
WORLD LEADER IN CONCRETE DENSIFICATION
SIXTY
60
YEARS
ANNIVERSARY
ASHFORD
FORMULA™

THE ASHFORD FORMULA™

AND THE

AVIATION INDUSTRY

LONG HISTORY

The Ashford Formula™ has been used as a **sealer**, **hardener**, and **dustproofing** agent on concrete surfaces for 60 years.

The Ashford Formula™ has a long history in the aviation industry, dating back to 1957. It has been widely used in such areas as:

- Maintenance Facilities
- Hangars
- Flight Ramps
- Tunnels
- Aircraft Manufacturing Plants, and
- Parking Garages.

AVIATION INDUSTRY

Among the earliest projects in the aviation industry was a facility built near Dallas, Texas, USA. The Ashford Formula was used to seal, harden, and dustproof the floors at **Braniff International Airways Love Field** maintenance facility in 1957.

437,000 square feet (41,000 m^2)

AVIATION INDUSTRY

The building was used until **Braniff** ceased operations in 1982. Facility managers remained impressed with the performance of the floor during the life of the building. Although traffic in the facility was heavy for many years, the floor showed no signs of wear. The floor also remained easy to clean, despite the use of the light-weight lubricants and other surface contaminants.

437,000 square feet (41,000 m^2)

AVIATION INDUSTRY

In 1981, the **Pennzoil Executive Hangar** in Houston, Texas, USA, was sealed, hardened and dustproofed with the Ashford Formula™. Despite heavy use, the floor has developed a permanent and attractive sheen with no erosion from traffic.

45,000 square feet (4,200 m^2)

AVIATION INDUSTRY

The Ashford Formula™ was used to treat about 45,000 square feet (4,200 m^2) of concrete floor space in the cargo facility at **Kansai International Airport** near Osaka, Japan in 2006.

45,000 square feet
(4,200 m^2)

AVIATION INDUSTRY

When **McDonnell Douglas** made improvements to their facilities in St. Louis, Missouri, USA, in 1983, the Ashford Formula™ was used on 700,000 square feet (65,055 m^2) of flight ramps and taxiways. The result is a hard, dense working surface that resists the effects of heavy traffic.

700,000 square feet
(65,055 m^2)

AVIATION INDUSTRY

This photograph of the tarmac, taken at the **McDonnell Douglas** site in 2009, demonstrates the durability of the surface after ***26 years*** of heavy military and municipal use.

AVIATION INDUSTRY

When the **Denver International Airport (USA)** was built in 1992, the Ashford Formula™ was used to dustproof and harden walkways and other concrete surfaces inside the train tunnel that runs between terminals. Two miles (3.2 km) of tunnel were treated.

2 miles (3.2 kilometers)

AVIATION INDUSTRY

More than 1,000,000 square feet (93,000 m^2) have been treated with the Ashford Formula™ at the **Boeing** manufacturing facility in Everett and Auburn, Washington, USA. Most of the work was done between 1988 and 1993. These floors still maintain their original sheen and resistance to abrasion.

1,000,000 square feet (93,000 m^2)

AVIATION INDUSTRY

The **American Airlines** hangar in Fort Worth, Texas, USA was sealed with the Ashford Formula™ when it was constructed in 1990. The building is used for maintenance of the Boeing 767-300 and 777 commercial jetliners. Situated at Alliance Airport, this facility measures 220,000 square feet (21,000 m^2) in area.

220,000 square feet
(21,000 m^2)

AVIATION INDUSTRY

The Ashford Formula™ was also used in a large hangar built for **Cargolifter AG** in Brand, Germany, near Berlin. The facility measures approximately 811,000 square feet (75,370 m2). This facility was designed and built to hold the CL 160 airship.

645,840 square feet
(60,000 m^2)

AVIATION INDUSTRY

The Ashford Formula™ was also used to seal the concrete decks of the new parking garage at the **Sacramento International Airport** in Sacrament, California, USA. The total area of concrete treated was approximately 2,000,000 square feet (186,000 m^2). This facility was completed in 2004.

2,000,000 square feet
(186,000 m^2)

AVIATION INDUSTRY

The Ashford Formula™ was also used to seal, harden, and dustproof the floors of the **Delta Airlines** hangars built at the Cincinnati/Northern Kentucky International Airport in Erlanger, KY, USA. The product was used to treat approximately 120,000 square feet (11,160 m^2).

120,000 square feet (11,160 m^2)

AVIATION INDUSTRY

When **DHL Express** built their new hangar at the Leipzig/Halle airport in eastern Germany, the floors were treated with the Ashford Formula™. Approximately 675,182 square feet (62,726 m²) were treated at this facility.

DHL European Hub
251,081 sqf (23,326 sqm)

Logistics Center for DHL
424,101 sqf (39,400 sqm)

AVIATION INDUSTRY

Over 3,588,000 square feet (300,000 m^2) of concrete received the Ashford Formula™ at the **Ulan Ude Airport** in the Baryatia Republic in Russia. Treated areas included runways, taxiways, and other exterior concrete. Despite harsh Siberian conditions, all of these areas remain sealed, hardened, and free of dust.

