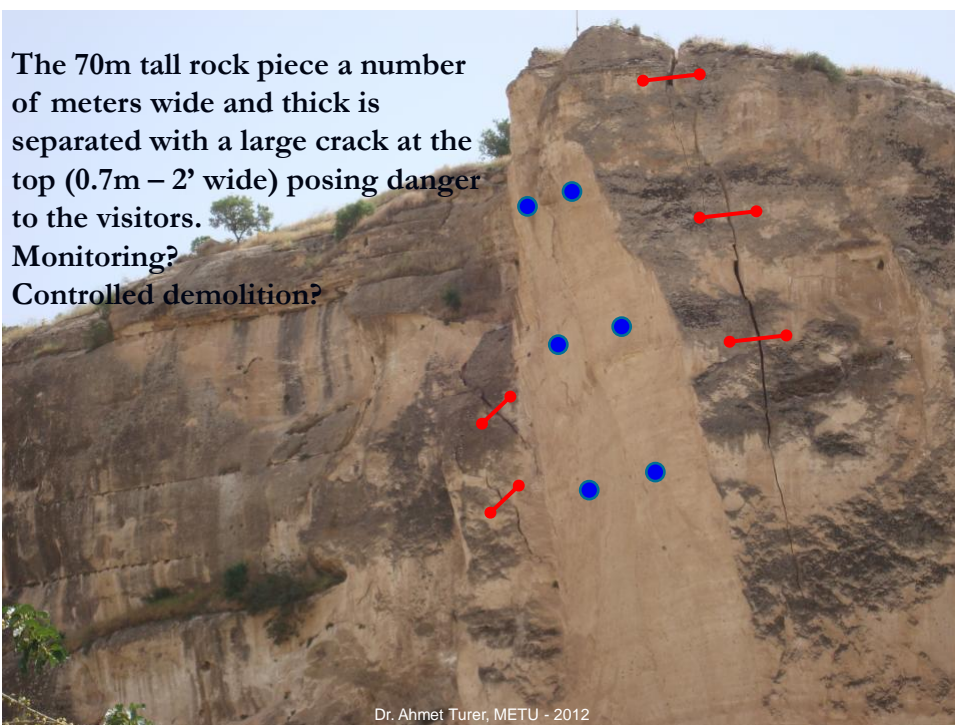
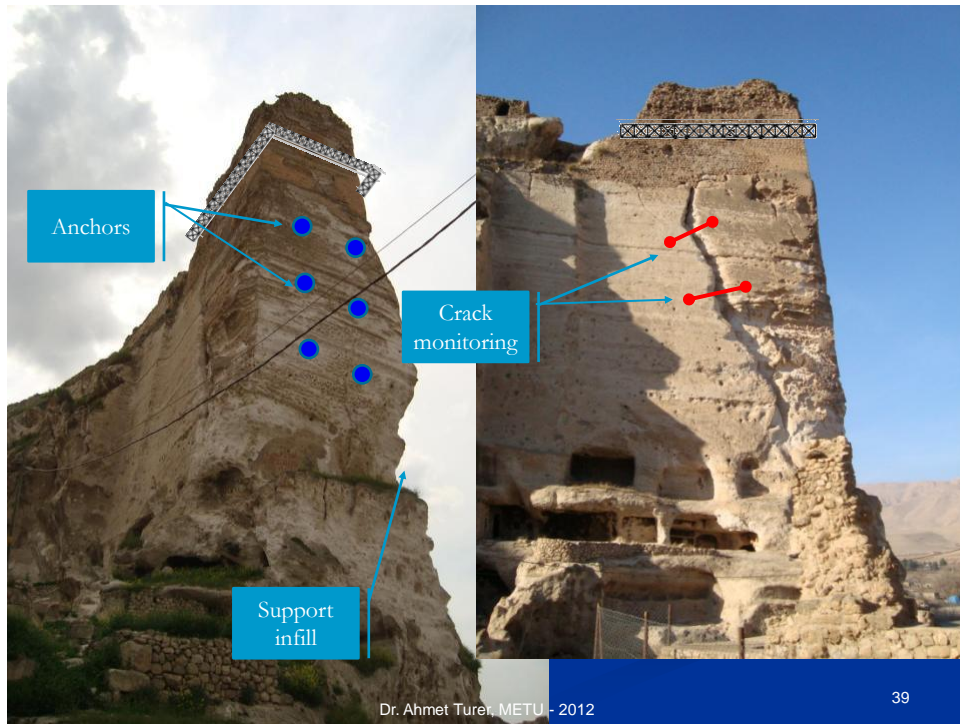


