

TICO Structural Bearings - CV/CA

Tiflex

TICO CV/CA - High Stress Bearing

As building land in modern cities is at a premium, it is common practise to build on sites near or above main line and underground rail systems. In addition, construction is becoming more closely allied to other major transport networks. These trends in construction demographics result in large amounts of ground borne noise and vibration which is transmitted directly into buildings through their, often deep, foundations. Such vibrations are a nuisance, particularly in parts of buildings where quiet is of paramount importance.

To achieve a major reduction in structural noise transmission it is necessary to separate one structure from another, or to isolate a complete structure itself from its foundation, depending on the source of vibration and amount of reduction required.

TICO CV/CA bearings have been developed for high load applications and have a maximum recommended working stress of 7000 kN/m². TICO CV/CA bearings are typically used for isolating medium to large structures from ground borne vibration although they can also be successfully employed on other application, e.g. isolation of internal structures or high stress seatings in bridge bearing applications.

TICO CV/CA Structural Bearings can be used in a number of different configurations from modular pad arrangements on pile caps to continuous strip footings. In suitable configurations, isolation systems based around TICO CV/CA Structural Bearings can achieve natural frequencies of 8 -10 Hz.

TICO CV/CA bearings are dimensionally stable under widely varying atmospheric conditions and should provide acceptable vibration attenuation properties for 50 years or more - the high quality constituents used in manufacture will render them durable and age resistant over many decades with a total bearing life expectancy well in excess of the normal working life of the building.

TICO CV/CA bearings have been designed and tested to meet and exceed the requirements of BS6177:1982 'Guide to selection and use of elastomeric bearings for vibration isolation of buildings'.

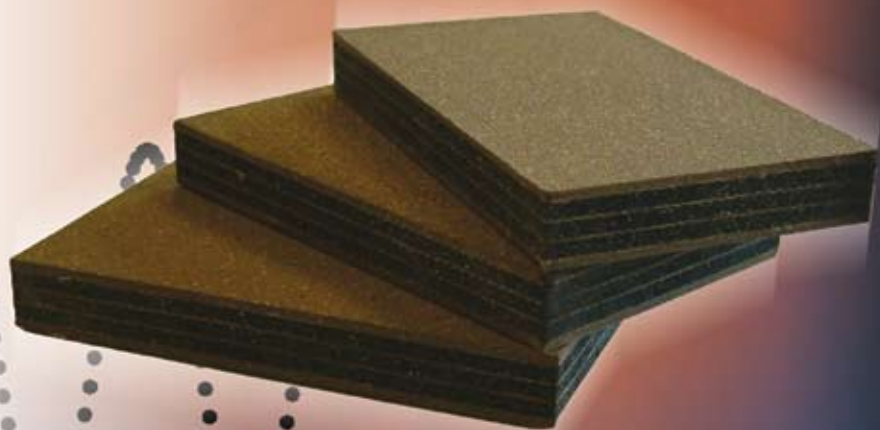
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CVCA-050606

Physical Properties

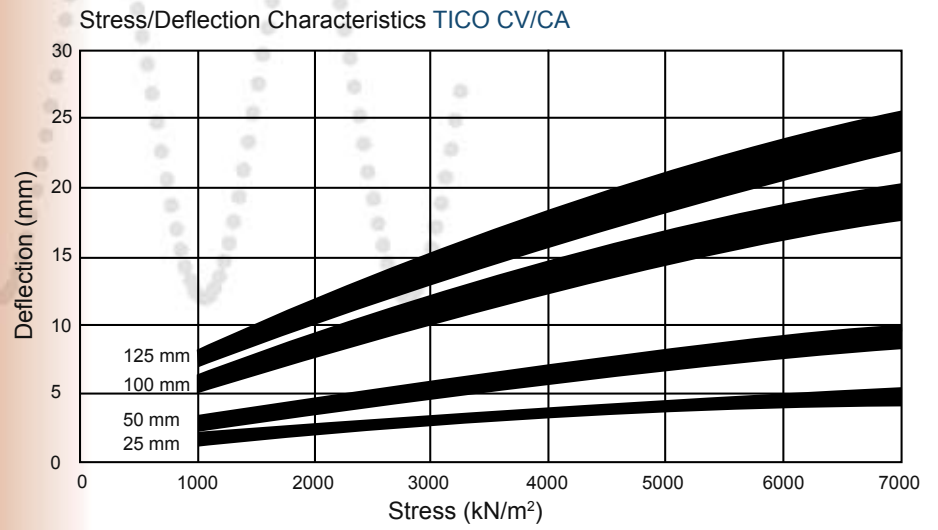
TICO CV/CA is a high stress material composed of vulcanized laminates of the highest quality neoprene elastomer, modified by the inclusion of cellular cork, and reinforcing layers of high tensile fabric. The bearing surfaces are of a special formulation created to accept slight irregularities in bearing surfaces and to facilitate bonding on site using adhesives.

