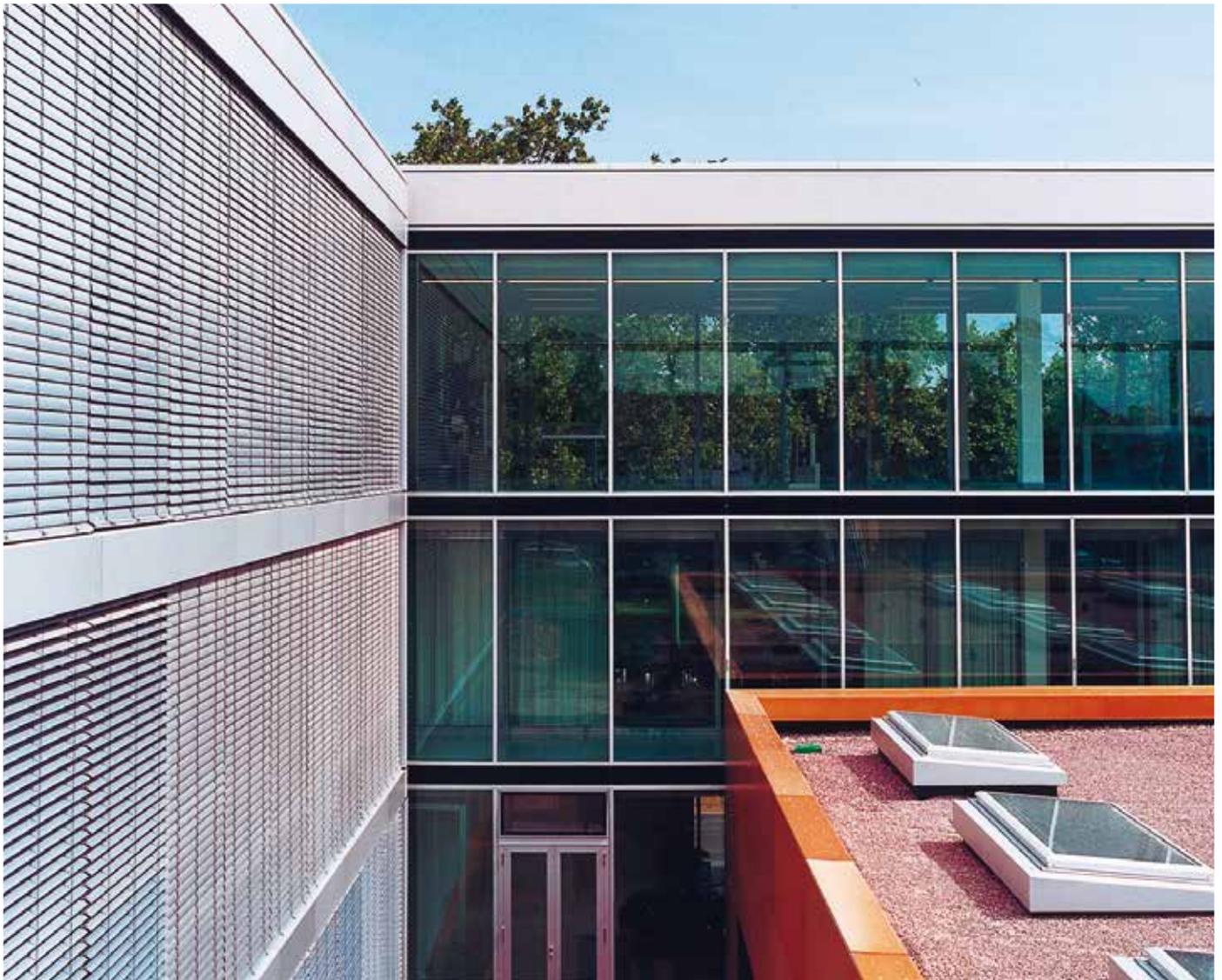
