



RIBuild
Robust Internal Thermal Insulation of Historic Buildings

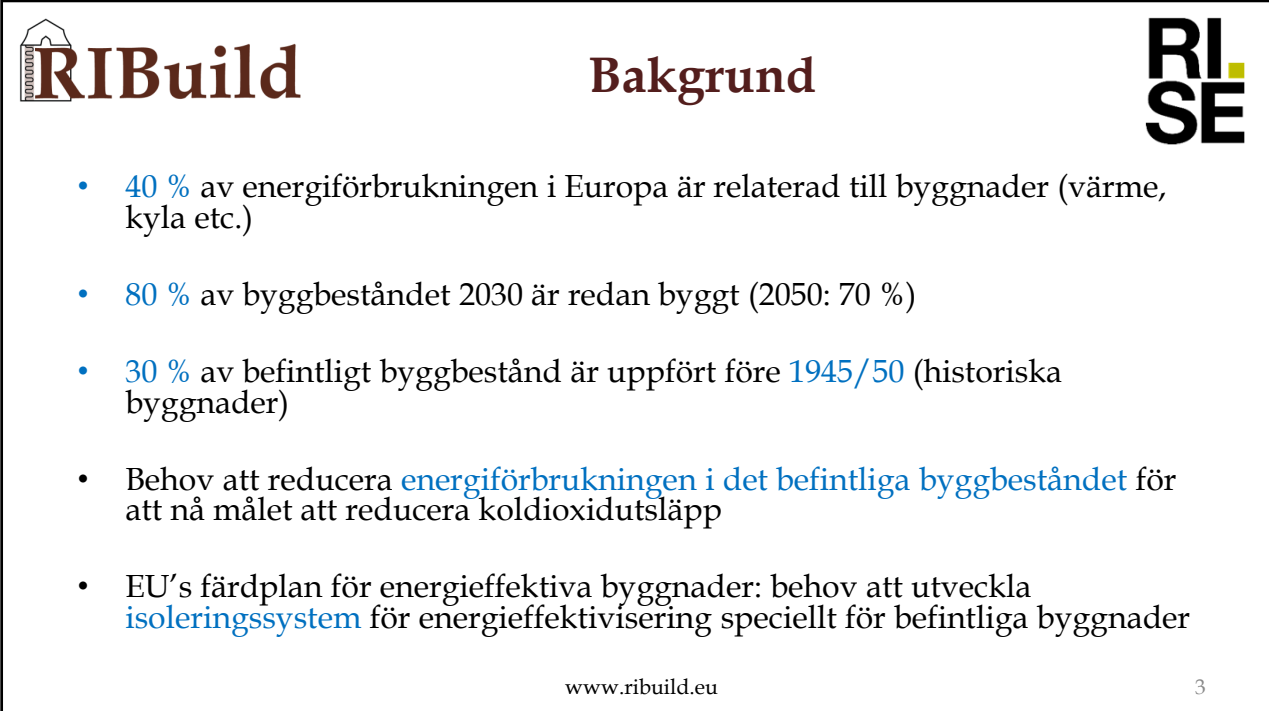
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 637268 

Intro till EU-projektet RIBuild
Praktisk vägledning till applicering av invändig tilläggsisolering i kulturhistoriska byggnader

Lukas Lång, RISE

RI SE

Fuktcentrums informationsdag,
Lund, 2019-11-28



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Bakgrund

RI SE

- 40 % av energiförbrukningen i Europa är relaterad till byggnader (värme, kyla etc.)
- 80 % av byggbeståndet 2030 är redan byggt (2050: 70 %)
- 30 % av befintligt byggbestånd är uppfört före 1945/50 (historiska byggnader)
- Behov att reducera energiförbrukningen i det befintliga byggbeståndet för att nå målet att reducera koldioxidutsläpp
- EU's färdplan för energieffektiva byggnader: behov att utveckla isoleringssystem för energieffektivisering speciellt för befintliga byggnader

