MINNISBLAÐ 02

Langholtsskóli - Sýnataka í íþróttahúsi

Skjalalykill:	Verkefni:
1274-104-MIN-02	Langholtsskóli - Íþróttahús
Höfundur/ar:	**Verkkaupi:**
Arnar Þór Sævarsson (AÞS)	Umhverfis- og skipulagssvið Reykjavíkurborgar
Dagsetning:	**Viðtakandi:**
16. júní 2025	Arnar Jónsson Köhler

Dreifing:

- ☐ Trúnaðarmál
- ☒ Verkkaupi
- ☐ Opin

FORSENDUR

Búið er að taka íþróttahús Langholtsskóla úr notkun. Skoðun á íþróttahúsi leiddi í ljós miklar raka-skemmdir í búningsherbergjum og í gólfi íþróttahúss. Jarðvatn og jarðvatnsálag er að öllum líkindum mjög mikið. Arnar Þór Sævarsson starfsmaður VERKVISTAR fór í skoðun og sýnatöku í gólfi íþróttahúss þann 14. maí 2025.

Íþróttasalur var skoðaður ásamt búningsklefum. Búið var að gera göt í uppstólað timburgólf á þremur stöðum. Tekin voru sýni úr ílögn undir gólfi.

Rakaskimun

Rakaskimun er framkvæmd til að athuga hvort að einhver byggingarefni í tilteknu rými eru með hækkað rakastig miðað við það sem getur talist eðlilegt. Þar sem rakastig er hátt eru auknar líkur á mygluvexti og öðrum rakaskemmdum. Rakaskimun er framkvæmd fyrst með sjónskoðun en oft má sjá ummerki eins og bólgur, hreyfingar, litamismun eða tauma utan á byggingarefnum eða í byggingarhluta. Einnig eru mælar sem eru lagðir á yfirborð notaðir eftir þörfum til að meta hvort komi fram frávik í raka í byggingarefnum.

Eftirfarandi litakóðar eru notaðir á teikningar að neðan til að sýna staðsetningar á niðurstöðum raka-skimunar og endurspegla hækkaðan raka eða rakaummerki á tilteknum svæðum. Teikningar í stærri upplausn má finna í **Viðauka 1**.

GÓLF VEGGIR LOFT

Efnissýnataka

Efnissýni eru tekin úr byggingarefni til þess að greina hvort að mygla vaxi í tilteknu efni á þeim stað þar sem sýnið er tekið. Sýni eru tekin úr byggingarefni á þeim stöðum þar sem skoðunaraðili telur líklegast að hægt sé að finna myglu út frá rakaskimun og upplýsingum sem liggja fyrir við skoðun. Einnig eru í einhverjum tilfellum tekin sýni á svæðum sem skoðunaraðili telur vera án rakaskemmda og reynir þannig að afmarka rakaskemmt svæði eða meta umfang. Sýnin eru síðan send til smásjárgreiningar hjá

rannsóknarstofu ByggMyko í Svíðþjóð.

Efnissýnataka gefur upplýsingar um hvort tiltekið efni eða sýni sé myglað og þá hversu mikið. Við greiningu eru tegundir myglu greindar og útbreiðsla innan eða utaná efni metið út frá skilgreindu kerfi . Þá er hægt að leggja mat á hversu alvarlegar hugsanlegar skemmdir á byggingarefni eða -hluta eru og ákvarða hvernig hægt er að bregðast við á skilvirkan máta og leggja fram tillögur til úrbóta.

Eftirfarandi form eru notuð á teikningar að neðan til að sýna staðsetningar efnissýnatöku:

○ SÝNI ÚR GÓLFI □ SÝNI ÚR VEGG △ SÝNI ÚR LOFTI

Eftirfarandi litir eru notaðir á teikningar að neðan til að sýna grófar niðurstöður efnissýnatöku, nánari umföllun á niðurstöðum frá rannsóknarstofu ByggMYKO má finna í **Viðauka 2**.

Enginn mygluvöxtur | Ummerki um myglu/ bakteríuvöxtur | Mygla/bakteríur

DNA Ryksýnataka

DNA sýni eru ryksýni sem eru tekin af yfirborðsflötum þar sem ryk hefur fengið að safnast upp til lengri tíma. Ryki er þá safnað á strokupinna eftir leiðbeiningum frá rannsóknarstofu og síðan eru þau send til raðgreiningar hjá rannsóknarstofu HouseTest í Danmörku.

DNA ryksýni gefa mynd á hvernig dreifing gróa og svepphluta er í lofti eða ryki og geta gefið vísbendingar um faldar rakaskemmdir í tilteknu rými. Við greiningu er tegundasamsetning og magn myglugróa og mygluhluta í ryki skoðað og er þá hægt að álykta um uppruna þeirra og hvort þau séu frá eðlilegri fúngu innanhúss eða utandyra eða hvort að samsetning gefi tilefni til að skoða betur hvort einhvers staðar sé falin rakaskemmd. Niðurstöður gefa ekki rétta mynd á staðsetningu hugsanlegra rakaskemmda. Athuga skal að niðurstöður ryksýna eru ætlaðar til þess að gefa mynd á alvarleika hugsalegra rakaskemmda í tilteknu rými en ekki hversu heilsuspyllandi myglusamsetningin er hverju sinni.

Eftirfarandi litir og stafir eru notaðir á teikningum að neðan til að sýna grófar niðurstöður ryksýnatöku, nánari umfjöllun má finna í **Viðauka 3**.

A Eðlileg myglusamsetning. Ósennilegt að leyndar rakaskemmdir séu í rými

B Eilítið hækkuð gildi af einhverjum myglutegundum en þó ekki af tegundum sem þrífast almennt í rökum svæðum innandyra. Ósennilegt að leyndar rakaskemmdir séu í rými

C Myglusamsetning óeðlileg. Tiltölulega líklegt að rakaskemmdir séu í rými en einnig mögulegt að myglugró komi utanfrá

