

CSTC comportement hydrothermique

PATHOLOGIE BOX

OBJECTIF du WB

OBJECTIF du WB

- S'approprier la PATHOLOGIE BOX

PREREQUIS

- Au-delà de la PEB

PREREQUIS

- Au-delà de la PEB
- Caractéristiques des matériaux

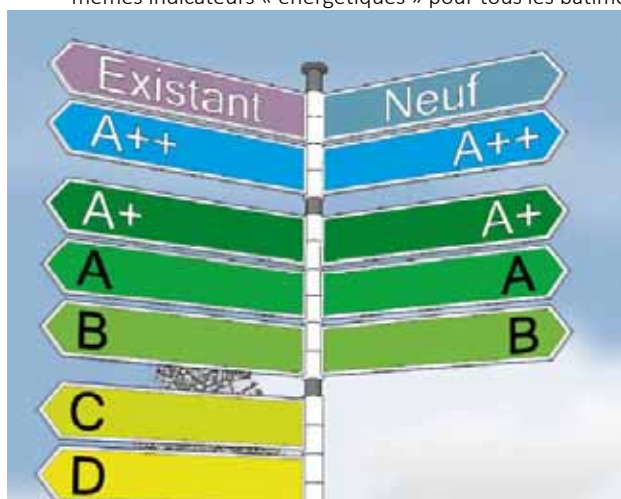
PREREQUIS

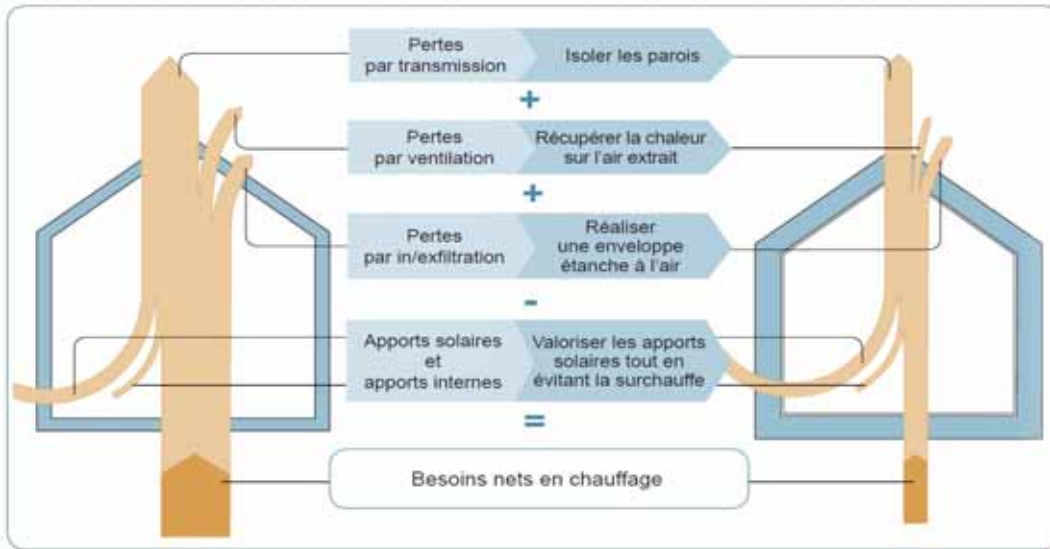
- Au-delà de la PEB
- Caractéristiques des matériaux
- FLUX

Le **certificat PEB**,
un outil pour comparer les logements



Le **certificat PEB**,
un outil pour comparer les logements
mêmes indicateurs « énergétiques » pour tous les bâtiments.





PRIORITE A L'ENVELOPPE du bâtiment:

- limiter les pertes de chaleur (isolation, étanchéité à l'air, ventilation),
- valoriser les apports solaires en limitant la surchauffe en été

POUR UNE MAISON

✓ confortable = contrôle

Température

Humidité

Qualité de l'air

✓ ISOLATION



✓ ETANCHEITE
A L' AIR

✓ VENTILATION

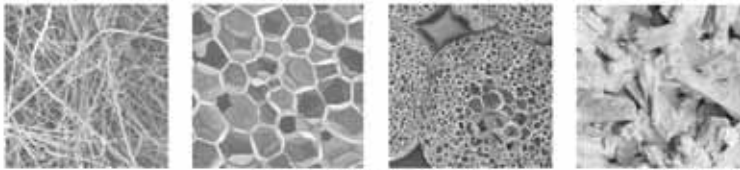
PREREQUIS

- Au-delà de la PEB
- Caractéristiques des matériaux



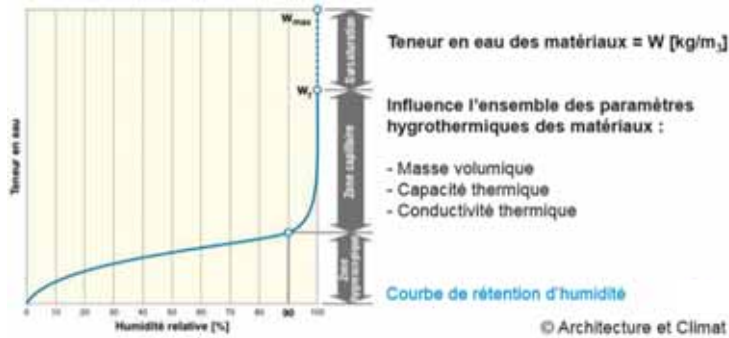
Nombreux paramètres à prendre en compte :

- Les phénomènes de transferts et de stockage sont principalement liés à la structure poreuse et à la nature des matériaux

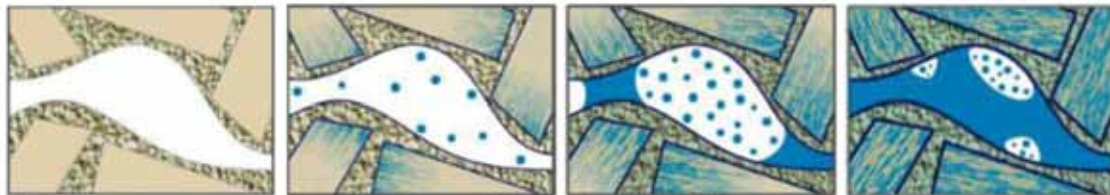


© Insulation materials, éd. Détails

© A. Evrard



Teneur en eau



Etat sec

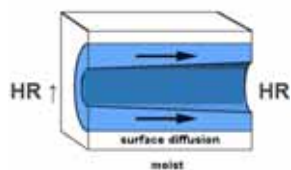
Zone hygroscopique

Zone capillaire

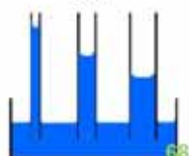
Sursaturation

Hygroscopicité d'un matériau :

Capacité à **absorber** l'humidité de l'air rapidement.

**Capillarité d'un matériau :**

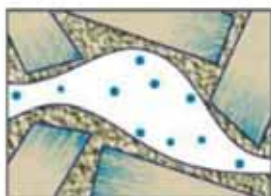
Capacité à **transférer** l'humidité



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**Teneur en eau**

Etat sec



Zone hygroscopique



Zone capillaire



Sursaturation

Nombreux paramètres à prendre en compte :

- Conductivité thermique
- Résistance à la diffusion de vapeur d'eau
- Absorption et transfert d'humidité
- Capacité thermique
- Résistance à la compression
- Résistance au feu
- Impact écologique
- ...
- Type de matériau suivant application (souple, rigide, en vrac, ...)



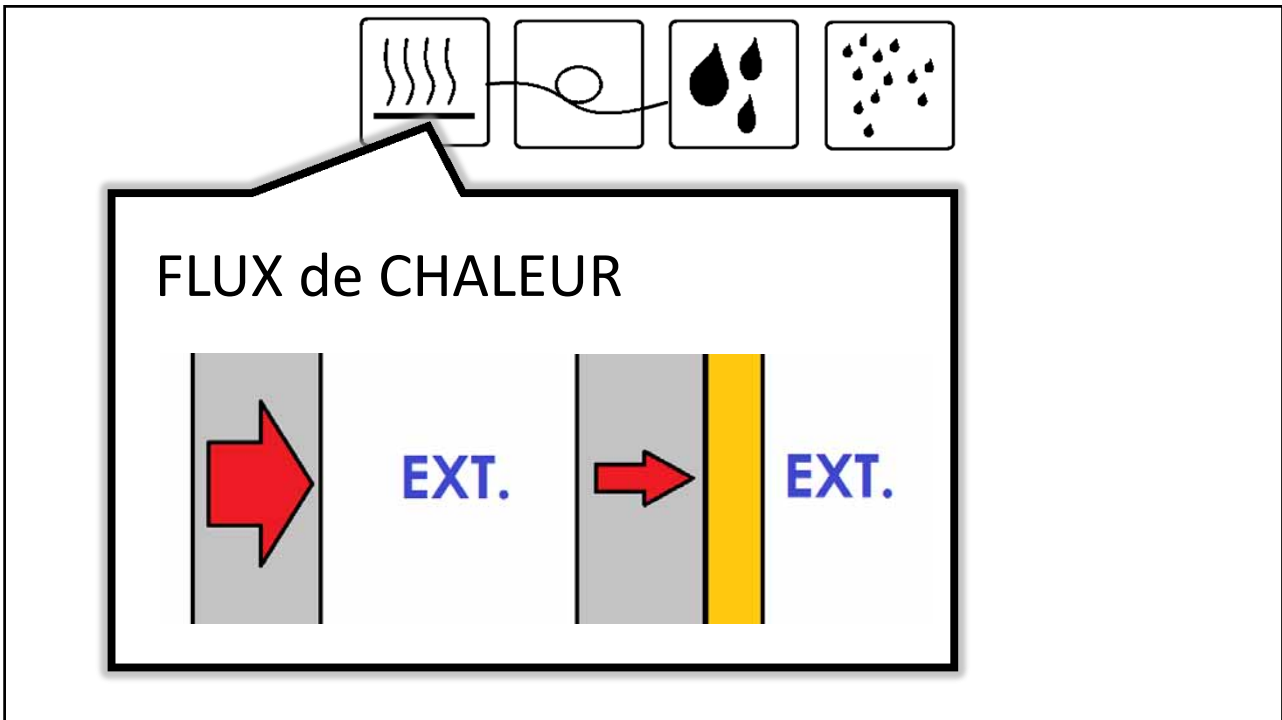
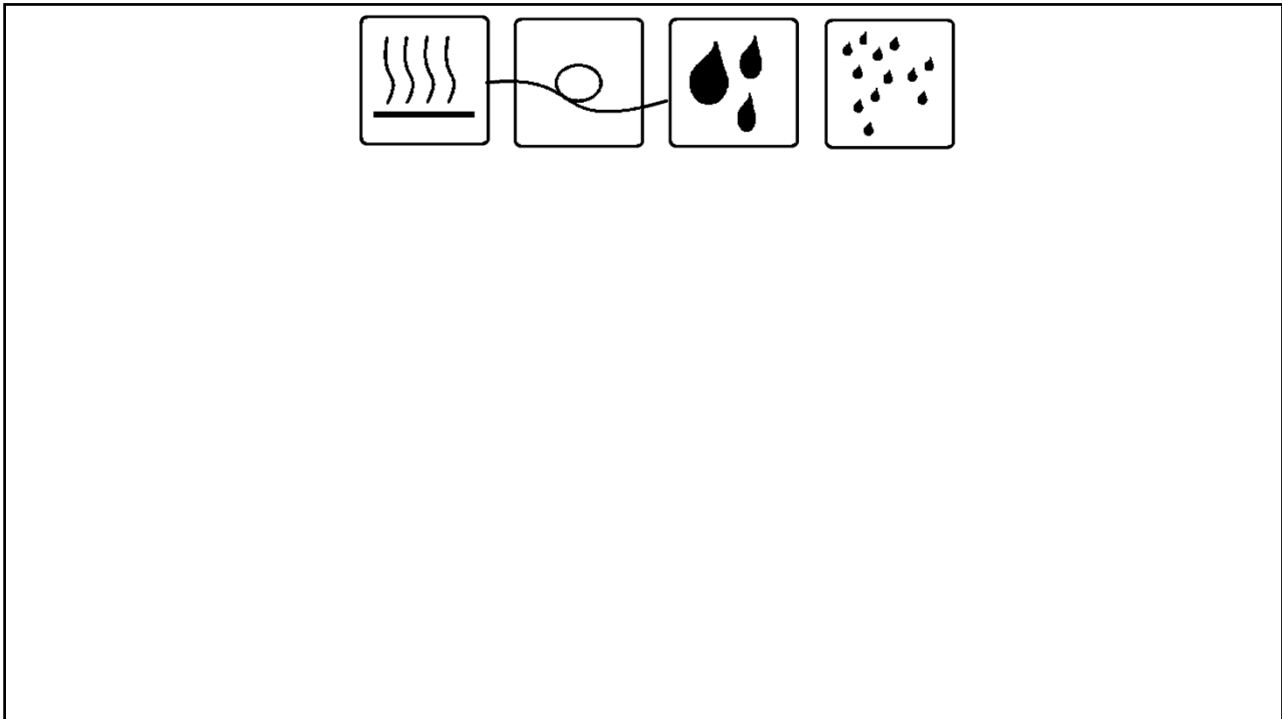
| CARACTERISTIQUES TECHNIQUES