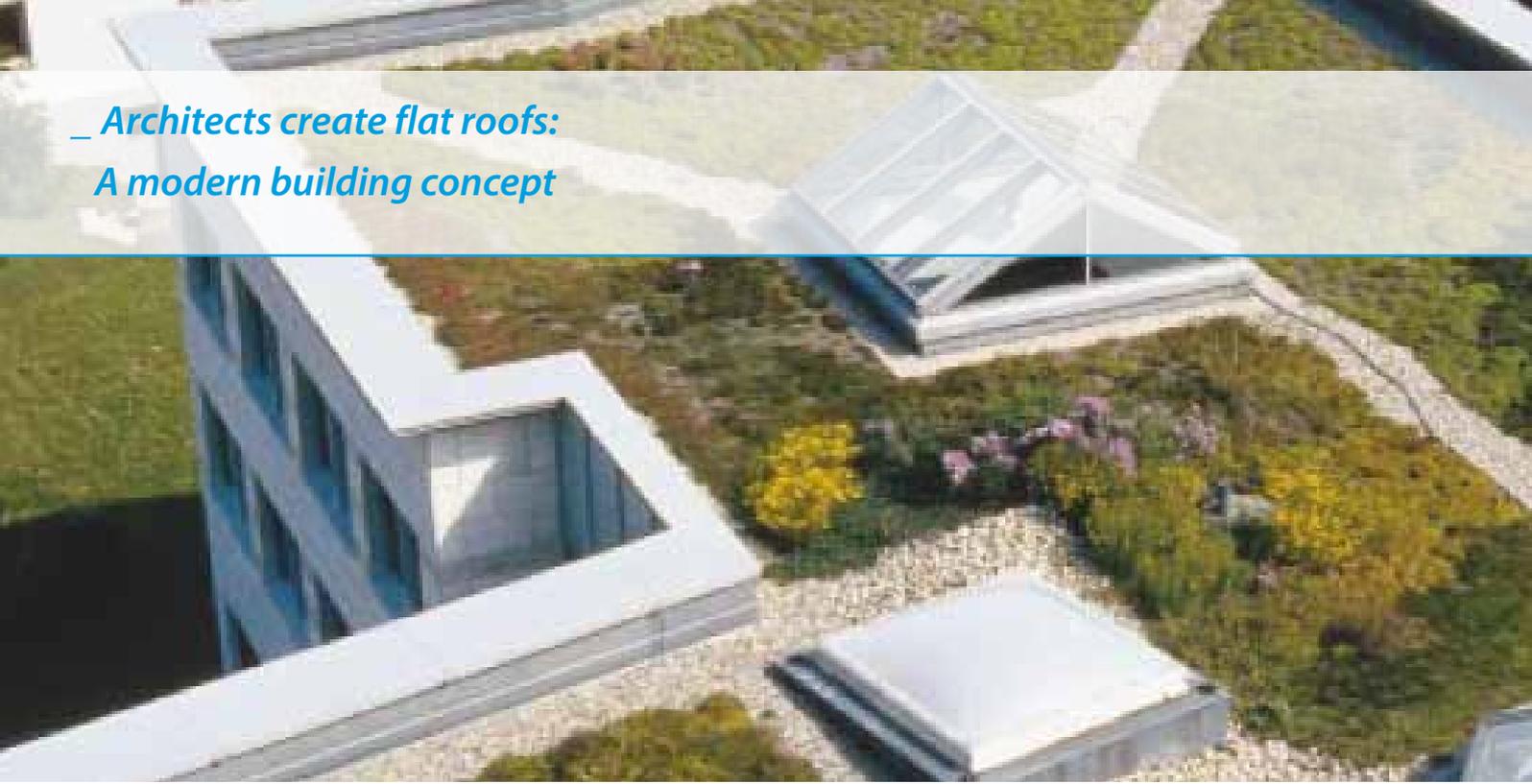

