SAFETY AND ORIENTATION

AT **AIRPORTS**

SWARCO | The Better Way. Every Day.

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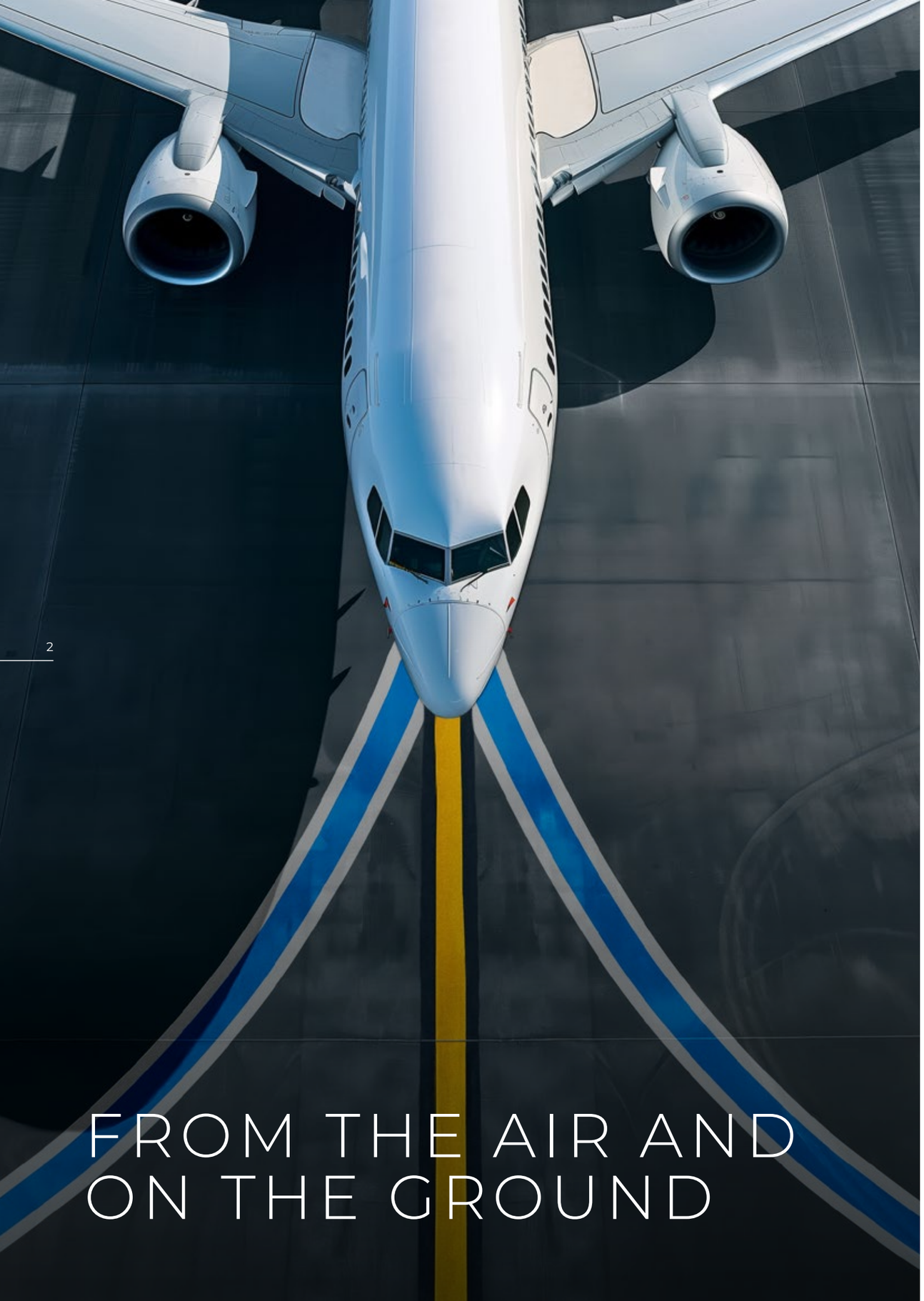
Road Marking Systems



FROM THE AIR AND ON THE GROUND

ON THE SAFE SIDE - WORLDWIDE

The use of glass beads for airport markings is recommended by several institutions. This increases the visibility of runways, taxiways and aprons significantly. These glass beads are designed to direct the light back to its source. This is a considerable safety improvement as it enables faster orientation, especially in poor lighting or adverse weather conditions.

Studies by the USACE (US Army Corps of Engineers), the FAA's (Federal Aviation Administration) Airport Safety Technology Research and Development team and the IPRF (Innovative Pavement Research Foundation) analyzed the retroreflective performance of markings with different glass beads.* These analyses revealed that Type III glass beads have higher retroreflective values than Type I glass beads. They have a higher refractive index than low-index beads, reflect more light, thus making markings more visible.