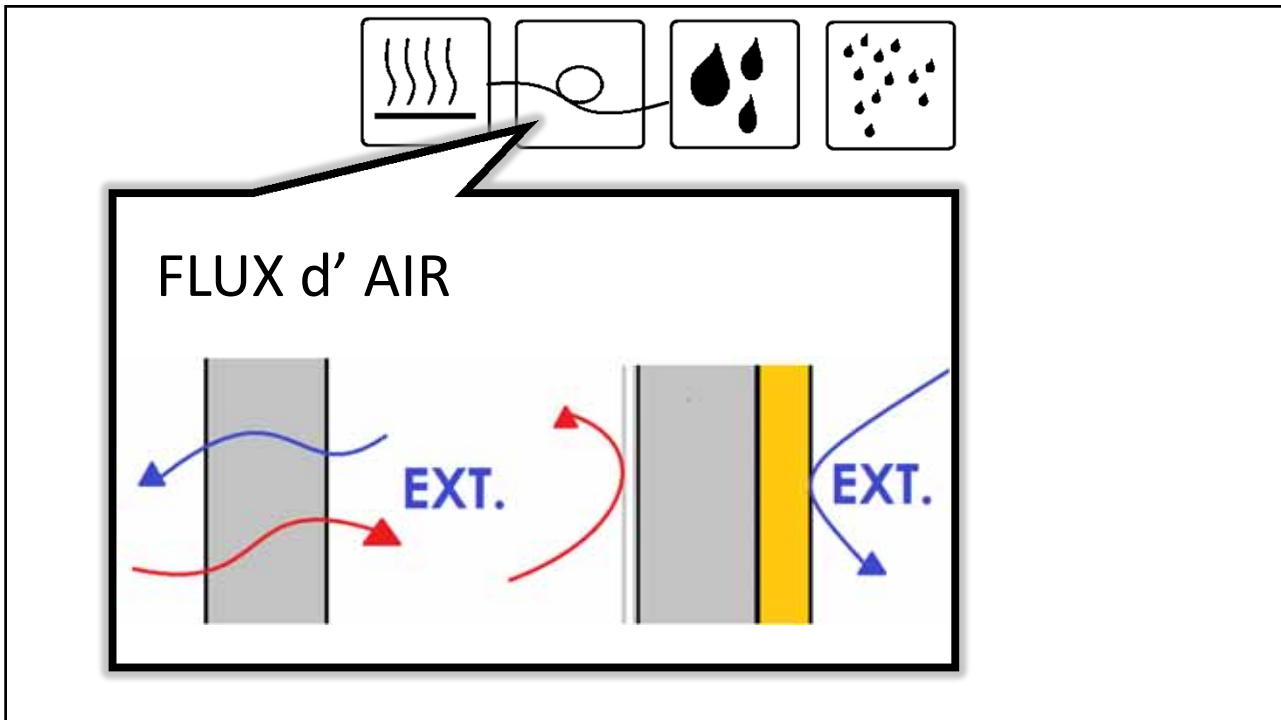
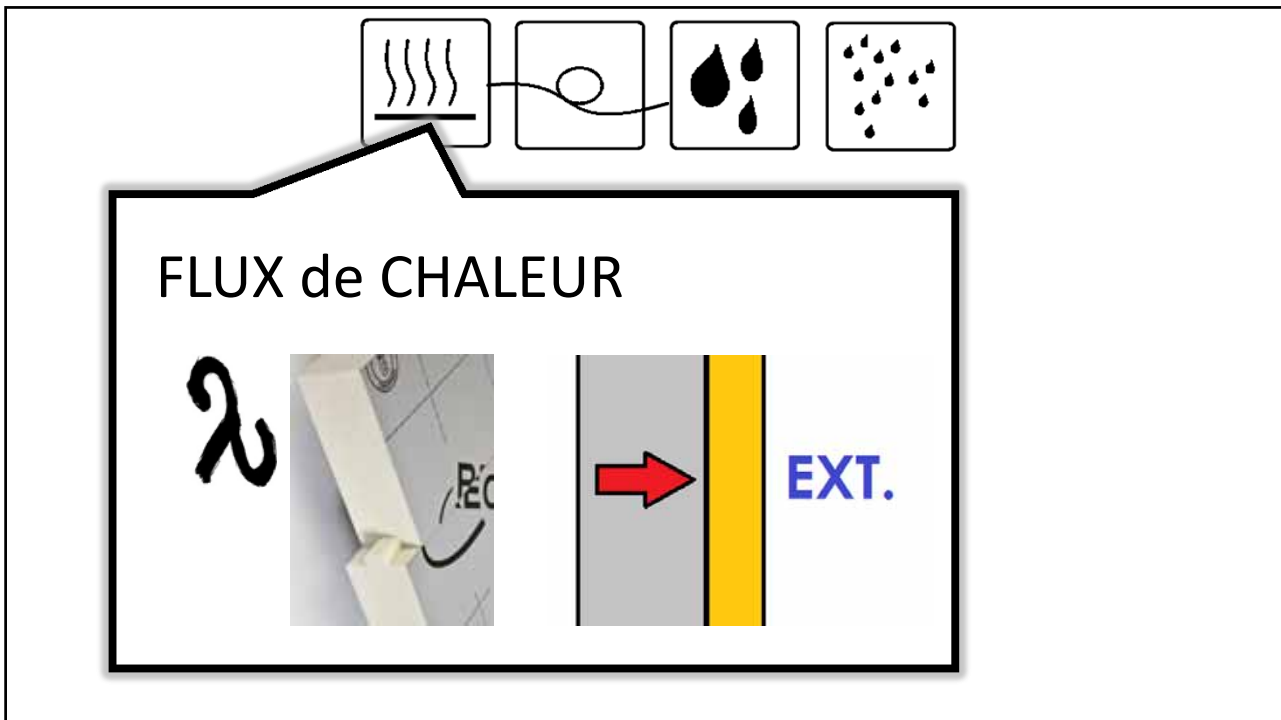
Marquage CE selon NF EN 13171	WF-EN 13171-T4-CS(10\Y)50-TR2,5-AF100
Profil	Rainure et languette / Chants droits
Réaction au feu selon norme EN 13501-1	E
Conductivité thermique λ_D W/(m*K) selon NF EN 12667	0,038
Keymark : conductivité thermique certifiée $\lambda W/(m^*K)$ selon NF EN 12667	0,038
Résistance thermique RD [(m*K)/W] + [(ép.)(mm)] selon NF EN 12667	1,05(40) / 1,55(60) / 2,10(80) / 2,60(100) / 3,15(120) / 3,65(140) / 4,20(160) / 4,70(180) / 5,25(200)
Masse volumique [kg/m³]	env. 160
Facteur de résistance à la diffusion de vapeur d'eau μ	5
Valeur s_d [m] + [(ép.)(mm)]	0,20(40) / 0,30(60) / 0,40(80) / 0,50(100) / 0,60(120) / 0,70(140) / 0,80(160) / 0,9(180) / 1,0(200)
Capacité thermique massique c [J/(kg*K)]	2100
Résistance à la compression σ_m [kPa]	50
Résistivité à l'écoulement de l'air AFR i [(kPa*s)/m²]	≥ 100
Composants	Fibre de bois
Qualité de l'air intérieur	A+
Code de recyclage (EAK)	030105/170201

