NEWS AND VIEWS

A Powerhouse on the Sands

If the vast expanse of the Thar desert in north-western India was harnessed to produce solar energy, it could lightup five of Asia's most populated cities. Scientists say the endless sands of Rajasthan could well earn the distinction of being the 'biggest' solar powerhouse by 2010, producing 10,000 MW of electricity. A charged Rajasthan Energy Development Agency (REDA) has started the spadework on an ambitious project. Says director Prabhat Dayal, "A major chunk of the desert, about 35,000 sq.km. will be declared a Solar Energy Enterprise Zone like the one in Nevada (US)." Dayal thinks that if the State was to install solar collectors in just one per cent of its desert which stretches over 200,000 sq.km., we could generate 6,000 MW of electricity. A city the size of Delhi with 10 million people needs 1,800 MW. This solar bowl of the desert will become the world's biggest centre for solar power generation, research and development.

The earth receives some 4,000 trillion kilowatt hours of electromagnetic radiation from the sun about hundred times the world's current energy consumption needs. At present, a 354 MW solar power project in southern California is the world's largest, providing 90 percent of the global solar energy.

Inspired by the progress made in the US, Australia, Japan, Britain and China, forerunners in the field of solar energy application, the authorities in Rajasthan invited applications from 29 countries for setting up power stations between 50 and 300 MW on a "build , operate and maintain basis". Giants like US-based Amoco Corp., and Enron, Energen Corp., Germany's Schailac Bergermann and India's Sun Source have already booked their spots under Rajasthan's sun.

This technology converts sunlight directly into electrical power with a solar cell small versions of which are commonly used in calculators.

-Excerpts from a report by Neena Bhandari
The Hindustan Times, May 8, 1996

Protecting the Green Cover for Hygienic Development

The term 'green' signifies environment protection. 'Green-sense' makes lot of sense in terms of money, too. There is more profitability and marketing advantage by going green, as has been demonstrated in the US, UK and Canada where 'green', or environment-friendly products are increasingly outselling the others in the same product category. With increasing awareness, people are totally rejecting chemical and synthetic products and those which cause harm to our environment. It's time to say no to the products which affect our forests, are difficult to dispose of production of which pollutes air or water, or which are a burden on energy network.

A step towards ushering in an era of green consumerism has been the introduction of the 'Eco mark' as the symbol of environment - friendly products. The Bureau of Indian Standards will issue this mark for several categories of consumables.

In the recent development, not only is the western market restricting products that are directly a strain on fast depleting resources at any stage of their manufacturing or usage, but the western markets have also shut their doors to products that involve abuse or exploitation of any element of the society. A recent example is the big 'no' to the carpets that were knotted by the nimble fingers of the children. The South-Asia has always been a treasure of natural resources.

-Excerpts, Standards India, vol. 9, 1995

Landslide Hazard Zonation Maps in Mountainous Terrains For Hygienic and Safe Hill Development

The mountain terrains such as Himalaya are generally characterised by steep slopes, high relative relief, weathered, fractured and folded rocks with unfavourable hydrogeological condition. The implementation of development schemes like road, dam building construction etc. often cause heavy environmental damages if the existing instabilities are not adequately accounted for.

A landslide hazard zonation (LHZ) map divides the land surface into zones of varying degrees of stability, based on the estimated significance of causative factors in inducing instability. If such multi/purpose terrain evaluation maps are used as a basis of planning the development schemes, it will help to select geo/environmentally sound sites which may pose minimum hazards of stability. The LHZ maps are prepared based on the basic causative factors of slope instability. The LHZ maps are useful for the following purposes :

a) To identify and delineate unstable hazard-prone areas, so that environmental regeneration programme can be initiated adopting suitable mitigation measures.

b) To help planners to choose favourable locations for sitting development schemes, such as buildings and road constructions. Even if the hazardous areas can be avoided all together, their recognition at the initial stages of planning may help to adopt suitable precautionary measures.

