



Structural Vibration Isolation Bearing

Model ATLAS

Patent Pending



Structural Vibration Isolation Theory:

There is a growing interest in structural vibration isolation systems to address vibration and structure-borne noise emanating from surrounding environments. Sophisticated foundation systems can be employed to support entire buildings, portions of buildings, and rail trackbeds for the purpose of mitigating vibrations and structure-borne noises that would otherwise interfere with work environments, sensitive equipment, residential settings, and entertainment venues. These systems use various types of resilient decouplers including springs, elastomeric bearings, and combinations of springs and elastomeric bearings to protect buildings, even surrounding neighborhoods, from vibrations and structure-borne noises originating from rail lines, subways, elevated trains, super-highways, and city streets. System design takes into consideration issues such as natural frequency, static and dynamic load conditions, de-bonding (in cases where elastomeric bearings are employed), and creep. These issues need to be addressed in the early design stages, typically following the filing of an environmental impact report by a qualified vibration consultant.

Application:

Kinetics Noise Control and GERB Vibration Control Systems have formed a partnership to address design issues concerning structural vibration isolation systems. Through this partnership, architects, structural engineers, and vibration consultants can seek assistance in designing product solutions for the most critical vibration and structure-borne noise isolation requirements on a project. Spring and elastomeric bearing vibration isolation systems can be designed and manufactured for isolating and supporting buildings and rail trackbeds. For instance, a combination of springs and bearings are used to support the world's largest column-free exhibition hall in Dallas, TX thereby mitigating vibration from heavy and light rail train systems passing under the building. In another situation, spring assemblies are used to support a rail trackbed that passes through a convention center located in Charlotte, NC thus reducing vibrations caused by trolley operations from propagating through the building. Because this technology and its supporting products exist, valuable land in downtown areas, around universities, and near large factories, that otherwise would be deemed unusable by city planners and real estate developers, can be developed and made useful for a variety of functions by a wide range of consumers.

Through the Kinetics/GERB partnership, Kinetics Noise Control has developed a new and unique structural vibration isolation bearing using alternating layers of elastomer and carbon fiber mesh reinforcement. Model ATLAS Structural Vibration Isolation Bearings provide several distinct advantages over conventional steel plate reinforcement built-up bearings. Traditional candidates considered for vibration isolation bearings include theaters and performing arts centers, but imagine being able to use this affordable technology for commercial, medical, and residential structures in areas that may otherwise go undeveloped. Some of the interest may be driven by the use of the building (e.g., sensitive hospital or laboratory equipment) and some may be driven by the building's location (e.g., next to rail lines or a super-highway). Regardless of the ultimate use of the structure, the need for isolation is based on the perceived benefit to the owner(s) concerning function, economics, or both. Depending on specific requirements for vibration mitigation, Model ATLAS Structural Vibration Isolation Bearings can be used either alone or in conjunction with spring vibration isolators to ensure a comfortable environment unaffected by ground- and structure-borne vibration.

Benefits:

- Lower natural frequency for a given load.
- Smaller operating height is achievable.
- Chemical and mechanical bonds are formed between elastomer and shim.
- Virtually no potential for de-bonding at shims
- No steel shims means the bearing is lightweight, non-magnetic, and requires no special processing prior to vulcanization.
- Last-minute modifications to the pads are easy to make - simply cut the pads to size as required.
- Part of a complete line of structural vibration isolation products offered through the Kinetics/GERB Partnership for Building and Rail Trackbed Isolation.

Performance Summary:

Experiments were designed to verify theoretical analyses and to investigate important aspects of the bearing behavior that cannot be mathematically predicted and therefore must be determined from physical testing. All testing was independently performed at the Multidisciplinary Center for Earthquake Engineering Research (MCEER) at the University at Buffalo, State University of New York. The testing program determined the static and dynamic stiffness of the bearing, checked for de-bonding of the elastomer and carbon mesh under extreme loading, and investigated long-term deflection (i.e., creep). Testing demonstrates the bearing provides performance equal to conventional steel plate reinforcement built-up bearings and that their operation meets current specifications. Additionally, an analytical solution for the pad behavior accurately predicts the measured response. In conclusion, Model ATLAS Structural Vibration Isolation Bearings will perform the same as traditional built-up bearings, but offer many additional advantages.



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