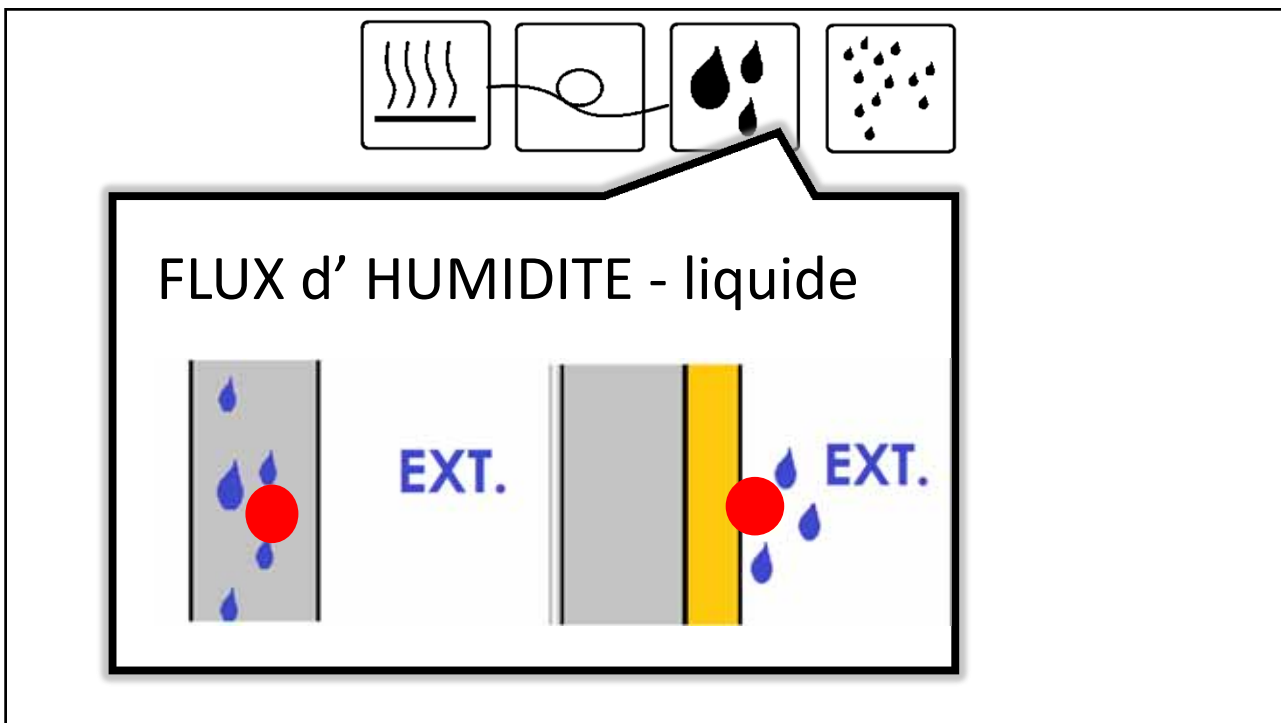
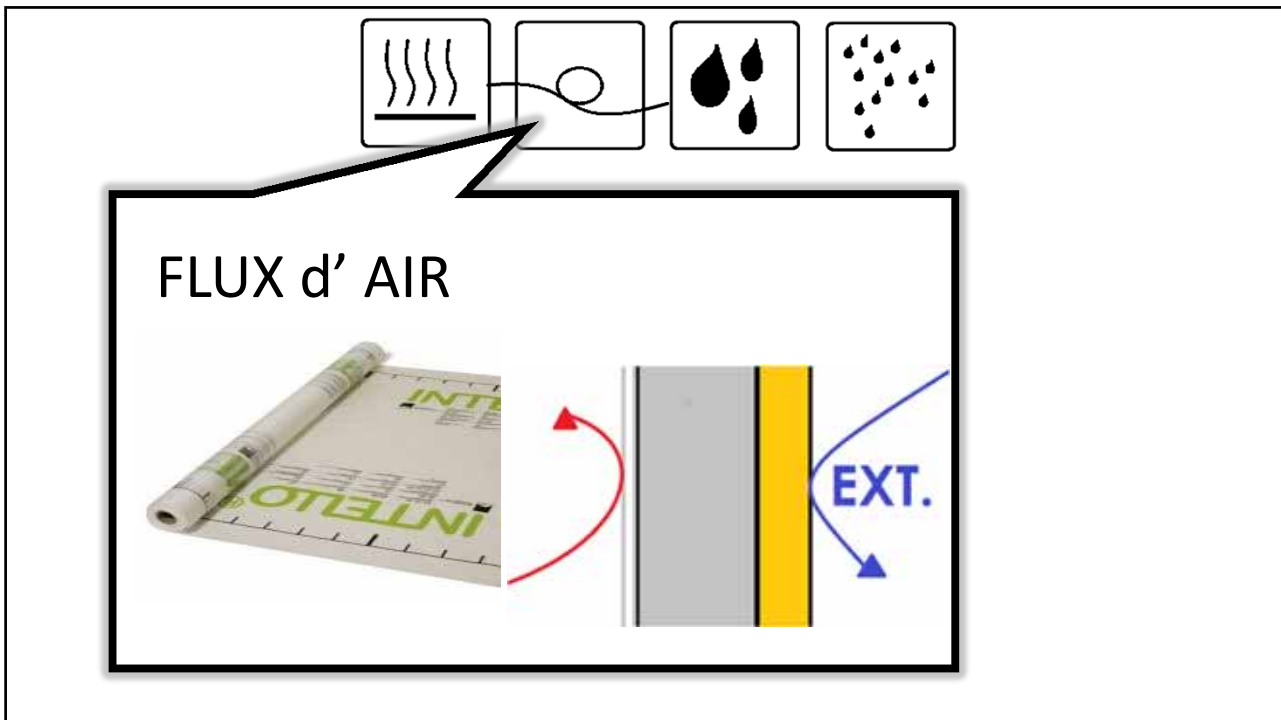


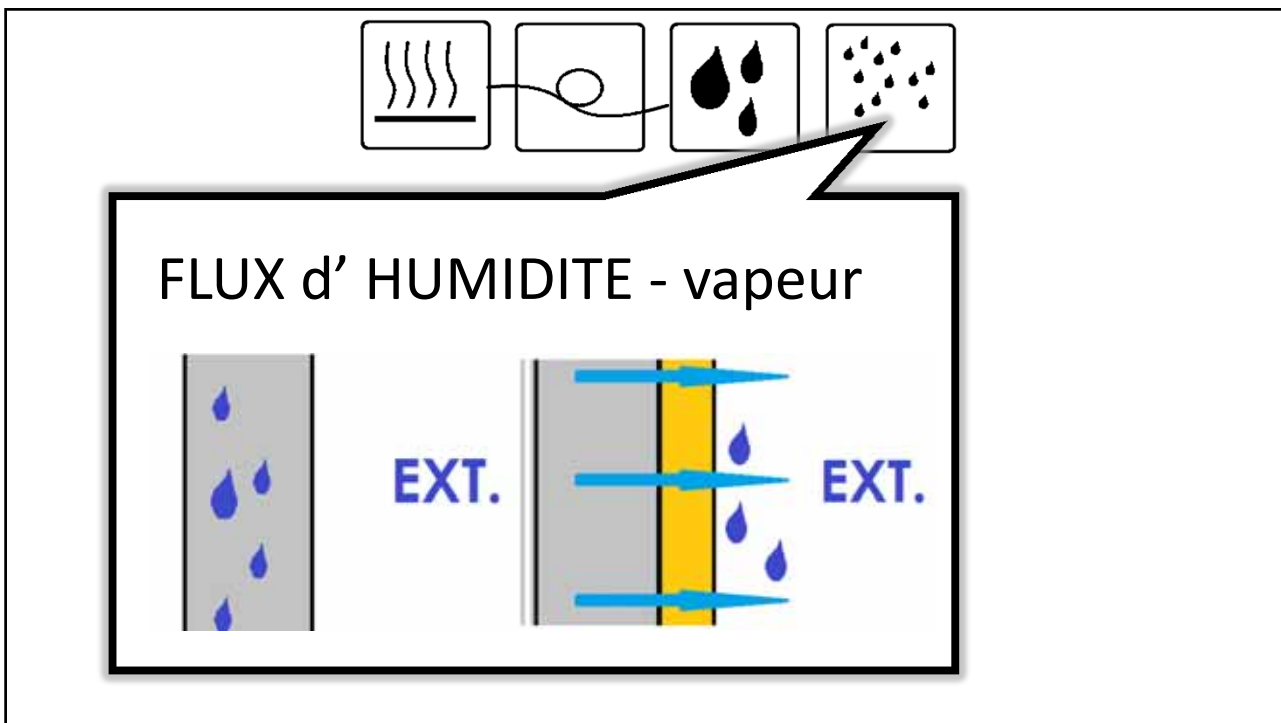
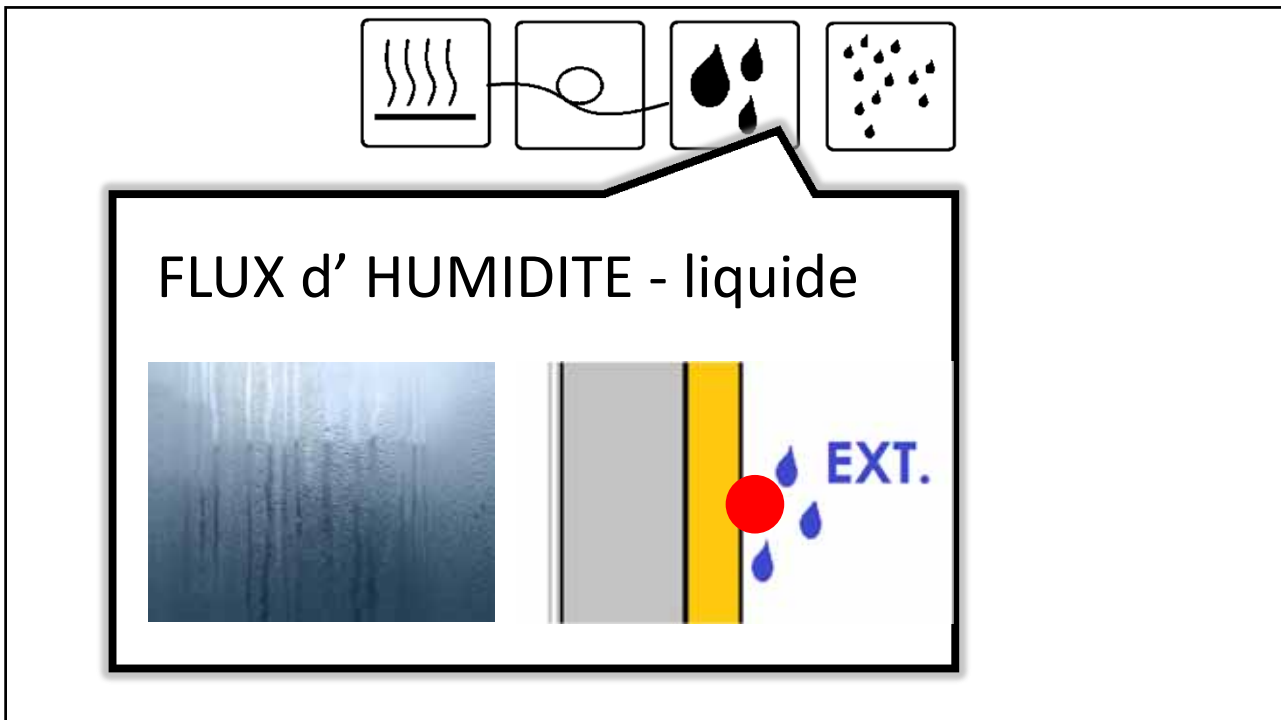
PREREQUIS

