

Risk Engineering Services

New Zealand Wineries Seismic Resilience
Guide for Bulk Wine Storage

CHUBB®



Chubb is the world's largest publicly traded property and casualty insurer.

Recent major earthquake events in the Marlborough wine region of New Zealand in 2013 (Seddon event) and 2016 (Kaikoura event) resulted in significant damage to bulk wine fermentation and storage tanks, as well as wine barrels in storage racks.

According to media articles, more than 1,000 tanks capable of holding in excess of 50 million litres of wine were damaged in the 2016 Kaikoura earthquake alone. Collectively, this represented approximately 20 per cent of total storage capacity in the region.

Bulk tanks can topple over and buckle if not adequately anchored, or can be punctured by structures such as catwalks or stairways. Damage can include total loss of the tank contents. In general, the larger the tank, the more prone it is to damage.

Wine barrels in metal storage racks can shift and cause total stack failure. Barrel contents may be lost if barrels crack on impact with the ground.

Damage to case goods in warehouses was experienced with most damage experienced by the outside rows.

Chubb's Risk Engineering Services



Lessons from Loss

Chubb's Risk Engineers visited numerous wineries following both earthquake events. This allowed us to inspect the damage first hand, giving us a much clearer understanding of the design features which led to increased losses, and those which helped minimise them.

This guide is intended to inform our insureds and industry partners of Chubb's underwriting criteria for earthquake coverage for wineries, as well as to provide general guidance on how to minimise winery earthquake exposures.

Risk Engineering and Underwriting Process

1. Please read this document in its entirety to gain a broad understanding of Chubb's risk appetite.
2. Complete the attached risk questionnaire and return it to Chubb via your broker.
3. Chubb's underwriting and risk engineering teams will review the questionnaire to establish your risk profile.
4. Chubb's underwriting process may require an inspection to be carried out by a structural engineer to review any specific areas of concern. This may be required before, or as a condition after, inception of the policy.
5. Chubb's terms will be offered via your broker and once an agreement is reached to continue insurance with Chubb, our risk engineers will perform a site inspection to verify the information provided, and discuss with you any opportunities for improvement.
6. Any Chubb approved risk improvements completed throughout the policy period should be communicated back to risk engineering or via the appointed broker. Chubb underwriting will ensure these are reflected in updated terms at the appointed time.

Concrete Plinth Tanks

Chubb has appetite for the following types of tanks:

- Tanks with a nominal capacity of 90kL or less, provided they have a well detailed concrete plinth and anchor design.
- Tanks with a nominal capacity of more than 90kL, provided they have been designed to consider the requirements of the New Zealand seismic loading standard, NZS1170.5 to meet Importance Level (IL) 2 with a 50-year design life, or a 1 in 500 year return period ($R = 1.0$).

Note that in both instances, the tank support needs to be well detailed to mitigate damage.

Based on our experience, smaller tanks and most current tank designs with a capacity of 90kL or less generally performed better than other tanks in both earthquake events. We can generally predict how a plinth mounted tank may perform; however failure modes are tank design specific and a detailed inspection of the tank is normally required

We have limited appetite for the following types of tanks:

- Tanks with nominal capacities above 90kL which have not been designed to IL2.
- Inadequately supported tank walls (skirt walls not extending down to the floor, walls too thin).
- Undersized or non-uniform plinths (can result in knuckling - internal tank base deformation due to poor load transfer to the plinth).
- Poorly detailed anchor bolts (insufficient in number, excessive in number, inadequate support).



Legged Tanks

Chubb has appetite for the following types of tanks:

- Legged tanks with a nominal capacity of 20kL or below, and
 - Regular structure - floor beams and legs should be of an adequate and regular size.
 - Braced legs - tank legs should be adequately braced to prevent buckling.

We have limited appetite for the following types of tanks:

- Legged tanks with nominal capacities above 20kL - larger legged tanks performed poorly in both earthquakes.
- Unbraced legs - a lack of stiffness at the beam-column interface often resulted in the legs buckling.

- Stress concentrations - size variations between structural members at connection, e.g. narrow legs connecting to wide beam flanges, or tab connections between the tank and base.
- Inadequate feet - many tank designs had adjustable feet, often much less substantial than the tank legs. Failures in the feet often resulted in the legs buckling

Catwalks and Service Bridges

All catwalks and services bridges must be supported independently from the wine tanks. Winery tanks should not be used to suspend catwalks and service bridges. During both earthquakes we observed the following losses:

- Damage to the upper portions of the tanks due to pounding of catwalks and services bridges against tank walls.
- Broken and ruptured services pipes, resulting in the loss of coolant (water/glycol in solution).

