Canadian Association for Earthquake Engineering and Seismology (CAEES)
L'Association Canadienne du Génie Parasismique et de la Sismologie (ACGPS)

NEWSLETTER

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From the Editor's Desk

by Tuna Onur

It is my pleasure to announce that our quarterly Newsletter is back after a hiatus, and I am also happy to share some exciting changes that happened for our Association in the interim.

Canadian Association for Earthquake Engineering (CAEE) is now Canadian Association for Earthquake Engineering and Seismology (CAEES)! Inclusion of our colleagues from the field of seismology was always within the spirit of our Association, but it is now also reflected in our name.

Membership to our Association has been free for many years, thanks to healthy attendance at the Canadian Conferences on Earthquake Engineering our Association hosts every four years, however, time has come to charge a small fee for membership as with most other professional associations. The fees will help improve the offerings of CAEES to our members and we appreciate your consideration.

Our Newsletter is a great way to share short articles, news or other items related to earthquake engineering with your colleagues. We also welcome your feedback. Please send your thoughts to secretary@caee-acgp.ca

INSIDE THIS ISSUE

Earthquake Waves: Canada's Largest Recorded Earthquake Beneath Land (to date)": M7.3 Vancouver Island

by John Cassidy

Given the lack of significant earthquakes across Canada recently, in this column I highlight a significant historical earthquake, Canada's largest recorded earthquake beneath land (to date) – the M7.3 Vancouver Island earthquake of 1946.

The ground started shaking at 10:13 on Sunday morning, June 23rd, 1946. The epicentre of this earthquake was about 25 km to the west of Courtenay, 30 km SSW of Campbell River, and 67 km NNW of Port Alberni. In those communities, frightening ground shaking was felt, most chimneys either collapsed or were damaged, windows broke and many bricks from unreinforced masonry buildings came crashing down. It was very fortunate that this earthquake struck on a Sunday, as a large chimney at the Courtenay Elementary School came crashing down into a classroom.

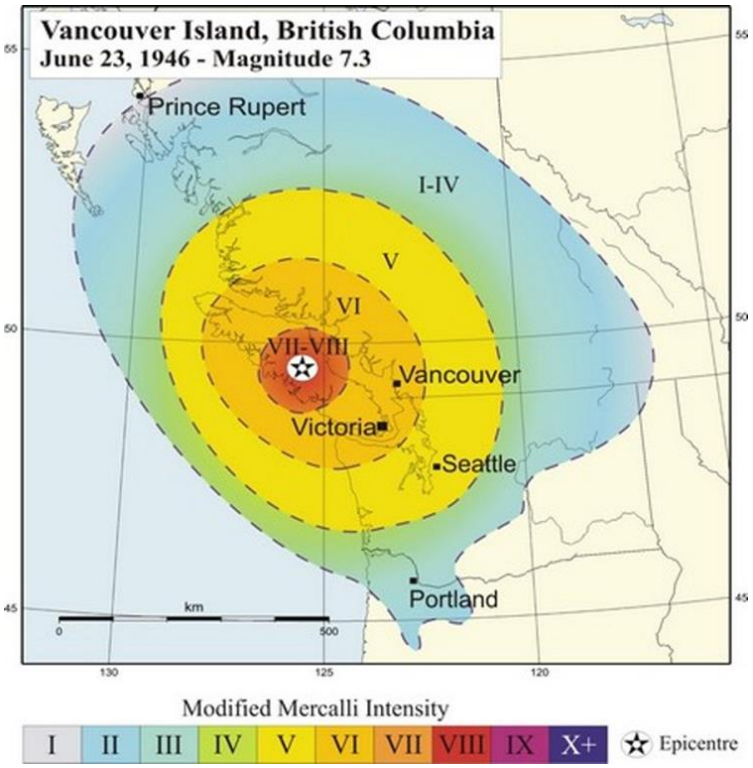
In Vancouver and Victoria (170–200 km away) people ran out of buildings (which we should not do during shaking!), items came off shelves and chimney and structural damage to older buildings occurred. In some cases, people reported "seeing" waves approach them.

Earthquake Waves... *Continued from Page 1*

Ground shaking was felt across most of British Columbia and Washington State, and as far south as Portland Oregon (530 km distant), north to Prince Rupert (~600 km) and east to near the Alberta border (~600 km distance). Two people died as a result of this earthquake, one from drowning when a small boat was capsized off the east coast of Vancouver Island (from a wave generated by a submarine slump) and the other from a heart attack in Seattle.

This strong earthquake triggered hundreds of landslides across Vancouver Island and parts of the Lower Mainland of southwest British Columbia, and caused numerous soil failures on central Vancouver Island. There were very few (2-3) aftershocks felt from this earthquake, very unusual for an earthquake of this size, but consistent with an inferred relatively deep focus of 30-40 km (in the lower crust).

At M7.3, this is not only the largest recorded earthquake beneath land in Canada, but also the largest known crustal earthquake in the entire Cascadia subduction zone. This earthquake occurred in the vicinity of the Beaufort Range Fault – a major structure that is currently being studied using a variety of fault mapping techniques (including high-resolution imaging of lake bottoms in the area). Better understanding of seismic activity on this fault, and the frequency of past earthquakes will help to improve our earthquake hazard model and future building codes.