3,588,000 square feet
(300,000 m^2)

AVIATION INDUSTRY

Other Facilities in the Aviation Industry Treated with the Ashford Formula™:

GENERAL DYNAMICS
Convair Plant,
San Diego, CA, USA
750,000 ft^2 (70,000 m^2)

AIR FRANCE/LUFTHANSA AIR CARGO
Chicago O'Hare Airport
Chicago, IL, USA
360,000 ft^2 (34,000 m^2)

UNITED AIRLINES MAINTENANCE HANGAR
Denver International Airport
Denver, CO, USA
300,000 ft^2 (28,000 m^2)

DELTA AIRLINES HANGAR
Salt Lake City Intl. Airport
Salt Lake City, UT, USA
290,000 ft^2 (27,000 m^2)

KELLY AIR FORCE BASE
San Antonio, TX, USA
340,000 ft^2 (32,000 m^2)

NORTHROP AIRCRAFT
Torrance, CA, USA
230,000 ft^2 (21,500 m^2)

HUGHES HELICOPTER
Phoenix, AZ, USA
180,000 ft^2 (17,000 m^2)

SHELL OIL AIRCRAFT HANGAR
Baytown, TX, USA
200,000 ft^2 (19,000 m^2)

NORTHROP AIRCRAFT
Newberry Park, CA, USA
200,000 ft^2 (19,000 m^2)

AVIATION INDUSTRY

The Ashford Formula™ has been used on these and other aviation facilities because it provides **benefits** and **properties specific to airport use**. Among these are:

- ***Compatibility*** with fly ash additives
- ***Proven performance*** on air-entrained concrete.
- ***Proven performance*** in freeze-thaw environments.
- ***Impermeability***.
- ***Resistance*** to tire marking.
- ***Resistance*** to abrasion, preservation of surface textures, and reduction of joint spalling.
- ***Environmental safety***.
- An ***industry-best 20-year*** product performance warranty.
- ***Versatility.*** The Ashford Formula™ can be used on all concrete surfaces, from runways and tarmacs to baggage sorting and airport entrances.

COMPATIBILITY WITH FLY ASH

Fly ash is normally used as a cement substitute in runway and tarmac concrete to reduce the heat of hydration, improve sulfate resistance, and increase long-term strength.

Testing performed by Curecrete Distribution, Inc. shows that fly as in the concrete mix does not affect the performance of the Ashford Formula™.

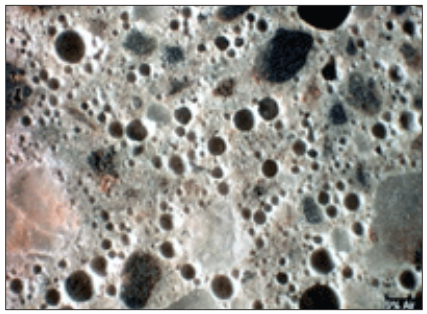
The conclusion of the testing was that the Ashford Formula™ continued to harden the surface of the concrete, even as concentrations of the fly ash were increased.

Fly Ash

COMPATIBILITY WITH AIR-ENTRAINED CONCRETE

Airport concrete is frequently air entrained to deal with temperature extremes. Air entrainment provides chambers for the expansion of water when it freezes, thus relieving pressure that would otherwise fracture the concrete.

The performance of the Ashford Formula™ is not affected by air entrainment. It consistently provides hardening, sealing, and dustproofing benefits on outdoor, air-entrained slabs.



Micrograph of Air Entrained Concrete

FREEZE THAW PERFORMANCE

The performance of the Ashford Formula™ in freeze-thaw conditions was tested by TÜV Labs in Dessau, Germany.

Samples treated with the Ashford Formula™ were tested according to European DIN standard 1045. The test results showed that after 32 freeze-thaw cycles in a salty solution, the concrete samples treated with the Ashford Formula™ lost only 177.3 g/m2. The acceptable amount of loss is 1500 g/m2.

FREEZE THAW PERFORMANCE

The following table shows the test results for concrete treated with AF versus number of freeze - thaw cycles.

Table 4: weight loss during freeze - thaw cycles.

Nº of cycles	Weight loss in g/m²
	Concrete treated with AF
4	43.8
8	75.9
16	129.4
32	177.3

According to the Basic Conditions, established by Prof. Setzer (Essen) the following criterion was used as the acceptable standard:

- **Average acceptable weight loss after 28 freeze - thaw cycles in salty solution is 1500 g/m²**

The following image shows the concrete surface after the testing. The AF treated area is on the left. Obviously it presents only a minor deterioration effect as compared to the untreated area.

Figure 2: surface after the freeze - thaw tests in salty solution.

IMPERMEABILITY

TÜV Labs also tested the Ashford Formula™ for impermeability.

Tests were carried out on concrete samples treated with the Ashford Formula™ according to requirements of DIN 1048. Three cored samples were kept under a pressure of 5 bar (72.5 psi).