This damage could be substantially reduced or eliminated by providing independent structural supports for all catwalks and service bridges, and by providing flexible connections on pipelines connecting tanks to the services bridge.

Barrel Racks

Wine barrel storage racks shall be of a “seismic” type. When purchasing a barrel racks we strongly recommend requiring the manufacturer to substantiate the seismic performance of their product.

Seismic barrel storage racks must be used in accordance with manufacturers’ specifications. Notwithstanding, Chubb requires that barrel rack stack heights are limited to a maximum of four racks high unless specific approval is sought from Chubb risk engineering.



References

Performance of Wine Storage Tanks: Lessons From The Earthquakes Near Marlborough, by James Rosewitz, Christopher Kahanek

Earthquake Damage to Cylindrical Steel Tanks, by Erica Fischer, Judy Liu & Amit H. Varma

Wine Industry Implementation of the NZSEE Guidance on the Seismic Design of Liquid Storage Tanks, by E.V. Au, A.F. Walker & W.J. Lomax

We have created
long-term
sustainable
value through
our culture of
underwriting
excellence.



Tank Number	Capacity	Age	Manufacturer	Is the Tank Mounted on Legs or Concrete Plinth?	Does it support catwalks?	How are services connected (e.g. flexible or hard connection)?	Detail any damage and repairs from previous EQ event?	Notes and Other Useful Information: <ul style="list-style-type: none">• For concrete plinth mounted tanks:<ul style="list-style-type: none">- Do tank skirts extend to ground.- Is plinth is undersized.- Provide details of tank anchoring systems, e.g. necked bolts, unnecked bolts, internal bolts and seismic anchors such as Onguard or similar.• For tanks mounted on legs:<ul style="list-style-type: none">- Provide details of cross-bracing of legs, anchoring, symmetry of support members, etc.• Provide details of tanks reviewed by an accredited by a structural engineer.

Barrel Rack Identifier	Number	Age	Manufacturer	How many levels high is the storage?	What capacity are the barrel racks?	What is the manufacturer's recommended storage height?	Where are they stored?	Notes

Meet Our Experts



Graham Ramsey
Risk Engineering Manager, New Zealand
Property & Casualty

Qualifications:

Masters of Business Administration and a Bachelor of Business Studies (Finance) from Massey University.

Diploma in Engineering (Mechanical) from Auckland University of Technology.

Background:

Based in Auckland, Graham joined Chubb as a Risk Engineer in 2010. Prior to joining the insurance industry, Graham worked in the fire protection industry for over ten years specialising in the installation and maintenance of fixed fire suppression systems and Hand Operated Fire Fighting Equipment. He also worked as a consultant in the fields of fire protection and security.

Graham recently represented the Insurance Council of New Zealand as a voting member of the limited technical revision of the New Zealand Fire Sprinkler Standard NZS 4541:2013. In addition, he worked on the Targeted Review of Qualifications for the fire industry qualifications as member of the Governance, HOFFE and, Inspection and Testing groups.

His industry experience includes extensive knowledge of New Zealand's primary sector, including the dairy and meat industries, steel production and timber production; as well as the tourism and hospitality sectors, knowledge of commercial and warehousing operations, secondary food processing and light manufacturing processes.



Anthony Jeffery
Casualty Risk Engineer
Property & Casualty

Qualifications:

Bachelor of Engineering (Chemical) and Bachelor of Applied Science (Wine).

Background:

Based in Sydney, Anthony has spent 17 years gaining management and operational experience from the Wine, Construction, and Retail industries. He works predominantly as a General Liability Risk Engineer who is responsible for servicing accounts throughout the Asia Pacific region.

He has completed degrees in both Chemical Engineering and Applied Science and joined Chubb after a career in Senior Winemaking both domestically and internationally, Tier One Civil and Traffic Management Construction roles on major motorway projects including the M2 upgrade in Sydney.

As a Chubb Risk Engineer he specialises in third party liability including general products, construction (OHS, Traffic and Site Management) and food related industries (HACCP and Product Recall).



About Chubb's Risk Engineering Services

Chubb Risk Engineering Services comprises a global network of more than 400 experienced in-house risk engineering professionals, with average company tenure of almost 12 years. We offer customised risk management programs and services supported by lessons from losses, industry best practices as well as recognised local and international standards. For more than 70 years we have provided risk consulting and loss mitigation services to assist our clients around the world.

About Chubb in New Zealand

Chubb is the world's largest publicly traded property and casualty insurer. Chubb's operation in New Zealand (Chubb Insurance New Zealand Limited) offers corporate Property & Casualty, Group Personal Accident and corporate Travel Insurance products through brokers.

More information can be found at www.chubb.com/nz.

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