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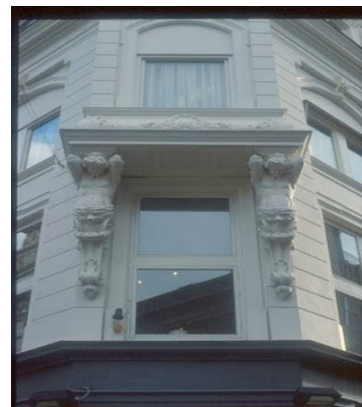
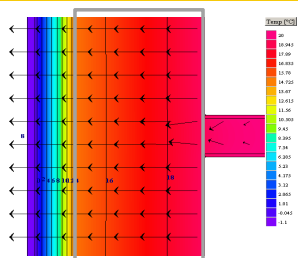
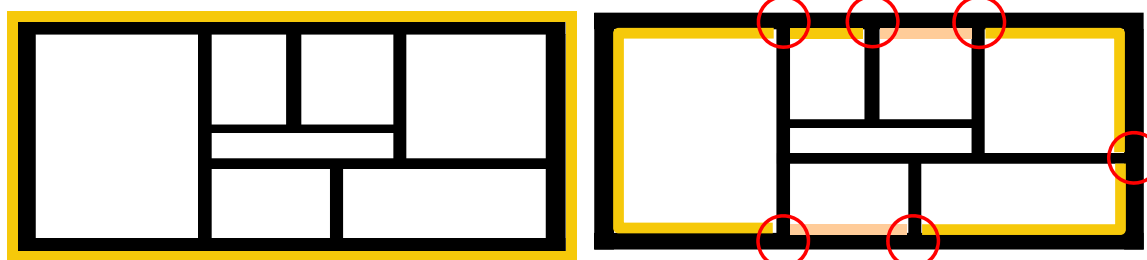


Foto: Jesper Engelmark

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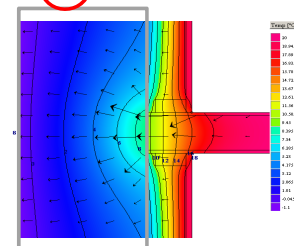


Originalvägg

Invändig isolering

1. Befintlig vägg blir kallare
2. Svårt att undvika köldbryggor
3. Reducerad uttorkning

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Originalvägg

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Hur?

- Del 1: Screening
 - Utvärdering innan renovering (WP1)
- Del 2: Tester
 - Materialkaraktisering och tröskelvärden (WP2)
 - Mätdata från byggnadselement and verkliga case (byggnader) (WP3)
- Del 3: Metoder
 - Probabilistisk hygrotermisk bedömning (WP4)
 - LCA och LCC (WP5)
- Del 4: Verktyg
 - Guidelines och web-baserat verktyg (WP6)

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Typer av isolersystem

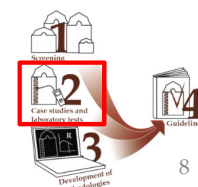
- Kondens-förebyggande system
 - Ångtäta material (stängd cellstruktur)
- Kondens-begränsande system
 - Traditionell lösning (mineralull + plastfolie)
- Kondens-tolererande system
 - Kapillärt aktiva material
 - Uttorkning av kondens

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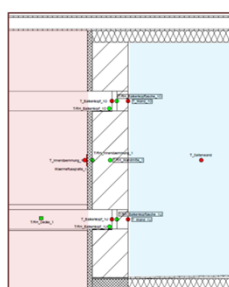
- Skademekanismer som hanteras:
 - Mikrobiell påväxt
 - Röta
 - Frost
 - Alger och missfärgning
- Modeller för skador
- Gränsvärden för skador
- Materialtester



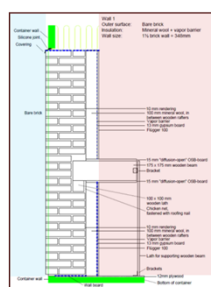
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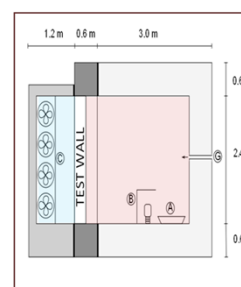
TUD:



