Swimming Pool Isolation

Mason Mercer

Mason have been designing and manufacturing systems for swimming pool isolation in Australia for over 20 years.

Pools within multi residential, aged care and hospitals have become the norm. Many with multiples throughout the project.

As our population density increases so do the heights of our buildings. It is not uncommon to see swimming pools installed on rooftops as high as 90 storeys. Because swimming pools are installed on rooftops, more often than not, this also means they are above the most sensitive spaces - penthouses.

In comparison to high rise construction, installation of swimming pools above grade is relatively new. As such, a modern approach is required to engineer out issues that may arise from structure borne noise generated by activities within the swimming pool.

Mason have developed a range of Bridge Bearing Natural Rubber and Steel Spring solutions to reduce the impact to amenity in the spaces immediately surrounding the pool.

Pool isolation design is by no means a one size fits all design component. Consideration needs to be given to longevity, performance, and practicality.

RUBBER ISOLATORS

Mason offer an extensive catalogue of Natural Rubber isolators for use in pool environments which have been developed to offer range in capacity and performance. Offered by many are multi-layered rubber pads. Although we manufacture rubber pads from the same compound as our pool isolators our preference is to keep them for use under plant and equipment.

We achieve class leading low natural frequencies from minimal isolator height (50mm) under the pool. Something that multi-layer pads do not offer.

BRIDGE BEARING NATURAL RUBBER

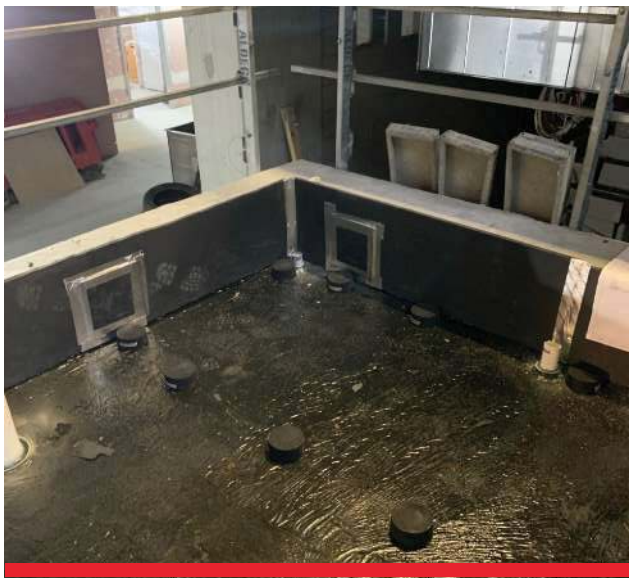
Not all rubber is the same. Commonly seen elastomers are Natural Rubber, Neoprene, EPDM and less commonly known low cost synthetic SBR (styrene-butadiene rubber).

Mason are one of the last manufacturers to still manufacture rubber themselves. The benefit of this is we can compound our own elastomers to much higher specifications than others who subcontract out their production of rubber. It gives us complete control of the compound and the ultimate in performance and longevity.

The term Bridge Bearing refers to the AASHTO (American Association of State Highway and Transportation Officials) specification required to supply bearings for a design life of 50 years+ of which we compound all our Natural Rubber bearings to.

The filler we use is the highest-grade carbon black and not inferior talc substitutes, we believe this to be the highest performance Natural Rubber compound available. This is the culmination of more than 50 years designing rubber compounds to where we can offer life of the building warranties on our range of Bridge Bearing Natural Rubber products. This is at a higher cost to cheaper compounds such as EPDM and SBR but due to our large scale inhouse manufacturing, we remain competitive in our offering.

The longevity of Natural Rubber has been heavily documented and fitting with our ethos of providing best in class solutions; it is the obvious choice for pools.



LOW DYNAMIC STIFFNESS

While not often discussed and not to be confused with Dynamic Factor, Dynamic Stiffness is a factor that illustrates how well a rubber compound will perform under load. The lower the dynamic stiffness the better the performance – E.g. our Pool Isolation Bearings will achieve a lower natural frequency than the comparable thickness multi-layer SBR pad system.

WARRANTY

We believe that if an element is being installed under a concrete structure with no access, the warranty of the elements should be reflective of the life of the structure itself.

The cost associated with a failed isolator is disastrous and, in many cases, impractical to remediate. The prospect of owning a broken pool is unpalatable to the developers, building owners and builders we speak with.

BENEFITS

- Significantly lower cost to steel springs.
- Longer design life and warranty than steel springs.
- Quicker to install.
- Low isolator height.
- No metallic parts within isolator
- Better acoustic performance than equivalent thickness multi-layer pads.

STEEL SPRING ISOLATORS

While we agree on paper that a steel spring will perform better than a rubber bearing, we also agree an air spring will perform better than a steel spring. Factors such as cost, practicalities come into effect sometimes more than performance.

Pools are typically a heated and chlorinated environment, not conducive to metallic elements. Over the years we have developed Teflon, Neoprene and Epoxy treatments to steel for aggressive environments. We are not confident that the current product offering of value-added finishes will provide life of the building warranties for our spring isolators

Mason will **ONLY** install our steel spring isolators under swimming pools where access is provided through design. A regular maintenance schedule needs to be established where the isolators can be visually inspected, and remediation work can be undertaken at regular intervals – typically synced to pool plant maintenance.