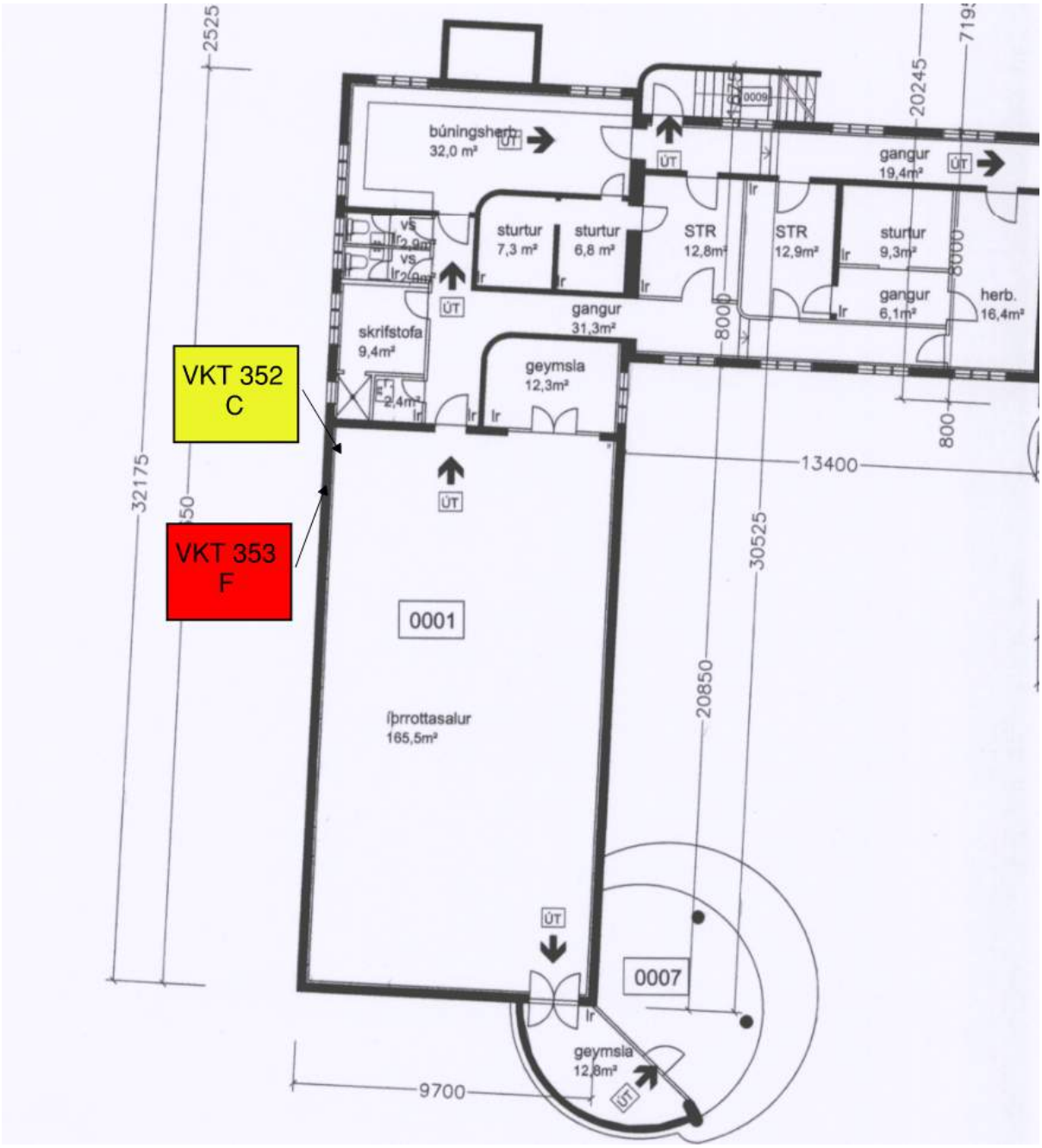
D Myglusamsetning óeðlileg og mikið magn. Annaðhvort er virkur mygluvöxtur í rými eða hefur áður áður verið það

E Myglusamsetning óeðlileg og mikið magn. Hækkuð gildi af myglu tegundum sem þrífast í rökum svæðum innandyra. Líklega rakaskemmdir í rými

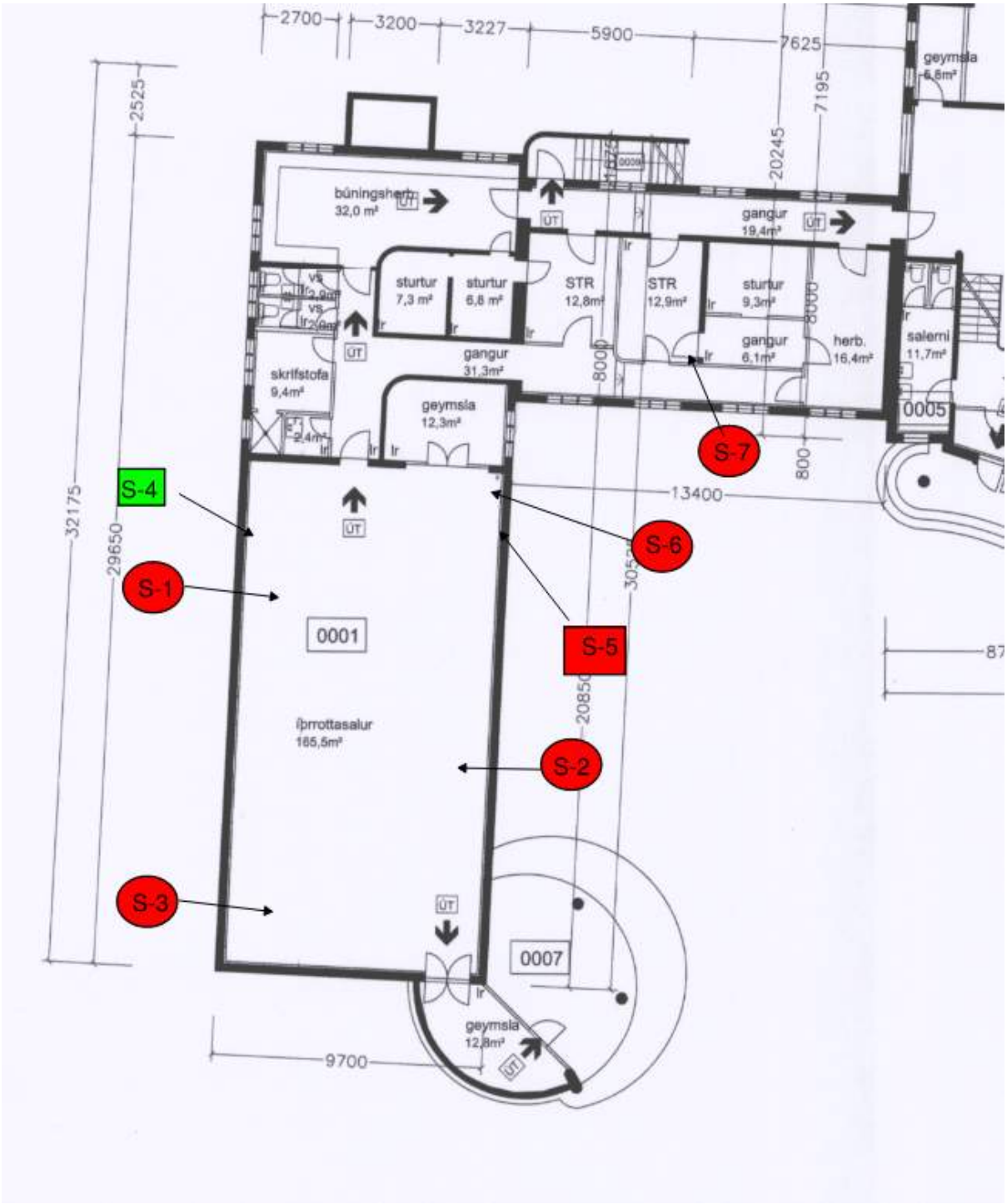
F Myglusamsetning óeðlileg og mjög mikið magn. Mikið hækkuð gildi af myglu tegundum sem þrífast í rökum svæðum innandyra. Mjög líklega alvarlegar rakaskemmdir í rými

SÝNATAKA

Tekin voru sjö byggingarefnissýni, fimm úr gólfi og tvö úr vegg. Einnig voru tekin tvö DNA ryksýni.