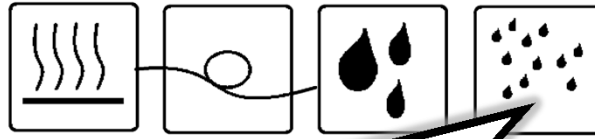
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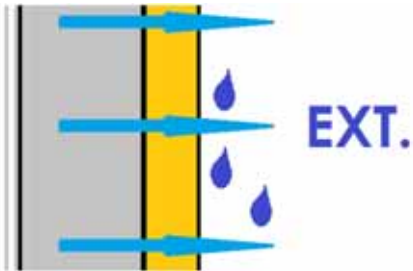








FLUX d' HUMIDITE - vapeur



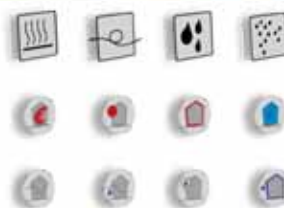
CONTENU ?

CONTENU ?



- Une clef USB avec 2 versions de PPT

CONTENU ?



- Une clef USB avec 2 versions de PPT
- Des magnets avec les différents logos

CONTENU ?



- Une clef USB avec 2 versions de PPT
- Des magnets avec les différents logos
- 4 fiches explicatives des logos.

CONTENU ?

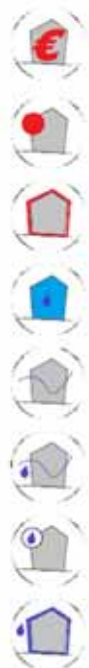


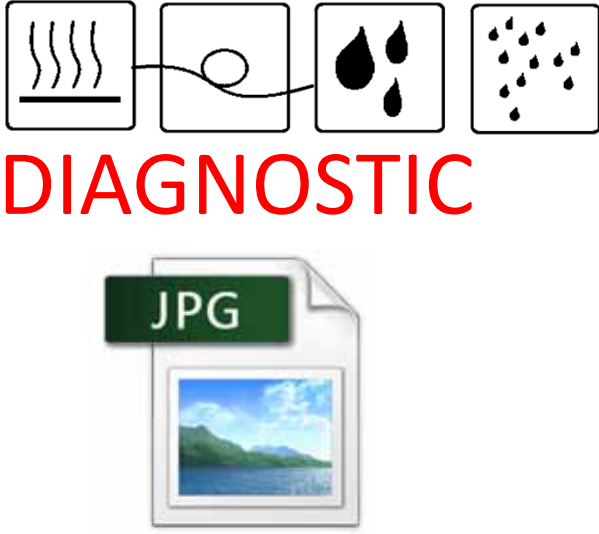
- Une clef USB avec 2 versions de PPT
- Des magnets avec les différents logos
- 4 fiches explicatives des logos.
- 4 exemplaires de chaque Fiche pathologie

ACTIVITE



- BUT DU JEU
sur base d'une illustration de pathologie
réalise un...

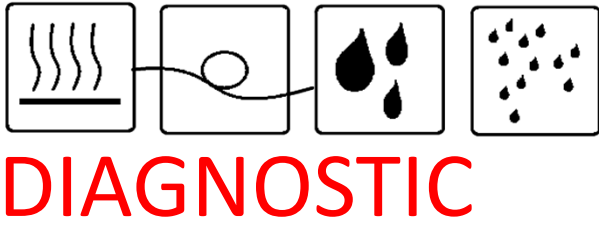





DIAGNOSTIC


JPG

- BUT DU JEU
sur base d'une illustration de pathologie
réalise un...



DIAGNOSTIC

⇒ Trouve les causes possibles



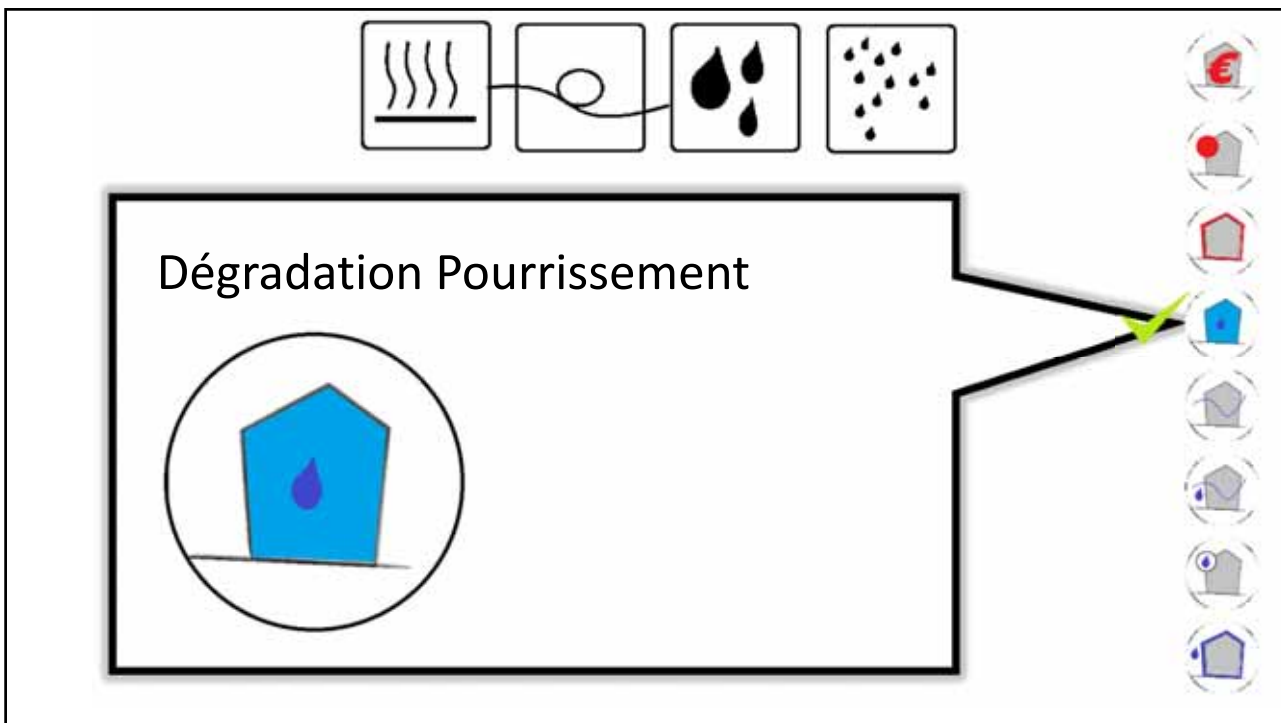
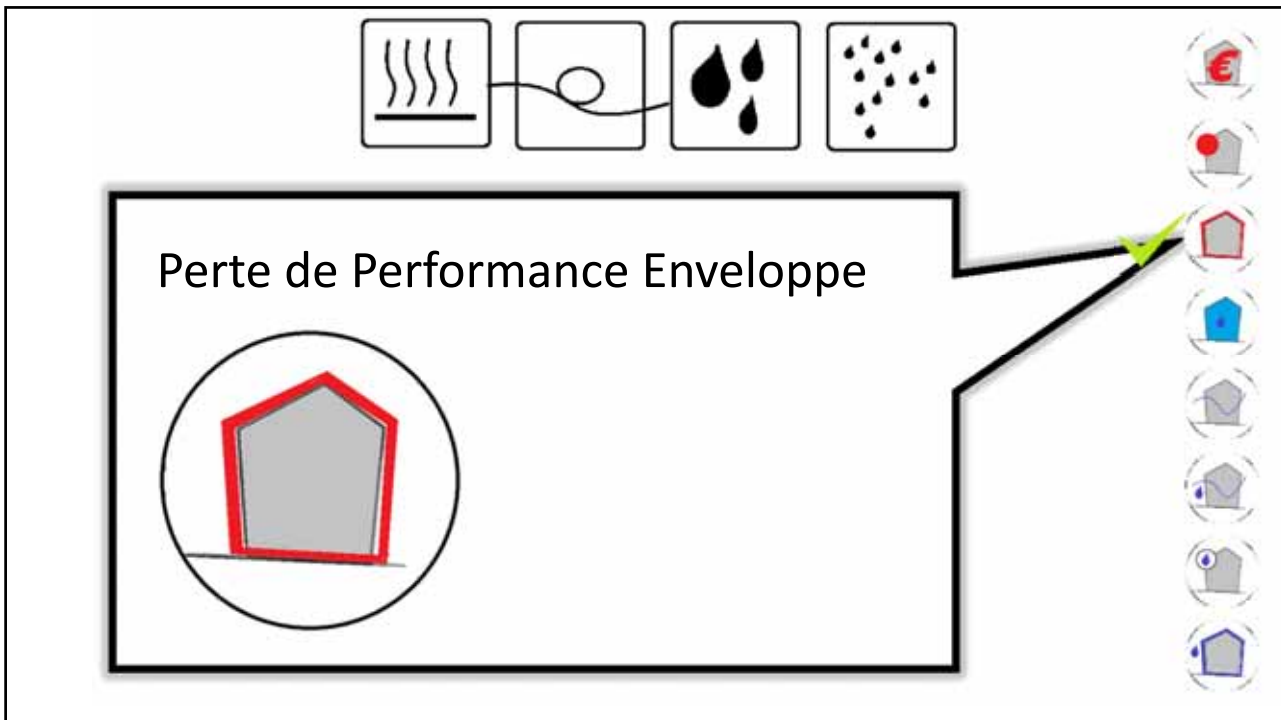
DIAGNOSTIC

