FLOOR SURFACE SPECIFICATIONS

CONCRETE FLOORS

Table of Contents

This document covers original/new floor specifications and surface continuity for the proper operation of Aero-Caster® equipment. Given a smooth sealed surface and a supply of air at the right pressure and volume, AeroGo® products can be sized to lift and move any load. Following these floor guidelines will ensure trouble-free performance of your AeroGo® equipment for years to come.

- For information on achieving sealed concrete floors, consult AeroGo EI-16 "*Concrete Surface Treatments*"
- For larger surface areas that are damaged or cannot be sealed, consult AeroGo EI-15 *"Temporary and Permanent Surface Overlays"*
- For instructions on how to correct or create a suitable operating surface, see AeroGo EI-13 *"Cracks, Joints and Holes in Concrete"*

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OVERVIEW OF COMPLIANT FLUID FILM FLOOR SURFACES

All load moving systems depend upon operating surfaces for their performance: cranes and trains use rails, cars and trucks use roadways. The condition and quality of these rail and roadway surfaces is important. So also is the condition and quality of surfaces on which fluid film (air or water) operate successfully. The remarkable load lifting, free floating and easy moving qualities of fluid film relate to the undulations, slopes and textures of the surfaces on which they operate. On proper surfaces *fluid film systems virtually never wear out* since they hover above the floor, not roll or slide on the floor.

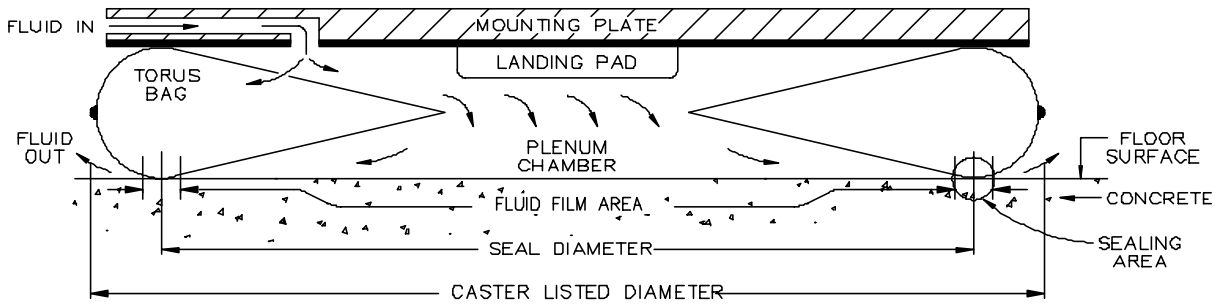
It is necessary to understand something of how fluid film systems work to see why certain floor surface qualities are important.

Basically, fluid casters work as a flexible interface between a load and the floor. Perfectly flat floors are simply not practical even in laboratories, much less in the industrial and commercial worlds. So, fluid film casters must extend and retract like springs to carry a load evenly over an uneven surface. AeroGo's bellows shaped fluid *Aero-Casters*® were specifically developed to meet this reality. Underneath the inflated fluid caster, between its working face and the floor, a thin fluid film escapes. In this area the flexible fabric of the *Aero-Caster*® deflects to maintain a constant clearance between the caster and the floor. The escaping fluid draws the fabric to near floor contact all around the circular perimeter, even though floor elevations vary. This automatically-regulating thin film gap supports the load above the floor, allowing the load to float freely in any direction. The paper thin gap (approximately 3-5 thousandths of an inch) is the key to the system. The volume of escaping fluid is very low and thus the system is highly efficient. Demonstrations show that a lighted match will not be blown out a few inches away from an *Aero-Caster*® operating on a proper surface.

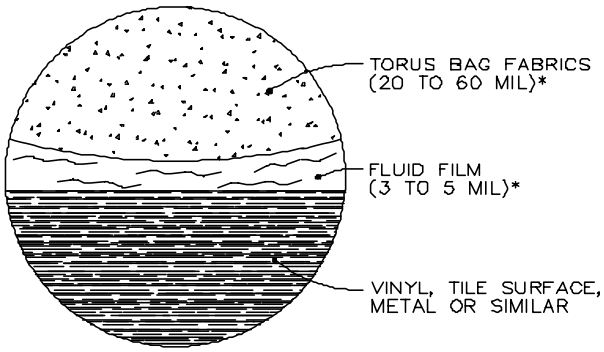
Aero-Casters® automatically follow undulations of normal floors as loads are floated across them. Fluid film *Aero-Casters*® also work well on sloped planes - floors do not have to be level for free floating. A load must be restrained by a guide wheel to prevent gravity from moving a near frictionless load down the slope.