We have seen firsthand, the catastrophic nature of a spring failure from others, supporting a pool. Utilising a design where there is no access to the pool spring irrespective of value-added treatments to the spring and/or housing is not best practise - A stainless steel housing is good but of no material benefit if the spring is still manufactured from spring steel.

There is a reason why even our competitors will not offer life of the building warranties on steel spring isolators. Given there are times where steel springs will be the right solution, we work carefully with the design team in these instances to mitigate the risk factors associated with steel springs in an aggressive environment through the design of the pool and host structure.

LATERAL & SEISMIC RESTRAINT

Arguably the most overlooked aspect of pool isolation design. Pools are heavy, sometimes located at the top of the building where acceleration is higher and the building is less stable, the pool structure can be a cause for concern should there be a seismic event.

Mason Industries have been at the forefront of seismic design for decades. Known throughout the world as the experts, we have Mason engineers previously and currently sit on and chair ASHRAE technical committees[1], conducted code review, technical guidelines and published literature pertaining to seismic restraint[2] for countries across the world.

A pool is not a static element and as such should not be determined as one when providing seismic certification for the lateral restraint and anchor system. Legislation is changing, and seismic restraint is becoming more of a discussion point in design as awareness grows.

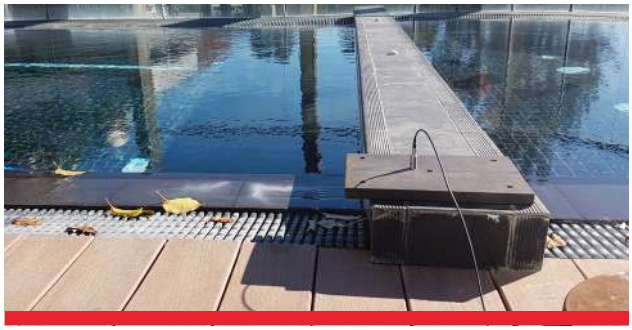
Our seismic engineers can assist with design guidelines and certified anchor designs to AS1170.4

Key to the performance of any pool isolation system is the disconnect between primary and isolated structure. Typically, a closed cell acoustic foam is used as a continuous loss formwork between concrete elements where they abut. Lateral restraint pads can be installed within the thickness of the void former at centres determined by the seismic restraint force to provide a resilient ‘connection’.

It is critical that floor finishes are kept short of the isolation joint on both sides of where the two structures abut.

1.Norm Mason, Douglas G. Valerio, Patrick Lama Sr. PE, James R. Tauby PE, Scott Butler PE, Richard Lloyd.

2.James R. Tauby PE, Richard Lloyd, “Practical Guide to Seismic Restraint”, The American Society of Heating, Refrigeration and Air-Conditioning Engineers (2000-01-01)



FORMWORK

There are many options for forming swimming pools, the use of metal tray, CFC sheet and shuttering are most common. Permanent (loss) and temporary formwork can be used to form slabs and walls. Consideration is needed on how the formwork will be installed to maintain the acoustic integrity of the pool isolation system.

In many cases the formwork methodology will dictate the type of mount used.

Pools can leak over their life; consideration needs to be given to drainage under the pool. The benefit of rubber or spring based systems as opposed to a continuous layer of polyurethane foam is that we achieve a positive airspace under the isolated pool shell. Should there be a leak, the water is free to drain to the nominated drains in the host slab and not left to pond.

TESTING

Acoustic testing of pool isolation solutions has been key for Mason in recent years. We form a strong relationship with our clients throughout the project which enables us to conduct post installation acoustic testing.

Prior to this work, in-situ testing of structure-borne noise had not previously been carried out for suspended swimming pools by anybody else to our knowledge. Recommendations have historically been made on the basis of theory and we prefer to be in a position which provides technical consultants with assurance in design based on objective data from real world installations.

DESIGN CONSIDERATIONS

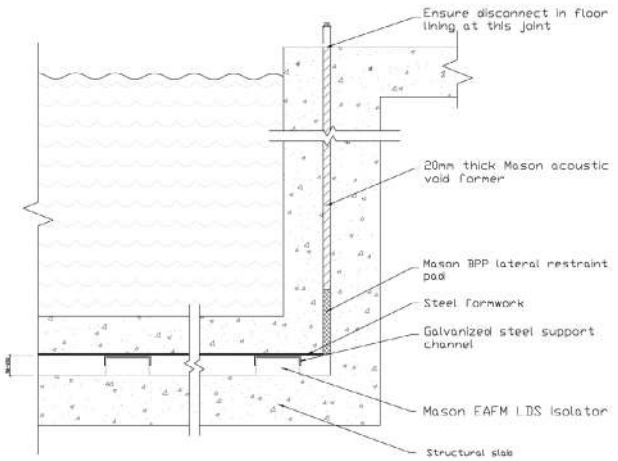
Below are some key considerations that need to be addressed when looking at pool isolation. Mason can assist with conducting a risk analysis on the swimming pool to provide recommendation on a solution.