WATERPROOFING MEMBRANES FOR SAFE AND WATERPROOF FLAT ROOF



... make better flat roofs



**_ Architects create flat roofs:
A modern building concept**

Construction of flat roofs is one of the modern building concepts of our time. The best proof of this is the millions of square meters of flat roof area that have lasted for decades without damage. Besides gravel covered / open air weathering flat roofs, garden roofs are gaining in importance as the planted area is a partial compensation for sealing and thus can have a positive impact on town climate. Damage, resulting from a variety of causes like improper laying and material deficiencies or that which is caused by construction physics, chemistry or technology, have time and again led to heated and less than objective discussions about the safety and efficiency of flat roofs. By providing comprehensive information about Lucobit® sealing sheets we want to make a contribution to a more rational view.

**_ Lucobit®: Prime
position in application**

Roof sealing is subject to the greatest variety of mechanical, chemical and biological stresses. The physical requirements of the industry are high. So, how safe is sealing? A comparative evaluation of the various sealing methods (material groups: ECB / Lucobit®, EPDM / IIR, EVA, PIB, PEC, TPO / FPO, PVC, PYE and liquid plastics) only became possible with the practice related and consistently executed investigations by ddDach in cooperation with TU Munich (1991,1999). They can be used as a decision-making tool for anyone involved in building.

Following practice trials of 105 different roofing sheets, W. Ernst (1999) reached the conclusion that it is possible to produce excellent weatherproof sheets from any of the material groups. The results in 1999 showed that, with regard to application, Lucobit® sheets had been improved since the first trials in 1991 and, with more than 70%, clearly rank above average quality.

Lucobit® sheets, as part of the total material groups, meet nearly all of the practical requirements defined by ddDach.



Every material has limits to its application and therefore must be used appropriately. The installation instructions by the various manufacturers for sheets made of Lucobit® are based on years of practical experience. These instructions are supplementary to trade regulations and lead to better installation safety. An important plus for the quick and economic installation of Lucobit® sheets is low weight (approx. 2 kg / m²) with sheet widths of up to 2 m and sheet lengths of up to 20 m. Even large and difficult roof areas can be sealed quickly. A further benefit is the safe and environmentally friendly welding with hot air. A material-homogeneous seam bonding can be effected safely even at low outside temperatures. Pre-treatment of the seams is not required. Measurements carried out by the Corporation of Civil Engineers, Hanover, show that during hot air welding of Lucobit® sheets no hazardous gases are created (far below all specified limits).

Advantage 1

Easy to lay with simple, safe seaming technique.

With practically weather independent installation of Lucobit® sheets, deadlines can be met even during seasonal periods of poor weather.

With the "willing" seam bonding technique for Lucobit® sheets, installation faults are virtually eliminated.

Material-homogeneous seam bonding with hot air welding ensures greater safety because only a roof with tight bonded seams will offer long-term protection for a building.

Final inspection of the hot air welded seams is extremely simple. Visual checks are sufficient and safe: optimum formation of the welding bead equals optimum seam bonding.

Short laying and installation times mean cost savings. Large areas can be sealed with just a few rolls. Each roll can cover up to 40 m² in just a few minutes, making it waterproof and safe. Wide Lucobit® sheets considerably reduce the workload for seam bonding.

The low weight of the roofing sheets doubles the saving because

- roof constructions can be designed for lighter structural loads
- transport costs to and at the construction site are considerably reduced

Roofing sheets must be easy to use on the building site, independent of weather conditions!

Especially important: simple to weld on the building site with maximum seam bonding.



**Roofing sheets must be permanently resistant to aging!
Changes to material properties must be so insignificant as
to guarantee the life of the roof sealing over long periods.**

Standard tests - e.g. specified by EN 13956 - serve to monitor minimum requirements. The practice-related tests according to ddDach (1999) can be indicators for estimating the life expectancy of roofing sheets. Different tests simulate the aging process and allow actual aging behavior to be linked to the actual test results. Good test results guarantee lasting functionality and long life. Nine roofing sheets made of Lucobit® underwent the practice tests. The results, according to W. Ernst, showed that with correct installation and servicing, one can expect Lucobit® sheets to function for 30 years or more.

Advantage 2

Long-term aging resistance and therefore lasting service benefits.

It has been proved scientifically that thin sheets age more quickly. The standard thickness for roofing sheets made of Lucobit® is therefore 2 mm.

A high degree of resistance to aging of the cover sheet means long-term security with regard to maintaining the value of the building and worry-free use.

Because of the excellent physical properties of Lucobit® sheets, the normal stresses occurring on the roof hardly affect the aging behavior.

