

NEW ZEALAND

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ENGINEERING

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**Designing for better
house heating**

Front cover

David Breuer details how simple architectural design techniques can result in energy savings, and improve comfort levels, on pages 13, 15, 16, 17 and 18.

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Brian Elwood, chairman of the Local Government Commission, believes New Zealand is over-governed, with the present system of local government resulting in a bias towards centralisation because local units are too small to be effective. For a report of his address to the Institution's Council, see page 34.

MPA
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ASSOCIATION OF NEW ZEALAND



Leading article:

Strategic planning of resources

Strategic planning is a currently fashionable but somewhat pretentious way of describing a fairly ordinary process. It is nothing new. Any public organisation or business enterprise worth its salt will want to analyse and understand the environment in which it operates, determine its objectives, evaluate choices, and select a strategy for achievement.

The process is inherently simple; its successful execution is more difficult.

Former Vice-President Walter Mondale recently made the comment that Treasury departments the world over have "an instinctive aversion to looking into the future." In MWD we take the opposite view. For many years we have seen it as essential to maintain a planning capability, involving a wide range of disciplines, if we are to offer balanced advice on policy options, key development issues, and the best use of resources.

The Development and Planning Division of MWD is in a good position in the public sector to apply a strategic planning approach and provide the objectivity which such planning requires. It has no commitment to any particular sector of the economy. While it has ready access to, and can draw extensively on, the professional skills of MWD's operational arms, it is not beholden to them. The division is their client, not the reverse. The division has an accumulation of experience in planning and forecasting extending over many years. It understands, and in part manages, the public planning processes that greatly influence how the country's land and water resources are to be used. In its staffing policy, and in its use of consultants from within the department and from the private sector, the division acknowledges it has no monopoly on skills or wisdom; and its team approach recognises that the interaction generated by an inter-disciplinary group of quality is one of the best ways of sparking creative thinking and achieving cost-efficient results.

While the initial stages of strategic planning — a thorough appreciation of the relevant environment and the forces operating within that environment — are essential, they are not enough. Success is only realised if the process goes further and demonstrates either that current policies and measures are effective — as judged against alternatives — or, if they are not, to indicate promising changes or new directions which have the potential for greater effectiveness.

The public sector and its considerable investment offers a wide field for strategic planning, yet the availability of people and resources for planning is strictly limited. The answer to this has to be selectivity. The most urgent and fruitful areas for attention are those which, for various reasons, have been ignored for too long; those where the level of political and public interest is significantly high; and those where as a result of changing conditions or untapped potential promising opportunities are believed to exist. Another valuable aid to husbanding scarce planning resources is to ensure that any major study is preceded by a critical reconnaissance phase. This often reveals false assumptions have been made or the wrong ques-

Mr GA (Tony) Town joined the Ministry of Works in 1961 after previous experience in the Army and as managing director of a private company. He held a number of positions in the ministry before being appointed Director of Planning in 1972. Last year he was appointed Assistant Commissioner of Works (Development and Planning). He obtained his BA degree in 1952 and the Diploma in Public Administration at Victoria University in 1966. He represented New Zealand at the United Nations Conference on Human Settlements (Habitat) in 1975 and in 1984-5 was the New Zealand representative on the OECD team reviewing urban policies in Japan. He is a member of the NZ Planning Institute and the NZ Institute of Public Administration.

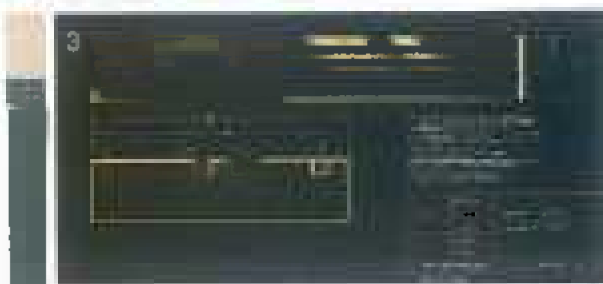
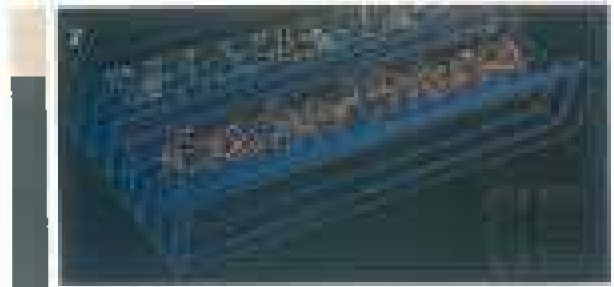
tions asked. The scope and direction of the planning can then be adjusted before too much time and effort has been committed.

