

MANHOLE LIFT SYSTEM

Press-Seal Gasket Corporation

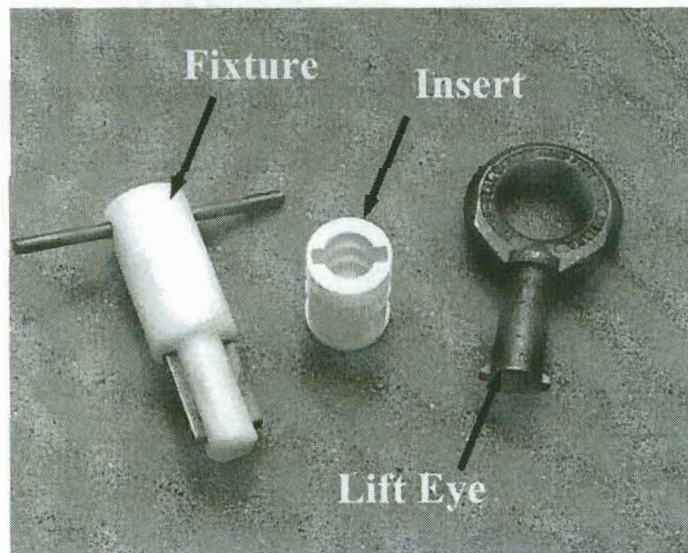
Introduction

The Press-Seal Gasket Lift System is designed as an easy to install method of placing precast manhole components in the field. The system is comprised of three parts: the insert, lift eye and fixture. The insert is a bonded impact styrene injection molded part, which forms the hole and anchoring area for the lift eye. The reusable cast iron lift eye is placed and locked into the insert in the field for lifting and installation. The fixture is a manufacturing-positioning tool for the precaster to insure each insert is positioned correctly and consistently in the product.

The concrete precaster installs the insert with the positioning fixture during the manufacturing process for the manhole unit. By monolithically casting the insert into the manhole, the insert has the opportunity to obtain good concrete consolidation around its numerous anchoring edges, which also assists in minimizing any voids that could allow water or air passage around the insert during testing.

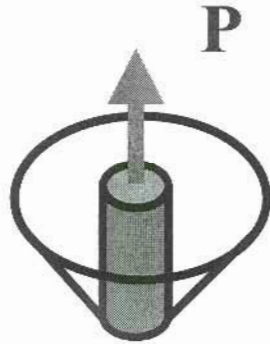
Once the concrete has obtained its required design compressive strength, the lift eye can be inserted, locked into place with a 90 degree turn and used for installation. Each lift eye is plant tested and rated for a lift force of 3,600 pounds.

This system has been in use for over 15-years with a proven record of integrity and safety, when used in accordance with the design, manufacturing and installation criteria contain herein.

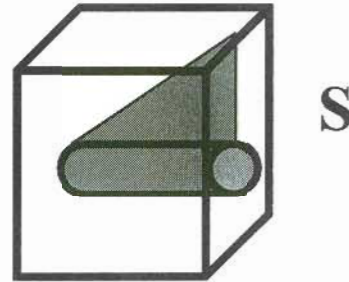


Design Criteria

Press-Seal Gasket provides customized design guidelines to each precaster for the use of the lift system with their particular product line. Each application is designed for its theoretical load capacity for both tensile and shear forces.



Tensile Capacity



Shear Capacity

APPLICATIONS

The lift system is designed for lifting manhole riser, base and conical sections. The design of the system is based on lifting structures with the insert placed perpendicular to the wall and the lifting force or device acting parallel to the wall. The lift system is not designed for the movement or placement of flat slabs.

DESIGN REQUIREMENTS

Each lift eye is design, rated and tested to a lift capacity of 3,600 pounds. The lift system requires the product to have a minimum concrete compressive strength of 4,000 psi for this lift rating. The maximum weight of a product for a two-lift eye system is, therefore, approximately 7,000 pounds.

Using more than two inserts and lift eyes will increase the maximum weight of the product that can be lifted. This limit must be determined by estimating the weight distribution of the product relative to the number and location of the lift inserts.