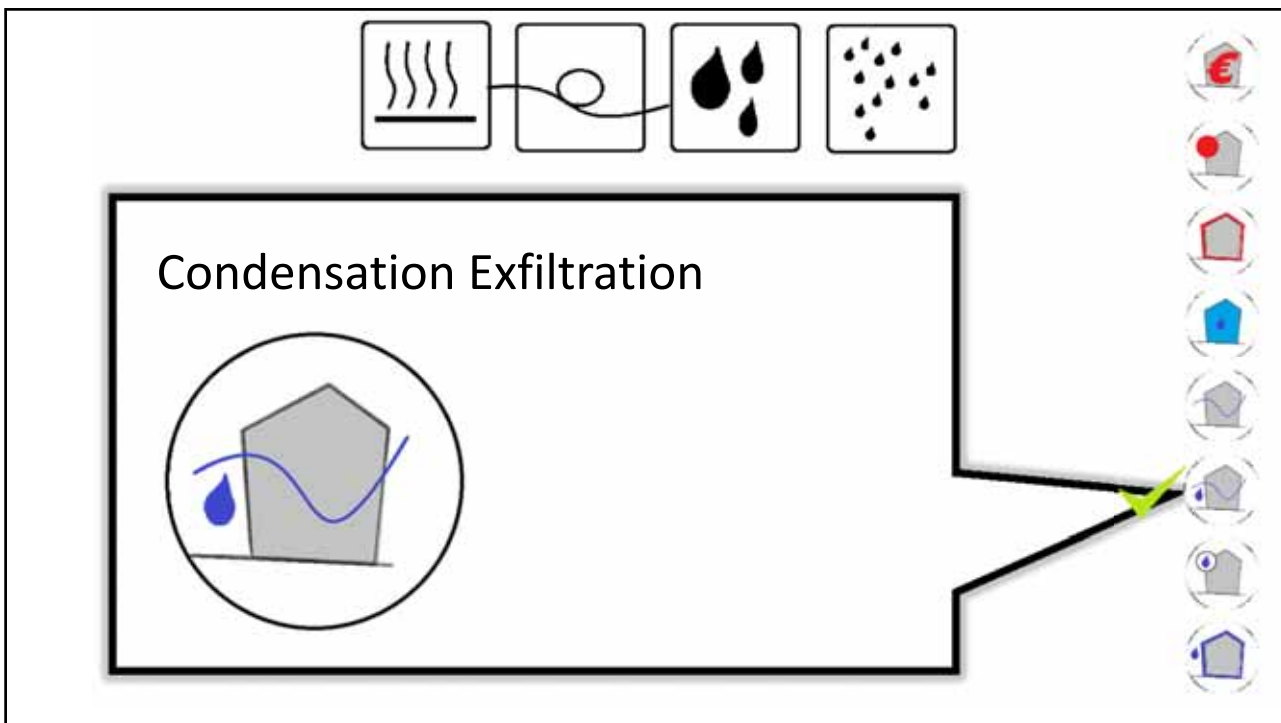
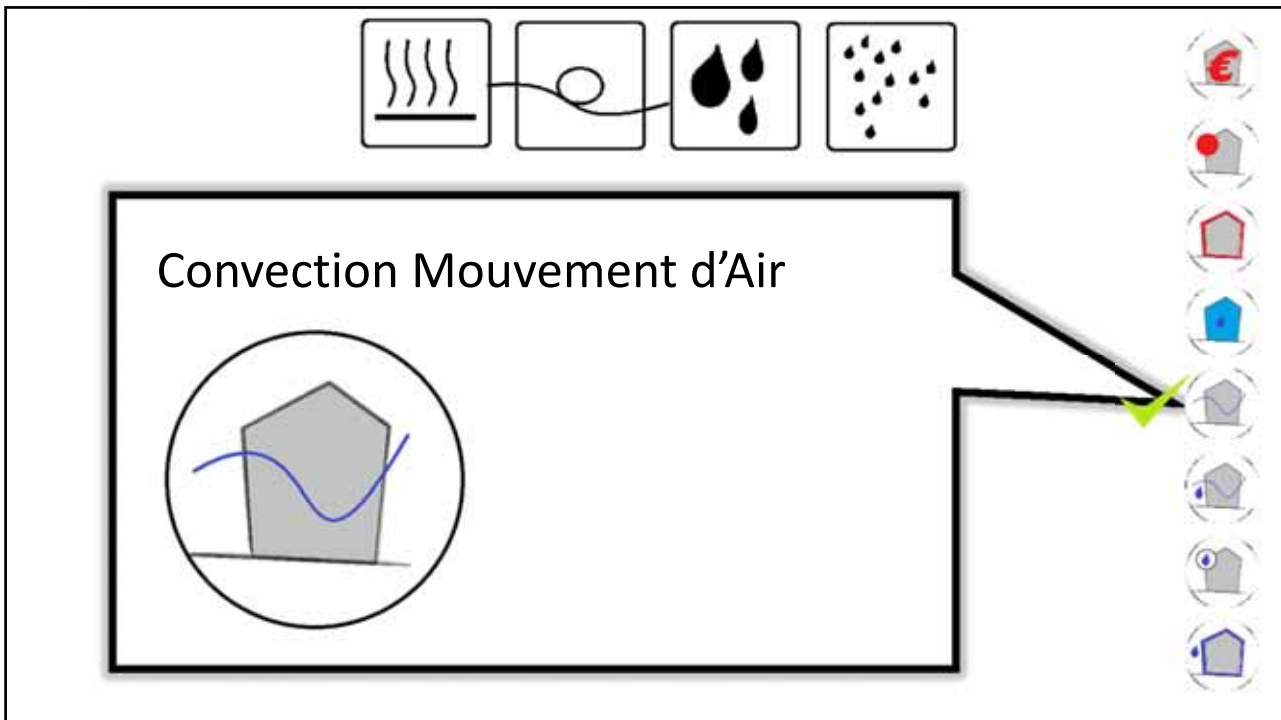
⇒ Trouve les causes possibles
 ⇒ Détermine les conséquences probables