In view of the above, the Bureau of Indian Standards has taken up the formulation of one Indian Standard 'Guidelines for Preparation of Landslide Hazard Zonation Maps in Mountainous Terrain'. It has been decided to formulate this standard into three parts to cover different scales of mapping to take care of different extents of details as required depending upon the type and stage of various projects. The Part I 'Mega-Regional' shall cover a scale of 1:50 000 or more, Part 2 'Macro-Zonation and Risk Zonation' shall cover the scale 1:25000 to 1:50000 and Part 3 'Micro-Regional' shall cover a scale of 1:1000 to 1:2 000. The Part 2 'Macro Zonation and Risk Zonation' has already been finalised by the concerned technical committee of the Bureau for printing. For Landslide zonation in Rocky Hill Areas, another IS code on quantitative classification system of Rock mass - Guidelines Part 3-Determination of slope mass rating has been finalised for printing. Three codes on retaining walls have been finalised. IS 14243:1995 (Part I & II) on Selection and Development of site for building in hilly areas-Guidelines, have been printed. More than 50 codes are being drafted for hygienic and safe hill development.

-Standards India, Vol.9, Jan 1996

Retaining Wall for Hill Area

Relaining wall is a structure used to retain backfill and maintain difference in the elevation of two ground surfaces. Retaining wall could be effectively utilised to tackle the problem of landslide in hill area by stabilising fill slopes and cut slopes. From the initial construction cost considerations, one meter of extra width in filling, requiring retaining walls, costs much more constructing the same width by cutting inside the hill. However, considering the maintenance cost, progressive slope instability and environmental degradation from unprotected heavy excavations, the use of retaining walls on hill roads and terraces becomes essential. In view of this, the Bureau of Indian Standards has undertaken formulation of a series of National Standards in different Parts covering the guidelines for retaining wall for hill area. In this effort, the Bureau has prepared the draft of the first of this series of standards covering the guidelines for selection of various retaining walls to suit the site conditions.

This draft has recently been issued for wide circulation for eliciting public comments.

- Standards India-Vol. 9, January 1996

Canal Turning the Thar into a Grain Bowl in Rajasthan, India

The Indira Gandhi Canal Project, an Engineering marvel in the desert stretch from Ganganagar to Barmer along the Indo-Pak border, is fast changing the Thar desert into a "Grain bowl", bringing about 7,580 sq.kms of area under irrigation.

The gigantic canal project, started in 1985 and estimated to cost Rs 2,8750 million, is likely to be completed by the year 2005. The canal project is not only transforming the sand dunes into green area but also quenching thirst of settlers in its command area, besides many urban centres and villages in Bikaner, Churu, Ganganagar and Jodhpur districts through lift schemes.

The canal with a capacity of 8.60 million acre feet of water stretches from the Harike barrage at the confluence of Sutlej and Beas river in Punjab to Jaisalmer district of Rajasthan covering a distance of 649 kms. The areas irrigated by the Indira Gandhi Canal Project produced crops worth Rs. 8000 million last year. Farmers now grow crops like mustard, groundnut and bajra. Wheat, groundnut, sugarcane, cotton, mustard, gram and pulses production in the canal area match the levels in the most productive regions of the country today.

-Excerpts from the News,
The Hindustan Times, June 15, 1996

Earthquake in Kobe City, Japan on January 17, 1995

Japan is located in one of the most active seismic zones of the world. An earthquake of 7.2 magnitude hit kobe city and adjacent areas of Japan in the morning of January 17, 1995. Reddy et al. (1995) have given an overview of the disastrous event.

* Number of damaged buildings 75000 (approx.)
* Reasons for damage
  1. Houses, bridges, elevated tracks built to old standards.
  2. Fire
  3. Liquefaction
* Approximate duration of main shocks : 8-12 sec.
* Number of aftershocks 1000 (approx.)

