

FLOOD-PROTECTION MEASURES: PROTECTION OF PROPERTY AND INFRASTRUCTURE

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The lecture explains why and how to design flood-protection measures for buildings and sites in an era of more frequent cloudbursts. It describes the principles of mobile aluminum barriers, their quick installation, and proper project pre-planning. It shows applications ranging from protecting entrances and garages to linear barriers at the plot or settlement scale, including maintenance, and it emphasizes prevention, the low carbon footprint of recyclable materials, and the architect's key role in climate-change adaptation.

.SUMMARY

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Motivation

- The rising number of floods and cloudbursts is a consequence of climate change, urbanization, and impervious surfaces.
 - Architects should design buildings and sites to withstand extreme rainfall and protect health, life, and property.
 - Prevention is more effective than remediation—good design reduces risks to assets and infrastructure.
 - Architects' responsibility is also embedded in the building code and spatial planning.
 - Well-designed flood-protection measures are an integral part of a resilient and safe environment.
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Principle of operation

- Flood-protection systems address extreme rainfall, sewer backflow, overtopping of watercourses, and runoff from fields.
- Systems used: mobile and stationary barriers made of lightweight recycled aluminum (e.g., PREFA Hochwasserschutz).
- Installation is fast—two people can complete it in about three hours, with barriers sliding into pre-installed bearing profiles.
- The standard system height is up to 2 m, with custom reinforced solutions also possible.

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Application in practice

- Measures are planned from the concept stage—at entrances, garages, basements, access routes, and also at the plot level.
 - Early preparation is crucial: install bearing profiles, sleeves, and anchors before the façade is finished.
 - Barriers can be combined with grading/landform works, concrete curbs/walls, or linear plot-edge defenses.
 - Correct installation prevents underflow or leakage—accuracy and flatness of surfaces are critical.
 - Maintenance is minimal—annual inspection, cleaning, and lubrication of components.
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Adaptation to climate change

- Flood-protection measures safeguard cities, infrastructure, and utilities from collapse during extreme rainfall.
- They reduce economic losses, property damage, insurance costs, and service outages.
- They use sustainable materials—recycled aluminum with a long service life and low carbon footprint.
- Adaptation means prevention—protecting territories, landscapes, and buildings from increasingly frequent weather extremes.
- The architect's role is key: assess flood risks already in the design phase and integrate protective solutions into the project.

.TRANSCRIPTION OF THE RECORDING

MOTIVATION

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Good day, I've come to talk to you about flood-protection measures to safeguard property and infrastructure.

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Good day.

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What actually motivates the design of flood-protection measures? And why should architects design them? The rising number of floods and cloudbursts—due to climate change, urbanization, and impervious surfaces—brings many more floods and climate-related problems. First and foremost must be safety and the protection of health and life, and of course also the safety and protection of property. Architects should ensure in their designs that the building and its surroundings can withstand extreme rainfall. Prevention is naturally more important than repairing major damage. The responsibility of architects here is irreplaceable. Proper design protects not only the building but also infrastructure and the landscape. Among other things, spatial planning and building laws require that flood risks be taken into account.

PRINCIPLE OF FUNCTION

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A few words about how it works. Flood-protection measures address extreme rainfall, which brings additional problems such as sewer backflow, flooding and inundation, rivers overtopping their banks, and of course runoff from dry, parched fields and meadows into structures that sit lower. Protection can come from setting the building or plot at the right elevation, shaping the terrain, acting at the plot boundary or at the building itself, using barriers, or by designing for pumping.

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Flood barriers can be designed as mobile systems. For example, the PREFAB Hochwasserschutz system uses modular stop logs 25, 50, and 80 millimeters thick. These are aluminum profiles with seals and with ground sleeves when we're talking about linear protections. This protection is designed and certified according to the European Flood Protection Association. Mobile temporary barriers can be erected by one person when a flood threatens. The initial installation at purchase and build-out takes about three hours with two people. The presentation also includes photos of the installation. Stationary solutions integrate stop logs into openings such as doors, garages, basements, and entrances. The material is aluminum—95% recycled—which is advantageous for these devices because it is very light, strong, and durable.

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So the key point is that aluminum is light. That's probably crucial here—the idea is that in a flood or crisis situation, people already have plenty to deal with, so it's important that as few people as possible are needed to assemble and mount it. Ideally

you shouldn't have to call the neighbors to help. Ideally even a woman or a teenager could assemble it, right?