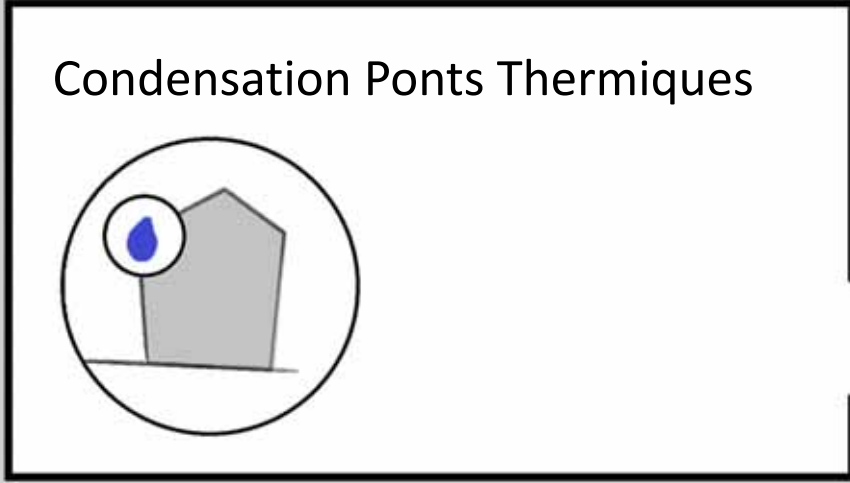
PRONOSTIC

Surconsommation Energétique

Ponts Thermiques

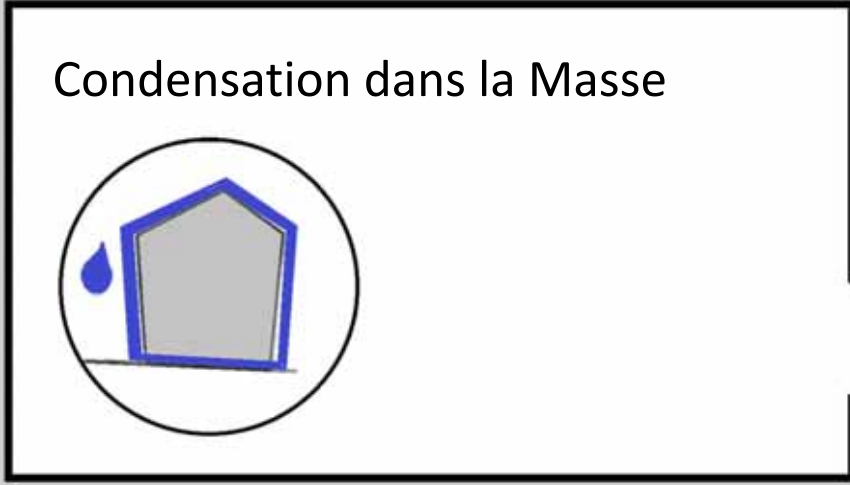






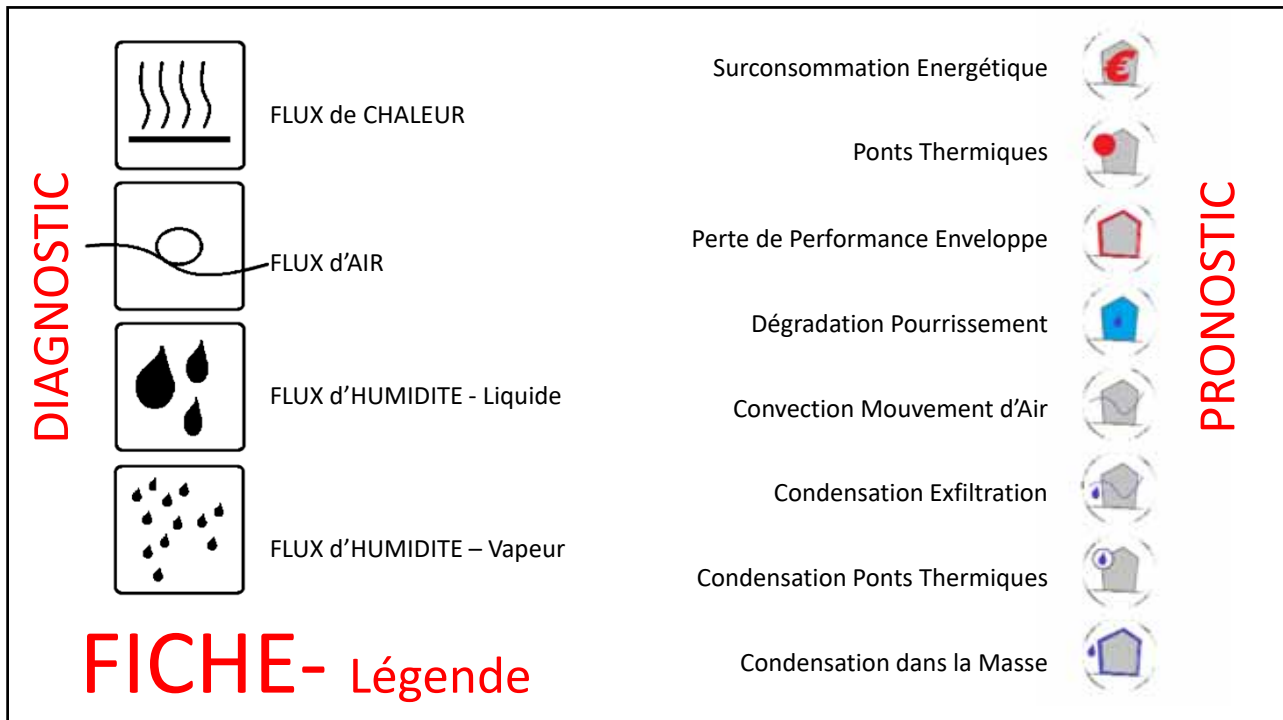
Condensation Ponts Thermiques

The diagram illustrates thermal bridges in a building. It features a central speech bubble with the text "Condensation Ponts Thermiques" and a circular inset showing a grey house with a blue water droplet on its roof. Above the speech bubble is a horizontal sequence of four icons: wavy lines representing heat, a circle with a line representing air flow, two black water droplets, and a cluster of small black dots representing condensation. To the right of the speech bubble is a vertical column of ten house icons, each with a different colored roof (red, grey, red, blue, grey, grey, grey, grey, grey, blue). A green checkmark is placed over the eighth icon from the top, which has a blue roof.

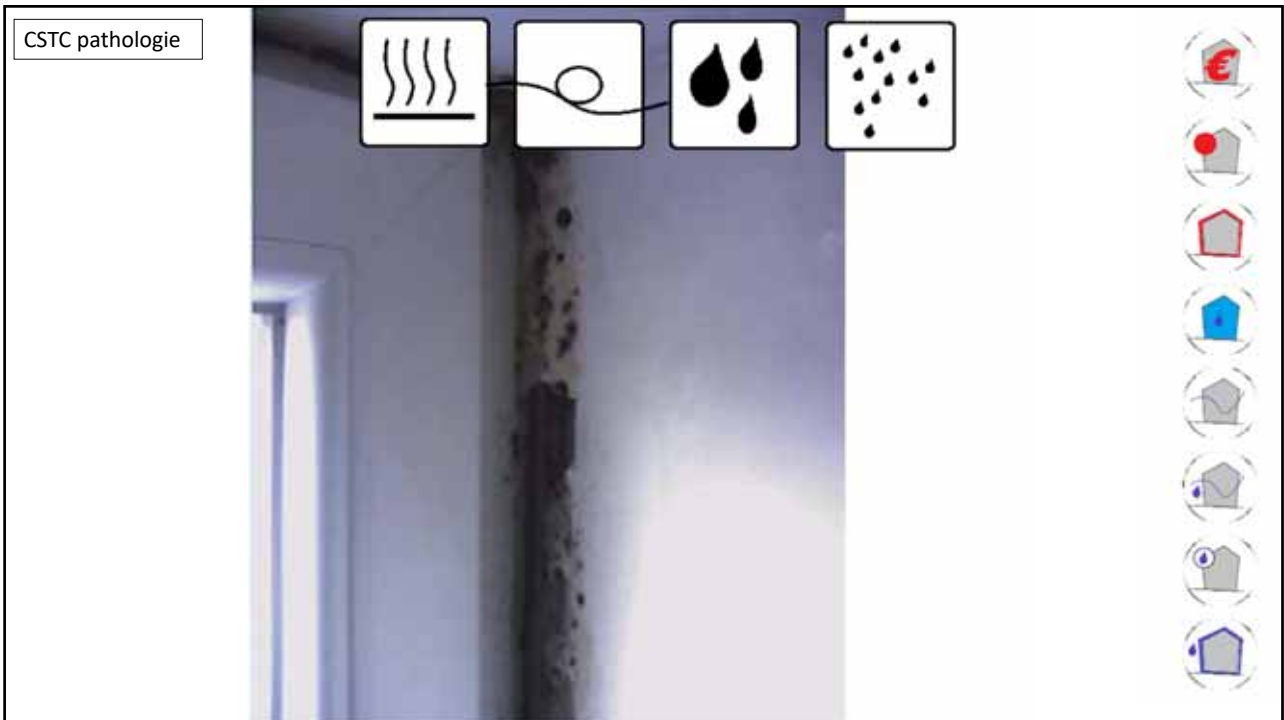
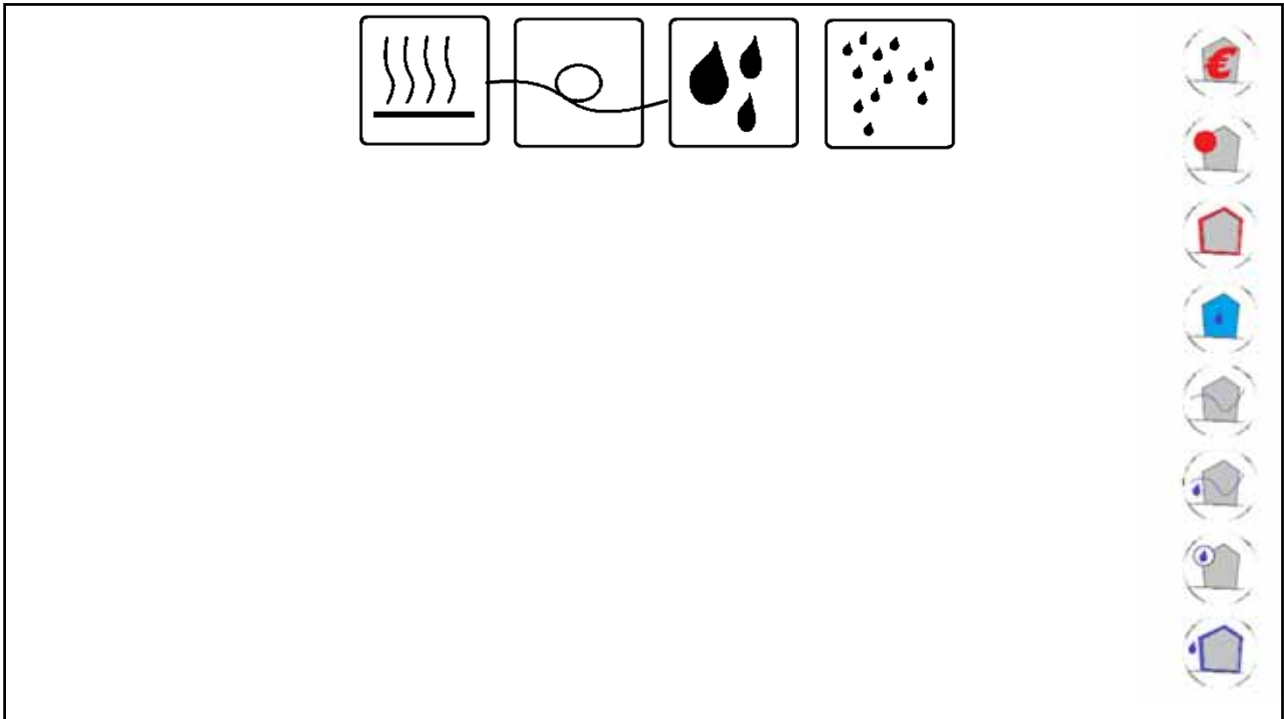