The earthquake damage observations revealed that some residential buildings failed due to heavy roof. Heavy roofs were used in Kobe city to avoid wind problems. Some buildings got damaged due to the failure of intermediate storeys and some other collapsed due to failure of columns at the ground/parking area. Uneven settlement of columns due to liquefaction appeared to be the cause of failure at the ground/parking area. Besides, some monuments appeared to fail due to strong ground acceleration and to some extent torsional ground motion.

In Japan, the railway tracks and roads were laid on elevated bridges due to space shortage in cities like Kobe, Tokyo etc. In Hagishinada ward of Kobe city about 500 m span portion of the expressway toppled down. In another place, columns were badly damaged. This may be due to weak columns and strong girders, strong ground shaking or uneven settlement of columns due to liquefaction.

A man made port island subsidised as much as 60 cm as a result of liquefaction. Land subsidence which ranged in depth from 5-60 cm across the 440 hectare island was found on all roads, around all the buildings in the island. Buildings on the island designed to withstand liquefaction sustained no damage.

The survey of Transport Ministry's railway transport bureau showed that damage was due to difference in the firmness of the ground above and below of the tunnels.

In Japan, many huge industries are located along the sea coast and equipped with large size cranes. These are used for loading and unloading material to and from ships. These cranes are usually located on the rails. Due to this earthquake, liquefaction displaced the rails and resulted in failure of the cranes. Also several cranes were damaged due to top-heavy rocking vibration of the jib of the cranes. Most of the machines, tools and foundations designed to withstand liquefaction were safe. Pile foundation was adopted to support machine tools. Pile foundations are of two types, in one case foundation base and the piles are integrated into each other and in another foundation base is laid on the piles. The piles used in industry were driven into the ground to a depth of about 30 meters. In some industries, type one foundations were used and in such situations failures at the foundation bolts were noticed. In another type of industry, tilting of foundation along with the machine was observed. In this case it is suspected that the piles and the foundation base were not integrated to each other.

Industrial pipeline supports failed causing large ductile deformation in the pipe lines. The large deformation did not interrupt their function. Brittle pipe joints had also failed. The pipes connecting tanks failed because of uneven settlement of the ground below the tank and below the pipe supports.

The structures built according to current standards were found safe. Therefore,

updated codal methodologies/procedures can eliminate, to a great extent, the great damage and loss of life due to earthquakes.

- Excerpts from an article titled "The Great Hanshin Earthquake of January 17, 1995" by Reddy G.R., H.S. Kushwaha, Mahajan S.C. (all from B.A.R.C. Mumbai, India) and Prof. Kohei Suzuki of Tokyo Metropolitan University, Japan, Bull. Ind. Soc.Earth. Tech., Paper No. 353, Vol. 32, No.4, Dec. 1995.

Probable Influence of Tehri Reservoir load on Earthquakes of the Garhwal Himalaya

The mathematical simulation suggested by the authors of this research article shows that the Tehri reservoir load may produce relatively small changes in the stabilities of nearby seismogenic faults and lead to comparable small advancements or postponement in the times of occurrence of earthquakes of the Garhwal Himalaya.

A major apprehension is that the reservoir may trigger earthquakes. The study has been conducted with a view to examine the possibility of an adverse influence of the reservoir on local seismicity through numerical simulations.

It appears that the reservoir should have a small stabilising influence on those parts of the intracrustal thrust fault below the main central thrust where the next great earthquake of the Garhwal Himalaya may nucleate on it. Had the Tehri reservoir been impounded shortly before 1991, it would have exerted a stabilising influence on the causative fault of the Uttarkashi earthquake.

The Tehri reservoir load should lead to postponement of the next great earthquake of the region by an unspecified time. It is our conjective that the reservoir load would have delayed the Uttarkashi earthquake also by an undetermined time. It is our sense from the simulation that the impact of Tehri reservoir on nearby future earthquakes may be small on the whole. Accordingly, the adverse influence of the reservoir in this regard may not be as severe as anticipated and estimates of seismic hazards to the Tehri project may be lowered to that extent.

-Excerpts from the research article by R.Chander and Kalpana, Current Science, Vol.70, No.4, Feb.,1996.