The test was for depth of penetration against time. To be regarded as impermeable, the concrete cannot allow a depth of penetration greater than 50 mm.

The average penetration of water into the samples treated with the Ashford Formula™ was 7 mm. Conclusion of the test: "An average penetration depth 7 mm observed in the test samples gives evidence of the high impermeability of concrete treated with Ashford Formula™."

IMPERMEABILITY

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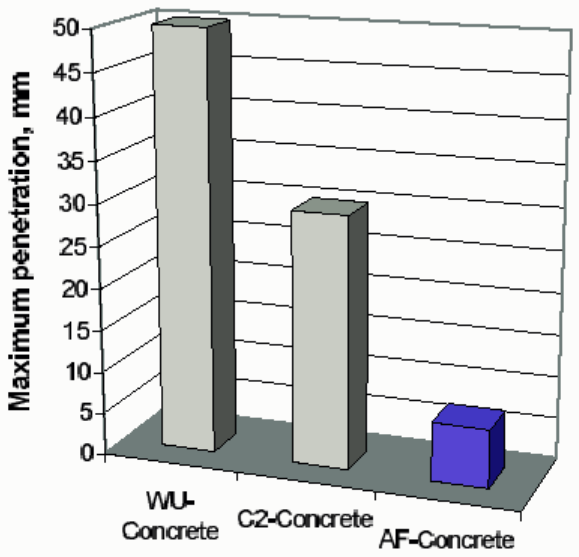
Determination of water impermeability according to DIN 1048 T. 5



RESISTANCE TO TIRE MARKING

In the past 60 years, the Ashford Formula™ has been used on a variety of surfaces exposed to wheeled traffic in the form of pneumatic or solid tires.

When the concrete is chemically densified, there are fewer pores and voids in which tire residue can be trapped.

Consistently, users report that tire marking is significantly reduced when the concrete is treated with the Ashford Formula™. They also report that when tire marks occur, they are much easier to remove than they are on untreated concrete.

When the concrete is chemically hardened with the Ashford Formula™, water blasting and other methods of tire mark removal do not damage the underlying surface.

RESISTANCE TO ABRASION

The Ashford Formula™ has been thoroughly tested in the United States and Europe for abrasion resistance. The ability of the Ashford Formula™ to prevent surface erosion has been verified by these results:

ASTM C779:

Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces. Concrete treated with the Ashford Formula™ was 32.5% more resistant to abrasion than untreated concrete.

DIN 52 108 (Europe):

- 50% improvement vs. 3600 psi concrete
- 37% improvement vs. 5000 psi concrete
- Equal to concrete treated with a dry shake hardener

PROFILE PRESERVATION and REDUCTION OF JOINT SPALLING

Runway and tarmac concrete is normally grooved, brushed, or dragged to introduce a non-skid surface that prevents hydroplaning. The hardening and stabilizing properties of the Ashford Formula™ ensure that these textures in the concrete are permanently preserved.

The Ashford Formula™ does not change slip resistance of the concrete finish.

Field experience has also shown that the Ashford Formula™ strengthens the shoulders of isolation, contraction, and construction joints in the concrete, making them far more resistant to rounding and spalling.

ENVIRONMENTALLY SAFE

The Ashford Formula™ is completely water-based. It contains no toxins, solvents, or volatile organic compounds (VOCs), and produces no harmful fumes or vapors. It requires no protective clothing or breathing apparatus. It produces waste that consists only of natural products, supports no combustion, and is sold in recycled drums.

Long before environmental mandates were in place, the Ashford Formula™ set the standard for safety and environmental responsibility.

WARRANTY

Because of the long history of the Ashford Formula™, a standard 20-year product performance warranty is available from Curecrete Distribution, Inc. Based in the U.S.A., Curecrete Distribution, Inc. has been the manufacturer of the Ashford Formula™ for six decades. The Ashford Formula™ is the only product on the market whose warranty is backed by a 60-year track record of proven performance.

The Product Warranty states:

"For a period of twenty (20) years commencing the date on which the concrete surface described herein is treated with Ashford Formula™, Curecrete Distribution, Inc. warrants to the owner that after the specified sealing and hardening period the treated surface will remain water-repellant, dustproof, hardened and abrasion resistant. In the event any area of the treated surface fails to remain water repellant, dustproof, hardened and abrasion resistant, Curecrete Distribution will, at its own expense, supply sufficient Ashford Formula™ to re-treat any such defective area."

In addition to the 20-year product warranty, Curecrete also offers a 5-year labor warranty, provided the material is applied by a certified applicator.

VERSATILITY

The Ashford Formula™ can be used throughout any airport facility in a variety of areas. These include entrances, baggage sorting, mechanical rooms, restrooms, cargo, parking, ramps, tarmacs, and runways.

Wherever there is a need for concrete that is easy to clean, resistant to abrasion, and free of annoying concrete dust, the Ashford Formula™ is the product of choice for permanent results.