Maximum Recommended Working Stress	7000 kN/m ²
Working Stress Range	4500-7000 kN/m ²
Breakdown	In excess of 3 times the maximum recommended working stress (in accordance with BS6177)
Hardness (IRHD)	75 ± 5
Density (Typical)	1150 kg/m ³
Temperature Range	-30 to +70°C Performance of bearing may be impaired at extremes of durable temperature range.
Typical Damping Ratio	0.043 to 0.053

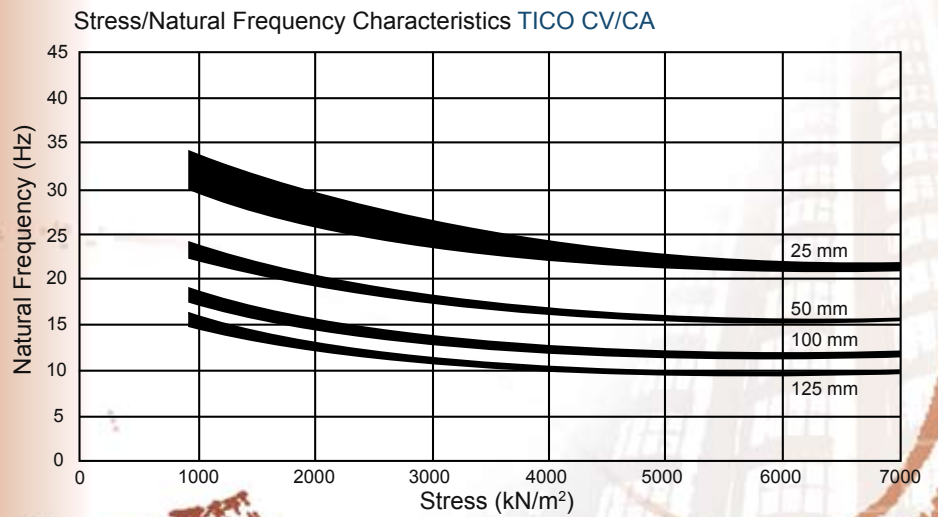


These graphs have been prepared from the results of extensive testing over many years. Where appropriate, data has been presented in the form of a shadow graph to illustrate the effect of shape factor on performance of the pads. All data is presented for guidance only.

