A Review on Design Considerations for Engineering Materials

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***Abstract*— This paper is dealing with design concepts while specifications, material selection, bill of materials, dimensions according to load withstanding capability and all. We can design any components by considering factor of safety and strain concepts only for better solutions and results. Further these results are helpful for analyzing predictions whatever we obtained models. Probability of failure is less in case 1**

***Keywords*— Factor of safety, strain concept, Probability failure.**

I. INTRODUCTION

These are a good addition to traditional analysis. The standard deviations of the parameters can be calculated with the same amount of data are frequently used in situations with significantly variable degrees of uncertainty appropriate factors of safety case 1:

If we take as an example of crane hook of factor of safety 1 and 10 for two specimens as in case of new trend current and traditional in both cases traditional specimen live longer, long durability, service factor as factor of safety 10. Most of the engine components parts factor of safety is considered for design as 10. The crane will lift maximum capacity beyond predicted value. Suppose designed allowable tons capacity if he mention 2 tons, definitely it will lift 2.5 tons also with safety proper work load

Fig 1. crane hook

Factors of safety operate as a buffer against computation uncertainties and the reality that full accuracy is impossible to achieve. Over time, conventions have developed on what factor of safety values are appropriate for specific scenarios. For long term slope stability, utilise F= 1.5. For bearing capacity, most geotechnical engineers recommend F = 2.5 to 3.0, as well as the same range of values for erosion and pipeline safety. Using the same factor of safety for all long term slope stability or bearing capacity applications is a "one size fits all" approach that will almost certainly result in inadequate factors of safety in some circumstances. A more reasonable approach would consider the uncertainties in the values used in computations, as well as the consequences of failure or poor performance. This can be achieved, at least roughly, by selecting safety criteria that satisfy the following relationship: (Reduction in pf associated with more reliable design)×(cost of failure)<(added cost of more reliable design Interpretation of ‘‘Probability of Failure’’

As previously stated, not all "failures" are disastrous. Some are better described as ‘‘unsatisfactory performance.’’ It is justified to employ reduced safety factors when the product of the likelihood of failure times the cost of failure or poor performance is negligible. Higher factors of safety are rational where the product of the chance of failure times the cost of failure or unsatisfactory performance is substantial. The quantities in (9) cannot be exactly calculated. Even though approximations and judgement will be required when applying this expression to realworld settings, the relationship described by this expression gives a framework for determining appropriate factors of safety. The retaining wall in Figure 1 is an example of this.

Unless the impacts of sliding were exceedingly severe, a 1% possibility of poor performance due to sliding would probably not justify the cost of raising the factor of safety above 1.5. However, in the instance of the LASH Terminal slope in Fig. 1, an 18 percent chance of failure, multiplied by the anticipated cost of failure, would have justified a greater expenditure to enhance the factor of safety and lower the risk of failure. It is advocated that probability of failure be used in addition to factor of safety rather than as a replacement. It is better to compute both the factor of safety and the chance of failure than to compute either one alone

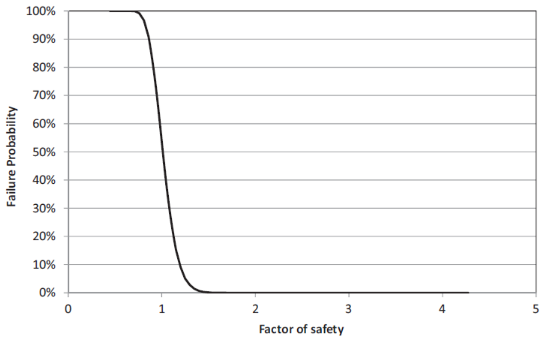

Fig 2.Factors of safety vs. probability of failure for concrete

STRAIN CONCEPT

Suppose we designed any material component as an best example of crane hook, without considering factor of safety i.e., 1, then applying strain concept we built required optimum results. This is how by means is if we know the changes in dimensions, it may be length, width , height etc.by loading results as strain we obtain good results as same as consideration of factor of safety. In crane hook example it will lift only predicted load 2 tonne after it will fail by exceeding load or it may failure improper operation.

CONCLUSION

1. We design any material component by taking factor of safety
2. Also we can design by taking strain concept
3. Both the cases material is good as first one case for long life span
4. Probability of failure is less in case:1
5. Almost civil construction fields case 1 factor of safety plays vital role
6. For less lower loadings case 2 strain concept is applicable is good

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