Mynd 1. *Niðurstaða DNA ryksýnatöku*



Mynd 2. *Niðurstaða sýnatöku úr byggingarefnum*

Í **Viðauka 1** má sjá staðsetningu sýna ásamt niðurstöðum. Einnig má finna frekari umfjöllun á niðurstöðum í **Viðauka 2** og **Viðauka 3**.

UMFJÖLLUN OG ÚRBÆTUR

Niðurstöður sýnatöku eru ekki góðar. Mygluvöxtur er djúpt niður í ílögn og augljóst að vatnsálag á botnplötu er mikið. Tekin voru sjö byggingarefnissýni og greindist mygla í sex þeirra. Ryksýni komu heldur ekki vel út og greindust tegundir í ryki sem að benda til rakaskemmda í húsnæðinu. Undir timburgólfi sáust Jafnfætlur en það eru skordýr sem að finnast eingöngu í mjög röku umhverfi.

Fara þarf í frekari rannsóknir og í framhaldi af þeim töluverðar aðgerðir til þess að gera húsið nothæft undir kennslu á nýjan leik. Áætlað er að mynda lagnir í skólanum og á lóðinni á þessu ári. Aðgerðir hér að neðan eru tillögur og miðaðar við þær rannsóknir sem búið er að framkvæma. Þörf er á frekari rannsóknum til þess að setja fram heildar áætlun.

Aðgerðir

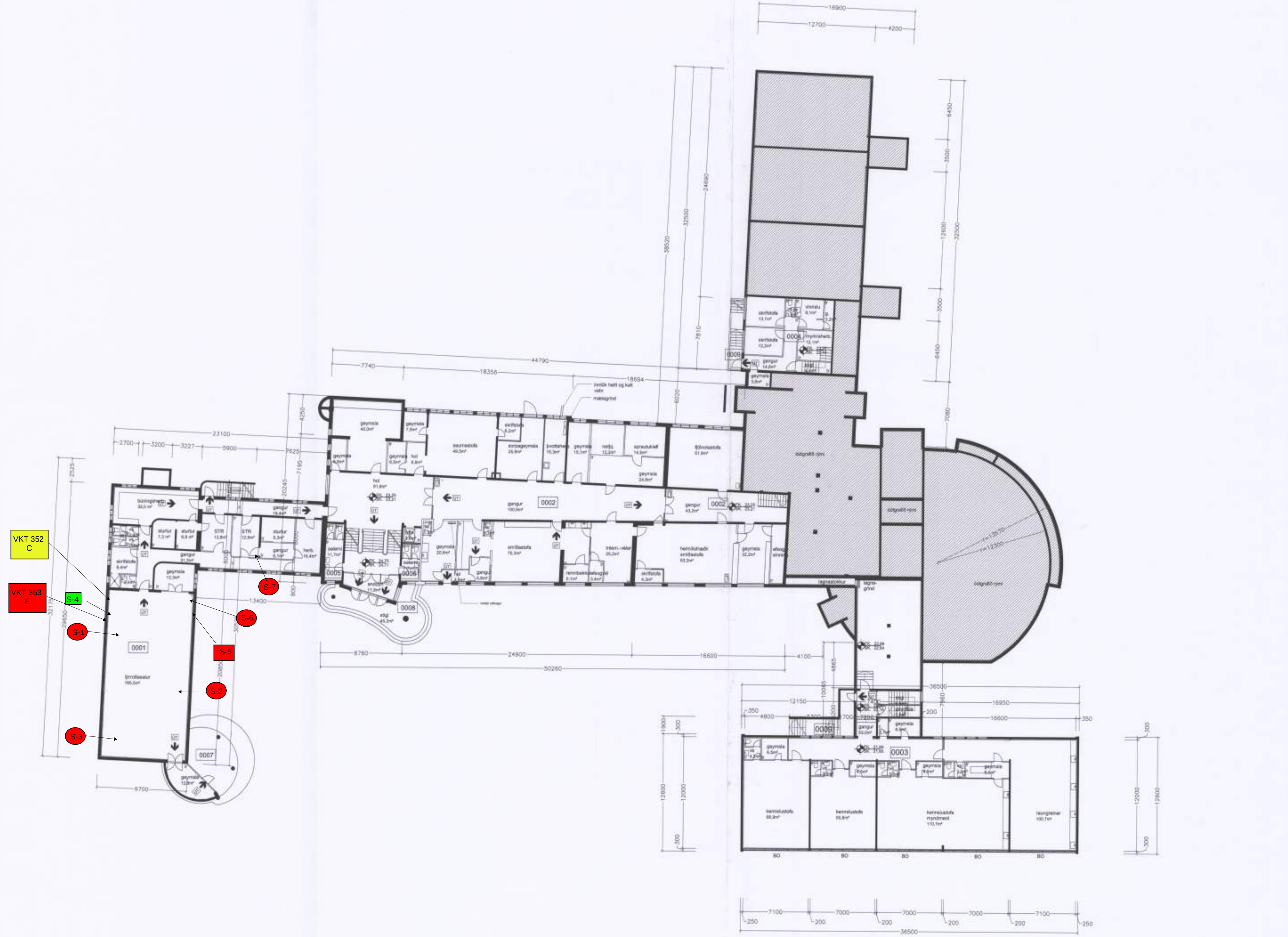
- Mynda frárennsli og dren.
- Moka þarf meðfram íþróttahúsi að utan.
- Vatnsverja sökkul og koma fyrir takkadúk og einangrun.
- Setja upp eða lagfæra drenkerfi.
- Fjarlægja allt timbur í gólfi í íþróttasal.
- Fjarlægja múr og einangrun af útveggjum.
- Meta þarf þörf á gluggaendurnýjun.
- Fjarlægja öll gólfefni í búningsklefum og öðrum rýmum.
- Fjarlægja ílögn í búningsklefum og öðrum rýmum.
- Slípa þarf neðri hluta innveggja.
- Framkvæma þarf frekari rannsóknir á botnplötu í íþróttasal. Að öllum líkindum þarf að endurnýja hana.

Ljóst er að ástand í íþróttahúsi og búningsklefum er ekki gott og að þörf er á umfangsmiklum viðgerðum til þess að gera húsið nothæft á nýjan leik.

MYNDIR

Mynd 3. *Jafnfætlur fundust undir gólfi í sal*

VIÐAUKI 1 - TEIKNINGAR, NIÐURSTÖÐUR SÝNATÖKU



Grunnmynd kjallari M 1:200

LYKILMYND

Verkheiti: Holtavegur 23, Reykjavík
Langholtsskóli- viðbygging

Verkhluti: Grunnmynd kjallari

Teikninúmer: 02- A

Mælikvarði: 1:200

Teiknað: SL

Yfirfarið:

Samþykkt:

Verknúmer: 0158

Útgáfudagur: 14.Maí 2003

Teikniskrá:

Útprentað: May 14, 2003 - 11:16

Sig. Hallgr.

