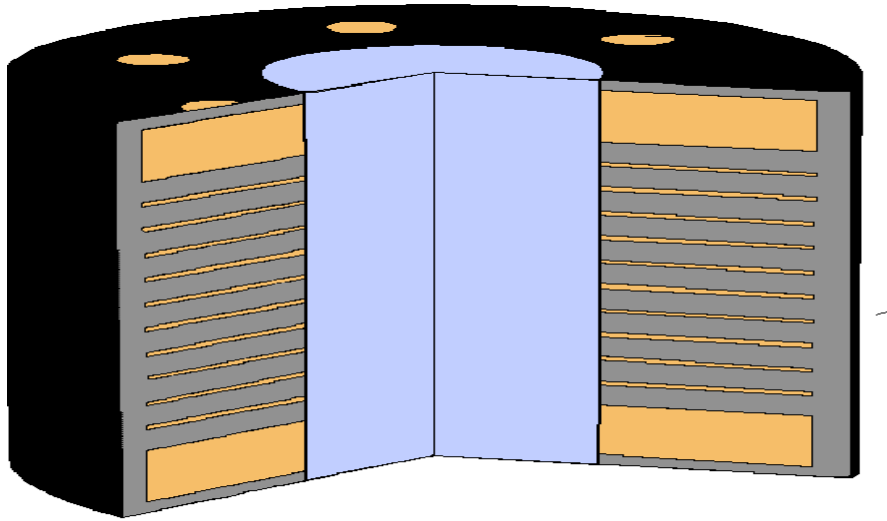


BASE ISOLATION OF STRUCTURES



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DESIGN GUIDELINES

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The Holmes Group of Companies

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COMPANY CREDENTIALS IN BASE ISOLATION

THE COMPANY

Holmes Consulting Group, part of the Holmes Group, is New Zealand's largest specialist structural engineering company, with over 90 staff in three main offices in NZ plus 25 in the San Francisco, CA, office. Since 1954 the company has designed a wide range of structures in the commercial and industrial fields.

HCG has been progressive in applications of seismic isolation and since its first isolated project, Union House, in 1982, has completed six isolated structures. On these projects HCG provided full structural engineering services. In addition, for the last 8 years we have provided design and analysis services to Skellerup Industries of New Zealand and later Skellerup Oiles Seismic Protection (SOSP), a San Diego based manufacturer of seismic isolation hardware. Isolation hardware which we have used on our projects include Lead-Rubber Bearings (LRBs), High Damping Rubber Bearings (HDR), Teflon on stainless steel sliding bearings, sleeved piles and steel cantilever energy dissipators.

SEISMIC ISOLATION EXPERTISE

The company has developed design and analysis software to ensure effective and economical implementation of seismic isolation for buildings, bridges and industrial equipment. Expertise encompasses the areas of isolation system design, analysis, specifications and evaluation of performance.

System Design

- Special purpose spreadsheets and design programs
- British Standards (BS 5400)
- Uniform Building Code (UBC)
- U.S. Bridge Design (AASHTO)

Analysis Software

- ETABS Linear and nonlinear analysis of buildings
- SAP2000 General purpose linear and nonlinear analysis
- DRAIN-2D Two dimensional nonlinear analysis
- 3D-BASIS Analysis of base isolated buildings
- ANSR-II Three dimensional nonlinear analysis

Specifications

- Codes
- Materials
- Fabrication
- Tolerances
- Material Tests

- Prototype Tests
- Quality Control Tests

Evaluation

- Isolation system stiffness
- Isolation system damping
- Effect of variations on performance

Services Provided

- Design of base isolation systems
- Analysis of isolated structures
- Evaluation of prototype and production test results

PERSONNEL

Trevor Kelly, Technical Director, heads the seismic isolation division of HCG in the Auckland office. He has over 15 years experience in the design and evaluation of seismic isolation systems in the United States, New Zealand and other countries and is a licensed Structural Engineer in California.

PROJECT EXPERIENCE

Project	Isolation System
Structural Engineers of Record Union House, New Zealand Parliament Buildings Strengthening, New Zealand Museum of New Zealand Whareroa Boiler, New Zealand Bank of New Zealand Arcade Maritime Museum	Sleeved piles + steel cantilevers Lead rubber + high damping rubber Lead rubber bearings + Teflon sliders Teflon sliders + steel cantilevers Lead rubber + elastomeric bearings Lead rubber + elastomeric bearings
Completed Projects as Advisers to Skellerup Missouri Botanical Garden, MI Hutt Valley Hospital, NZ 3 Mile Slough Bridge, CA Road No. 87, Arik Bridge, Israel Taiwan Freeway Contracts C347, C358 St John's Hospital, CA Benecia-Martinez Bridge, CA Berkeley Civic Center, CA Princess Wharf, New Zealand Big Tujunga Canyon Bridge, CA	High damping rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings Lead rubber bearings
Plus 26 other projects where we have prepared isolation system design as part of bid document submittals.	



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