Within the general need to be selective, MWD's planning has its own emphasis. Because of the department's traditional interest and expertise in assessing issues in spatial terms, high priority is given to identifying, in association with regional and local government, the regional implications of national/sectoral policies. Regional effects can be very uneven. Decisions by Government, or other influential organisations in the public or private sector, can be beneficial to some regions while the effects in other regions can be to impose real handicaps. A better understanding of such effects, preferably before the decisions are taken, can result in more sensitive policies and measures being devised centrally, and more constructive responses being formulated regionally.

Priority is also given to gaining an understanding of the cumulative effects on the regions of resource use decisions by different sectors, and the interaction between sectors. In the current climate, as public agencies are reconstructed, accorded single-purpose objectives, and required to demonstrate they can be commercially successful, there is even more need for such planning to span sector boundaries.

Inevitably strategic planning may challenge the fixed assumptions and attitudes of others, and is thus liable to be attacked. The response to this must be that such planning decides nothing — any force or influence it has rests solely on the quality of the work and the presentation of ideas. What use is made of them is up to the decision-makers, but as Barbara Wootton has said: "Practical men in positions of power can always demonstrate the impracticality of new ideas by the simple device of making sure they are never tried". And the counter to this? Public debate. Planning cannot maintain credibility or be effective if it is conducted in secret. Open, public debate of the results of planning can be the important first step in encouraging decision-makers to take them seriously.

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mimic, imitate;
pretend to be.
CIMulation
(simewlayshon) n
act of simulating.



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This is where all information from "Design" through to "Manufacturing Production Analysis" interfaces with tools or robots and true manufacture commences.

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An engineer comments: Overseas applications of seismic isolation systems

In September 1982 Dynamic Isolation Systems Inc. of Berkeley, California, received a licence from the Development Finance Corporation of New Zealand to market and manufacture seismic isolation products in the United States that were developed in New Zealand. The product of primary interest is the patented lead-rubber bearing developed by Dr Bill Robinson of DSIR and enhanced by Dr Ian Buckle of the University of Auckland.

The seismic isolation design concept, now applied to over 40 structures in New Zealand, received little exposure to the design profession in the United States before 1982. To market the concept in the United States we first undertook to develop appropriate marketing and technical material to enable the United States design profession to understand the benefits of seismic isolation. We have made significant progress in our marketing efforts over the past three years and there are now two completed bridge projects with three more in the design phase. The design development of two building projects has been completed, and there are several more in the early phases of design. DIS was also given the marketing and manufacturing rights to other countries and to date we have completed three bridge retrofit projects in Italy.

DIS has a real New Zealand connection in that four of the senior personnel of the company were all born and educated in New Zealand. Ron Mayes, the President, received his PhD from Auckland in 1972; Lindsay Jones, the Vice President, received his BE from Canterbury in 1967; and Trevor Kelly, the Director of Engineering, received his ME from Canterbury in 1974. More recently, Ian Buckle has joined the company from the University of Auckland.

The Development Finance Corporation of New Zealand is the patent-holder of the technology and has provided equity financing for DIS to develop the tremendous market opportunities that exist in the United States.

A more detailed description of the projects either completed or in progress follows.

California Department of Transportation

The Sierra Point retrofit project, constructed in February 1985, consisted of the seismic retrofit of an existing nine-span bridge on Highway 101 just south of San Francisco. DIS was requested by the California Department of Transportation to investigate the use of base isolation on what they considered to be one of their most difficult retrofit projects. Our studies indicated that the bridge could be successfully retrofitted with base isolation, such that its ability to resist an earthquake was six times greater than in its original configuration. The total construction cost for base isolation was \$0.5 million. This was only six percent of the bridge replacement cost, which was the only other feasible way to attain the same level of seismic resistance.

Los Angeles Municipal Water District

This project, currently under construction, consists of the seismic retrofit of an 11-span bridge, using lead-rubber bear-

Ronald L. Mayes received his PhD in structural engineering from the University of Auckland in 1972. From 1972-6 he was a research officer at EERC, University of California, Berkeley, and was responsible for the initiation and implementation of the masonry research programmes. From 1976-81 he was Technical, then Executive, Director of Applied Technology Council, an organisation that was charged with the responsibility of translating research information into a format useful to practicing engineers. He has been a principal in the consulting firm Computech Engineering Services since 1976. In 1982 he joined Dynamic Isolation Systems Inc. and has been active in the development and implementation of the seismic isolation concept.

ings, that carries a 10-foot diameter water supply pipeline for the Northern Los Angeles basin. Lindvall/Richter and Associates, of Pasadena, were the structural engineers for the project.