ARKÞING
BOLHOLT 8 -105 REYKJAVÍK
SÍMI: 551 0870 - FAX: 551 0875
arkthing@arkthing.is - www.arkthing.is

GUÐMUNDUR KR. GUÐMUNDSSON, ARKITEKT
ÓLAFUR SIGURÐSSON, ARKITEKT
SIGURÐUR HALLGRÍMSSON, ARKITEKT
HJÖRTUR PÁLSSON, BYGG.FR.

MÁL NR.
26418

VIÐAUKI 2 - SKÝRSLA FRÁ BYGGMYKO, NIÐURSTÖÐUR BYGGINGAREFNISSÝNA

Kerstin Gillen
ByggMyko KG
Skallmeja Måns Johansgården 2
SE-53295 Skara

Viðtakandi:
Verkvist ehf.
Hallgerðargata 13
105 Reykjavík

Langholtsskóli íþróttahús: Sveppagreining á 7 sýnum

Sýni tekin: 14.05.2025
Sýni móttekin: 20.05.2025
Skýrslu lokið: 28.05.2025

Skoða skyldi hvort að mygluvöxt og örveru væri að finna í 7 sýnum af byggingarefnum. Sýnin voru skoðuð í víðsjá og umfang myglu metið. Síðan var tekið eitt eða fleiri sýni til staðfestingar og greiningar með smásjárskoðun. Sýnin rannsakaði sveppafræðingurinn Kerstin Gillen.

Kerstin Gillen
ByggMyko KG
Skallmeja Måns Johansgården 2
SE-53295 Skara

Eftirfarandi litakóðun gildir yfir þau sýni sem greind voru.

Niðurstöður

1	Steypa undir gólfi	Steypa	Myglan ca. 1,7 cm djúp og í ca. 10% af holrýmunum í steypunni. - ógreind(ar) tegund(ir): í litlu magni (fáeinir sveppaþræðir)
2	Steypa undir gólfi	Steypa	Myglan ca. 1,2 cm djúp og í ca. 50% af holrýmunum í steypunni. - ógreind(ar) tegund(ir): í nokkru magni (nokkrir sveppaþræðir)
3	Steypa undir gólfi	Steypa	Myglan ca. 1,7 cm djúp og í ca. 50% af holrýmunum í steypunni. - ógreind(ar) tegund(ir): í nokkru magni (nokkrir sveppaþræðir)
4	Veggur – norður	Múr	
5	Veggur – suður	Múr	Myglan ca. 1 cm djúp og í ca. 70% af holrýmunum í múrnum. - tegund: í nokkru magni (nokkrir sveppaþræðir) - geislabakteríur: í nokkru magni
6	Gólf í suðausturhorni	Steypa	Myglan ca. 1,9 cm djúp og í ca. 50% af holrýmunum í steypunni. - tegund: í nokkru magni (nokkur aldin og gró) - ógreind(ar) tegund(ir): í nokkru magni (nokkrir sveppaþræðir)
7	Gólf í búningsklefa	Ílögn	Myglan ca. 1 cm djúp og í ca. 80% af holrýmunum í steypunni. - geislabakteríur: í nokkru magni - ógreind(ar) tegund(ir): í nokkru magni (nokkrir sveppaþræðir)

VIÐAUKI 3 - SKÝRSLA FRÁ HOUSTEST, NIÐURSTÖÐUR DNA RYKSÝNA

DNA Analysis Dust

Address tested:
Langholtsskóli - Íþróttahús

Date of analysis:
26/05-2025

VERKVIST
Hallgerðargata 13, 105 Reykjavík

HOUSE TEST
Petersmindevej 1A, 5000 Odense C

Overall assessment

VKT 352 Undan gólfi, ofan af ofnagrind

C

Our analysis shows that levels of mould in the sample are slightly higher than levels normally expected in dry, clean and undamaged buildings. It is likely that this is either due to indoor mould growth or because naturally occurring outdoor mould species have been accumulating in the dust in the building.

VKT 353 Í gluggasyllu, úr gluggakistu

F

Our analysis shows that there are very high levels of mould in the sample. The species composition of the mould is abnormal and there are very high levels of mould species that thrive in damp indoor environments. This means that there is likely to be a damp problem in the building that is adversely affecting the indoor air quality.

VKT 352 Undan gólfi, ofan af ofnagrind

A	B	C	D	E	F

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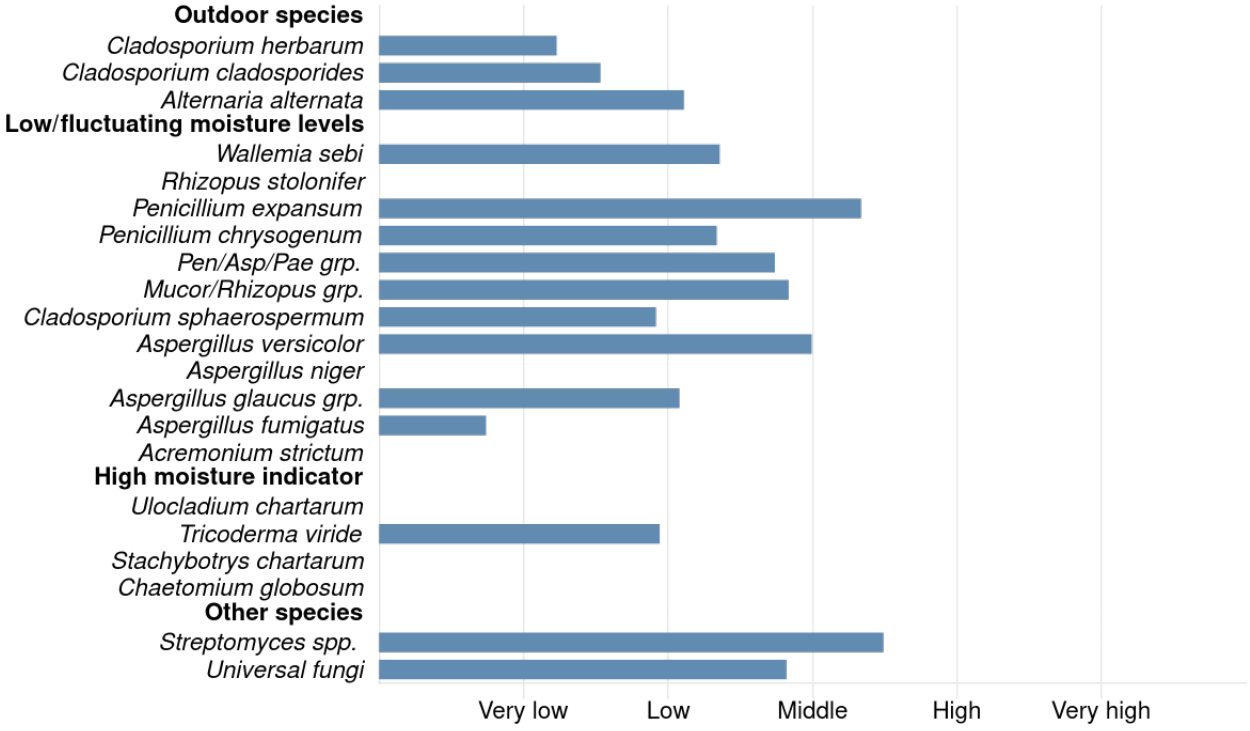
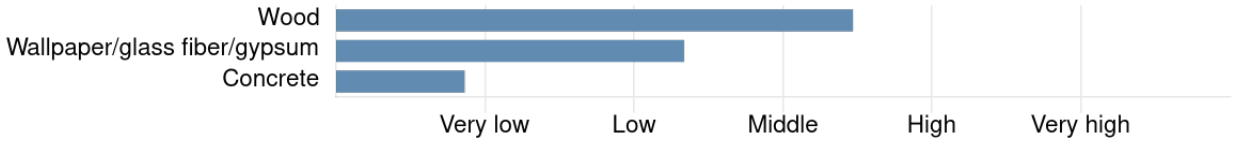
Weighted distribution