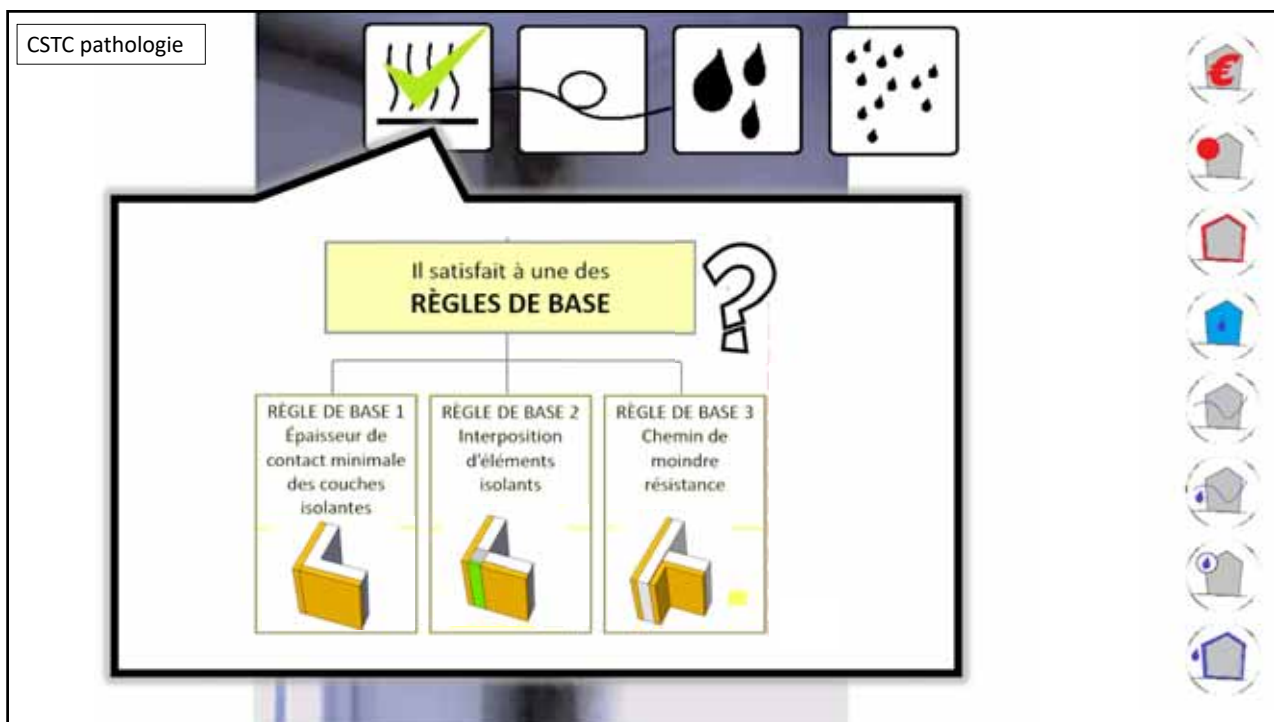
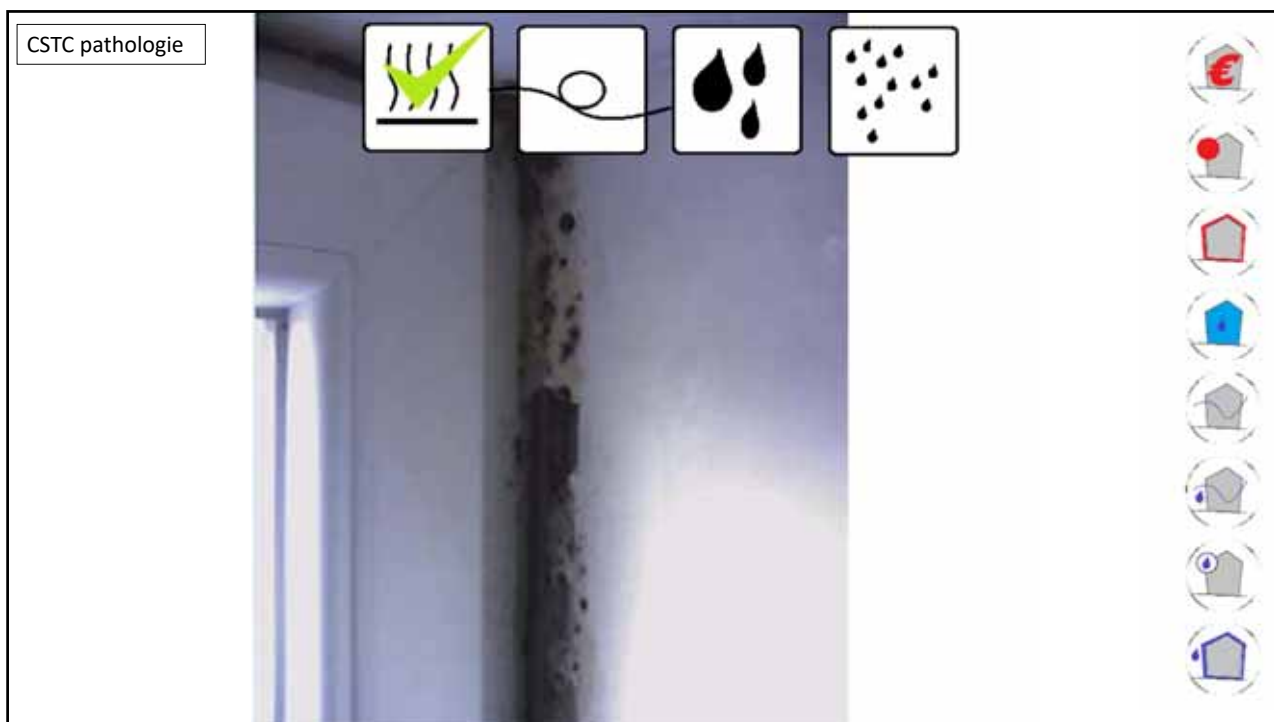
Condensation dans la Masse

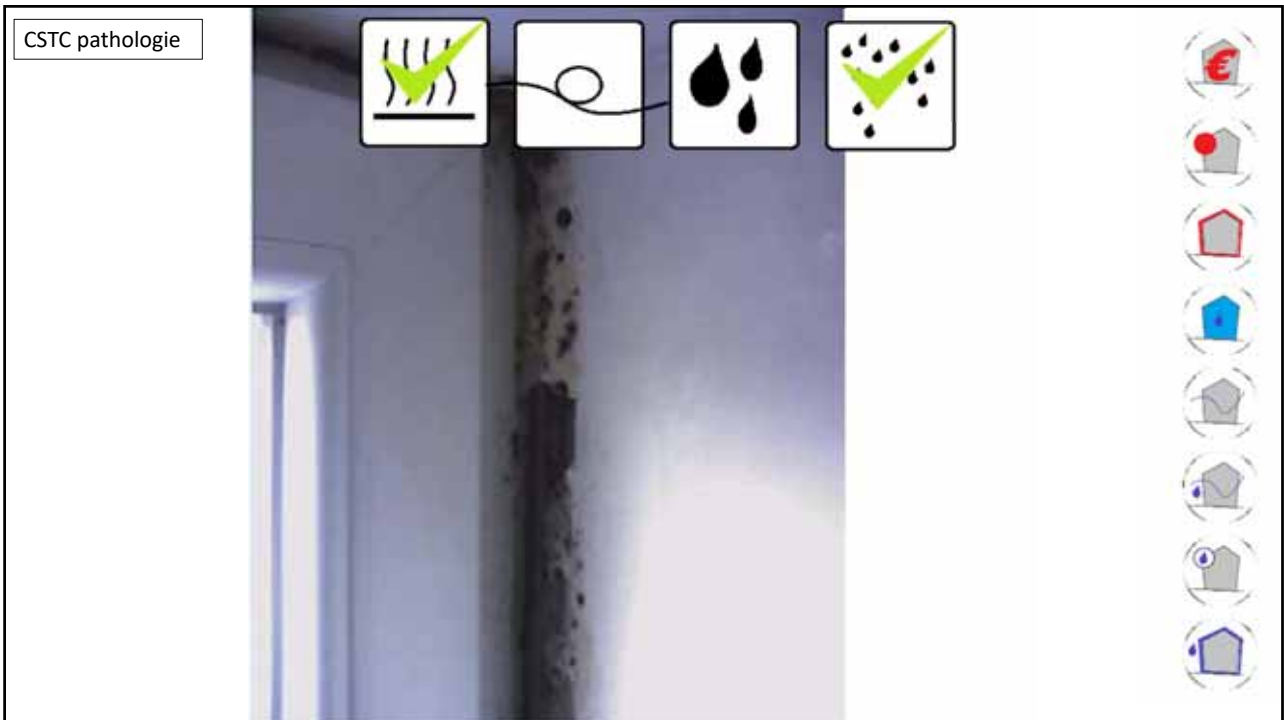
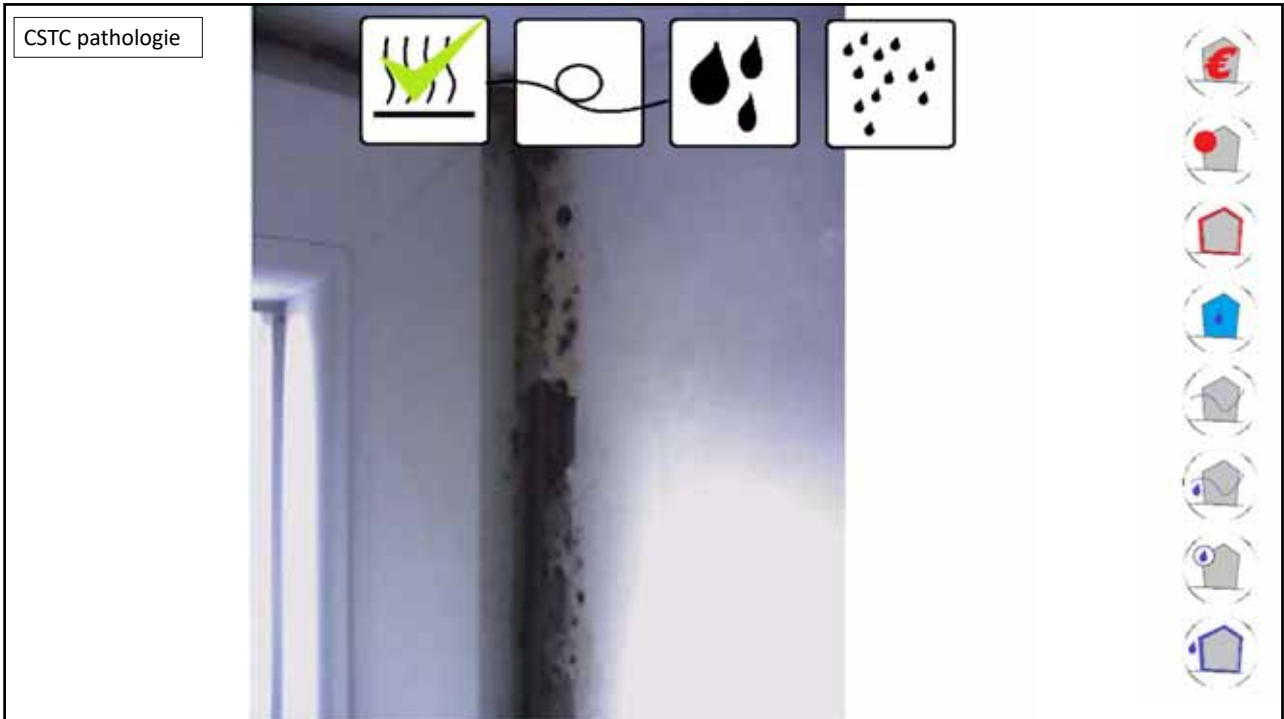
The diagram illustrates condensation within a building mass. It features a central speech bubble with the text "Condensation dans la Masse" and a circular inset showing a grey house with a blue outline and a blue water droplet on its roof. Above the speech bubble is a horizontal sequence of four icons: wavy lines representing heat, a circle with a line representing air flow, two black water droplets, and a cluster of small black dots representing condensation. To the right of the speech bubble is a vertical column of ten house icons, each with a different colored roof (red, grey, red, blue, grey, grey, grey, grey, grey, blue). A green checkmark is placed over the tenth icon from the top, which has a blue roof.