Italian Autostrada System

Lead-rubber bearings have been incorporated into the seismic retrofit of the Carafone and Vallonchio 1 and 11 autostrada bridges. Manufacture of the bearings has recently been completed and they will be installed early in 1986.

Electric Power Research Institute (EPRI)

In 1983 DIS performed a detailed feasibility for Burns and Roe and EPRI on the application of lead-rubber bearings for isolating nuclear power plants. EPRI has now formed a joint project with its Japanese counterpart and has recently ordered 16 lead-rubber bearings for a detailed component and shake table test programme.

Tandem Manufacturing Facility

This complex of 12 four-storey buildings is to become the new office and manufacturing facility for Tandem Computers. Phase 1, which consists of three of the 12 buildings, has had the design development completed, incorporating lead-rubber bearings. The go-ahead for construction should be given in the near future.

Salt Lake City and County Building

This five-storey gothic structure, constructed in 1896, is a historical restoration project. As part of the restorative work, seismic upgrading will be performed. After evaluating both a conventional and base isolation scheme, the city selected the base isolation scheme for design development. Design development is in progress and construction is scheduled to begin in late 1986.



Earth deformation studies and their application

DSIR's plan for the future

The DSIR's recently released plan for the future reveals the department's new commercial emphasis.

The corporate statement, the first such department-wide review in the DSIR's 60 year history, outlines the department's goals and future direction as well as areas for improvement.

A reduction in Government funding means the DSIR has to earn more money from services to clients in the private and public sectors if it is to maintain its current level of operations. This year (1986-87) the DSIR expects to earn about 17 per cent or \$20 million of its operating budget from charges for services, rising to about 28 per cent in three years' time.

Research areas now given emphasis include biotechnology, manufacturing and processing technology, materials sciences, information technology and oceanography along with technology transfer (or making sure the results of research get used in industry).

Most OECD countries are investing in new technology areas such as biotechnology, information technology, materials science and manufacturing automation. New Zealand needs to be selective in the way it invests effort, according to the corporate statement.

It notes that, as well as opportunities, there are constraints and areas for improvement.

Many New Zealand enterprises cannot effectively use specialist skills or technologies. Many managers are not technically knowledgeable and have an aversion to risk-taking and co-operative ventures with other enterprises. Businesses are oriented to short-term rather than long-term investments.

Measures, outlined in the report, to attract and retain highly motivated, innovative, quality staff include performance assessment and improved performance — linked rewards, improved career development, training, and more competitive salaries.

Plans are being drawn up to implement the strategies identified in the corporate statement.

Earthquakes and volcanoes provide the most forceful indicators of shifting ground, but unseen and unfelt minute displacements occur all the time. Detecting such displacements is part of the work of the DSIR, the Lands and Survey and the Ministry of Works and Development, for direct scientific and practical reasons. A report on 10 years of such work has been issued by the Royal Society of New Zealand, through which it has been co-ordinated.

Conceived as a programme of basic research, the work progressively included more applications in the fields of development and planning. These applications depended heavily on the still inadequate store of information, commonly obtained by the departments for other purposes, as well as on the specific studies in the programme.

The scientific aspects have provided a significant contribution to the application of plate tectonics theory to New Zealand, which straddles two of the major plates — Australian and Pacific. Geological work has improved knowledge of the distribution of deformation and of the detailed variation in its nature.

The studies have been used in local

and regional planning, particularly where active faulting extends through urban areas and needs to be considered in zoning; earth deformation also needs to be taken into account in the siting of pipelines and LPG facilities. In geothermal development, precise surveys show that the areas of greatest ground movement are not confined to those where most hot water has been drawn off. In hydro-electricity development, particularly in the Clutha Valley but now extending more widely, assessments of the hazard of potential earthquakes have depended on the integration and interpretation of data from all sources.

It is hoped to capitalise on the preceding work by some re-surveys and by adopting new programmes and methods, including satellite systems. A better tide gauge network would assist in separating the effects of earth deformation from those of sea-level fluctuation. The links between earth deformation and large earthquakes and volcanic eruptions require intensive study, although prediction is probably many years away.