Profile of the sample analysed. Values are normalised against a database of mould levels found in samples taken both from sound buildings and buildings with known moisture damage.



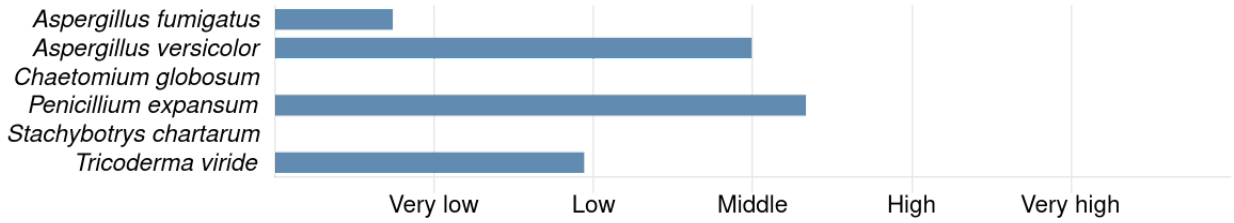
Materials

Different mould species have different preferences with regards to habitat. The species composition of a sample can therefore indicate which materials the mould is likely to be growing on.



Biologically active mould

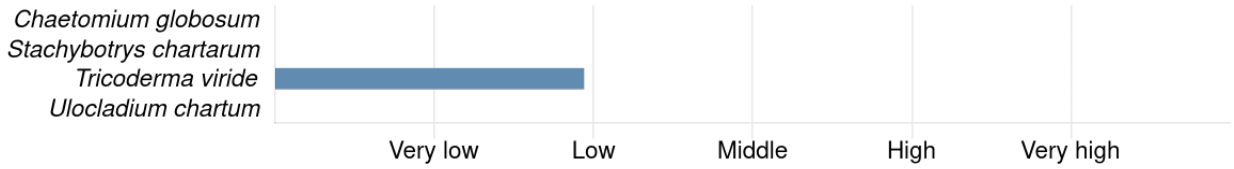
A number of species of mould can produce toxins called mycotoxins. These are thought to affect the immune system and can cause discomfort to users of affected buildings. These species of mould are called *especially biologically active* moulds. The growth conditions for these moulds and the materials they are growing on are thought to have an influence on whether or not they produce mycotoxins. They occur more often where there have been longer-term damp problems



Moulds at high humidity levels

All species of mould require moisture in order to grow. Some species can grow where there are relatively low moisture levels. Other species require very high moisture levels.

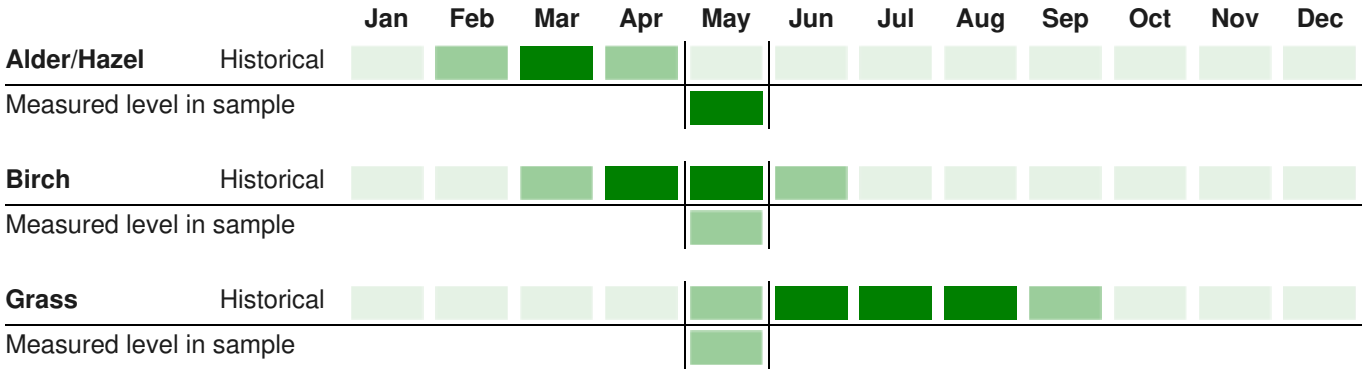
When our analysis reveals the presence of highly moisture-dependent species in a sample, this is an indication of the presence of very damp building materials.



Pollen for determining age of dust

Several of the mould species that grow in damp buildings also occur naturally in the air outdoors. Over time, fragments of this mould will accumulate in the dust indoors. If that indoor dust has been accumulating over a long period, it can contain a relatively high level of mould without this necessarily meaning that mould is growing inside the building.

Determining the age of the dust collected in the samples, therefore, gives an important indication of whether any mould in the sample has come from growth within the building or whether it has accumulated from the outdoor air. Measuring the level of various groups of pollen found in outdoor air during particular periods allows for a precise assessment of the age of the dust in the sample. This allows us to assess whether any mould found in the sample originates from inside or outside the building. We also measure the level of a certain type of mould primarily found in the outdoor air to assess the age of the dust.



Historical pollen activity

This diagram shows when each type of pollen is present in the outdoor air and deposited indoors in the dust.