As per US Federal Specification TT-B-1325, there are three types of glass beads suitable for airports. These three types differ in glass composition, size, refractive index and retroreflection.

SPECIFICATION TT-B-1325

The only difference between Type I and IV beads is their size, which also influences their retroreflective values. Type I beads reach up to 400 mcd/m2*lx. Type IV glass beads are larger than Type I beads, with retroreflective values reaching up to 600 mcd/m2*lx. Type III glass beads are high-index beads. These have better optical properties and significantly higher retroreflective values of up to 1500 mcd/m2*lx because they are made from special high-grade glass.

LOW-INDEX

TYPE I (≥ 1,5)

up to 400 mcd/m²*lx

TYPE IV (≥ 1,5)

up to 600 mcd/m²*lx

HIGH-INDEX

TYPE III (≥ 1,9)

up to 1500 mcd/m²*lx

Type III glass beads deliver up to five times higher retroreflection, as tested by the FAA, USACE and IPRF

** Sources: ERDC/GSL TR-07-20, A Comparative Field Study of Permastripe™ Polymer Concrete and Waterborne Airfield Pavement Markings, June 2007, John K. Newman, Ph.D. DOT/FAA/AR-TN-05/43, Adsil Glass Coating Study, September 2005, Holly M. Cyrus*

PLUS9BEADS

High-index PLUS9BEADS by SWARCO Road Marking Systems are Type III beads with a refractive index of at least 1.9 and retroreflective values of up to 1500 mcd/m2*lx. They are designed for the most challenging marking requirements. Because of its physical properties, the specially developed glass composition of high-grade raw materials is suitable exclusively for airports. PLUS9BEADS deliver up to five times better visibility compared to conventional glass beads and respond to the landing lights of aircraft.

USED WORLDWIDE

PLUS9BEADS are in line with Specification TT-B-1325. Their use has been authorized by all US federal authorities, the Federal Aviation Administration and the International Civil Aviation Organization.

STRONG IN DIFFICULT LIGHTING AND WEATHER CONDITIONS

Used in conjunction with high-grade marking materials, PLUS9BEADS achieve optimal retroreflection even in difficult lighting and visibility. They show their strengths particularly at night or in rainy and foggy conditions. This makes our high-index glass beads the first choice for marking tasks on demanding sites like airstrips or helicopter landing pads.

Runway without PLUS9BEADS

Runway with PLUS9BEADS

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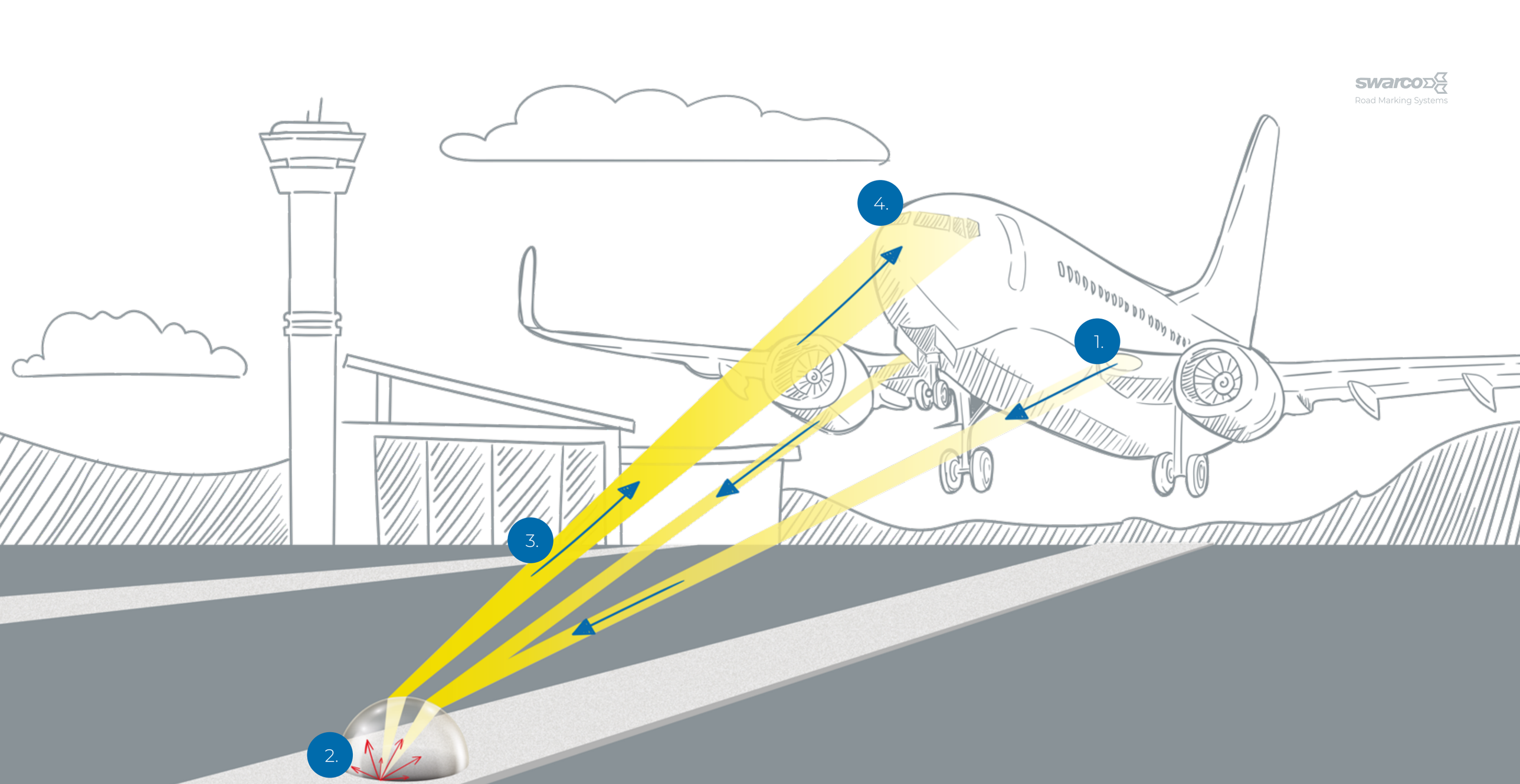

