Lecture –241
Target Reliabilities (Part - 04)

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So this concern of not wanting to end up comparing apples with oranges made the early investigators approach the problem of setting target reliabilities very gingerly. Although the problem had been well formulated for at least 20 years before the first reliability-based codes came out in the 1970s and 1980s. So, as an example let us take a look at the classical example that we have talked about often Freudenthal's 1956 paper.

So, clearly we see the understanding that the target reliability should be a numerical value of a probability in fact probabilities because there was the distinction made between failure and unserviceability which is basically the two major groups of limit states that we have been talking about the life safety or ultimate or collapse type which is failure and the functionality or serviceability that we are talking about which is the unserviceability term mentioned here.

Then we see the idea that there could be a cost minimization approach and so, the sum of the cost

of the structure which presumably the construction cost and the probable cost of failure or unserviceability. So, that is in other words what we just described would be the expected cost which would be the failure cost times the probability of failure. And then when talking about important structures or failures that lead to loss of life then the author was very conservative.

And in fact suggested that such failure probabilities should be practically zero although now we have moved away from that and we do agree and we do accept the probability of collapse or endangering life safety would be greater than zero but small enough so that we could live with the risks. And then an understanding that we do not have the match between the computed probabilities and the actual failure probabilities that they cannot be compared on the same basis in other words that led fraud.

And thought to say very clearly that until we are ready for that we should be able to make an indirect comparison ah and so, if we know probabilities of failure with similar consequences that could be the basis of setting target reliabilities. So, if we now have to group together all the different ways that exist for setting target reliabilities the very first one would be calibration based and we are going to look at that in detail next slide onwards.

And there are other methods which are lost based and among the losses that are considered would be purely fatality losses that is loss of life or there could be consideration of economic losses instead and then there are other methods which involve an optimization of total cost or benefit cost ratio and such uh. So, now we look at calibration based approaches which is the oldest and the most traditional and most widely used approach to setting target reliability.

And we present a survey of both the reliability that are implied in existing codes as well as the numbers that have been recommended by experts. So, let us now look at the method of using calibration to set target reliabilities.