Dams - What are the alternatives ?

The arguments and evidence presented against the construction of dams are widely published in the popular media and fall into the following categories :

* displaced communities,
* flooding of valuable animal and plant habitats,
* damaging effects to the flood plain and river below the dam,
* increases in water borne diseases, and
* destruction of a natural river valley, often of outstanding beauty.

If we are truthful, we all know that the human race depends on water, expects water and indeed demands water. The public outcry over water restrictions in Northern England during the autumn of 1995, following the summer drought, is as clear a demonstration of this fact, if one is needed.

If the human race is dependent on water and the sole purpose of a dam is to provide it, whether for potable (drinking) water or irrigation, then what are the alternatives?

* increased use of groundwater,
* reductions in water use through demand management,
* desalination.

Desalinisation is the shining hope for the future but at present it only has potential for providing potable supplies in such developed countries where no other resources exist.

There is not therefore any real alternative to the dams. In terms of efficiency and economics, one large dam is usually better than a number of small ones even in ecological terms.

- Excerpts from an article
by Terry Evans, U.K., Geoscience and development,
No.3, January 1996, AGID, Brazil

Communication - An important stage of design process

The ultimate purpose is the production, construction or initiation of a course of action. Achievement of this objective requires the engineer to communicate or 'sell' his findings. Unless he can persuade his associates, client or society of the merit of his

ideas they are essentially stillborn. Effective communication requires that all pertinent facts be properly presented. If a mathematician were to sum up these thoughts, he might well do so by the equation (with apologies to Albert Einstein).

$$E = MC^2$$

where, E equals effectiveness,
M equals mastery of the subject matter, and
C equals communications.

The designer must recognise that the efficient transfer of his knowledge and findings is an essential part of his task. Hence, the ability to convey thoughts concisely and clearly and to transmit technical knowledge effectively must be acquired by design engineers.

-Z.T. Bieniawski, 1984

Abilities of the Engineer of future, He/She should possess to increase the self reliance globally

Technical Abilities

1. A fundamental Understanding of Mechanics, Mathematics, Physical Sciences, Material Science and Entropy Crisis
2. Practical Knowledge of Entropy Management, Environmental needs,Environment Friendly Manufacturing Processes, Bio-Sciences, Bio-Engineering and Bio-Technology for Improvement of Micro-Ecosystem in and around Industries
3. Aptitude & *Skills in Solving Open-Ended* and Mind Boggling *Problems* of Future
4. *Innovative and creative Abilities* to offer New Design Methods and to deal with the unknown
5. *Vision of Future Trends* w.r.t. Global Perspective in Engineering Activity
6. *Proficiency in Using Tools of Engineering* - Analysis, synthesis,Optimization, Computer Modelling and Simulation. Experience in Using Modern High Quality Software Programs and Information Super Highway
7. *A Breadth and Depth of Technical Background in One's Area of Specialization* to Satisfy Actual/Urgent Needs of Industries/Multi-National Corporations

Management Abilities

1. Entrepreneurship Ability
2. Maturity and Confidence to Manage Technical Crisis
3. Capacity and Willingness to Learn and Keep Learning; New Break-Throughs
4. Integrity of thought and Action With the Spirit of Perfection - Values with High Ethical and Professional Standard. Knowledge of International Standards
5. Ability for Technological Assessment / Adaptation / Upgradation / Transfer
6. *Knowledge of Business Strategies*, Energy / Technical / Construction / Risk/ Retrofitting; and *Financial Management* and Public Psychology
7. Knowledge of Strategy to Win Public Debates on Burning Technological Issues. Communication Skills both Oral and Written; and Ability to Persuade Policy Makers to One's Findings
8. *Ability to Identify Competent Experts* and Pseudo Experts
9. Understanding of Global Impact of Technological Developments on Society / Health of Environment and its Sustainability
10. *Ability to Coordinate Interdisciplinary / International Engineering Teams.* Contacts with International Experts

