

**COST E55 – Helsinki, March 2008**

# **Structural failure in a wider context**

*An informal discussion*

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# James Amrhein on structural engineering:

(former director of the Masonry Institute of America)

Structural Engineering is the art and science of

- molding **Materials** we do not fully understand;
- into **Shapes** we cannot precisely analyze;
- to resist **Forces** we cannot accurately predict;
- all in such a way that the society at large is given no reason to suspect the extent of our ignorance.

Amrhein's definition recognizes that

Successful engineering design requires experienced-based professional judgements, and that lessons learned from failures or accidents are extremely useful in clarifying uncertainties and leading to improvements in the design process.

**→ We need to know about the failures**

# The aim is to

collect, organize, store and present relevant information about **all** structural failures “of a certain severity” in an orderly and systematic way.

NOTE: Analyzing the information is beyond this discussion

# Questions

- Definition of failure
- Type and amount of information
- Availability and anonymity
- Information dissemination
- Organization, responsibility and funding

# Definition of failure

- Distinguish between failure and performance deficiency?
- Failure means collapse or partial collapse – structural repair required
- Only “engineered” structures of a certain size and/or cost?
- “Public” buildings only?

# Type and amount of information

- Description of structure
- Type of failure
- Cause of failure
- Pictures and drawings
- Compact and standard format
- References to more detailed info.

# Availability and anonymity

- Transparency
- Sensitive information? If so, what?
- Confidentiality? If yes, why?
- Answers depend on timing?  
distinguish between the past and the future
- Goal: all relevant information ought to be generally available



# Information dissemination

- Database accessible on the web?
- Statistics?
- Specialized reports, meetings, journals?
- ASCE:
  - Technical Council on Forensic Engineering
  - Journal of Performance of Constructed Facilities

# Organization, responsibility and funding

- Common European format, but national “projects”?
- Operated by government agency or research organization?  
Norway: BE (National Office of Building Technology and Administration)
- Funding: Government and/or EU?

# Failure report - part 1

<b>STRUCTURE</b>	<p><b>Name:</b></p> <p><b>Place:</b></p> <p><b>Type:</b></p> <p><b>Built (date):</b></p> <p><b>Alterations:</b> (what and when)</p> <p><b>Size (<math>b \times l \times h</math>):</b></p> <p><b>Structural system:</b></p> <p><b>Miscellaneous:</b></p>
<p><i>Picture(s) and/or drawing(s)</i> <i>(use additional page if necessary)</i></p>	

## Failure report - part 2

<b>FAILURE</b>	<p><b>Time:</b></p> <p><b>Type of:</b></p> <p><b>Extent of:</b></p> <p><b>Human injury:</b></p> <p><b>Loading:</b> (at failure)</p>
<p><i>Picture(s) and/or drawing(s)</i> <i>(use additional page if necessary)</i></p>	

### Failure report - part 3

<b>CAUSE(S)</b>	<b>Primary:</b>
	<b>Secondary:</b>
	<input type="checkbox"/> conclusive <input type="checkbox"/> inconclusive
	<input type="checkbox"/> design error <input type="checkbox"/> construction error <input type="checkbox"/> inferior material <input type="checkbox"/> overloading <input type="checkbox"/> other (elaborate)
	<b>Code issue(s):</b>
<b>Legal issue(s):</b>	

<b>Source / reference(s):</b>
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<b>Comments:</b>
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<b>Prepared by:</b>	<b>Date:</b>
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