Pollen measured

This diagram shows which groups of pollen are present in the sample. If pollen is present in a dust sample, this shows that the dust has lain since the pollen in question was circulating in the outdoor air

Species/group			Species/group		
Universal fungi	36,183		***Mucor/Rhizopus grp.***	68	0.19%
Acremonium strictum	0	0.00%	***Pen/Asp/Pae grp.***	1,534	4.24%
Alternaria alternata	4	0.01%	***Penicillium chrysogenum***	3	0.01%
Aspergillus fumigatus	1	0.00%	***Penicillium expansum***	43	0.12%
Aspergillus glaucus grp.	2	0.01%	***Rhizopus stolonifer***	0	0.00%
Aspergillus niger	0	0.00%	***Stachybotrys chartarum***	0	0.00%
Aspergillus versicolor	296	0.82%	***Streptomyces spp.***	1,544	
Chaetomium globosum	0	0.00%	***Tricoderma viride***	1	0.00%
Cladosporium cladosporides	170	0.47%	***Ulocladium chartarum***	0	0.00%
Cladosporium herbarum	254	0.70%	***Wallemia sebi***	41	0.11%
Cladosporium sphaerospermum	123	0.34%			

Spore equivalents calculated on the basis of standard curves for the individual species and percentage of total fungi

VKT 353 Í gluggasyllu, úr gluggakistu

A	B	C	D	E	F

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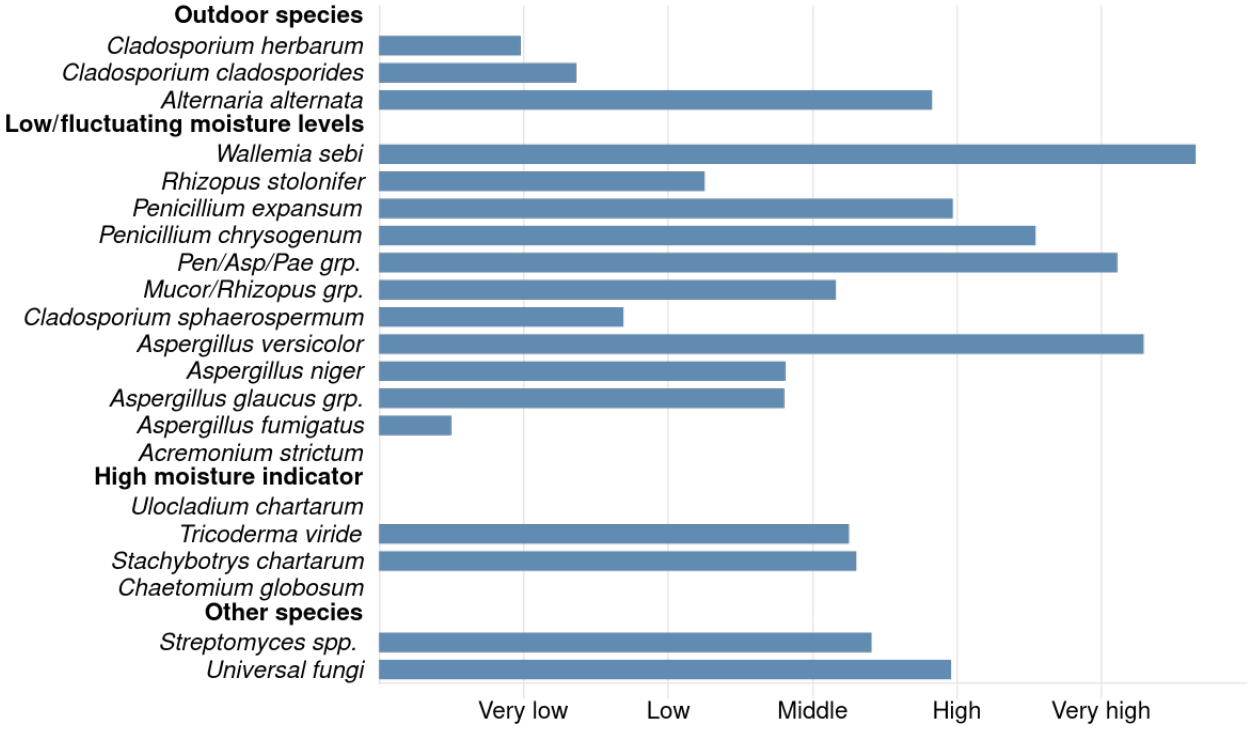

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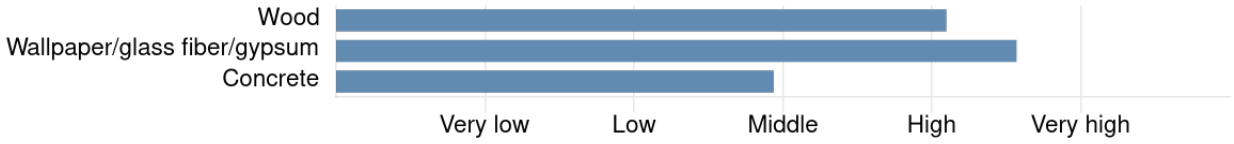

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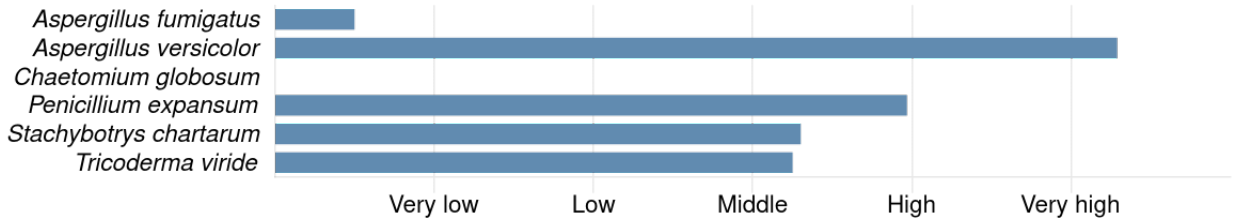

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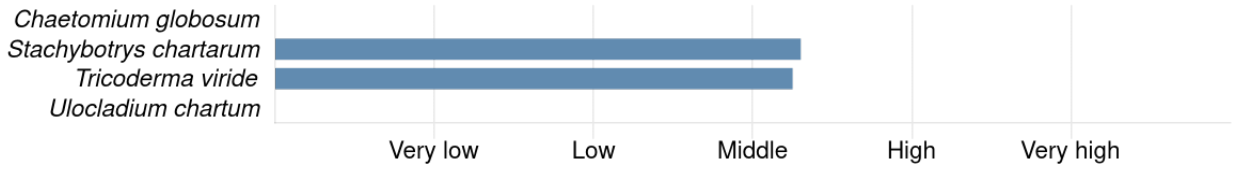

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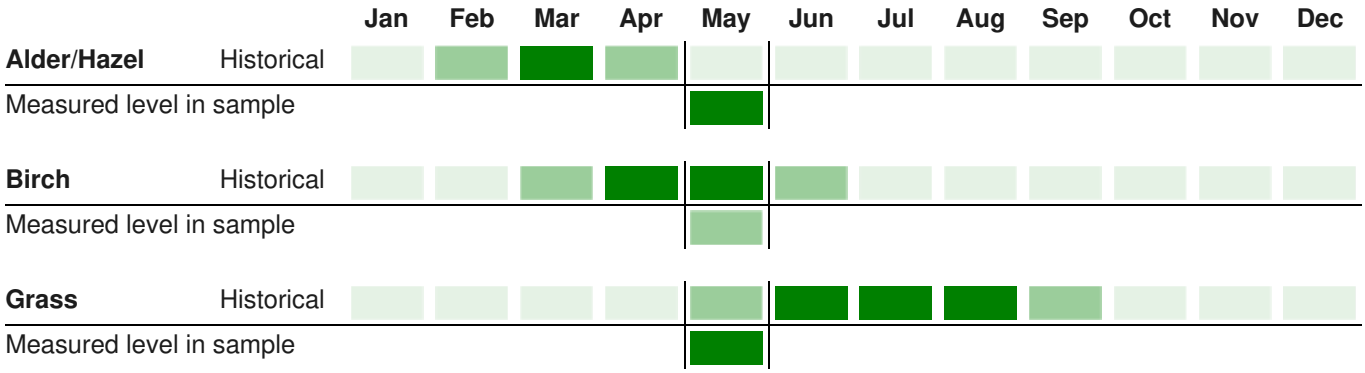