DTU:

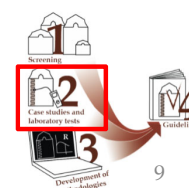


KUL:



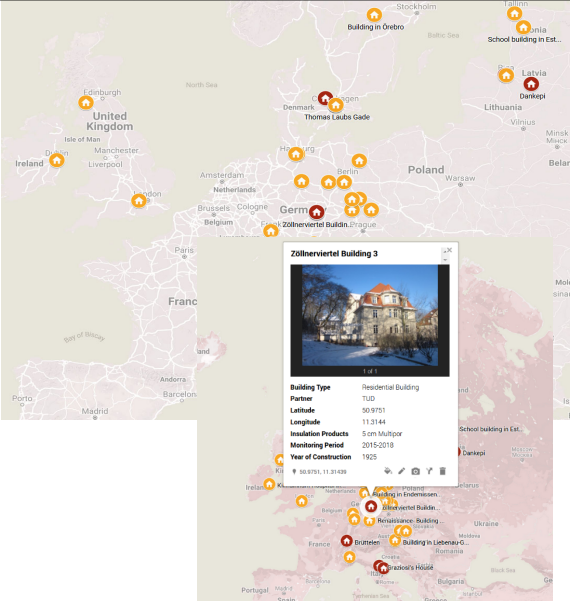
- Invändigt isolerade väggar
- Validering av hygrotermiska simuleringar

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RIBuild Case

- 14 RIBuild case (byggnader)
- 31 case utanför projektet
- Ur dessa har bland annat bra och dåliga exempel hämtats som underlag till vägledning



