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RECENT TRENDS IN CIVIL ENGINEERING

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1.ABSTRACT :

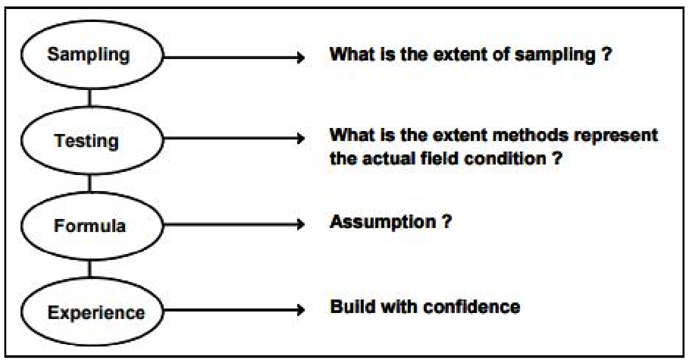
Intend subjectively to understand 'recent' as meaning 'post-world war IT'. However the recent Civil engineer still depends on the control of a well defined streak of common sense, there, has been an increase in the range of techniques obtainable for design and construction, and this permits more complicated work to be under taken safely. Unfortunately this often increases, rather than reduces, the inevitable dilemmas facing the engineer, for, at its crudest, he may have to choose between a simple structure with a trouble-free life of many decades and a more refined and cheaper structure with a shorter life requiring continuous and expensive maintenance. He may also have to take note of the diverse talents, resources, and particular favorite methods of the various contractors who will tender for the work. There is-no direct solution to any of these problems, and in any event the solution would be different in different countries, for some nations are convinced of the rightness of a 'scrap and rebuild' economic policy while others are certain that it is a good thing to build for future generations at some cost in present inconvenience.

KEYWORDS: *Civil, engineer, problems, economy, construction.*

2.INTRODUCTION :

The trend in civil engineering today more than ever before is to provide

1. Economical or solid plan at specific degrees of security,
2. Use new materials in development. When more up to date materials are being utilized in structural designing plan, there is a need to appreciate how much the construction is protected, and
3. Consider vulnerabilities in plan. One needs to perceive that there are numerous cycles like information assortment, investigation and plan in structural designing frameworks which are arbitrary in nature. Plan of numerous offices, for example, structures, establishments, spans, dams, parkways, air terminals, seaports, seaward designs, burrows, clean landfills, unearthing and so forth need to address the plan issues judicious.
4. The stacking in structural designing frameworks are totally obscure. Just a portion of the highlights of the stacking are known. A portion of the instances of stacking are recurrence and event of quakes, development of ground water, precipitation example, wind and ice loadings and so on Every one of these stacking are irregular in nature, and on occasion they make over-burdening circumstance. What we have been doing as such far can be schematically displayed as follows:



At all stages indicated above, there is an element of uncertainty with regard to the suitability of the site in terms of soils, construction materials, which we transfer to a different level using a set of expressions to obtain the desired quantities such as the floor capacity, allowable loads in buildings etc.

2.1. Probability of failure and reliability

The disappointment of structural designing frameworks is a meaning of choices making under dubious conditions and diverse sort of disappointments like transitory disappointments, upkeep disappointments, disappointments in plan, disappointment because of normal risks should be tended to. For instance, an extension breakdowns which is a lasting disappointment, in case there is a gridlock on the scaffold, it is an impermanent disappointment. In case there is flood in a channel or a line because of weighty precipitation, it is an impermanent disappointment. Accordingly meaning of disappointment is significant. It is communicated as far as likelihood of disappointment and is surveyed by its failure to play out its proposed work enough on interest for a while under explicit conditions. The opposite of likelihood of disappointment is called dependability and is characterized as far as the accomplishment of a framework or unwavering quality of a framework is the likelihood of a framework playing out its necessary capacity sufficiently for determined timeframe under expressed conditions.

1. Unwavering quality is communicated as a likelihood
2. A nature of execution is normal
3. It is normal throughout some stretch of time
4. It s expected to perform under indicated conditions

2.2 Uncertainties in Civil engineering:

In managing plan, vulnerabilities are unavoidable. Vulnerabilities are characterized into two expansive sorts. Those related with acknowledged capriciousness and those related with errors in our expectation and assessment of the real world. The previous kind is known as a leatory type where as the last is called epistemic sort. Regardless of the grouping understanding the idea of haphazardness is important. The idea of the main kind emerging out of nature (for instance, seismic tremor and precipitation impacts) should be taken care of objectively in plan as it can't adjusted and the second one should be decreased utilizing fitting expectation models and examining strategies.