- What is the design life for the pool isolators?
- Where is the pool located within the building?
- What access will my design provide to the isolators installed under the pool?
- What is the purpose of the pool?
- Is the pool for private or public use?
- What are the operating hours of the pool?
- What is the transient noise criteria in the area?
- How will the pool be used?
- How deep is the pool?
- How will you enter the pool?
- What is directly underneath the pool?
- What is directly adjacent to the pool?
- What is the provision in the host structure for the pool?
- What is the consideration for lateral restraint of the isolated pool structure?
- How will the isolated pool structure be formed?
- How will I provide drainage under the pool?

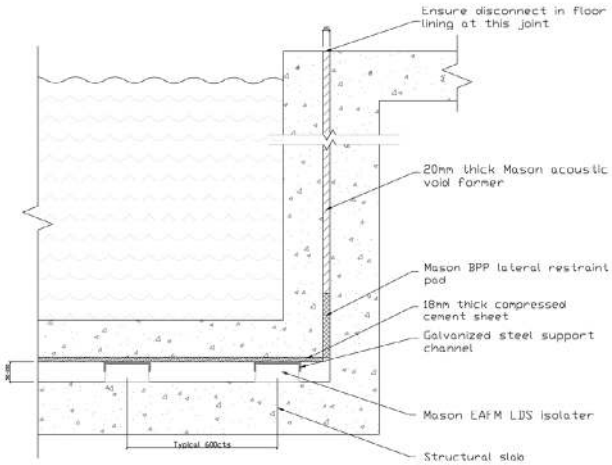
TYPICAL DETAILS

We have typical details and regularly provides project specific details to assist with the design process of swimming pool isolation.

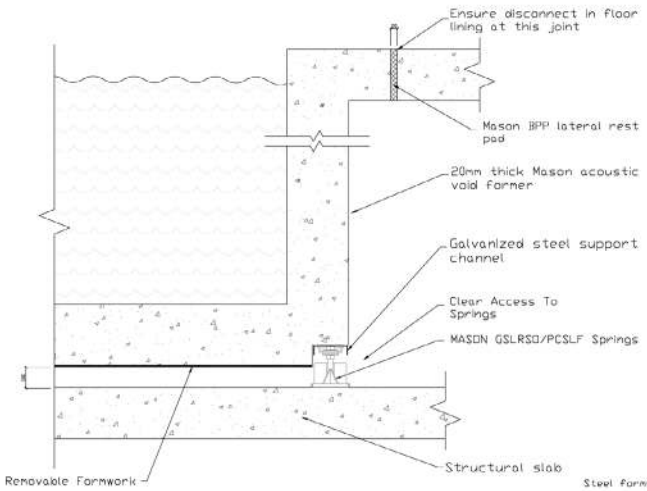
We are not interested in simply supplying materials off the shelf, more so we are a solution-based business intent on aiding the design for the overall system.



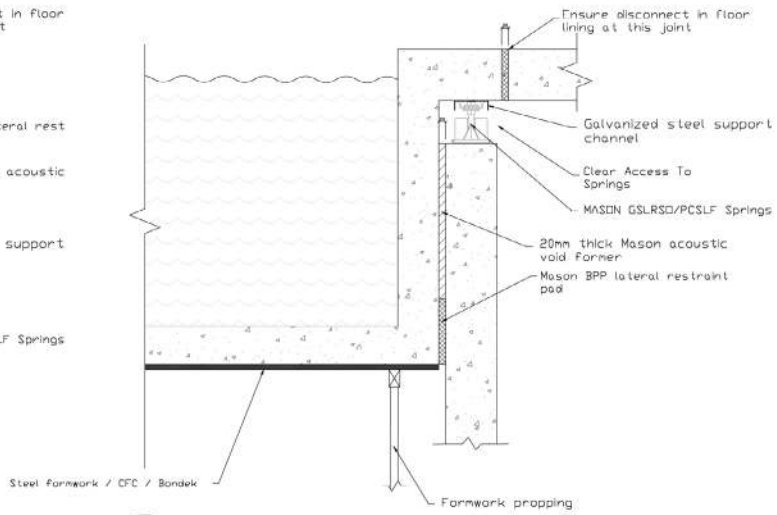
PD 01 TYPICAL DETAIL - EAFM POOL ISOLATION
NTS - Steel Formwork



PD 02 TYPICAL DETAIL - EAFM POOL ISOLATION
NTS - Compressed Cement Sheet Formwork



PS 01 TYPICAL DETAIL - SPRING POOL ISOLATION
NTS - Spring on Structural Slab (Removable Formwork)



PS 02 TYPICAL DETAIL - SPRING POOL ISOLATION
NTS - Spring on Host Wall

For our full range of typical details please visit our website our contact us for project specific design.

CONTACT

Mason Mercer

Head Office

30 Chaffey Street,

Thomastown Victoria, Australia. 3074

+61 3 9462 2357

www.masonmercer.com.au

info@masonmercer.com.au

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