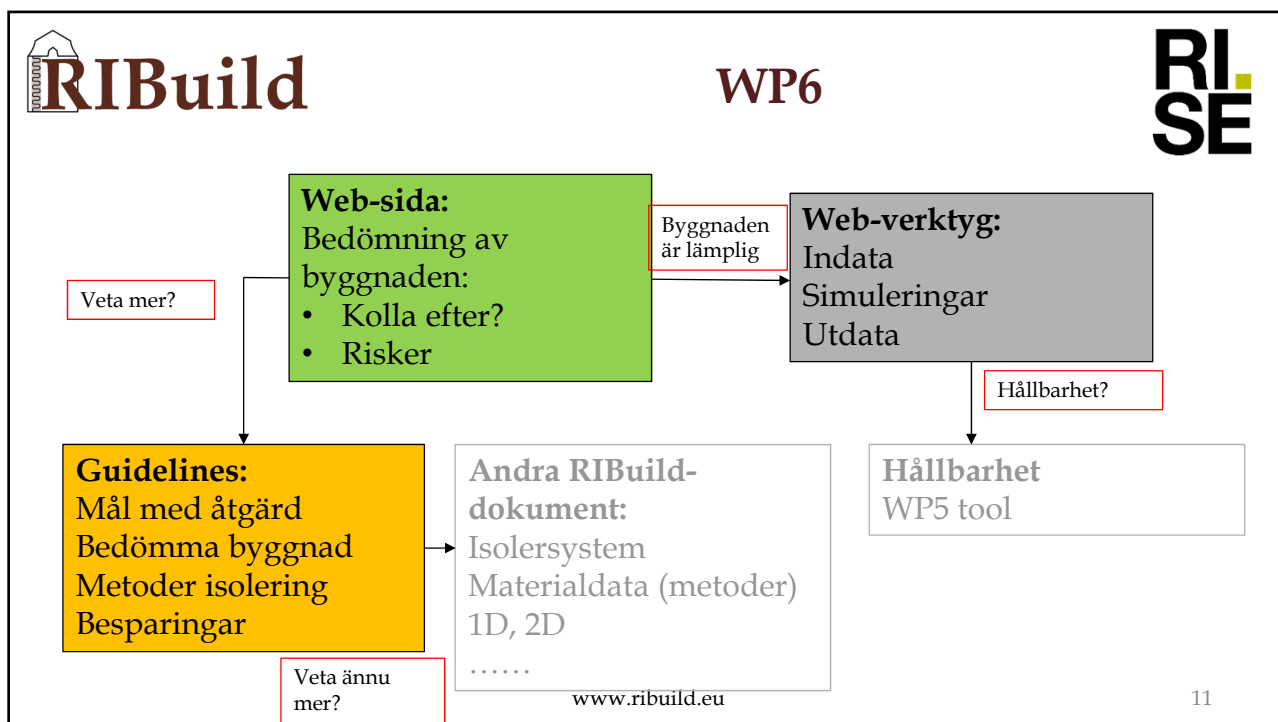
Zöllnervertel Building 3

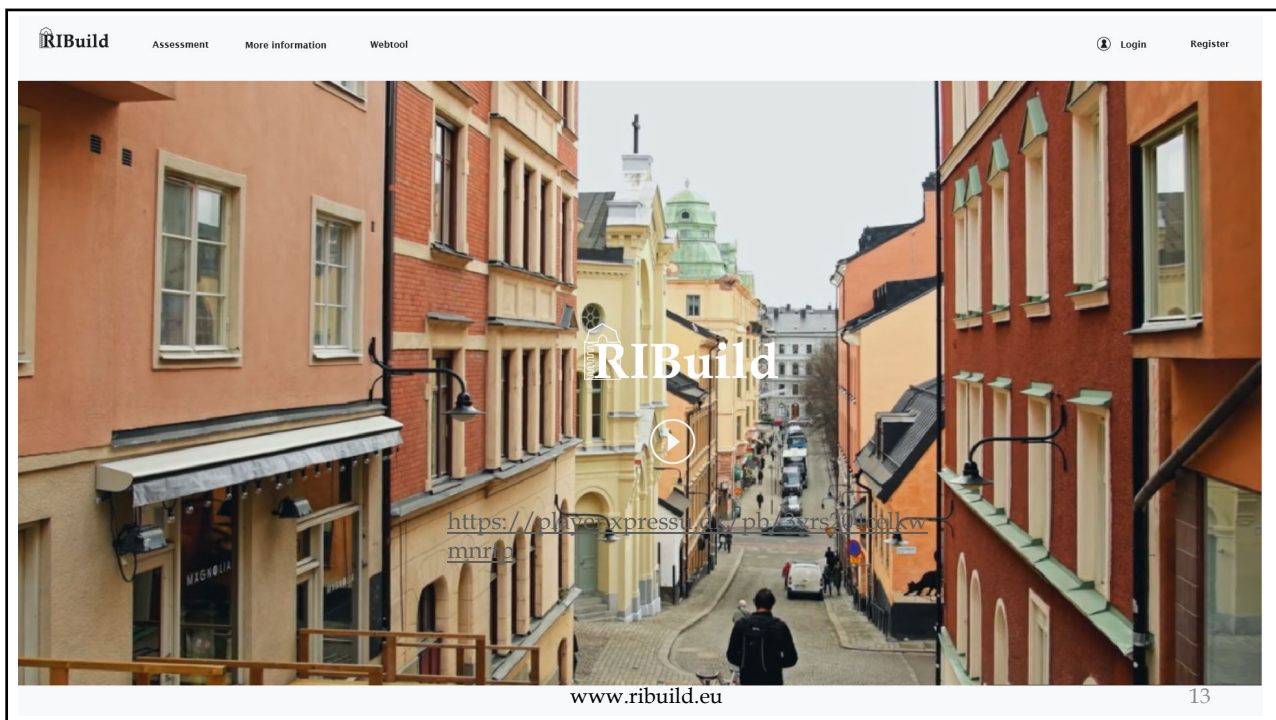
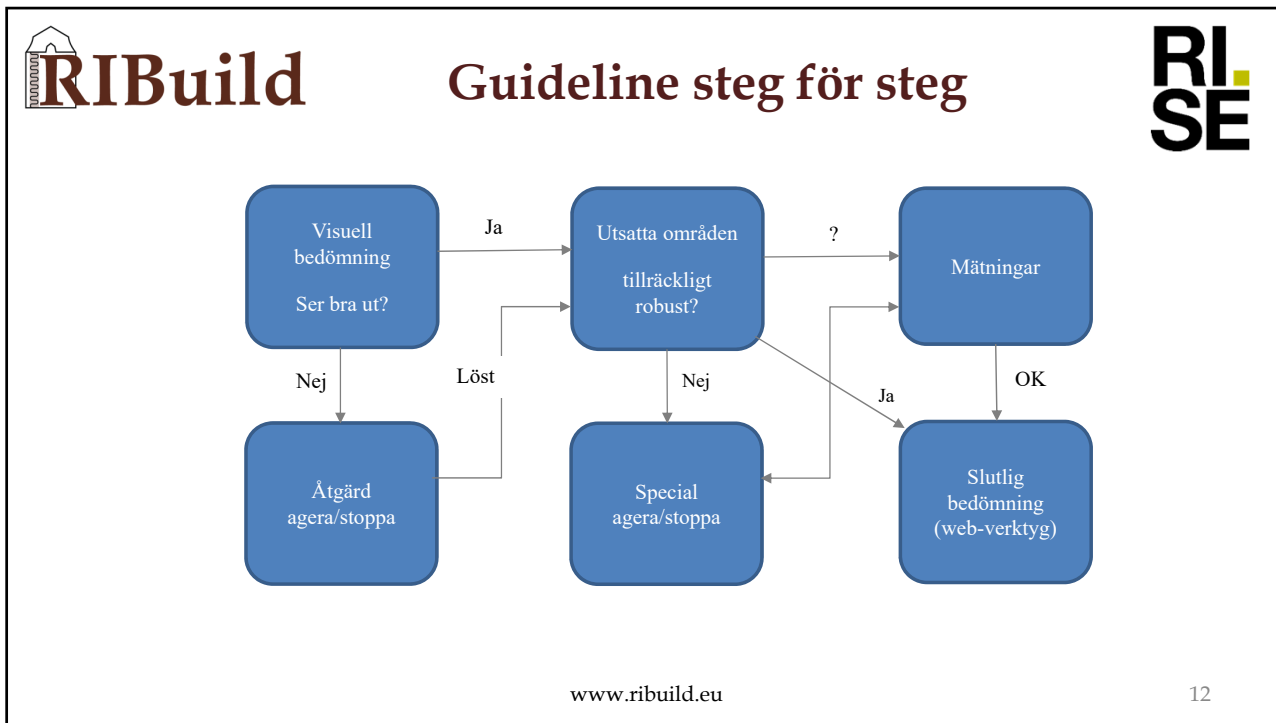
Building Type	Residential Building
Partner	TUD
Latitude	50.9701
Longitude	11.3144
Insulation Products	5 cm Multipor
Monitoring Period	2015-2018
Year of Construction	1925