The reaction of materials like cement, soil and rock to stacking and dumping is of essential worry to the structural specialist. In a wide range of issues, the specialist is regularly managing deficient data or questionable conditions. It is essential for the architect to know about numerous suppositions and glorifications on which techniques for investigation and configuration are based. The utilization of insightful instruments should be joined with sound designing judgment dependent on experience and perception.

Over the most recent twenty years the requirement for taking care of complex issues has prompted the turn of events and utilization of cutting edge quantitative techniques for demonstrating and examination. For instance, the flexible limited component technique has end up being significant in issues of soundness, deformity, quake reaction examination and so on The fast improvement of PCs and registering strategies has worked with the utilization of such techniques. Notwithstanding, it is notable that the data got from refined strategies for examination will be valuable just if far reaching inputs information are accessible and just if the information are solid. Accordingly, the subject of vulnerability and irregularity of information is fundamental to plan and investigation in structural designing.

Choices must be made based on data which is restricted or deficient. It is, along these lines, attractive to utilize techniques and ideas in designing arranging and plan which work with the assessment and investigation of vulnerability. Conventional deterministic techniques for examination should be enhanced by strategies which utilize the standards of measurements and likelihood. These last strategies, frequently called probabilistic techniques, empower an intelligent examination of vulnerability to be made and give a quantitative premise to surveying the unwavering quality of establishments and designs. Therefore, these techniques give a sound premise to the turn of events and exercise of designing judgment. Down to earth experience is consistently significant and the observational methodology can end up being important; yet, the ability to profit with these is enormously upgraded by normal investigation of vulnerability.

2.3 Types of uncertainty:

There are numerous vulnerabilities in common geotechnical designing and these might be ordered into three fundamental gatherings as follows:

(a) The first gathering comprises of vulnerabilities in quite a while like modulus of cement, steel dependability of cement and steel in various condition like strain and flexure, soil unit weight, attachment, point of inner grinding, pore water pressing factor, compressibility and porousness.

For instance in a supposed homogeneous soil, every boundary might shift essentially. In addition, normal media, for example earth masses are regularly heterogeneous and an isotropic and the dirt profile is mind boggling because of discontinuities and minor land subtleties.

(b) The second gathering comprises of vulnerabilities in loads. Under static stacking conditions, one is worried about dead and live burden and there are normally more vulnerabilities according to live loads. Constructions and soil masses may likewise be exposed to dynamic burdens from tremors, wind and waves. Huge vulnerabilities are related with such irregular burdens. Frequently the vulnerabilities related with static burdens might be irrelevant in contrast with those related with material boundaries. Then again, vulnerabilities related with dynamic burdens might be of a similar significant degree or considerably more noteworthy than those related with material boundaries. It ought to likewise be noticed that under powerful loads, the size of material boundaries might change altogether.

For instance, the shear strength of a dirt declines during cyclic stacking and, all things considered, there are extra vulnerabilities concerning geotechnical execution.
(c) The third gathering comprises of vulnerabilities in numerical demonstrating and techniques for investigation. Each model of soil conduct depends on some admiration of genuine circumstances. Every technique for examination or configuration depends on working on suspicions and self-assertive elements of security's are regularly utilized.

3 DETERMINISTIC AND PROBABILISTIC APPROACHES

3.1. Deterministic approach

A methodology dependent on the reason that a given issue can be expressed as an inquiry or a bunch of inquiries to which there is an unequivocal and remarkable answer is a deterministic methodology. For instance, the idea that special numerical connections administer mechanical conduct of soil mass or a dirt design framework..

3.2. Probabilistic approach

A probabilistic methodology depends on the idea that few or changed results of a circumstance are feasible to this methodology vulnerability is perceived and yes/no sort of answer to an inquiry concerning geotechnical execution is viewed as shortsighted. Probabilistic displaying focuses on investigation of a scope of results given information. As needs be the portrayal of an actual circumstance or framework incorporates arbitrariness of information and different vulnerabilities. The chose information for a deterministic methodology would, overall not be adequate for a probabilistic investigation of a similar issue. The crude information would need to be coordinated in a more legitimate manner. Regularly extra information would be for significant probabilistic investigation.

3.3 Risk and reliability

In engineering practice, we routinely encounter situations that involve some event that might occur and that, if it did, would bring with it some adverse consequence. We might be able to assign probability to the occurrence of the event and some quantified magnitude or cost to the adversity associated with its occurrence. This combination of uncertain event and adverse consequence is the determinant of risk. In engineering practice to assess risk, three things need to be defined.

1. Scenario,
2. Range of consequences,
3. Probability of the event’s leading to the consequences.

Based on the above, the risk analysis attempts to answer three questions:
1. What can happen?
2. How likely is it to happen?
3. Given that it occurs, what are the consequences?

