Structural Reliability
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Lecture –07
Introduction (Part - 07)

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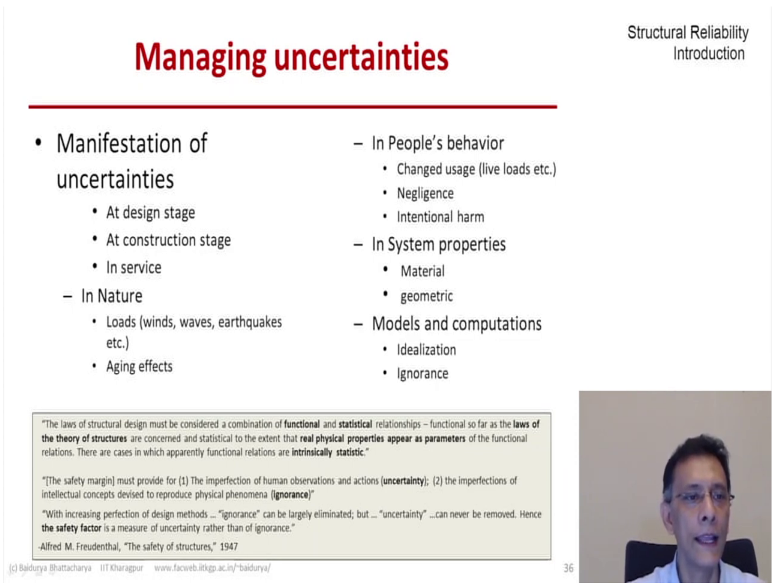

Now in the context of structural systems what are these uncertainties that we must be aware of and where are they? You will find them in all stages the design stage the construction stage and throughout the structure service life. You will find them in nature natural hazards and processes that cause aging we find them in the behavior of people who use them and are supposed to take care of them in the strength properties of the system in models through which we analyze the structural systems and the computations that we perform in order to get the answers.

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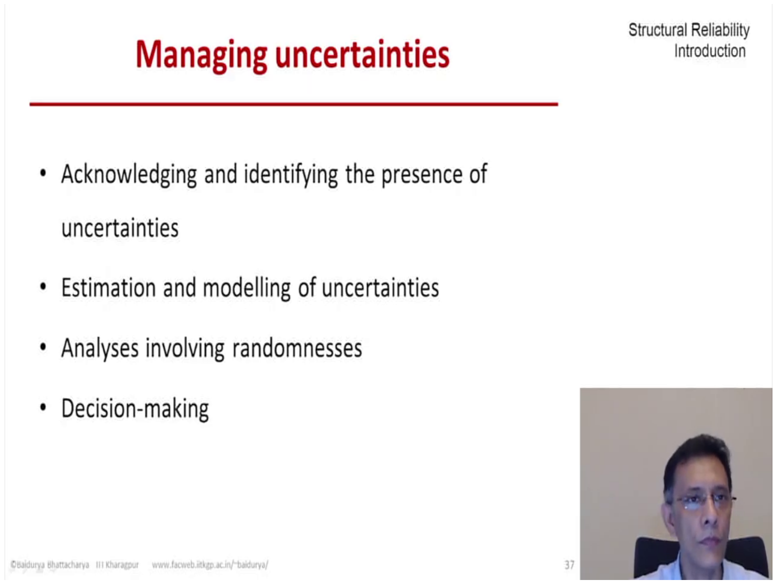

So, once we acknowledge and identify the presence of these uncertainties how do we handle them and provide the best engineering solutions. The first important step is to estimate and model these uncertainties appropriately through the using theory of probability through random variables, stochastic processes, random fields as appropriate. Analyze the structure by including all relevant randomness's and then take the best decisions.

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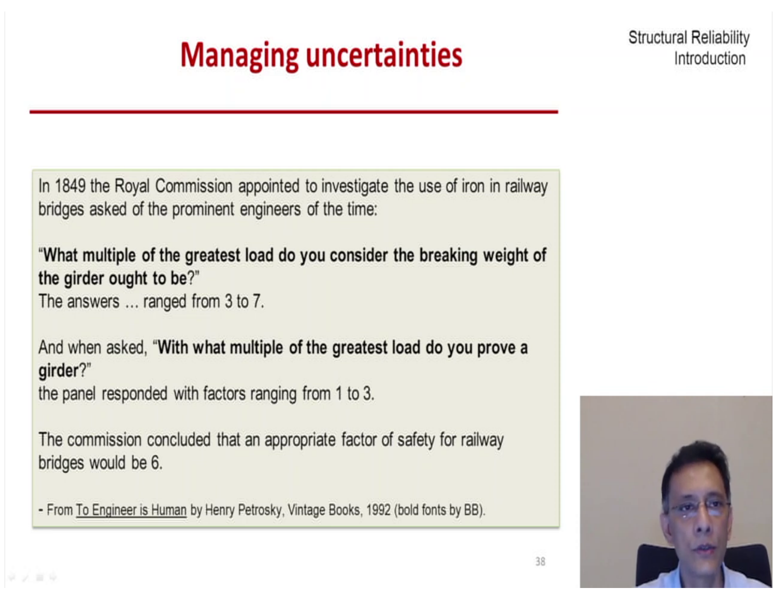

Now this thinking is not new as early as the middle of the 19th century engineers were trying a systematic method to find factors of safety and counter these uncertainties.