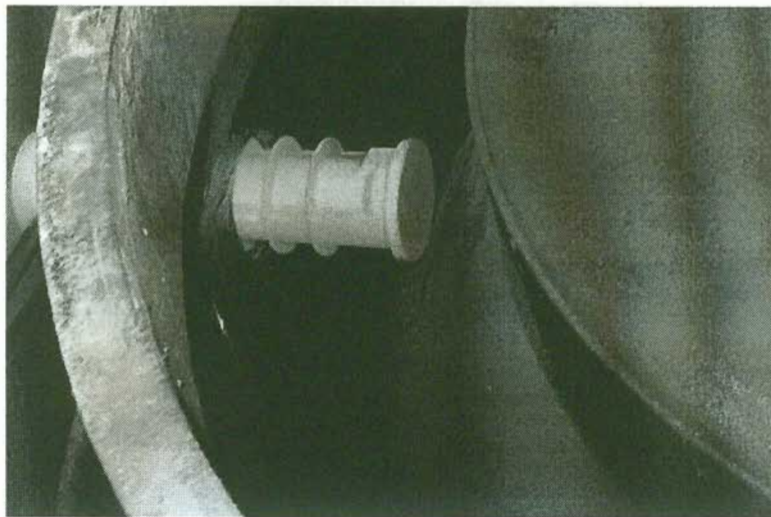
The vertical positioning of the lift eyes in the riser and base walls varies depending on the height of the section, but to minimize the shear capacity concerns, the lift eye should ideally be placed just above the center point of the section.

As a service to its customers, Press-Seal Gasket will determine recommended lift insert locations and maximum lift capacity for the system based on the product's geometric configuration and material properties. When requested and supplied, these designs will incorporate appropriate safety factors for lifting devices, but obtaining critical

Manufacturing Guidelines

The manufacturing process for installation of the lift inserts is relatively simple. The plastic insert is placed over the assembly fixture and locked in place. The combined fixture and insert are then installed in the casting form and secured in place. A resilient gasket between the fixture and form prevents concrete seepage into the insert during the casting process.

The most critical manufacturing detail for the lift system is the placement and positioning of the fixture and the insert at the proper location in the precast manhole product. Depth, orientation and location are all important for the systems proper performance.



Insert Positioned in Form with Fixture

DEPTH OF INSERTS

The greater the burial depth of the insert, the greater its tensile and shear capacity. Reducing the burial depth of the insert from its 4-inch depth will reduce the lift capacity of the system.

Conversely, placing the insert greater than 4-inches will increase its lift capacity but may lead to problems associated with leakage during hydrostatic or air testing. The insert has a depth of 4-inches, if buried deeper than this distance in a standard 48-inch manhole, the cover over the bottom of the insert will be less than one inch. Even though waterstops are designed into the insert, an increase in burial depth will decrease the effectiveness of these devices during test pressures.

The fixture is designed to consistently place the insert at a 4-inch depth. Periodic maintenance checks for concrete buildup and wear of the fixture and forms will insure proper positioning.



INSERT ORIENTATION

The tensile capacity of the system is based on a 90 degree or perpendicular orientation of the insert to the form. When an insert is at a shallow angle to the form, load capacity is reduced. It may also be more difficult for the contractor to position the lift eye in the insert in the field. If there are problems obtaining proper orientation of the lift insert, check the condition of the fixture and possibly the form for concrete buildup, bending or warping around the fixture opening.

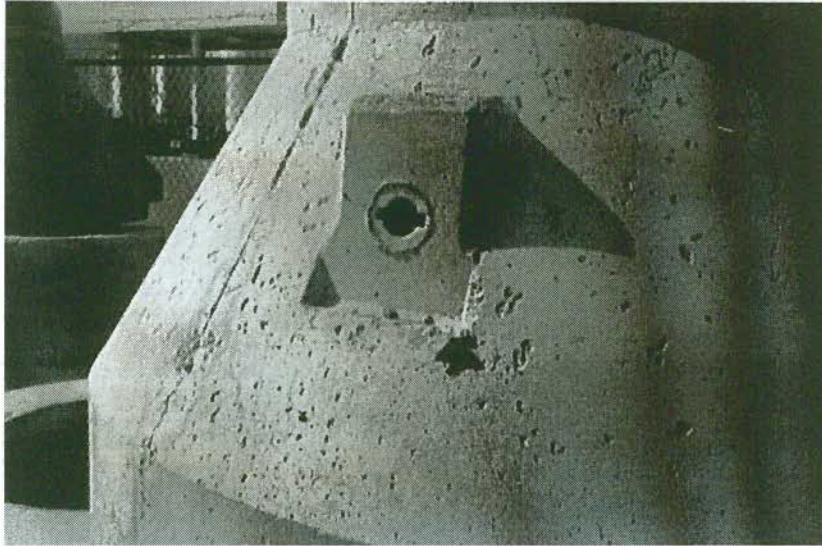
INSERT LOCATION

Inserts are designed to be placed in the walls of manhole risers, cones or base sections. They can not be used in flat slabs due to shear capacity limitations associated with the relatively shallow depth and high weights of these sections.