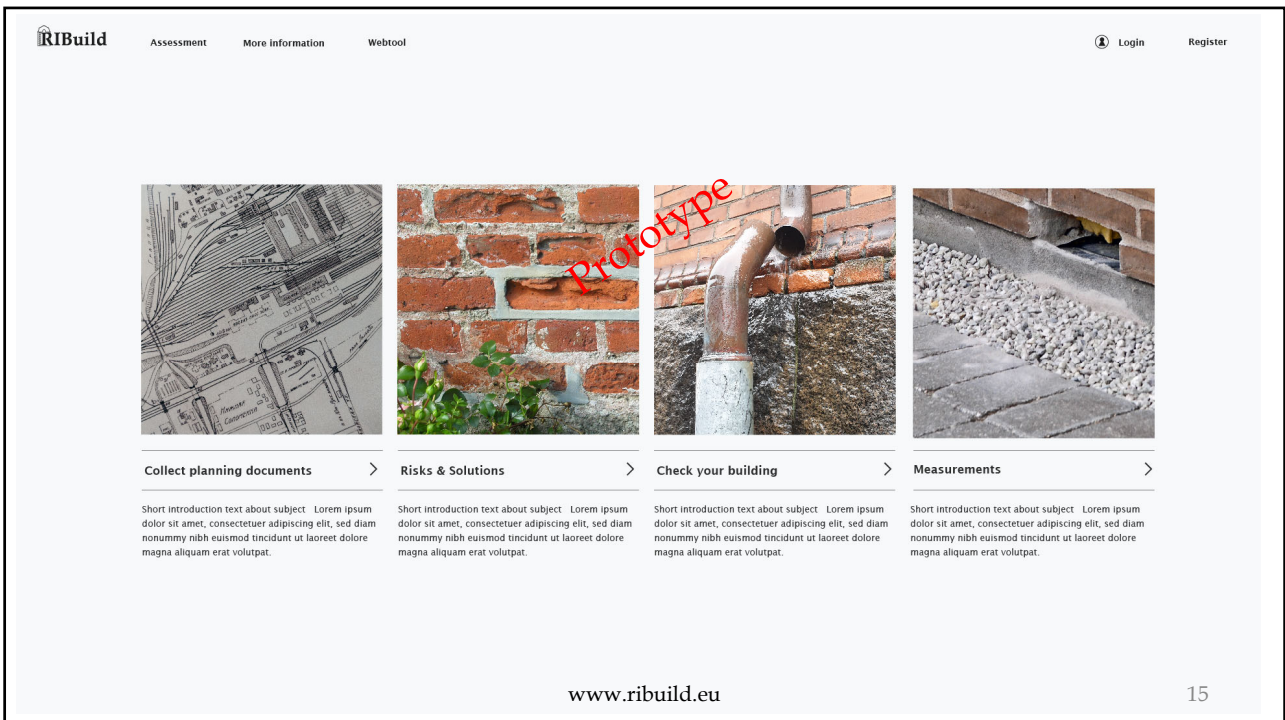
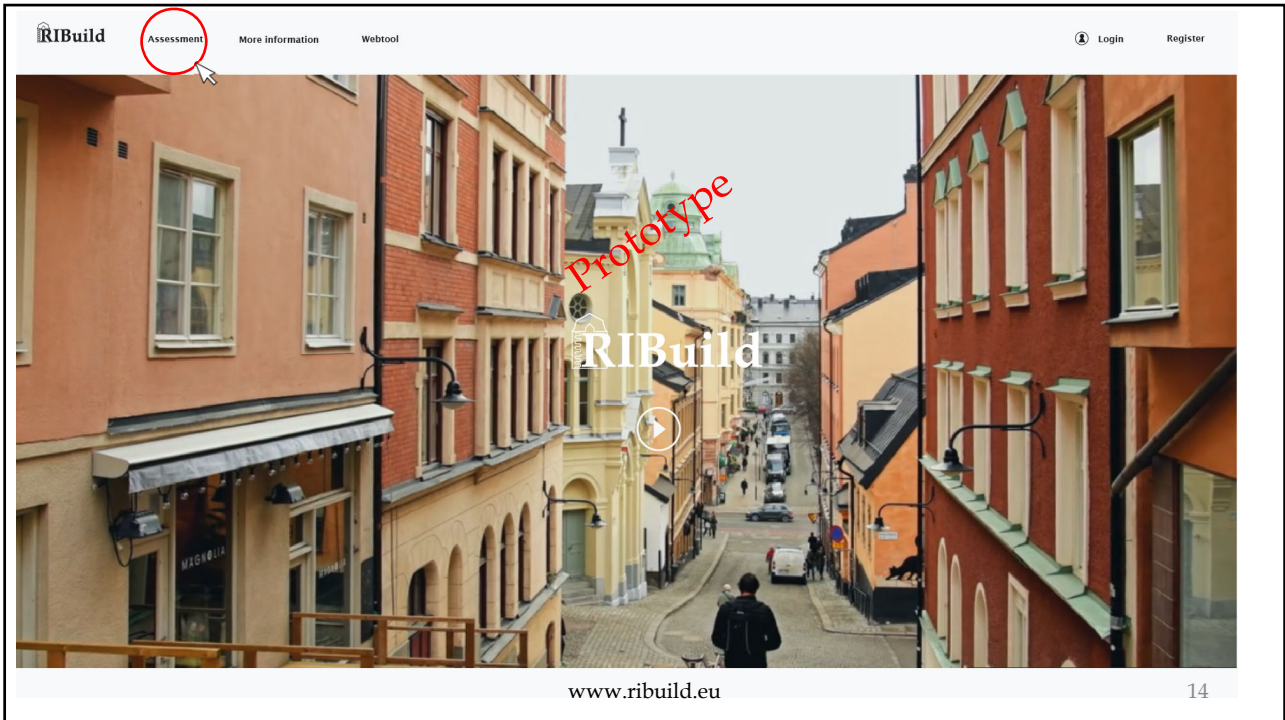


