Structural Reliability Prof. Baidurya Bhattacharya Department of Civil Engineering Indian Institute of Technology, Kharagpur

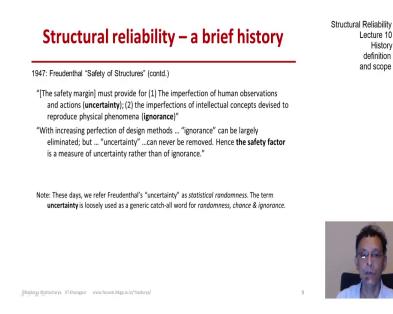
Lecture –86 History Definition and Scope (Part - 04)

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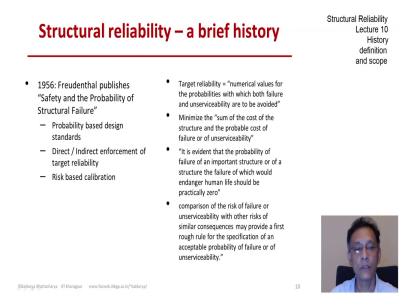
As the electronics industry was investigating the reliability of its products in the 50's, 60's and beyond. The structural engineering community was also playing the pioneering role in formulating the safety of structures on a probabilistic platform. And the effort was led by Professor M. Freudenthal with the publication of his famous paper the safety of structures in 1947. What I have done here is taken out one or two sentences from that paper which identifies the key concepts of measurement uncertainty the difference of randomness and ignorance acknowledges statistical variations in load and strength and calls for a probabilistic basis of the factor of safety.

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If we continue reading that paper then professor Freudenthal clearly makes a distinction between uncertainty which we now understand as statistical variations versus ignorance which we now understand as epistemic uncertainty modeling uncertainty etcetera.

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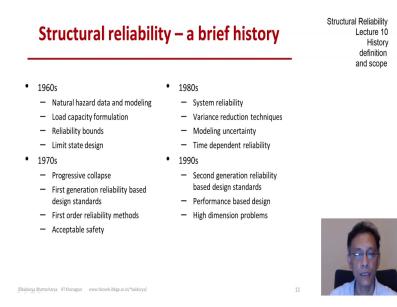


A few years later Freudenthal published in 1956 his paper safety and the probability of structural failure in which he developed these concepts in far greater detail and we see the concepts of probability based design standards the seed of that idea and particularly his understanding on target reliability. How to enforce that target reliability in design and how to calibrate that target

reliability based on risks.

And in fact he clearly points out the relation between acceptable safety, safety standards and the consequences of failure.

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The subject of structural reliability grew in the 60's and beyond we see an emphasis on limited design natural hazards, data collection and modeling and the load capacity formulation that we do today. In the 1970s there was emphasis on development of reliability-based codes which we now call the first generation design standards a focus on progressive collapse led by the Ronan point disaster

The development of the first order reliability methods or form which we will study later in this course and continued investigation on acceptable safety or target reliability. There were emphasis on systems reliability variance reduction and development of time-dependent reliability concepts from a capacitive demand point of view which again we will look later in this course that was in the 1980s.

The 1990s saw refinement of the design standards the introduction of the concepts of performance-based design and a look at high dimension problems in reliability.

Structural reliability – a brief history	Structural Reliability Lecture 10 History definition and scope
• 2000s	
 Nonlinear analyses 	
 Robustness 	
- Resilience	
 Interaction with other disciplines like economics, sociology 	
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In this century we see the subject evolving into non-linear analysis the concepts of robustness, resilience and we see more and more interdisciplinary work taking place between structural safety and economics and sociology.