The position of inserts in the walls can vary depending on the shape and weight distribution of the precast section. In general, for round monolithic sections, the inserts are equally spaced around the periphery of the unit at a uniform height, a third of the distance from the top of the section. This depth estimate is acceptable for standard 48-inch diameter manholes, but it must be reanalyzed for larger diameter manholes and any specialty structures. The position of inserts below cutouts or hole openings should be avoided, as there may not be adequate depth to resist shear stresses. Lift inserts should also have a 4-inch minimum lateral clearance distance to any cutout or hole to maintain proper tensile capacity.

Base sections may contain a number of cutouts or openings, which may make the proper positioning of lift inserts difficult. In these cases, it is advisable to provide extra inserts to assist in the distribution of the loads and to stabilize the structure during contractor lifting and installation. Allowing for additional insert positioning during the initial equipment modifications for this system will make this option possible in the future without any disruption to production.

Eccentric and concentric cones have sloped surfaces, which must be taken into consideration if inserts are to be placed in these areas. The problem with installation on a sloped surface is the reduction of shear capacity of the system based on the direction of lift. Ideally, the lifting direction should be parallel to the wall, but this may not always be the case with sloped surfaces. If the contractor uses a lift bar, the angle of lift relative to the wall and insert position becomes more acute, reducing the wall area for shear resistance. Since there are no ways of insuring lift procedures in the field, it is prudent to place the insert in the wall in such a manner to minimize any of the detrimental effects of possible lifting methods. By recessing the insert in the wall with a box cutout, shear concerns can be reduced.



Recessed Insert on Sloped Surface

OTHER PRODUCTION ISSUES

Production techniques and mix designs vary from one region to another depending on aggregates and plant-to-plant depending on production equipment. Regardless of the materials used or production method utilized, consolidation of concrete around the lift inserts is critical for both structural performance, as well as, leakage testing.

Wet-cast production methods will yield the best results for consolidation of materials around the insert's waterstops. Dri-cast production methods may yield higher concrete compressive strengths due to their low water-cement ratios, but conversely may have a more difficult time in consolidating material around the waterstops. This condition may become a problem if there are difficulties maintaining the proper depth of the insert and thereby concrete cover over the backside of the insert. If porosity is an issue with the material used for a dri-cast process, considerations should be given to increasing the amount of fines in the mix with the use of fly ash or finer sand and aggregate gradations. *Additional vibration around the inserts is another means of obtaining better consolidation around the inserts.*

A final point, which can not be stressed enough, is the importance of achieving the minimum concrete compressive strength of 4,000 psi prior to using the inserts for lifting. The structural capacity and safety of the system depends on reaching this minimum concrete strength.

Installation Guidelines

All manhole components will be delivered to the field with all inserts installed and positioned for quick lifting and installation. To lift a piece, a cast iron lift eye is inserted into each insert in the product. Each lift eye will be placed into the insert in a horizontal position, with the eye opening parallel to the ground. The lift eye is then turned 90 degrees to the vertical position to lock it in place. If the lift eye is not in the vertical position or does not lock in place, do not lift the product with the lift system or use this lift eye or insert.

Once the lift eyes have been installed and secured, the product can be lifted into position with chains and lift bars. Lifting devices must have a minimum capacity rating adequate for lifting a dead weight of 3,600 pounds for each lift eye. It is the contractor's responsibility to assess impact and drag forces on the product during lifting to insure an adequate safety rating is used for all lifting devices.



Voids and Poor Consolidation Around Insert

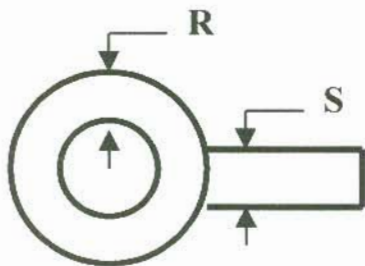
FIELD INSPECTION

Prior to the insertion of the lift eye, each insert shall be inspected for cracking, spalling or delamination of concrete around the insert. When the lift eyes are locked in place, there shall be no movement of the lift insert and the lift eye should not be at a skewed angle to or wedged against the wall of the precast section. If any of these conditions exist, they shall be brought to the immediate attention of the precast manufacture for evaluation prior to using the system.