Thus, in engineering, risk is usually defined as comprising:
- A set of scenarios (or events), $E_i, i = 1, \dots\dots, n$;
- Probabilities associated with each element, P_i and
- Consequences associated with each element C_i

The quantitative measure of this risk might be defined in a number of ways.

3.4 Acceptable Risks:

In engineering as in other aspects, lower risk usually means higher cost. Thus we are faced with question “how safe is safe enough” or “what risk is acceptable?”. In the United States, the government acting through Congress has not defined acceptable levels of risk for civil infrastructure, or indeed for most regulated activities. The setting of ‘reasonable’ risk levels or at least the prohibition of ‘unreasonable’ risks is left up to regulatory agencies, such as the Environmental Protection Agency, Nuclear Regulatory Commission, or Federal Energy Regulatory Commission. The procedures these regulatory agencies use to separate reasonable from unreasonable risks vary from highly analytical to qualitatively procedural.

Four observations made in literature on acceptable risk are:

1. The public is willing to accept 'voluntary risks roughly 1000 times greater than 'involuntary' risks',
2. Statistical risk of death from disease appears to be a psychological yardstick for establishing the level of acceptability of other risks
3. The acceptability of risk appears to be proportional to the third—power of the benefits,
4. The societal acceptance of risk is influenced by public awareness of the benefits of an activity, as determined by advertising, usefulness and the number of people participating. The exactness of these conclusions has been criticized, but the insight that acceptable risk exhibits regularities is important.

4.0 Risk perception:

People view risks not only by whether those risks are voluntary or involuntary, or by whether the associated benefits outweigh the dangers but also along other dimensions. Over the past twenty years researchers have attempted to determine how average citizens perceive technological risks. Better understanding of the way people perceive risk may help in planning projects and in communication. The public's perception of risk is more subtle than the engineers.

Table: Risk perception

Separation of risk perception along two factor dimension	
Factor I : Controllable vs. Uncontrollable	
Controllable	**Uncontrollable**
Not dread	Dread
Local	Global
Consequences not fatal	Consequences fatal
Equitable	Not equitable
Individual	Catastrophic
Low risk to future generation	High risk to future generation
Easily reduced	Not easily reduced
Risk decreasing	Risk increasing
Voluntary	Involuntary
Factor II : Observable vs. Unobservable	
Observable	**Unobservable**
Known to those exposed	Unknown to those exposed
Effect immediate	Effect delayed
Old risk	New risk
Risk known to science	Risk unknown to science

Basic Probability Concept

By probability we are referring to a number of possibilities in a given situation and identify an event relative to other events. Probability can be considered as a numerical measure of likelihood of occurrence of an event, relative to a set of alternatives. First requirement is to

1. Identify all possibilities on a set
2. Identify the event of interest

In this context elements of set theory are very useful.

Elements of set theory

Many Characteristics of probability can be understood more clearly from notion of sets and sample spaces.

Sample space

Sample space is a set of all possibilities in a probabilistic problem. This can be further classified as continuous sample space and discrete sample space. Again discrete sample space can be further classified as finite and infinite cases.

Discrete Sample Space:

Example for finite case:

1. The winner in a competitive bidding
2. The number of raining days in a year

Example for Infinite case:

1. Number of flaws in a road
2. Number of cars crossing a bridge

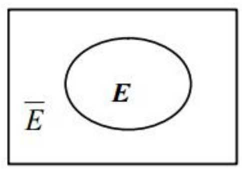
Sample point is a term used to denote each of the individual possibilities is a sample point

Continuous Sample Space

If number of sample points is effectively infinite, then it can be called as continuous sample space. For example, the bearing capacity of clay deposit varies from 150 to 400 kPa and any value between them is a sample point.

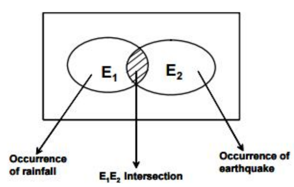
Venn Diagram

A sample space is represented by a rectangle, an event (E) is represented by a closed region. The part outside is complimentary event $\bar{E}$



Combinations of events

Example



If an event E1 occurs n1 times out of n times , it does not occur n_2 times. i.e. $n_2 = n - n_1$ for which the probability of non-occurrence being $\frac{n_2}{n}$

$$P[E_1 \cup E_2] = \frac{n_1}{n} + \frac{n_2}{n} = P[E_1] + P[E_2] \quad (6)$$

Multiplication rule and Statistical Independence The occurrence (or non-occurrence) of one event does not affect the probability of other event, the two events are statistically independent If they are dependent then

$$P[E_1 E_2] = P\left[\frac{E_1}{E_2}\right] P[E_2]$$

$$= P\left[\frac{E_2}{E_1}\right] P[E_1]$$

If they are independent then, $P[E_1 E_2] = P[E_1] P[E_2]$ (7)