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Pollen measured

This diagram shows which groups of pollen are present in the sample. If pollen is present in a dust sample, this shows that the dust has lain since the pollen in question was circulating in the outdoor air

Species/group			Species/group		
Universal fungi	499,864		***Mucor/Rhizopus grp.***	145	0.03%
Acremonium strictum	0	0.00%	***Pen/Asp/Pae grp.***	358,937	71.81%
Alternaria alternata	201	0.04%	***Penicillium chrysogenum***	523	0.10%
Aspergillus fumigatus	1	0.00%	***Penicillium expansum***	187	0.04%
Aspergillus glaucus grp.	13	0.00%	***Rhizopus stolonifer***	5	0.00%
Aspergillus niger	11	0.00%	***Stachybotrys chartarum***	5	0.00%
Aspergillus versicolor	58,568	11.72%	***Streptomyces spp.***	1,278	
Chaetomium globosum	0	0.00%	***Tricoderma viride***	18	0.00%
Cladosporium cladosporides	116	0.02%	***Ulocladium chartarum***	0	0.00%
Cladosporium herbarum	143	0.03%	***Wallemia sebi***	80,181	16.04%
Cladosporium sphaerospermum	74	0.01%			

Spore equivalents calculated on the basis of standard curves for the individual species and percentage of total fungi

Appendix

General information

HouseTest cannot under any circumstances be held liable for any comments your surveyor adds to our report, either directly or indirectly.

HouseTest does not carry out quality assurance on your surveyor’s comments or review them in any way. Any questions, remarks, objections etc. that you may have relating to your surveyor's comments must be addressed directly to them.

Explanation of HouseTest's analysis

HouseTest's DNA analysis shows the total quantity of biological material present at the site where the sample was taken from a panel of 24 species/groups of mould, bacteria and pollen.

The results of our analysis should always be considered as part of a wider damp/indoor air quality investigation and must be placed into the context of other observations and measurements. Such assessments and the procedure for making them are always the responsibility of the surveyor.

Several factors determine whether people who are exposed to mould will experience discomfort or develop symptoms. It is therefore not possible to set a threshold for when indoor mould growth becomes a health hazard. However, the World Health Organisation (WHO) recommends that mould infestations in buildings be remediated, that contaminiated material be removed and that the source of the damp be eliminated.

The qPCR method

The qPCR method is widely used in medical science and is best known to the public from its role in COVID-19 testing. The technology is also used by the police to solve crimes where traces of DNA have been left at the scene of a crime.

The method involves washing the organisms present in a sample before cleaning and re-forming their DNA. The relevant DNA sequences are detected by excitation using lasers. The total number of mould spores/bacteria is calculated by comparison with DNA standards. Since every DNA code is unique to each individual organism, the species and total quantity can be calculated. This method is highly precise and it rapidly identifies how many indicator organisms are present in the sample.

Our Assessment

The assessment offered here assumes that the sample has been taken correctly in accordance with the instructions.

In the overall assessment of the result that we offer, we take into consideration the total number of mould and bacteria found in the sample alongside the species composition in the sample and the relationship between the individual species. Some moulds are found naturally in all homes, but other moulds occur in large quantities in connection with moisture-related damage to buildings. This means that some types of mould have a significant impact in small quantities, while others have less impact in higher quantities. The assessment of the likelihood that there is hidden mould growth in the building and whether it has any harmful effects is based on objective, fully tested criteria by comparing it with data from more than 10,000 samples taken from buildings with or without damage.

NB: The rating (A-F) given in this report is an indication of the likelihood that there is hidden mould growth in the building where the sample was taken. It is not an assessment of whether staying in the building is hazardous to your health.

Information about the species

HouseTest's DNA analysis tests dust samples for 21 species of mould and bacteria and calculates how much of each species is present.
The method we use makes it possible to tell the difference between mould spores that occur naturally in the outside air and spores from mould growing inside due to moisture damage.
Different mould species thrive in different environments. They thrive on different materials and at different temperatures and levels of moisture. The composition of the mould species can therefore be analysed to give an indication of the type of moisture damage and its location.
Some general information about different mould and bacteria species is provided below.

Universal fungi

The category Universal fungi states the total number of mould spores in the sample. The majority of the mould spores present in most buildings originate in the outdoor air, which means that they can occur in large numbers without there being any evidence of damp in the building. The amount of universal fungi will also vary seasonally, with high levels during summer and autumn months and very low levels during winter months. The total amount of fungal spores must therefore be compared with other species/groups in order to assess whether there is mould growth in the building.

A

Acremonium strictum

Acremonium strictum is found naturally in soil and in dead plant material and can therefore occur naturally indoors in small quantities. However, if a large number of spores are detected in household dust, this is evidence of indoor growth. The mould can grow for example on concrete, plaster, damp wallpaper or woodwork.

Alternaria alternata

This fungus occurs worldwide and sustains itself primarily by decomposing dead organic matter. Spores from*Alternaria alternata* are spread in the air during the summer months and will therefore occur naturally indoors in limited quantities. HouseTest uses these spores to assess the age of the dust. In rare cases, the fungus can grow in buildings and produce large quantities of spores. This can be very problematic for people who are allergic to fungus.

Aspergillus fumigatus

Aspergillus fumigatus like most other *Aspergillus* species, thrives in relatively high temperatures, which makes damp and heated homes ideal locations for growth. *Aspergillus fumigatus* is one of the few moulds that is potentially pathogenic for people with weakened immune systems, e.g. people who have had organ transplants and AIDS patients, since it can invade lung tissue (aspergillosis). The mould can also produce several different mycotoxins such as gliotoxin and fumagillin, which may cause discomfort and allergic reactions. It should be noted that *Aspergillus fumigatus* also occurs naturally in outdoor air and only rarely causes serious problems.

Aspergillus glaucus grp.

This is a collection of various *Aspergillus* species which primarily occur naturally in warm regions. In homes they can be found on food, in carpets and on plasterboard walls. *Aspergillus glaucus* requires lower moisture levels than other mould species. If large numbers of *Aspergillus glaucus* spores are present in a sample without there being any spores from more moisture-dependent moulds, this can be a sign of damage from damp without there being high moisture levels.

Aspergillus niger

Aspergillus niger is a frequently occurring fungus both outdoors and in homes. It forms large colonies, which are often found on vegetables and fruit, but can also grow in soil from potted plants and on building materials. It thrives in high temperatures and at lower moisture levels compared to some other moulds, and can therefore grow where there is only minor moisture damage. *Aspergillus niger* can be pathogenic for people with weakened immune systems and produce the mycotoxin aflatoxin.