Experience gained over three decades has shown: Lucobit® roofs remain safe and waterproof over a long period! More than 90 million square meters of sealed roof areas are indeed the proof.

The safe welding capability is still guaranteed for additional installations years later.



Roofing sheets must be permanently resistant to aging!



Roofing sheets must be able to withstand high stresses on site and without a safety layer offer high perforation protection, e.g. against hail, snow or subzero temperatures!

Material standards do not take into account the demands of the often very rough realities on a building site. Additional information comes from trials (cigarette burns, hard-solder drops and felt nails). The results established by Ernst confirm the experience we have gathered over the years. A sheet thickness of 2 mm and the inserted glass fibre fleece core reduce the risk of damage during building to a minimum. The same applies to the mechanical / thermal stresses on open air weathering roof areas. The layer of nonwoven glass fibres ensures excellent flatness and avoids waves and creases being formed during laying.

Advantage 3

High mechanical strength and good perforation resistance. Resistant to biological and chemical influences. Root penetration-proof.

Great protection against damage during installation and up to inspection and / or application of protective layers also means great protection against damage by other building activities.

Open air weathering roofing areas made of Lucobit® offer protection over decades, even against intense stresses such as hail, snow or subzero temperatures!

The resistance of the Lucobit® roofing sheet is maintained over a long period!

Tests from an independent body has confirmed that approximately 30-year old Lucobit® sheets on a roof will still function as effective roofing sheets.

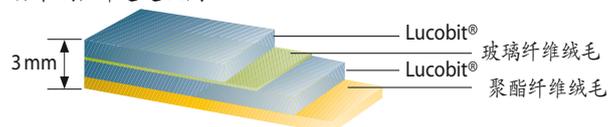
Lucobit®: Design of a sealing sheet

Similar to the spine in the human body, the roofing sheet is stabilized by an intermediate layer of non-woven glass fibres. This structure is the result of innovative extrusion technology. This guaranties that the roofing sheets meet the particularly high requirements for durability.

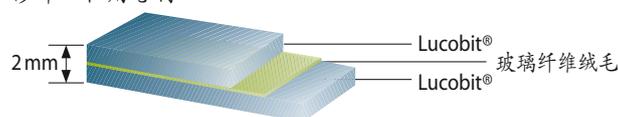
ECB sheets with an intermediate layer of nonwoven glass fibres are:

- tear resistant,
- heat resistant,
- resistant to high spot loads,
- excellent in regard to flatness and dimensional stability,
- simple and safe to weld,
- easy to cut into different shapes,
- easy to lay without direct contact with glass fibres.

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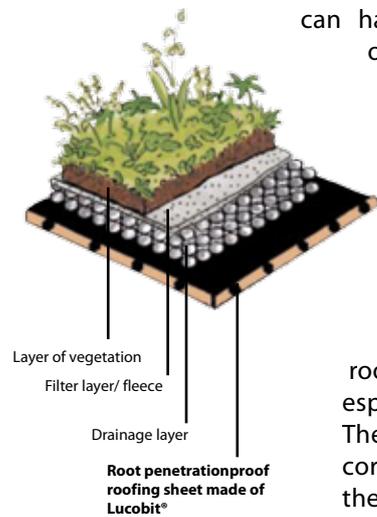
修葺工程用卷材



Roofing sheets must be resistant to biological and chemical influences! The type of application should not matter: open air weathering, gravel covered or planted.

Flat roofs have to be proof against the influences of chemical or biological substances such as acid rain, concrete and plaster run-offs, algae and microbes. They have to be resistant to milk of lime, acids, compost / rotting leaves and much more. All these factors can have a negative influence

on the material properties of a roofing sheet. They may speed up the aging process. The material standards mostly deal with short-term trials on new materials. They only have a limited bearing on the actual stresses to which roofing sheets are subjected especially over long periods. The practice related tests according to W. Ernst examine the long-term behaviour of roofing sheets taking the actual influencing factors into



account under laboratory conditions. From the results of long-term tests one can deduce the actual aging behaviour of the sheet. In these long-term tests, sheets made from Lucobit® showed excellent results.



Advantage 4

Resistant to biological and chemical influences. Root penetration-proof.