1.

The aircraft's landing lights emit directional light towards the runway.

2.

The light is refracted by PLUS9BEADS in the airport marking and reflected back in a concentrated beam.

3.

The refracted rays of light are reflected back towards the cockpit.

4.

The markings are clearly visible, which reduces pilots' reaction times and increases safety in airport operations.

FOR OPTIMAL SAFETY

The marking materials comply with the latest European directives. All colour shades have passed the stringent EASA (European Aviation Safety Agency) tests. SWARCO Road Marking Systems' products ensure a perfect view over airports, enabling swift orientation.

PRODUCT OVERVIEW

In addition to its high-index glass PLUS9BEADS, SWARCO Road Marking Systems manufactures a complete range of marking materials.

Dispersion Paint	Wet film thickness	Characteristics	Recommendation of use
LIMBOROUTE LW48F	Type I markings 0.3 mm, 0.4 mm Type II markings 0.6 mm	▪ Environmentally sound ▪ Reduced emissions ▪ Note the WOT ▪ Low wear resistance	Well suited for runways and areas where tyre particles have to be removed and markings have to be frequently renewed

1-C High-Solid Paint	Wet film thickness	Characteristics	Recommendation of use
LIMBOROUTE K828F	Type I markings 0.4 mm, 0.7 mm Type II markings 0.6 mm, 0.7 mm	▪ Good day and night visibility ▪ Low wear resistance	Well suited for runways and areas where tyre particles have to be removed and markings have to be frequently renewed

2-C High-Solid Paint	Wet film thickness	Characteristics	Recommendation of use
LIMBOROUTE 2-K K809F	Type I markings 0.3 mm, 0.4 mm Type II markings 0.6 mm	▪ Good wear resistance and night visibility ▪ Good adhesion on damp, mineral substrates ▪ Well suited for application on damp substrates ▪ Longer drying time	Well suited for taxiways and permanent markings on aprons Long application window until autumn on permanently damp substrates

Cold Spray Plastic	Dry film thickness	Characteristics	Recommendation of use
LIMBOPLAST KSP 120F	Type I markings 0.3 mm, 0.4 mm Type II markings 0.6 mm	▪ Cost-efficient marking ▪ Good day and night visibility ▪ Good wear resistance ▪ Quickly trafficable	Well suited for taxiways and permanent markings on aprons, and traffic load (aircraft and landbased vehicles)

PERFORMANCE ACC. TO STANDARD

The U.S. Federal Specification TT-P-1952F defines the technical requirements for water-based marking paints used in airfield applications. It specifies the chemical composition, physical properties, performance requirements, and behavior under mechanical stress and weathering conditions.

AREAS OF APPLICATION ACCORDING TO TT-P-1952F

TYPE I

Standard paint for general use

Type I paints are applied at standard film thicknesses and are ideally suited for markings that are regularly renewed, such as on runways or on surfaces subject to high mechanical stress.

TYPE II

For more demanding application conditions

Type II paints are designed for use under adverse conditions. They remain easy to apply even at higher humidity levels, with limited air circulation, or during nighttime operations. They are not intended for application at increased film thicknesses, such as those required when using Type IV glass beads in accordance with TT-B-1325.