This 1946 earthquake serves as a reminder of the very large earthquakes that occur along the active plate boundary of Canada's west coast, and the importance of earthquake monitoring, earthquake science, structural and geotechnical engineering to help reduce the impacts of future large earthquakes.

For those interested in details – the original report on damage and extent of this earthquake, by seismologist E.A. Hodgson, is available at *https://adsabs.harvard.edu/full/1946JRASC..40..285H*

BC Hydro Prepares Seismic Upgrades to Campbell River Dams

by Stephen Watson, BC Hydro

Day to day BC Hydro's dams are safe and functioning normally. The dams are supported by a comprehensive dam safety program.

For many decades we have been assessing earthquake hazards at our dams and related facilities, and upgrading the dams when required. In 2007, we launched a six-year, $10 million 'Probabilistic Seismic Hazard Analysis' study with the results released in 2014. This was done to better evaluate dam assessments and validate the resulting upgrades. Not surprisingly, it was determined that

BC Hydro Prepares Seismic Upgrades… *Cont. from Page 2*

the highest risk to BC Hydro's dams was on Vancouver Island, given its proximity to the plate boundaries of the Cascadia Subduction Zone and crustal earthquake sources on Vancouver Island and the Olympic Peninsula.

BC Hydro has three extreme consequence dams on the Campbell River system – John Hart, Ladore and Strathcona. Until they are upgraded, there is an interim downstream risk to the public. The City of Campbell River, Strathcona Regional District and BC Hydro have been collaboratively working together since late 2014 to communicate with the downstream community on the potential impact of a severe earthquake and what measures the public could do to protect themselves. We developed the saying: If it knocks you down, go to high ground. This collaboration includes the development of brochures, kiosks and evacuation area maps.

The John Hart facilities were built in the 1940s and the mostly earthfill dam is about 32 metres tall, more than 800 metres long, and is the closest downstream dam to the City of Campbell River. The upstream Ladore Dam, made of concrete, is about 38 metres tall and 95 metres long. The earthfill Strathcona Dam, that holds back about eighty percent of the system's water storage, is about 53 metres tall and 500 metres long. There is a generating station at each facility location.

Since about 2014, the John Hart, Ladore and Strathcona proposed seismic upgrade projects have been in the planning and design stages. All three projects are going through various regulatory and funding approvals. We have been meeting with First Nations, government agencies and stakeholders as we refine the three projects and consider community interests.

Early site preparation works at the John Hart Dam started in fall 2022. The key components of the John Hart Dam Seismic Upgrade Project are new water seepage barriers, stability improvements to the earthfill and concrete dams, new spillway gates and seismically qualified hoist systems, and a new overflow spillway on the main concrete dam.

"We are committed to delivering safe and reliable electricity to our customers across the province and that of course includes continuing to invest in the safety of our many dams," says BC Hydro's Director of Dam Safety, Bob Schubak. "For the John Hart Dam, our planned seismic upgrades will strengthen the dam and improve the reliability of its spillway gates system so the facility can withstand a severe earthquake and continue to safely contain and control the John Hart Reservoir."

Construction at the Ladore Dam is expected to start in early 2025. The Ladore Spillway Seismic Upgrade Project is mainly focused on the replacement of the three spillway gates and related works, such as the hoist system, so they can retain and pass water in a controlled manner downstream post-earthquake or during a major flood event.

Construction at the Strathcona Dam is also expected to start early 2025. The Strathcona Dam Water Discharge Upgrade Project is mostly about building a new low level outlet structure, in rock, around the dam to provide for the capability of lowering the reservoir water level after an earthquake.

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News

The 2020 Edition of the National Building Code (NBC) has been released!

As of March 28, 2022, the latest editions of the National Model Codes, including the National Building Code of Canada (NBC) 2020, the National Fire Code of Canada 2020, the National Plumbing Code of Canada 2020, and the National Energy Code of Canada for Buildings 2020 are available for access (see link below for NBC 2020).

The Structural Commentaries for the 2020 Edition of the NBC are expected to be released later this year.

https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-building-code-canada-2020

News and Upcoming Events

Below, we provide some information on upcoming events related to earthquake engineering and seismology. Please send us any other events you would like highlighted here.

Upcoming events

Webinar: FEMA P-807-1, Guidance and Recommendations for the Seismic Evaluation and Retrofit of Multi-unit Wood-frame Buildings with Weak First Stories
28 February 2024
Online. Click the link below to register:
us02web.zoom.us/webinar/register/WN_kPQPBClaQR-fEFv40Ltx7A#/registration

2024 EERI Annual Meeting
9 – 12 April 2024
Seattle, WA
2024am.eeri-events.org/

Seismological Society of America (SSA) Annual Meeting
29 April – 3 May 2024
Anchorage, AK
meetings.seismosoc.org/

8th International Conference on Earthquake Geotechnical Engineering (ICEGE)
7 – 10 May 2024
Osaka, Japan
sites.google.com/site/geodpriku/home/8icege?pli=1

18th World Conference on Earthquake Engineering
30 June – 5 July 2024
Milan, Italy
www.wcee2024.it/

GeoMontréal 2024
15 – 18 September 2024
Montréal, QC
www.geomontreal2024.ca/