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Collect planning documents >

Short introduction text about subject Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

Risks & Solutions >

Short introduction text about subject Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

Check your building >

Short introduction text about subject Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

Measurements >

Short introduction text about subject Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

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Algae growth >

Mould growth >

Salt efflorescence >

Rising damp >

Wood rot >

Frost damage >

Risks & Solutions

General introduction to visual assessment

Historical buildings are generally composed by brick, mortar, plaster and natural stone. Deterioration of these materials partly depends on the properties of the material itself and partly upon several environmental factors acting separately or in various combinations.

Before applying internal insulation, a visual inspection of the building facade is necessary to capture a visual impression of the facade and its protective state. The inspection will thus reveal hygrothermal structural damages and potential risks renovating the building.

It is advisable during the inspection to proceed with a certain system, e.g. from outside to inside, from the overall view to the detail, from the basement to the attic, etc. in order to obtain a comprehensive overview of the state of the existing constructions.

Especially, high levels of moisture might result in several types of deterioration and reduce the service life of building components. Moisture induced damages include mould growth, wood decay, salt efflorescence, and frost damage. The presence of moisture in porous materials might further increase the thermal transmittance through walls and thereby the overall heat loss of the building.

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Risks & Solutions

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Algae and cyanobacteria* are aquatic microorganisms with the ability to conduct photosynthesis*. Algae and cyanobacteria are microorganisms able to create a biofouling* film covering building surfaces. The microorganisms can tolerate climatic variations, maintaining the metabolic activity only when appropriate combinations of dampness, warmth and light are present.

What to look for

Biofouling* on building façades form patinas varying in extent, thickness, consistency, and colour from green to grey and black. This may cause stains, readily recognizable stains on the material surfaces. The bright green colour usually takes place on areas that are sufficiently moistened and not directly exposed to sunlight.

Algae colonization appears on stone, brick, plaster and mortar whenever suitable combination of dampness, warmth and light occurs.

Explore

ALGAE GROWTH >

MOULD GROWTH >

RISING DAMP >

WOOD ROT >

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Algae colonization appears on a large variety of façades (i.e. on stone, brick, plaster and mortar), whenever suitable combination of dampness, warmth and light occurs. The microorganisms are very sensitive to the presence of water on the material's surface. On the contrary, during dry and cold weather they tend to die, leaving a dirt deposit which later permits a rapid new growth as soon as suitable weather comes again.

Risks

Algae and cyanobacteria are the main colonizers of building façades, and later they may favour the growth of mould, lichens, fungi and other microorganisms.

The biological colonization of external façades by microorganisms can change the aspect of the surfaces and can even compromise the durability of materials. In addition to the aesthetic deterioration, algae and cyanobacteria may also cause a biochemical and a biophysical deterioration of the substrate, like mechanical stress and

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Risks

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The biological colonization of external façades by microorganisms can change the aspect of the surfaces and can even compromise the durability of materials. In addition to the aesthetic deterioration, algae and cyanobacteria may also cause a biochemical and a biophysical deterioration of the substrate, like mechanical stress and loosens mineral grains especially on stone surface.

Algae growth is influenced by several factors such as climate, building design and façade materials. Among the most important ones are environmental conditions, temperature and free water availability.

Why it occurs

Algae growth is influenced by several factors such as climate, building design and façade materials. Among the most important ones are environmental conditions, temperature and free water availability.