TYPE III

For maximum durability and long-term visibility

Type III paints are developed for applications requiring maximum durability, high abrasion resistance, and excellent glass bead adhesion. When used in combination with high-index glass beads (Type III in accordance with TT-B-1325), Type III paints achieve outstanding retroreflectivity values and ensure long-lasting visibility—making them ideal for permanent airport markings.

CLASSIFICATION OF OUR PRODUCTS ACCORDING TO TT-P-1952F

Product	Type acc. to TT-P-1952F	Characteristics	Recommendation of use
LIMBOROUTE LW48F	Type II*	▪ Water-based, low-emission paint ▪ Excellent application properties even under high humidity conditions	For runways that require regular renewal, as well as for applications under more demanding environmental conditions
SWARCO AQUALINE ECO W17 Airport	Type III*	▪ Water-based high-performance paint ▪ Excellent adhesion and durability ▪ Very high retroreflectivity when used in combination with high-index beads	For permanent markings on runways as well as on surfaces where maximum visibility and adhesion are required

**Type II includes the requirements of Type I; Type III includes the requirements of Type I and Type II.Type II.*

FOR PERFECT VISIBILITY AND ORIENTATION

By combining the specifications TT-P-1952F for airfield marking paints and TT-B-1325 for airfield glass beads, SWARCO Road Marking Systems provides optimally matched marking systems for worldwide airport applications. These systems stand for maximum safety, long-lasting visibility, and reliable guidance—by day, by night, and under all weather conditions.

AIRPORT MARKINGS

HIGH-QUALITY AIRPORT MARKINGS BY SWARCO ROAD MARKING SYSTEMS IMPROVE SAFETY AND ENSURE OPTIMAL ORIENTATION AT AIRPORTS FOR AIRCRAFT AND GROUND TRAFFIC VEHICLES.

RETROREFLECTION

The systems by SWARCO Road Marking Systems offer excellent retroreflection and night visibility on dry and wet surfaces due to innovative glass bead blends (various particle sizes, low and high index).

INNOVATION, MORE CONTRAST

Coloured glass granulate can be added to the marking systems as needed to adjust the colour shade. The resulting marking symbols and lines appear much more vivid and rich in contrast.

DURABILITY

SWARCO Road Marking Systems' products have been successfully tested by independent bodies for resistance against fuels, deicers, engine oils and hydraulic fluids and excel in their resistance to kerosene.

ABRASION RESISTANCE

By choosing the right solutions from SWARCO Road Marking Systems' wide range of products, complemented by various glass granulates as well as coloured glass granulates, excellent functionality and abrasion resistance of marking systems on airfields and runways, taxiways and aprons are ensured.

SURFACE BONDING

Apart from their stipulated product-specific characteristics, markings need to have sufficient adherence to the surface to avoid engine ingestion of loose marking material. The right choice of an optimal and cost-efficient marking system for the different areas depends on airport specifications and other prerequisites.

CERTIFIED

The marking systems by SWARCO Road Marking Systems have been successfully tested and approved by the German Federal Institute for Material Research and Testing in regard to colour standards according to DIN 5033, the assessment according to ICAO, Annex 14, Aerodromes and STANAG 3711.

REFERENCES

SWARCO ROAD MARKING SYSTEMS
USED WORLDWIDE

EUROPE

Aviano
Berlin
Düsseldorf
Eelde
Fairford
Frankfurt
Cologne
Copenhagen
Lajes
Lakenheath
Moscow
Munich
Ramstein
Riga
Rome
Rotterdam
Seville

USA

Chicago O'Hare
Dallas Fort Worth
Denver International
Detroit Metro
Jacksonville International
Los Angeles International
Milwaukee Mitchell International
Nashville International
Philadelphia International
Phoenix Sky Harbour International
Salt Lake City International
San Antonio Texas

AFRICA

Accra
Uganda

ASIA

Amman
Ashgabat
Baku
Bengaluru
Basra
Chennai
Cebu
Delhi
Dili
Doha
Dubai
Kaohsiung
Kuwait
Mumbai
Muscat
Phnom Penh
Sihanoukville
Taipei
Tashkent

SHOWING THE WAY, WORLDWIDE

SWARCO | The Better Way. Every Day.

In 1969 we started out with the manufacture of tiny reflective glass beads. Today we have grown into the world's largest systems provider for road markings, making roads safer and saving lives on a daily basis. Our high quality products and services, safely direct traffic flow from A to B, every day and night. On all roads, in any weather, and all from SWARCO.

We prepare for the future by fusing knowledge with innovation at our Competence Center for Glass Technology and Marking Systems. So, even with smart and autonomous driving, we continue to blaze the trail of premium road markings to the world. Jump in and drive with us; we will be happy to help you find your ideal road marking solutions.

www.swarco.com/rms

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