Copies of the publication are available from Royal Society of New Zealand



A new type of telephone cable is being installed by the Post Office. Undercarpet cable is flat and designed to be laid on the floor and covered by carpet. Carpet tiles are the preferred covering as they allow easy access when the Post Office needs to make repairs or alterations.

Pictured on the left above is the undercarpet cable, with ordinary cable on the right.

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6/94/2004

Civic centre complexities

The newly commissioned Rotorua Civic Centre provided Murray North Partners Limited with unusual engineering problems, according to project manager and senior architect, Ewen Christie.

The centre meets a pressing need by the Rotorua District Council because the former city and county councils had resulted in local body affairs being administered from several buildings.

The council required that work be undertaken quickly to coincide with the price freeze, then in place. Murray North provided a "fast-track" design and construction programme, with construction on site starting before documentation was finalised. The building took two years to complete.

After a design contest, Warren and Mahoney Architects Limited (Christchurch) were appointed design architects.

Their "post-modern" design features a north and south wing joined by an overhead bridge. The north wing houses the council's administrative offices and staff amenities. The council chamber, committee rooms, councillors' rooms and a public gallery are incorporated in the south wing.

The lift tower in the centre of the north wing resembles the campaniles of old Italian churches and houses lift machinery.

The building site is in a hydrothermal environment with hot and moderately hot acidic ground water and average cross bearing pressure of 20 KPa at foundation, says Roumen Shipkov, Murray North's site engineer.

"The engineering design allows for seismic movement and thermal expansion in a system especially suited to the Rotorua area."

A 1.4 metre deep partially compensated raft foundation was used to reduce the net bearing stress on the subsoils and minimise the angle of distribution of the building. Over 3000 square metres of butynol sheeting protects the concrete from chemical action and prevents hydrogen sulphide gas, prevalent in the Rotorua area, from rising through the foundations and into the building.

The building has almost 5000 square metres of multi-level floor space. The concrete floor slabs, separated by prestressed diaphragm units and reinforced concrete frames, act as a diaphragm, distributing seismic loads to the east in-situ concrete shear walls and external precast walls.

A three storey atrium, extending almost the full length of the building, allows abundant natural light into interior public spaces. This glass roof utilises vacuum-sealed double solar glazing to minimise heat gains and losses.

Geothermal energy heats the building and full air conditioning is provided.

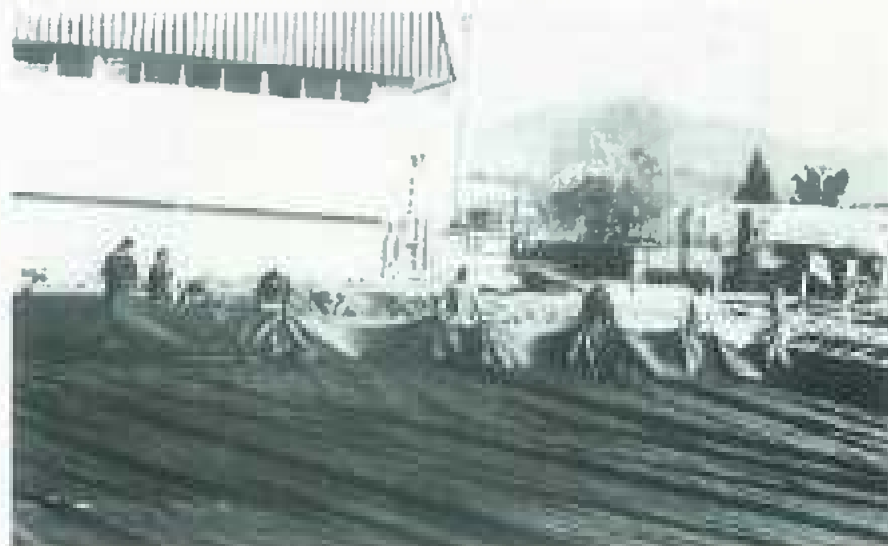
The council's brief stipulated that local timber be used wherever possible and the building makes much use of laminated timber from locally grown radiata pine. The north and south wing roofs are supported by glued laminated

beams, up to 540 x 185 mm in diameter and up to 12 metres long.

About 25 cubic metres of laminated beams, custom made at the Waipa sawmill, were used.

"The beams were a pleasure to work with," says Roumen Shipkov. "They are light, easy to install, fire resistant and visually, very pleasing."

Woven tukutuku panels made by local Rotorua Maori women feature in the meeting rooms, while a new carving has been commissioned for the council chamber.



Laying the butynol sheeting.



The completed Rotorua Civic Centre with its distinctive lift tower.