**Parts of the walls or individual stones can fall off the cliff about 60m where visitors are walking on the street level.**

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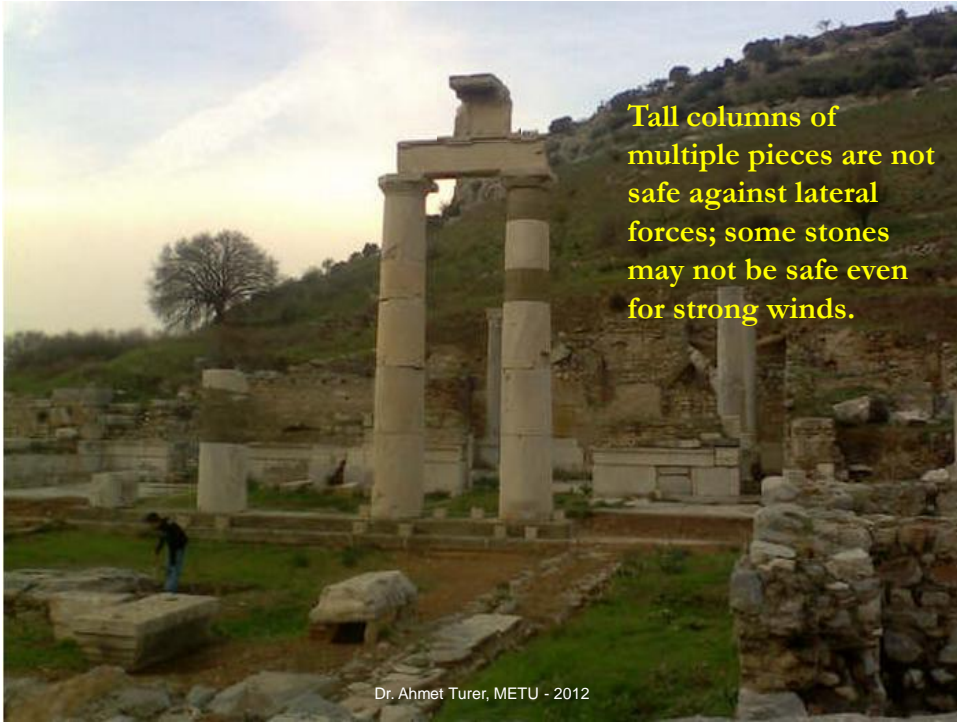
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## Dilemma?

- Should we leave them vulnerable and untouched until they collapse, then we can rebuilt (broken/unbroken) pieces (pray that it won't injure or kill anyone) ?
- Provide enough (or sometimes excessive) intervention to stabilize structures and provide some minimum level of structural safety?

too Romantic X too Rational

**is an intermediate approach possible?**

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## Preliminary Conclusions

- Historic structures and monuments often times pose danger for their own structural safety as well as can cause deadly harm to people around them. They should be repaired/strengthened.
- Risk of injury and death during repair/strengthening work on historic structures exist (helmet / hard head won't help in this case).
- Stability should be maintained by proper means.
- Analytical modeling can give hints.
- Monitoring may be a tool for understanding forecasting slow progressive cracks, tilts, etc.

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## We have to take some risk at some level !

“Protective scaffolding is in all cases erected beneath structures that are in danger of collapse. If we cannot find someone to erect a safety scaffolding because of safety then we might as well find a new line of business to go into as these types of projects will be impossible. Clearly they are not.”

Steve Kelly

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Thank you for your attention; I would be happy to provoke/promote any positive constructive discussion about (structural and site) safety issues on historical constructions and monuments.

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