Bearing Stress vs Static Deflection



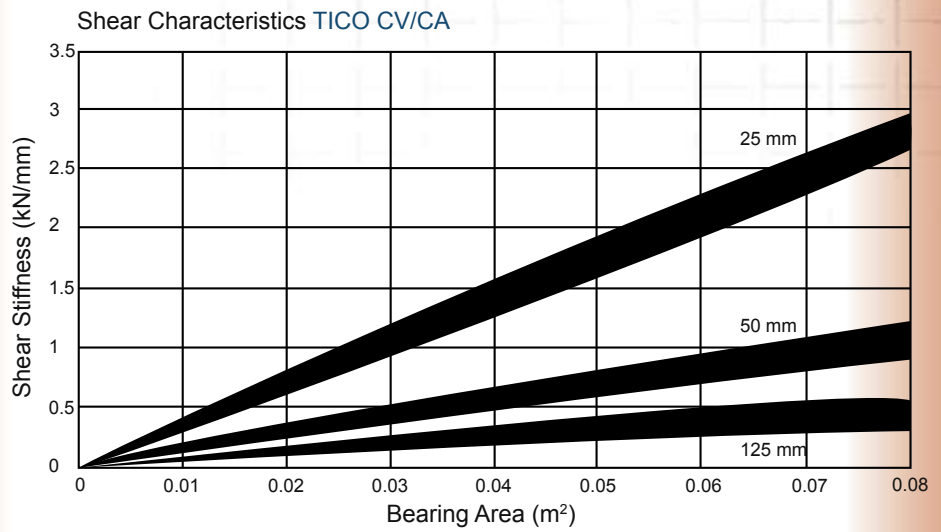
Bearing Stress vs Natural Frequency



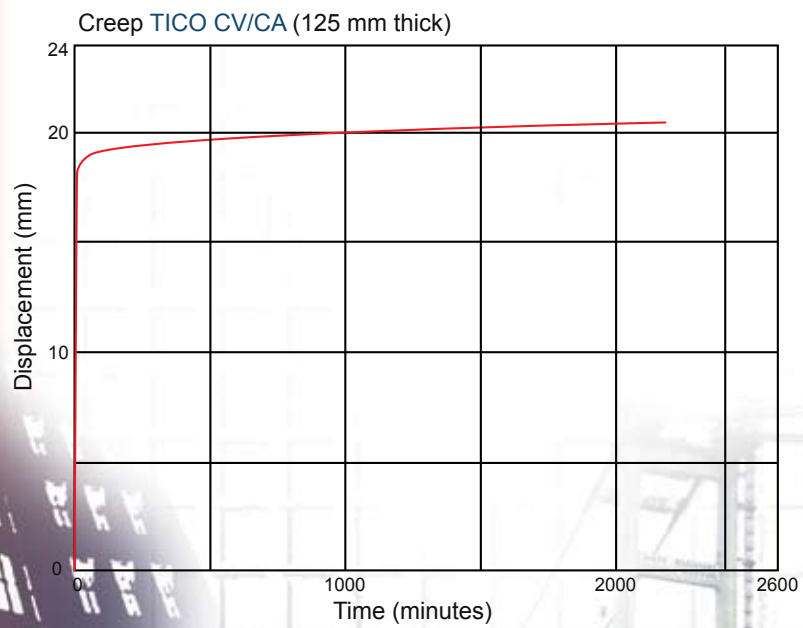
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Shear Properties

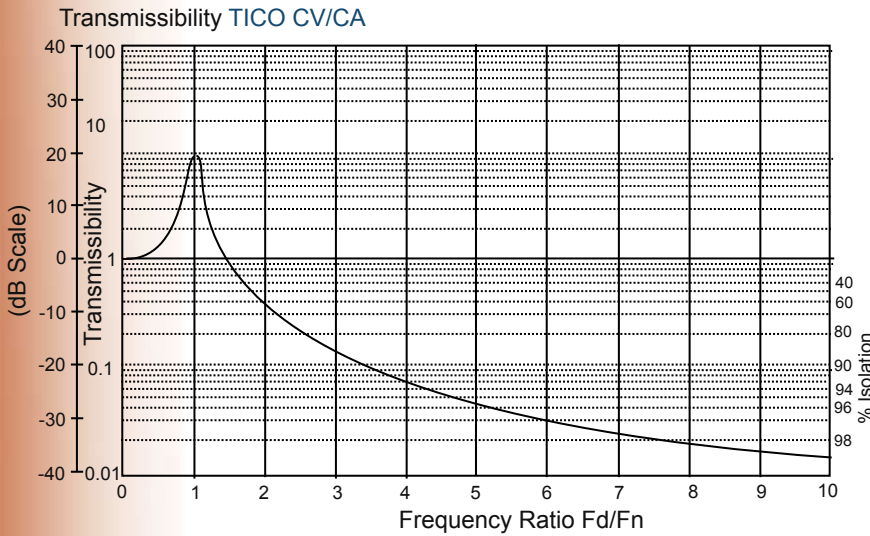


Creep



Transmissibility

Design Considerations



Because of the wide range of applications for which TICO CV/CA is suitable, and the variation of material properties under different operating conditions, it is difficult to provide a simple design guide.

Key parameters in the specification of TICO CV/CA bearings are:

- Operating loads (dead and live loads)
- Available space to incorporate bearings
- Required natural frequency of isolation system (bearings)
- Disturbing frequency of vibration to be isolated (if known)

The load and available area will largely determine the plan dimensions and configuration of bearings, whereas the required natural frequency or disturbing frequency will strongly influence the bearing thickness. The interdependence of these parameters is indicated in the graphs in the previous section.

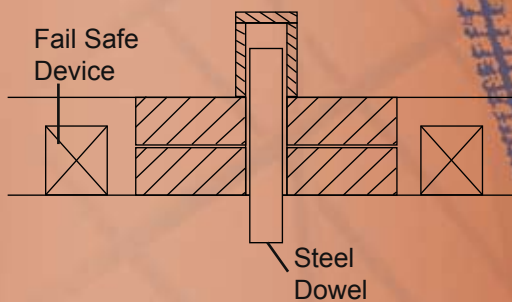
It is recommended that bearings are employed in modules of the order of 200 - 300 m square to offset the reduced deflection and increased natural frequency which occurs due to the area/shape factor when employing larger bearing sizes.