Leadership Abilities

1. Ability to Motivate Very Deeply Young Engineers for Original Thinking
2. Global Concern for People/SOCIETY and for Relevance of Engineering Solutions Requiring Minimum Maintenance
3. Appreciation and Understanding of world Affairs and Culture and Geo Political Environment
4. Awareness of Parameters of International Competitiveness - Quality, Reliability, Safety, Productivity, Cost Effectiveness
5. Proficiency in Adventurous Sports and Nutritious Food and Drinking Habits

- Faculty Members,
University of Roorkee, Roorkee , INDIA

Dogs' Barking Saves 350 Hill People

The belief that dogs bark before any natural calamity saved the lives of 350 hill people of Chuikhim locality of landslip-hit Kalimpong subdivision, Chunabhati (West Bengal).

A survivor, the head of the local body, said that as the dogs barked that midnight, all 350 villagers led by him ran more than a kilometre in heavy rains to a safer place. After an hour, a big chunk of rock slid down the river and 13 houses were buried under the debris and 33 others were severely damaged.

- The Hindu, July 17, 1996

Highest Dam

CHINA'S Three Gorges Project, when completed will be the highest dam with a largest hydropower station in the world. The reservoir will discharge a peak flow of 27,000 to 33,000 cubic meters per second, the greatest discharge per second for any water control project in the world. The main structures of the 113-meter-capacity dam will be for the first time made of cement.

The main construction phase would include record-level earth work, pouring highest quantity of cement and using largest quantity of metal structures. The hydropower station will have 26 generators with an installed capacity of 70,000 kw. Its total installed capacity will reach 18.2 million kw with the average annual generating capacity soaring to 84.68 billion kwh. Besides, the project is also designed to benefit the shipping network. The river channel from the reservoir will be able to service ships with a capacity of 10,000 dwt.

-The Hindustan Times, April 16, 1995

Aspirin a Day .....

Half a tablet of aspirin a day can prevent heart attacks and strokes. And world -wide, the humble aspirin has the potential to prevent more than 100,000 premature deaths annually, according to the study published in the British Medical Journal which establishes aspirin as a life-saver. It says "long-term aspirin therapy should now be considered for almost all people with suspected acute heart attack or unstable angina or those with history attack or stroke". Aspirin therapy is also recommended

for those who had bypass surgery angioplasty (a technique in which a narrowed artery is widened by inflating a balloon), or any occlusive disease of blood vessels "irrespective of age, sex, hypertension or diabetes". Doctors, however, cautioned against self medication and warned that "such treatment is generally not recommended for low risk people without previous vascular disease". Prof Richard Peto, co-director, of the study said that aspirin has been found to be a "first class drug not only for developed countries but also for any population in the world".

-Technorama, The Indian Express
Spring 1996

Michael Coates, The commander of the challenger space speaks of his experiences in space

Was there anything spectacular you noticed about the earth and which is not common knowledge ?

When you get away from the earth and look back, you start to feel protective about it. When you look away at space, there is no other place to go, so you need to take good care of the living spacship that is the earth.

The jungles and forests are being cleared away quickly all over the world and particularly around the equator where the rain forests are located. The slides taken in 1984 and 1991 show a marked difference in just seven years.

Did being in space alter you in any way ?

It humbles you. Most of us tend to live in a small frame of reference. You go to work, come home, have your family and friends and live in your own little world. You are not thinking about the other side of the earth or the other country for that matter. When you look at the vastness and total void in space, it's really a cold, forbidding universe. Stars don't twinkle in outer space. When you look back at the earth it looks so warm and inviting. That makes you appreciate all kinds of life when you come back. Looking at the earth from this perspective makes you feel we've been given a real gift which we need to take care of. I don't think we can live on the moon or any other planet on the solar system. So we need to figure out how to get along on this planet. (The experiences of the austronaut remind us the message given in Upnishad : "Vasudhev Kutumbkam" - WORLD CITIZENSHIP).

-Extract from an
interview with Neelanjana Singh,
The Times of India, 1996