Porosity: Surface texture, specifically porosity and smoothness, is the most important consideration for fluid film floors. Remember that fluid film is efficient because of the very small escape volume that passes under the *Aero-Caster*®. The fluid pressure within the *Aero-Caster*® forces it to expand up to lift the load. The same pressure, in some cases up to 50 pounds per square inch, is pushing down on the floor surface. We have captured a bubble of pressurized fluid. If the floor surface is porous, the fluid can escape through it and be wasted and the system loses much of its efficiency. Therefore, operating surfaces for fluid film systems should be non-porous. Linoleum, varnished hardwoods, vinyl tiles or metal plates are examples of non-porous floor surfaces; however, some of these may be impractical in industrial applications. Concrete, the most common industrial floor, can be easily made non-porous by applying commercial sealants.

AERO-CASTER
(CROSS SECTION)



GOOD SURFACE



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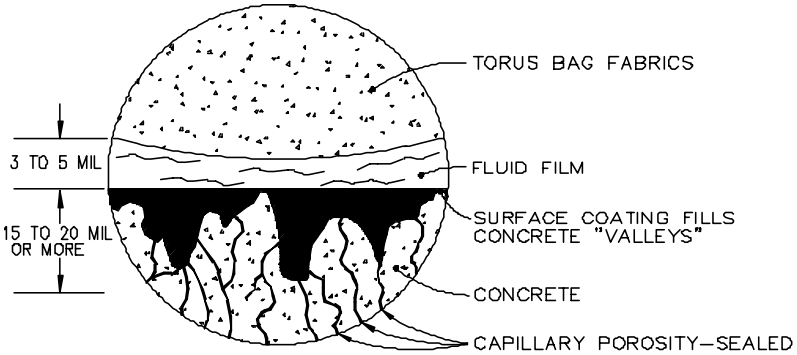
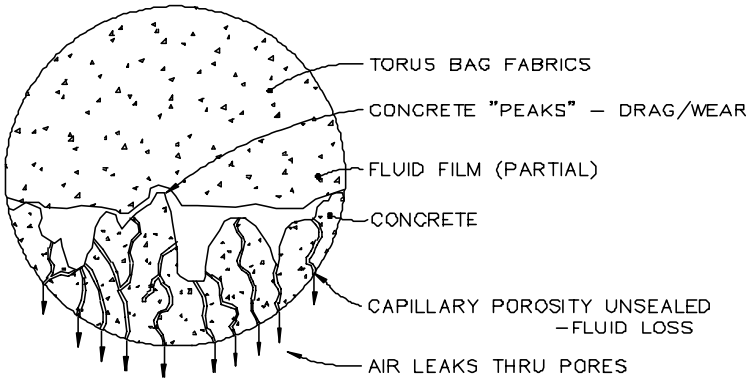


POOR SURFACE



* 1000 MIL = 1 INCH

Surface Finish: Local smoothness of the surface is perhaps the most important single factor relating to fluid film. Run your hand across concrete. Some concrete is smooth and some is like sandpaper. Looking closely at a cross-section of these surfaces shows "peaks" and "valleys". Elevations of these "peaks" can easily be 15-20 thousandths of an inch which, in comparison to a fluid film of 3-5 thousandths of an inch, are massive. The sketches on the previous page show a magnification of the fluid film area on a vinyl tile surface (top sketch), on surface filled concrete (middle sketch) and on unfilled/unsealed concrete (bottom sketch).

From these sketches it is clear why smooth surfaces are important to fluid film casters. The "peaks" of rough concrete extend through the fluid film and abrade the *Aero-Caster*® surface – resulting in increased friction and shorter *Aero-Caster*® life. By contrast, a smooth surface does not contact the *Aero-Caster*® at all and thus there is no physical wear. Fluid casters operated properly on smooth surfaces literally never wear out.

We have explained that undulations (planarity) of common industrial floors are perfectly adequate for *Aero-Caster*® fluid film operation. The bellows action of the *Aero-Caster*® accommodates normal floor irregularities. Further, we have explained that sloped floors are no problem for fluid film casters except that floating loads must be restrained so that they won't drift away. Also, we have explained that porous floors waste fluids and cause important losses in system efficiency. Concrete floors are easily sealed and made non-porous with commercial sealants. Finally, we have explained and sketched why surface smoothness is the most important single factor resulting in successful fluid film application. By filling the surface *valleys* flush with the *peaks*, concrete can easily be made suitable for fluid film operations.