TICO CV/CA bearings may be employed in thicknesses in multiples of 25 mm to provide the required natural frequency for a specific project. When a low natural frequency dictates that a very thick bearing is required, it may be necessary to provide some form of horizontal restraint, e.g. dowels or side restraint bearings.

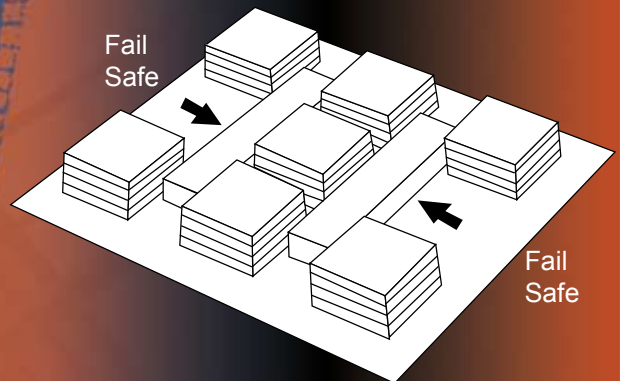


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It is also advisable to include some form of fail safe such as a steel or concrete upstand in the foundation design to support the structure should failure of the bearings occur through a major fire or other exceptional circumstance. Any block fail safe system needs to be carefully designed to take into account the natural deflection (creep) of the bearings over long periods of time.



The incorporation of resilient structural bearings into a structure has to be considered at an early design stage to enable a safe, effective and economical system to be engineered. Detailing such systems late in the construction process can cause major complications and in some instances may simply not be feasible. It is Tiflex' custom to work closely with consultants, engineers and other authorised bodies throughout the design and build process to ensure that we provide a bearing solution best suited to each individual application.

When incorporating bearings into a building, where possible and relevant the guidance and recommendations of BS6177:1982 'Guide to selection and use of elastomeric bearings for vibration of buildings' should be observed.

Installation of TICO CV/CA Structural Bearings will vary from application to application and also depend on the design and arrangement of the bearings.

For plain bearings, pads or strips should be securely fixed in position with Tiflex Marine Epoxy Adhesive. The instructions for use of this adhesive should be followed carefully and are available on request. Pre-cast units can be placed directly on top of the bearing without any further bonding.

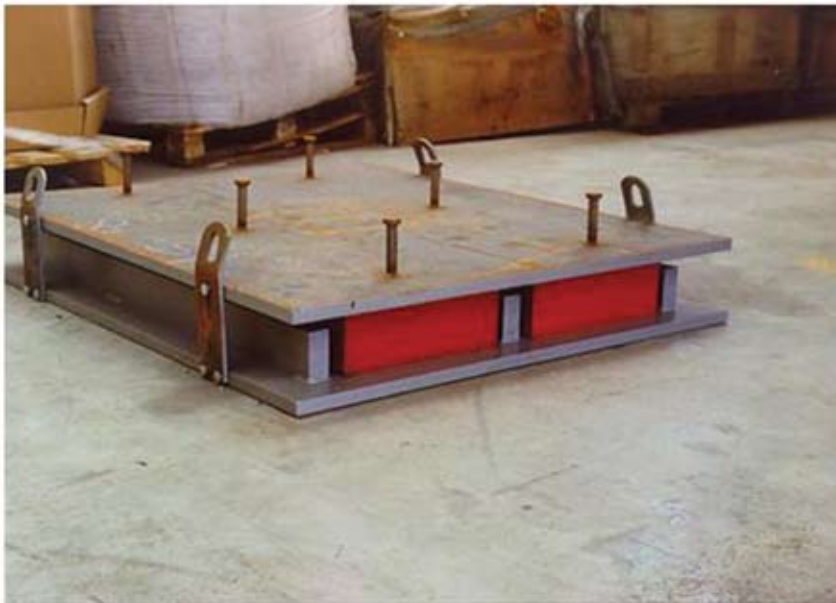
Good surface preparation is essential for a strong and durable bond. Surfaces onto which the bearing is to be placed, and surfaces mating with the upper surface of the pad, should be clean and as level as possible. Although bearings have been designed to take up some surface irregularity, out of plane mating surfaces can produce excessive stresses on the pads and impair their performance. Where possible the guidance of BS6177:1982 should be followed, in particular section 4.6 regarding bearing support surfaces.

TICO CV/CA assemblies may also be incorporated into complete steel assemblies which can be used to allow structures to be cast in-situ. An example of such a custom designed unit is shown in the photos on the following pages where positive fixing of the assembly within the structure is achieved using steel studs and keys. Such an assembly can also incorporate a simple fail safe device and, fire protection and environmental strouding.