The above equation gives the probability of occurrence of $P\left[\frac{E_i}{A}\right]$ *if* $P\left[\frac{A}{E_i}\right]$ *is known*I.

$$P\left[\frac{E_i}{A}\right] = \frac{P\left[\frac{A}{E_i}\right]P[E_i]}{P[A]} \qquad (9)$$

Hence $\frac{P[E_1 \cup E_2]}{P[E_2]} = P_1[E_1]$

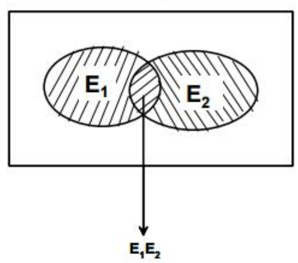
➔ $P[E_1 \cup E_2] = P[E_1]P[E_2]$ ---- Multiplication Rule

A generalized multiplication rule is

$$P[A_1 A_2 A_3 \ldots\ldots A_N] = P[A_1]P[A_2]P[A_3]\ldots\ldots P[A_N] \qquad (10)$$

Conditional Probability The occurrence of an event depends on the occurrence (or non-occurrence) of another event. If this dependence exists, the associated probability is called conditional probability. The conditional probability E_1 assuming E_2 occurred $P\left[\frac{E_1}{E_2}\right]$ means the likelihood of realizing a sample point in E_1 assuming it belongs to E_2 (we are interested in the event E_1 within the new sample space E_2)

$$P\left(\frac{E_1}{E_2}\right) = \frac{P(E_1 E_2)}{P(E_2)}$$



Total probability theorem and Bayesian Probability There are N outcomes of an expression A_1, A_2, A_3…………., A_n which are mutually exclusive and collectively exhaustive such that

$$\sum_{i=1}^{N} P[A_i] = 1$$

For the sample space N=5 and there is an other event B which intersects A_2, A_3 A_4 and A_5 but not A_1. For example, the probability of joint occurrence B and A_2

$$= P[BA_2] = P[A_2]P\left[\frac{B}{A_2}\right]$$

The probability of joint occurrence of B is dependent on the outcome of A_2 having occurred. Since A_2 precipitates that past of B that it overlaps, It is said to be a prior event. The occurrence of the part of B that overlaps A_2 is called posterior. Now considering that we need to determine the occurrence of B as it is a joint event with A_2, A_3 A_4 and A_5, one can write,

$$P[B] = \sum_{i=1}^{N} P[A_i]P\left[\frac{B}{A_i}\right] \quad \textit{Where i is from 2 to 5} \qquad (11)$$

The above equation is called Total Probability Equation.

We have already examined that

$$P[AB] = P[B]P\left[\frac{A}{B}\right] = P[A]P\left[\frac{B}{A}\right]$$

Hence

$$P[A_i B] = P[A_i]P\left[\frac{B}{A_i}\right] = P[B]P\left[\frac{A_i}{B}\right]$$

$$P\left[\frac{A_i}{B}\right] = \frac{P[A_i]P\left[\frac{B}{A_i}\right]}{P[B]}$$

Using total probability theorem which states that

$$P[B] = P[A_i]P\left[\frac{B}{A_i}\right]$$

$$\textit{Hence} \quad P\left[\frac{A_i}{B}\right] = \frac{P[A_i]P\left[\frac{B}{A_i}\right]}{\sum_{i=1}^{N} P[A]P\left[\frac{B}{A_i}\right]} \qquad (12)$$

This is called Bayesian theorem. This equation is very useful in civil engineering and science where in based on the initial estimates, estimates of outcome of an event can be made. Once the results of the outcome known, this can be used to determine the revised estimates. In this probability of the event B is estimated knowing that its signatures are available in events A_i .

5. CONCLUSION:

Some of the examples of loading are frequency and occurrence of earthquakes, movement of ground water, precipitation example, wind and ice loadings and so on Every one of these stacking are arbitrary in nature, and now and again they make over-burdening circumstance. The disappointment of structural designing frameworks is an outcome of choices making under dubious conditions and distinctive sort of disappointments like impermanent disappointments, upkeep disappointments, disappointments in plan, disappointment because of normal perils should be tended to.

The opposite of likelihood of disappointment is called dependability and is characterized as far as the accomplishment of a framework or unwavering quality of a framework is the likelihood of a framework playing out its necessary capacity sufficiently for determined timeframe under expressed conditions. Hence, the subject of vulnerability and arbitrariness of information is integral to plan and investigation in structural designing. These last techniques, frequently called probabilistic strategies, empower an intelligent examination of vulnerability to be made and give a quantitative premise to evaluating the dependability of establishments and constructions.

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