Spall and Damage Around Insert

Lift eyes shall also be examined for wear and damage prior to use. Lift eyes, which have cracks, spalls or evidence of heat treating, shall be immediately destroyed and discarded. Wear exceeding minimum thickness also requires the service removal and disposal of the lift eye.



Lift Eye	R Minimum Thickness	S Minimum Thickness
M3	1.18-inches	1.41-inches

**Minimum Lift
Eye Dimensions**

POSSIBLE OVERLOAD CONDITIONS

The Press-Seal Gasket lift system has been designed to lift precast concrete sections into a final installation position. Many field conditions can result in overloads on the product not included in the design of the system. These may include but not limited to lifting products containing water or ice, products in contact with frozen ground, products in contact with soil especially wet or saturated clays, and any field added castings or other related structures.

The lift system should also not be used to separate assembled manholes or for repositioning set manholes. Drag and frictional forces on the inserts in these applications

are substantially higher than their design. Impact to the lift eye or product during positioning may also weaken the integrity of the lift insert and the safety of the installation.

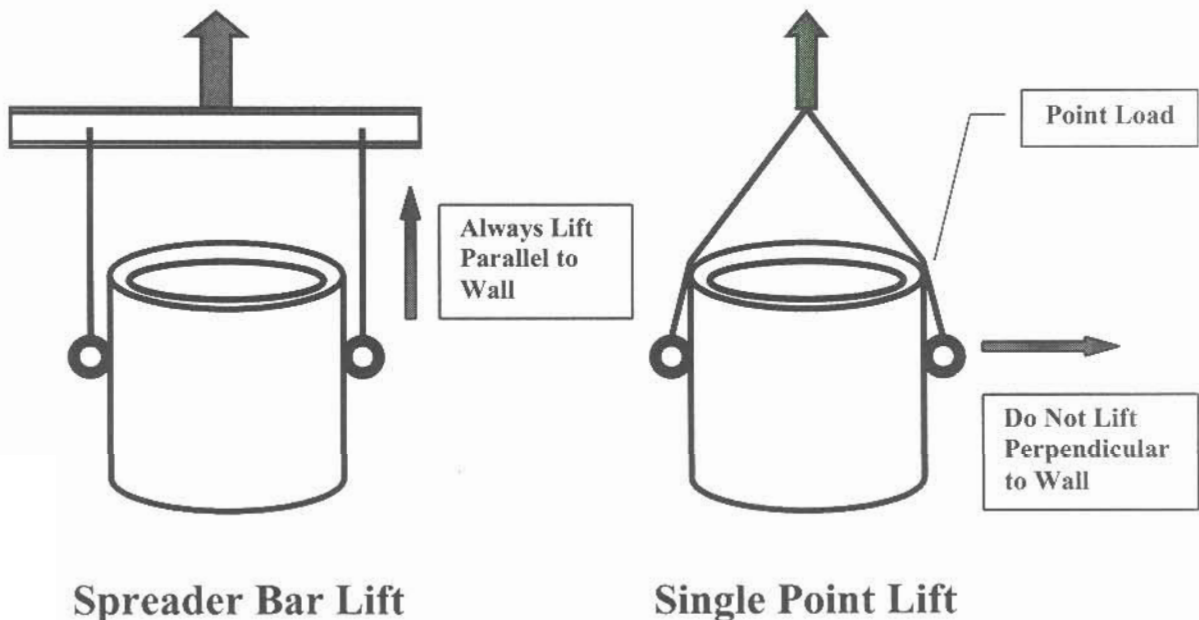
All these field conditions are outside the control of Press-Seal Gasket, and as such, voids all design and implied warranties on the lift system and its components.

REPAIRS AND PATCHES

The plastic lift insert is designed as a monolithically cast unit within the precast concrete. Field patches and repairs do not have the same integrity of the initially cast concrete. No field repairs are, therefore, permitted with this system. If voids, cracks or spalling are noted around the lift insert, do not use the system to lift the product.

LIFTING DEVICES

The most common method for lifting structures in the field is with chains. Spreader bars, however, provide some unique benefits when used with the lift system. The spreader bars apply loads at the best angle, minimize tongue and point loads to the product and are safer. Although the lift system is designed to use either system, the quality of the product and ease of installation will be greater with the spreader bars.



Questions and Information

For information on this system or any of Press-Seal Gasket Corporations other product lines, please contact us:

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