The Tiflex logo consists of the word "Tiflex" in a bold, yellow, sans-serif font, set against a dark blue, rounded rectangular background.

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TICO CV/CA modular bearings with steel fail safes.



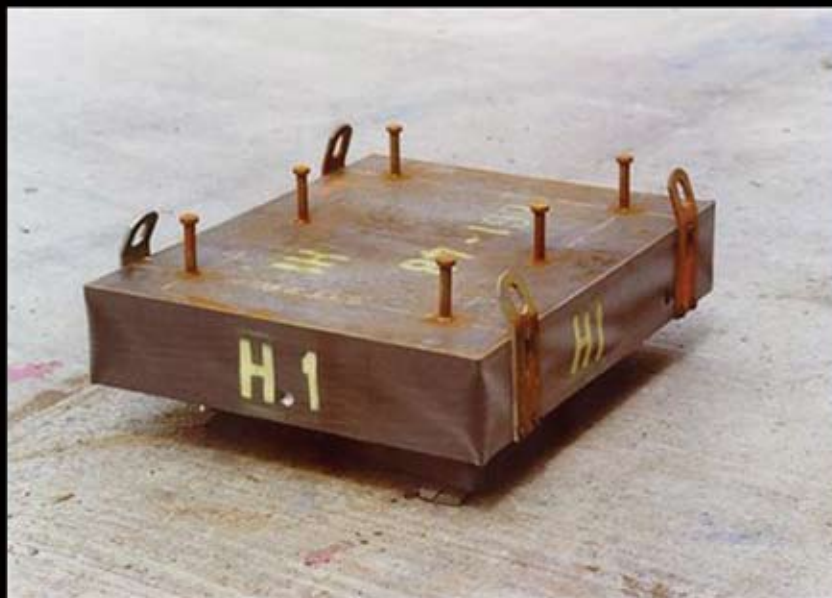
Upper bearing plate bonded to pads, note fixing studs on surface to allow concrete to be cast on top.



TICO ceramic fire blanket provides fire protection for bearing.

Similar assemblies can be employed replacing the CV/CA with CV/M or indeed a combination of both.

When installing TICO CV/CA bearings, care should be taken to ensure that pads are not inappropriately loaded during the construction process i.e. high vertical or horizontal forces beyond the design parameters that would overstress or damage the materials. It should also be borne in mind that the bearings will continue to deflect during construction as the weight of the structure increases and therefore distribution of load should be controlled appropriately.



Completed bearing with environmental shrouding.

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Storage and Handling

On arrival on site, TICO Structural Bearings should be stored away from direct sunlight, excessive heat, chemicals or any liquid media. They should be kept in a safe, secure location where they are unlikely to be damaged or tampered with, become immersed in water, or have other building materials stacked on top of them.

Bearings should be handled with care during installation to ensure that they are not dropped or in any other way damaged. Damaged bearings should never be incorporated in the works and should be brought to the attention of the resident engineer or consultant.

On no account should welding be carried out on, or next to, a bearing either before or after installation.

Safe Handling data sheets are available for TICO CV/CA bearings on request.

Supply Details

TICO CV/CA is manufactured in sheet form up to a maximum sheet size of 1200 x 1000 mm. However, it is more common and advisable to employ this material in modular or strip form for the best performance.

Typically supplied bearing sizes and load bearing capacities are given in the following table.

Length (mm)	Width (mm)	Maximum Recommended Load (kN)
150	150	157
175	175	214
200	200	338
225	225	354
250	250	437
275	275	529
300	300	630



Tiflex recognises that in civil applications bearings often have to be custom sized to meet the project requirements and thus we are happy to supply custom sizes up to the maximum sheet size available.

CV/CA bearing materials are available in thicknesses which are multiples of 25 mm. Typical thicknesses employed are 25, 50, 75 and 125 mm.

For severe environments, bearing edges can be protected with a hypalon based coating applied during manufacture.

In major installations where fire protection is required, Tiflex are able to supply a protective ceramic fibre blanket and environment shrouding, as well as full assemblies as described previously.

Tiflex also offer a post installation bearing inspection service where required, to ensure that the bearings are performing adequately over long periods of time.

Please contact our customer services department with full details of your requirements for a free written quotation. Our Technical Department will also be pleased to assist you in determining your exact bearing requirements.

All TICO materials are manufactured in accordance with BS EN ISO 9001: 2000



Uniclass L31:N14	EPIC C215
CI/SfB (29)	X

Tiflex

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