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Of course, that applies to small flood-protection measures, but now consider large linear structures—mobile flood-protection systems—where civil defense, firefighters, and police have to get involved.

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There it really matters how many tons of material each person needs to carry, transport, and assemble.

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Exactly.

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How do the measures actually work? The mobile flood-protection system consists of aluminum profiles for effectively sealing windows, doors, or gates, and for protecting developed areas near banks or adjacent zones. Mobile protection made of light yet robust aluminum profiles gives a house maximum protection and safety. It's an individually designed solution in two realms: protecting property and protecting the landscape. These solutions can be used in private as well as commercial settings.

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The entire system is a set of well-thought-out details. You'll find them detailed in the lecture slides. The key point is that it's a system we design for you and deliver as such. Structural calculations are, of course, part of it. These systems are typically designed up to a height of two meters, but custom reinforced solutions are possible where greater heights are needed.

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System functions. The system is mounted either in front of an opening, within the opening, or behind it, so that during a flood—or just before—individual stop-log beams can be slid into the bearing profiles. You start with the bottom beam and continue stacking up to the top, where a simple clamping bracket closes the system with pressure so it can resist the flood wave or water. If higher pressures or heights are expected, additional supports can be used. The main components, as mentioned, are the bearing profiles—U-shaped or other shapes. And when we talk about linear barriers, ground sleeves for posts must be pre-installed and concreted in place, then covered; in case of need, you remove the covers, insert the posts, and then fit the stop logs between them. Everything is then tightened at the end with a locking clamp.

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The most important component is of course the stop log itself which, depending on the system's height and width, comes in 25, 50, or 80 millimeter thicknesses. All stop logs are always 200 millimeters in height. The 25 and 50 millimeter variants use aluminum with a 2.5 millimeter wall thickness—so you can see it's a relatively robust system. The 80 millimeter system uses a 5 millimeter wall thickness.

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Let me ask: for a standard case, say a garage door or a small gate at a family house—what thickness are we talking about if the width is, say, 2.5 to 3 meters?

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Up to three meters wide, you're certainly looking at the 50 millimeter stop log, but of course it also depends on the expected water level. For some, a 20 or 60 centimeter barrier height is enough; someone else may need one and a half meters. Based on that, the structural calculation will show which stop-log thickness must be used.

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Fastening profiles are very important, but they're mainly for the final anchoring and clamping of the profiles so that the known forces don't lift the entire system during a flood.

APPLICATIONS

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Application is, of course, an important point.

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What's crucial is the design of the entire flood-protection solution, whether in the architectural design or urban planning. At the scale of a single house, things are relatively simple—we design protection at entrances, garage doors, possibly basement windows, and access roads. It must tie in with the insulation system and the building's overall elevation design. In other words, don't forget that the entire bearing system needs to be designed and anchored in advance, before other construction measures. To put it simply, you have to think ahead so you don't end up with avoidable defects later.

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Ultimately it's in the architect's interest, because the vertical elements must be installed long before any flood actually occurs. They need to be ready so that, when a flood is imminent, you're only inserting the stop logs. So it's in the architect's interest to incorporate this into the design—ideally not like in the photo here where it's tacked on externally—but integrated so the architect is happy with the solution.

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I absolutely agree for new builds. But conditions across the country are changing often, and many existing properties still need flood protection today, and some will need it in the future. In the past we didn't think much about this—or there wasn't much need—because small local streams didn't overflow as often.

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The drying of arable land and similar issues mean that cloudbursts now bring flood waves and the like. So yes, for new builds—when we know about the risk—we can address it. For existing buildings it can be handled in a retrofit, though very difficult right before a flood; we can't react that fast. But after a flood, we should definitely tackle it if we've been hit by something that hadn't happened there for a hundred years.

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So, yes, flood-protection systems can protect buildings. And of course, they can protect the landscape as well.

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There are many implementations and solutions. The design must be right so that it actually works.

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I'd add one point: some protections are placed directly on the building—in openings—while others are at gates. So, in the design, you should first decide on the main approach: will I protect my property at the level of the house itself, or will I prepare flood protection at the property boundary?

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Exactly—decide that in advance, and make sure the elevation parameters of the site and the building align. If the site boundary is relatively low, perhaps you don't need protection there but need it elsewhere.

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Right.