Aspergillus versicolor

Aspergillus versicolor is one of the least demanding fungi in terms of growth conditions and is therefore widespread throughout the world, from Arctic regions to the Dead Sea. It is among the most common fungus found in damp buildings, where it needs only slightly elevated levels of moisture in order to grow. Spores from *Aspergillus versicolor* are found naturally in small amounts in dry buildings. Very high levels can occur in buildings that are damaged by damp. This species can produce sterigmatocystin and aflatoxin.

C

Chaetomium globosum

This fast-growing fungus requires high levels of moisture and is often found on concrete and on materials that contain cellulose such as wallpaper and wood. It is only present in low levels in the outdoor air, so if even a small number of spores are present in a dust sample this strongly indicates that the building has been damaged by damp in the past or there is ongoing damage from damp. *Chaetomium globosum* can produce mycotoxins such as chaetoglobosin A, which are suspected of causing discomfort to people who occupy moisture-damaged buildings.

Cladosporium cladosporioides

Spores from *Cladosporium cladosporioides* occur in huge numbers in outdoor air, especially during the summer months and early in the autumn. Spores from this mould occur naturally in household dust, which means that it can be used to assess the age of the dust. However, *Cladosporium cladosporioides* can also grow indoors and can thrive at lower temperatures and places with varying moisture levels (such as in a loft with a leaky roof) or in a location that has alternating wet and dry weather, which provides the ideal growth conditions.

Cladosporium herbarum

Cladosporium herbarum spores are the most common fungal spores in outdoor air and can cause allergic reactions during the summer and autumn months when it is most active. *Cladosporium herbarum* is found in wallpaper, woodwork and elsewhere in damp buildings. See also *Cladosporium cladosporides*.

Cladosporium sphaerospermum

Cladosporium sphaerospermum occurs naturally in outdoor air, but it can also grow in homes, including on wallpaper, plasterboard walls, painted surfaces and wood. It requires less moisture than most moulds. See also *Cladosporium cladosporides*.

M

Mucor/rhizopus grp.

Mucor/rhizopus grp. is a large group of mould containing several thousand species. Despite this, only a few spores will ever be found in the dust from a building that does not have damp problems. Mould in this group generally requires high levels of moisture to grow indoors, where they can be found on concrete, wood, carpets and elsewhere.

P

Pen/Asp/Pae grp.

This large group contains all the fungi belonging to the genus *Penicillium*, *Aspergillus* and *Paecilomyces*. Spores from these fungi occur naturally in outdoor air and they accumulate in the dust in buildings that do not have moisture damage. However, when there is damage from moisture they will be some of the first mould species to grow and can rapidly begin releasing large quantities of spores into the indoor air. Several species in this group can grow in relatively low moisture levels.

Penicillium chrysogenum

Penicillium chrysogenum is well known because it produces the antibiotic penicillin, which is toxic to bacteria but not to people. This makes it ideal for treating certain bacterial infections. However, *Penicillium chrysogenum* can also produce mycotoxins such as citrinin and cause allergic reactions, so this species of mould can be very problematic when it grows in homes. This mould is found in small quantities in outdoor air and in large quantities in dust in homes and therefore is a strong indication that the indoor air is being adversely affected by damage from damp and associated mould growth. *Penicillium chrysogenum* can grow at lower temperatures and lower moisture levels than most moulds.

Penicillium expansum

Penicillium expansum often grows on fruit, where it can produce mycotoxins that spoil the food. In buildings it frequently grows on woodwork. Because of its ability to produce several different mycotoxins such as citrinin, ochratoxin and chaetoglobosin, it is suspected of causing discomfort to people who occupy buildings where it grows. *Penicillium expansum* requires relatively high levels of moisture to thrive.

R

Rhizopus stolonifer

Rhizopus stolonifer is a fast-growing mould that often grows on bread and fruit and thrives at high moisture and temperature levels. If large quantities of spores from this species are found in a dust sample this can indicate that there is moisture damage to insulation or there is a burst hot water pipe.

S

Stachybotrys chartarum

Stachybotrys chartarum can produce mycotoxins, e.g. roridin E, verrucarin A and satratoxins, and it is thought to be responsible for some of the discomfort experienced by people who occupy damp buildings. The species grows on plasterboard in particular and requires a sustained and high level of moisture over a prolonged period of time. It is typically found in connection with older - and extensive - damp damage *Stachybotrys chartarums* spores are heavy and, unlike most other fungal spores, they do not spread very efficiently in the air. If these spores are found in a dust sample, therefore, the sample was probably taken very close to the location where the mould is growing. The spores are only present in very low levels in outdoor air, so finding even a small number of these spores will strongly indicate that the indoor air quality is being affected by moisture damage.

Streptomyces spp.

Streptomyces spp. is not a mould but a group of bacteria that are primarily found in soil, where they release substances that give soil its earthy odour. *Streptomyces spp.* frequently occurs in connection with damp in floor structures and in concrete elements on the ground, but it can also find its way into dust via contamination caused by dogs or cats bringing dirt into the home. *Streptomyces spp.* is able to produce a large number of organic compounds, some of which can adversely affect indoor air quality and can cause discomfort.

T

Trichoderma viride

In natural environments this mould lives on dead trees and in the soil, where it can attack other fungus. It can grow in buildings on materials that contain wood where there is moisture damage and it prefers high temperatures. It can grow very rapidly where there is moisture damage and the presence of even a few spores in a dust sample is an indicator of moisture damage.

U

Ulocladium chartarum

Ulocladium chartarum grows relatively rarely in buildings, even when there is damage from damp. However, at high levels of humidity and over a long period of time, it can grow on wood, wallpaper and plasterboard. The outdoor level is very low, so even a few spores in the dust indicates a problem with moisture.

W

Wallemia sebi

Wallemia sebi is very difficult to identify using traditional methods but the HouseTest DNA method has shown that it is one of the most frequently occurring mould species in damp buildings. Small amounts of *Wallemia sebi* can be found even in dry buildings, but if there is indoor growth the number of spores can increase dramatically and cause discomfort to allergy sufferers. The spores are also very small and are thought to be able to penetrate deeply into the respiratory passages. *Wallemia sebi* can grow at relatively low levels of moisture.

Outdoor species	VKT 352 Undan gólfi, ofan af ofnagrind	VKT 353 Í gluggasyllu, úr gluggakistu
Alternaria alternata	4	201
Cladosporium cladosporides	170	116
Cladosporium herbarum	254	143
Low/fluctuating moisture levels		
Acremonium strictum	0	0
Aspergillus fumigatus	1	1
Aspergillus glaucus grp.	2	13
Aspergillus niger	0	11
Aspergillus versicolor	296	58,568
Cladosporium sphaerospermum	123	74
Mucor/Rhizopus grp.	68	145
Pen/Asp/Pae grp.	1,534	358,937
Penicillium chrysogenum	3	523
Penicillium expansum	43	187
Rhizopus stolonifer	0	5
Streptomyces spp.	1,544	1,278
Wallemia sebi	41	80,181
High moisture indicator		
Chaetomium globosum	0	0
Stachybotrys chartarum	0	5
Tricoderma viride	1	18
Ulocladium chartarum	0	0
Other species		
Universal fungi	36,183	499,864