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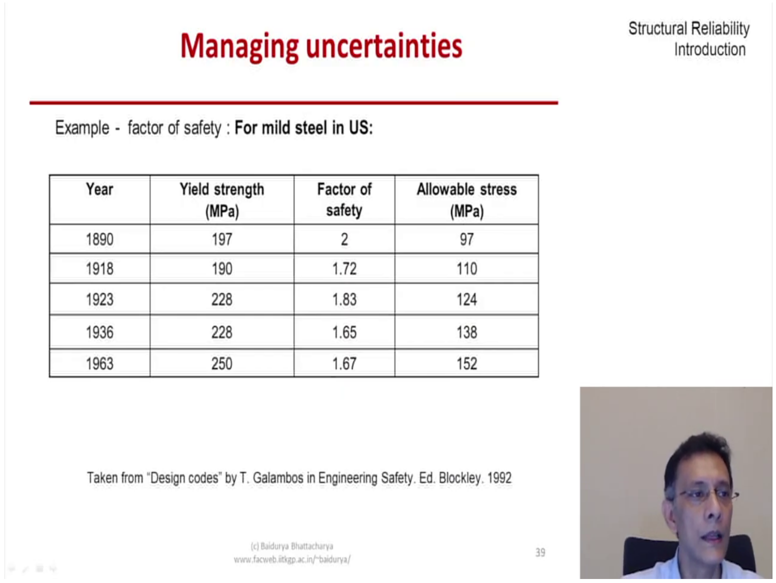

This table which shows the evolution of factor of safety for mild steel in the US in the starting from the late 19th century to the middle of the 20th century it also reflects the same thought process to be able to ensure against all that might go wrong but not waste resources in the process. And the sudden and temporary decrease in the fact of safety during the middle of the world war one is a testament to that thinking.

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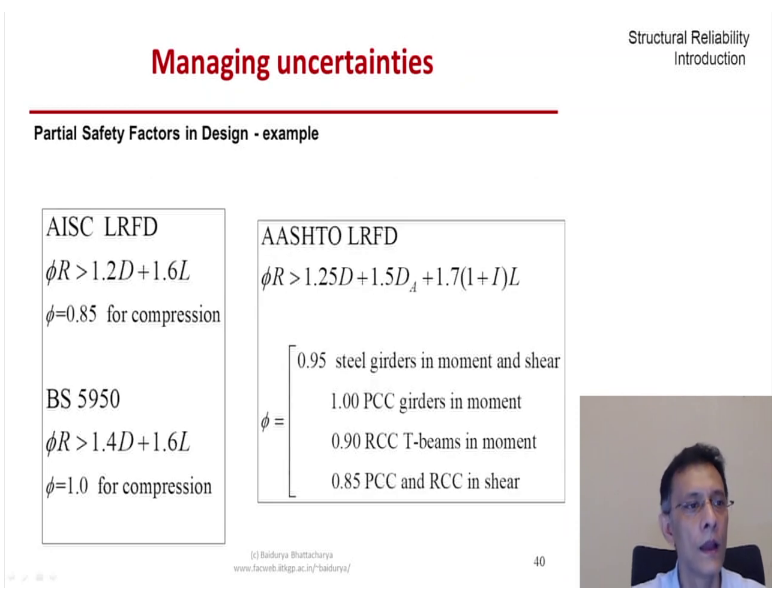

More recently we see that the dawn of partial factors of safety not just one safety factor but more than one to account for multiple sources of uncertainty the AISC LRFD the load and resistance factor design the old British standard the ASHTO LRFD.

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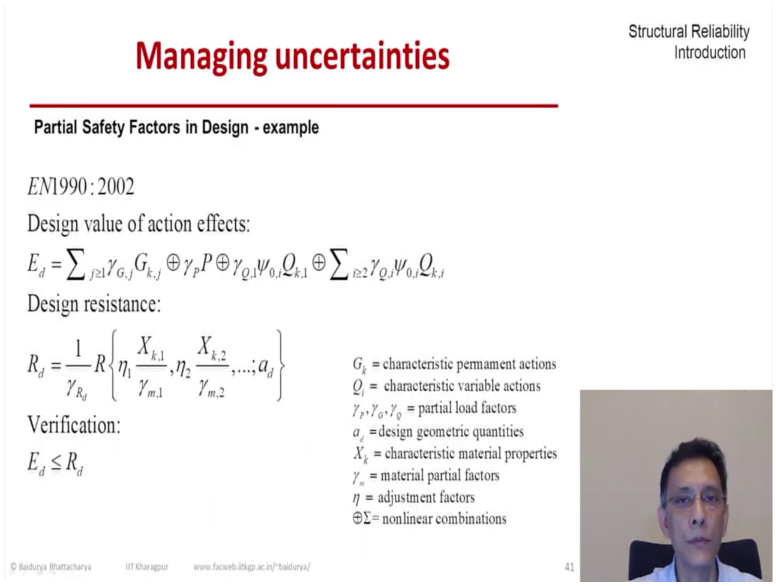

And more recently the EURO codes that we use today.