Façades exposed to dominant winds are more easily colonized compared to other sides of the building, since the wind may transport both rain and biological contaminants. A façade which is often wet by rainfall promotes the growth of algae.

The main causes for wetting of façades are mainly given by wind driven rain, leaks from rainwater drainage systems and dew water. However, algae and cyanobacteria can survive dry periods and restart their growth when enough water is available. Therefore, the drying of façades during the day is not enough to prevent algae colonisation.

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Where to look for risks

1. Surfaces with water streams often moistened for long periods
2. Porous or rough building materials such as bricks, stones and mortar
3. North-facing walls not directly irradiated by the sun
4. Balconies, roof overhangs and roof drain
5. Damaged waste-water pipes





What to do


Case-by-case evaluation and tests are needed for a proper recommendation to solve the problem.


Overall three methods are available: www.ribuild.eu


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

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

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What to do

Case-by-case evaluation and tests are needed for a proper recommendation to solve the problem.

Overall three methods are available:

- Mechanical methods remove of biofilm, stains and patinas from contaminated elements either by hands or tools
- Physical intervention using ultraviolet (UV) radiation for surface treatments
- Chemical methods include the use of biocide agents of synthetic origin like pesticides and disinfectant. Notice that legislation of chemicals approved for this purpose differ from each country!

More information

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Check your building (prototype)



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3 GUIDELINE FOR SETTING THE
GOAL OF APPLICATION OF
INTERNAL INSULATION

4 GUIDELINE FOR DETERMINING
WHETHER A BUILDING IS SUITABLE
FOR INTERNAL INSULATION OR NOT

5 GUIDELINE FOR INTERNAL
INSULATION

6 GUIDELINE FOR EVALUATING
THE ENERGY SAVING POTENTIAL
AND THE ENVIRONMENTAL IMPACT

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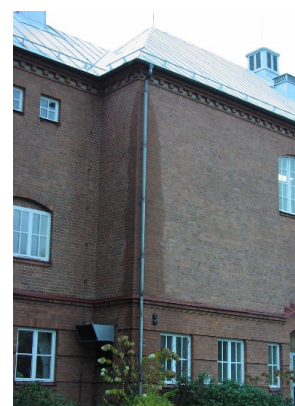
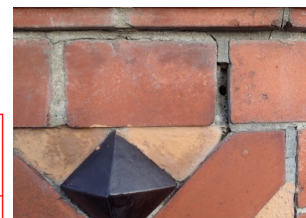


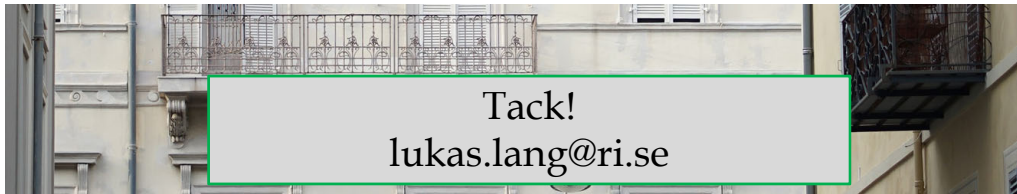
(B)

Figure 4.7: (A) Illustration of how the visible impression of mould growth varies. On all samples in this example there is the same extent of mould growth, although the growth on samples to the right is not visible to the naked eye. (B) Example on how the mould growth may be hidden within the building structure. In this example the interior surface materials and insulation have been removed. Note that although most growth is visible in this example, the growth is most often not visible to the naked eye.



Establish defect rain water collection system		Cause	Possible mitigation:
Inspection after heavy rain fall:	Wet spots around water collection system (horizontal and vertical pipes)	Leakages in the piping system	Locate and fix the leakage /blockage
Inspection in frost:	Icicles from eaves, chutes and pipes	Can be congested pipes	Clean the piping system
General inspection	Regular assessment of entire building facade – especially joints	Water can stand still and accumulate on horisontal surfaces, e.g. around friezes	Locally damaged joints close to water collection system should be filled in





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