Since concrete is the most universally common floor material, our specifications address this. Materials of virtually any other type that satisfy fluid film conditions, support the loads and endure the working environment are acceptable. By following the fluid film floor specifications, providing fluid supplies (air or water) as defined in our literature and maintaining the housekeeping recommendations and operating instructions supplied with an *Aero-Caster*® system, the user will realize the many outstanding benefits of fluid film load moving systems.

GENERAL FLUID FILM SURFACE SPECIFICATIONS

This section only addresses the operating surface on which fluid film (air and water) systems operate. Structural considerations of materials/structures supporting these surfaces (strength, stability, etc.) are to be determined by competent technical authorities considering soil bearing capabilities, environmental conditions, available materials, etc. For this specification, it is assumed that floor or slabs are stable and properly engineered for the planned loads.

Surface Planarity

The overall planarity of the finished top concrete surface may deviate (X) from a true plane. The local planarity of the finished top concrete surface may be within (Y) in any 10

feet as determined by a 10-foot straight edge when placed on the surface.

Aero-Caster Size	X	Y
60″ to 36″	±1/4″	±1/4″
27″ to 21″	±3/16″	±3/16″
15″ to 8″	±1/8″	±1/8″

Note: These deviation tolerances are the acceptable range of concrete planarity for *Aero-Caster*® operation; however, since these requirements are less restrictive than normal building specifications, it is recommended that the normal standards apply.

References:

- American Concrete Institute Standard 302 "*Specification for Floor and Slab Construction*"
- American Concrete Institute Standard 301 "*Specification for Concrete*"

Normal tolerance of ¼-inch in 10 feet applies. Steel trowel finish is required.

Surface Levelness

The finished top concrete surface shall not slope from a flat overall plane greater than 0.1%.

Note: The importance of levelness relates solely to the frictionless nature of a load floating on fluid film. With levelness exceeding the specified levelness, loads will tend to drift toward a lower level and require anti-drift restraints (e.g. guidewheels).

Surface Continuity

Proper operation of Aero-Caster equipment is achieved on concrete that is smooth-troweled and sealed. The top concrete surface shall be continuous without cracks, steps or other interruptions through which fluid losses can occur. For unavoidable cracks or expansion joints, a load bearing filler material is required. The finished surface must be smooth and continuously bonded to the crack/joint walls to prevent fluid losses, must be load bearing, must flex with temperature and operating changes, and must provide minimum surface planarity interruption consistent with fluid film operational requirements. If all air passages are not sealed, air may escape during operation and/or put upward pressure on other joint areas. Thus, the filler must be applied securely so that it resists both down or up air forces

In some instances it may not be possible to achieve complete surface continuity. In these cases the following apply:

Cracks: Clean free of all loose materials, then epoxy fill smooth and flush with adjoining surface. (See AeroGo EI-13 *"Repairing Cracks, Joints & Holes in Concrete" for complete instructions*).

Steps: Blend by grinding to slope angle of 1:20 or greater. Steps not to exceed local planarity height limits noted above. Blended areas should be sealed.

Projections: Grind flush with adjacent concrete or blend as with steps. Projections not to exceed local planarity height limits noted above. Areas should be sealed.

Joints: Construction joints shall be avoided wherever possible. If mandatory, such joints shall be keyed to prevent shift between adjacent surfaces. Clean joint or groove, fill with backer rod, and fill smooth and flush with adjoining surfaces. (See AeroGo EI-13 *"Repairing Cracks, Joints & Holes in Concrete" for complete instructions)*.

Concrete Quality

The concrete shall be a dense workable mixture designed to be free of plastic shrinkage cracks and have low long term shrinkage characteristics.

Note: Design considerations must be given to local weather conditions (temperature, humidity) to control set rate, slump and shrinkage rates

Concrete Surface Finish

The top surface shall be of high quality, smooth, steel troweled finish. Finish shall have uniform appearance without trowel marks, ridges or voids.

Work Protection

At all times during concrete emplacement, curing, sealing and coating, all work shall be protected from physical or environmental damage.

Note: For fluid film performance, the essential purpose of this statement is to ensure a durable final surface finish.

AeroGo Approval

The floor surfaces shall be subject to inspection approval by a qualified technical representative of AeroGo, Inc. Such inspection bears the right to reject workmanship or conditions not meeting these specifications. Survey documentation shall be required to affirm that planarities and levelness conform to specifications. Coatings shall be securely bonded to the concrete and present a uniformly finished operating surface according to the specifications. Corrections, if any, required to meet specifications shall be the responsibility of the contractor.

Note: This section may be deleted or modified to suit specific contract conditions. Its intent is to assure that workmanship and materials shall be of durability and quality fitting the needs of high performance fluid film systems.