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...you might need to protect the plot; in other cases, the building itself. We also see possible protection via linear barriers around the whole plot—that's another variant—and then at the settlement or landscape level. Those can be quite expensive solutions. But as the slides show, landscape protection can often be achieved with reinforced concrete decorative walls or similar, and then only the passage points are handled with mobile flood protection. In large linear schemes there are known cases where those reinforced concrete walls serve as the base for additional mobile protection when we're talking about, say, 100- or 1,000-year floods. So landscape protection is also very important—especially protecting lands along rivers and streams, such as access roads and streets. Flood protection installed in anchored ground sleeves can protect entire sites from floodwaters.

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Those concrete embankments we mentioned can of course be raised with a flood wall to the final expected water level.

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What should not be forgotten when designing flood protection? You must respect hydrogeological and structural conditions. You must consider maintenance, access, and storage of the systems. At a family house this is simple—if you protect a garage, you store the system in the garage. But if you protect landscape areas, do you need an extra storage hall, or how do you keep it as close as possible to where flooding may occur? The architect's role is to create safe spaces and homes that don't endanger neighboring buildings, and to incorporate flood protection—especially for new builds—already at concept stage. In other words, warn the investor that this problem may exist, based on assumptions, flood maps, and other factors that the architectural community engages with too little today—but will increasingly need to in the future.

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First of all, the architect must take the initiative to analyze the site and ask whether this is even an issue there. For example, by asking locals: "Has there been a flood here in the last ten to fifteen years? Did something happen?" Studying flood maps is a

given, but in my opinion you always need to investigate locally to understand the real level of risk at that site. Yes?

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We can see it basically every day—new single-family homes are designed as satellite developments, and these issues are often not addressed. But in the future, they will be needed—not only for flood protection, but for other hazards too: strong winds, heavy rains, and so on. I think climate-related problems are increasing and will continue to do so.

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The installation procedure is important, even though the basic approach simply needs to be mastered. It's not difficult work; certain rules must be followed, especially regarding flatness and how the bearing elements are mounted so water doesn't leak around them. But a skilled craftsperson can do it themselves, and for an opening or garage roughly 2.5 meters wide and up to about 1.5 meters high, two men can install it in about three hours. Then, in the event of a flood, a single person can mount the stop logs themselves in, say, half an hour. That's not rocket science.

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Ah—so to be clear: once the house exists and we prepare and anchor the posts, we don't mean that someone will be sliding the barriers in for three hours right before a flood. That part goes much faster.

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Exactly. During the initial installation you have to test everything—so you essentially do a drill: you mount it and then dismount it again. You test and check everything needed, then pack it away where it will be stored. So yes, the time is much shorter when the flood wave is actually coming. As we said, the initial target—about two men for three hours for a garage opening—is for the first fit-out. The slides also show how we store the profiles so they last until the next season—or until needed. Basically all you need to do is check them once a year, wipe them down if they're damp, and so on—just look after them so they work when they're needed. We can also talk about installing flood protection—especially the ground sleeves for protecting buildings...

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...but that's a larger-scale protection—especially for landscape protection—where the ground sleeves need to be installed and concreted. Again, all of this must be prepared before deployment, before a flood. We can design systems that change direction—15 degrees, 30 degrees, etc.—which lets us protect a plot or a particular landscape issue very effectively. But all of that takes time, so it must be prepared in advance. Here you can see the ground sleeve with a cover; in case of flooding you remove the cover, insert the post, and then mount the flood-protection stop-log system. A few warnings related to installation: you don't want to create flood protection where water will simply bypass it due to some technical issue.

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For example, mount the profiles in the opening so the stop logs can be slid in on a slight angle, and avoid what you see in this photo, where the insulation system closed off the slot for sliding in the stop logs. In other words, the U-profile can't accept the stop log—or, as I mentioned, someone mounted the bearing U-profile onto a crooked façade. In that case, it needed to be shimmed and sealed first, otherwise water will leak behind the stop logs and the effectiveness will be minimal. Likewise, the elevation

of the ground sleeves must be set so water can't undercut the bearing system. And now, adaptation to climate change.

ADAPTATION TO CLIMATE CHANGE

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Which flood-protection measures contribute to climate adaptation? Preventing infrastructure collapse—protecting utilities, sewers, power, and roads from outages and overloads. That means designing mobile flood protection at, for example, high-voltage stations. Keeping cities safe and functional during extremes—protecting residential and public spaces from flooding. Reducing economic losses—lower property damage, fewer insurance claims, fewer service outages. Using sustainable materials—recycled-aluminum systems with a lower carbon footprint and long service life. And, not least, responding to climate reality: cloudbursts are more frequent, and adaptation through preventive measures is essential. Thank you for your attention. — Thank you very much.