Lucobit® sheets offer long-term safety and confidence because they are resistant to recognized detrimental environmental stresses.

They offer a practical solution for problems in all areas of application.

Roof planting offers more useful area and an improved quality of life. All Lucobit® sheets are resistant to root penetration. This has been proven in FLL tests.

Advantage 5

Environmentally sound and recyclable at the end of its life.

Lucobit® sheets are kind to life and are environmentally sound materials. Products made of the raw material polyethylene have for decades proved themselves to be environmentally friendly.

Ecologically oriented architecture is consciously accepting responsibility for the future, also in its choice of roofing sheets!

Lucobit® sheets have for a long time been fulfilling the aims of AGENDA 21 and are setting benchmarks for future eneration in the field of sealing.

Ecologically optimal roofing sheets made of Lucobit® are contributing to maintaining a healthy environment!

Roofing sheets must be environmentally friendly, ecologically safe and resistant to hydrolysis. Pollution of precipitation must be avoided!

The aim of AGENDA 21 is to apply an all-inclusive and ecological perspective to contemporary building. Protection of the soil, water and air as natural basic requirements for life is receiving special consideration. Further goals include the prevention of damage and careful use of resources. This includes keeping material usage, energy consumption during manufacture and transit to a minimum, and of course the possibility of re-using materials in the interest of a recycling economy. Hydrolysis means the decomposition of a substance by water. Under certain conditions, substances are split back to their constituent components. Toxic particles can cause damage to waste water and thus become harmful to nature. They can even affect the purity of drinking water. A particularly sensitive test for the quality of drinking water is a test with live fish as used in sewage works. On the basis of this test specified by DIN 38 412 / pt. 31, Test Procedure With Water Organisms (Group L), W. Ernst developed the "Fish Test" for sealing sheets. This test checks whether water-soluble components in the installed roofing sheet will have an effect on the quality of the precipitation run-off. In this test Lucobit® sheets are the only ones of 105 sealing sheets tested that have very good material properties above the average and thus can be considered environmentally sound.

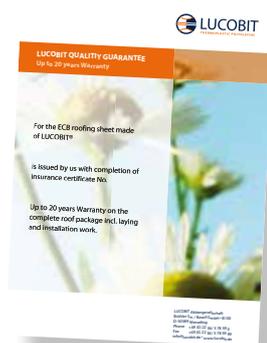




Roofing sheets must be resistant to all influences!

Only one roofing sheet for all areas of application with a comprehensive guarantee for material and installation!

Lucobit® represents 30 years of continuous product optimization and adjustment to constantly changing demands, high quality and reliability. LUCOBIT AG's comprehensive expertise guarantees these advantages and makes it an integral part of the world-wide manufacturing association of the BASF / Shell joint venture for polyolefins, named Basell. The ideal composition of raw materials is leading to optimum material properties. This enables the use of Lucobit® sheets in flat-roof constructions, in new buildings and refurbishment projects. Special solutions in line with flat-roof guidelines and roof planting offer builders, architects and contractors long-term ecological and economic advantages. The research and material testing institute FMPA Stuttgart found that a Lucobit® sheet installed 30 years ago with open air weathering still met the minimum requirements of material standard EN 13956 and is therefore fully functional.



Advantage 6

Suitable for refurbishment projects and new buildings. Warranty and specially agreed insurance for the whole roof construction. Manufacturers of Lucobit® sheets do not merely meet En 13956 quality standards. The high quality requirements also take into account the demands of practical applications. Provided that there is professional installation and regular servicing, according to Ernst, flat roofs from Lucobit® sheets can last 30 years or more.

For new buildings or refurbishment projects, for open air weathering, gravel covered or planted roofs, the sheet manufacturers will give, subject to regular maintenance, a comprehensive material and installation guarantee, and if required also for the total roof construction. The insurance period can be agreed individually via the sheet manufacturer with one of the largest European property insurance companies, Gerling Insurance.

With this extensive insurance coverage, the question of liability in the event of a future claim is no longer relevant. Apart from that the builder is covered against possible insolvency risks during the insurance period.

Lucobit® sheets are safe and waterproof.

LOCATIONS



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