EXEMPLES







CSTC pathologie

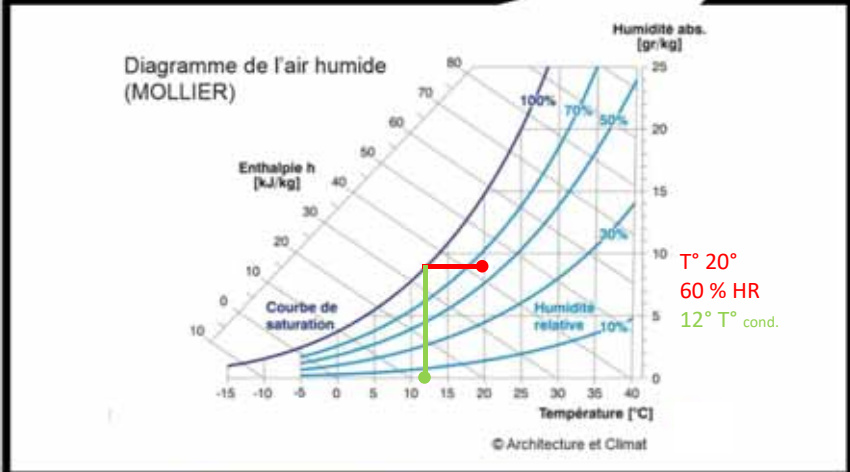




Diagramme de l'air humide (MOLLIER)

Enthalpie h [kJ/kg]

Humidité abs. [gr/kg]

Température [°C]

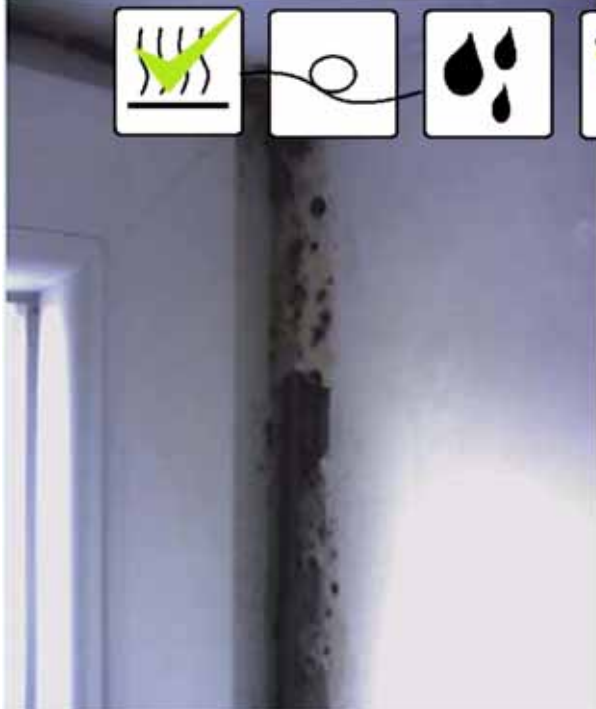


Courbe de saturation

Humidité relative 100% 70% 50% 30% 10%

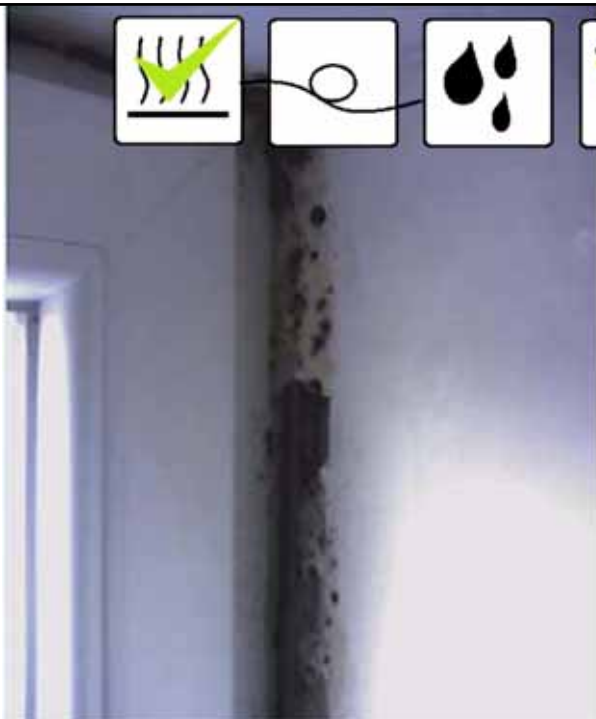
$T^{\circ} 20^{\circ}$
 $60\% \text{ HR}$
 $12^{\circ} T^{\circ} \text{ cond.}$


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CSTC pathologie





CSTC pathologie









































CSTC pathologie


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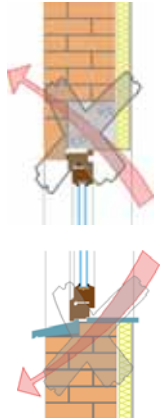




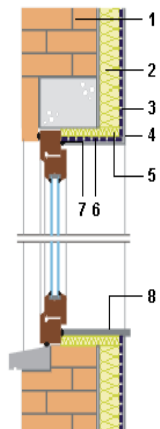




















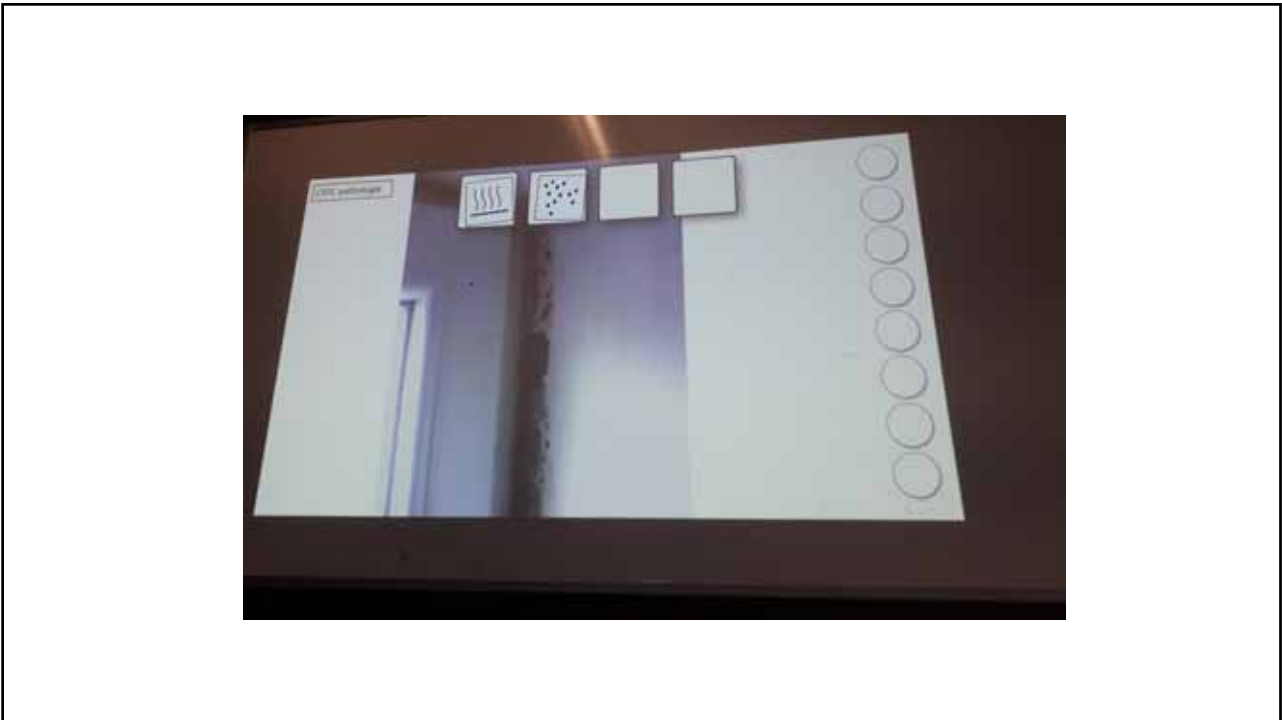
AVANT

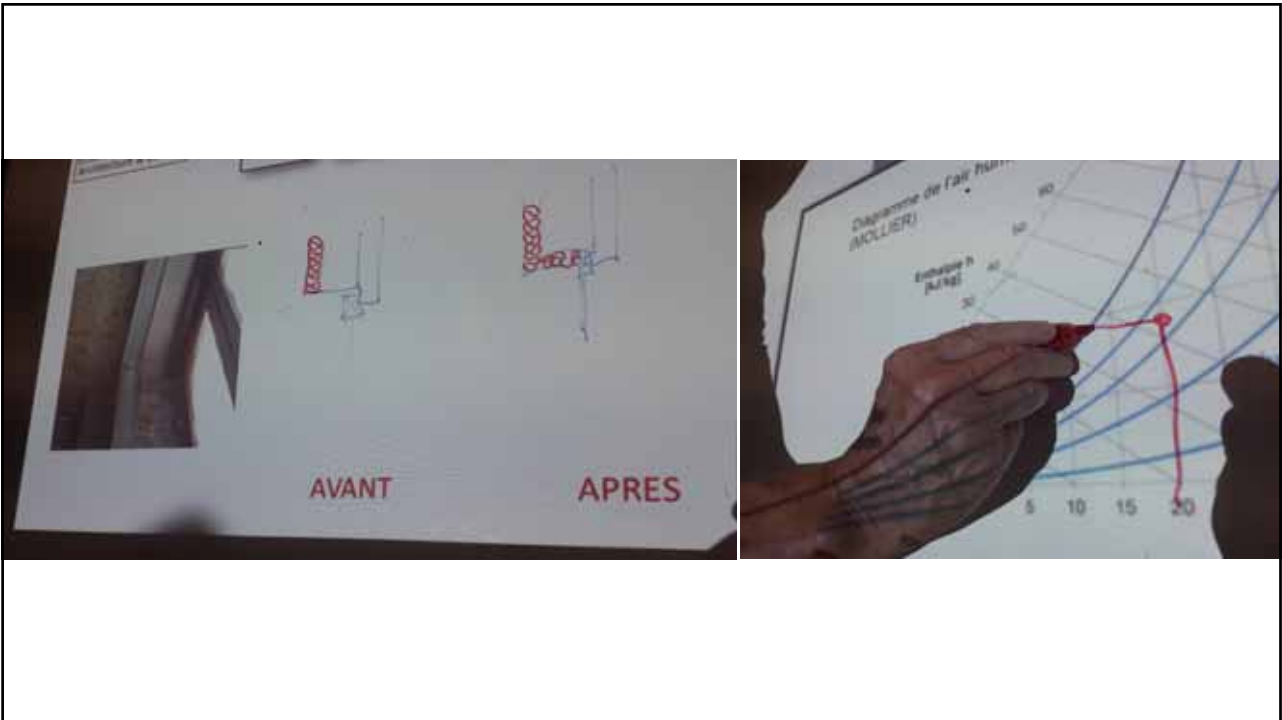
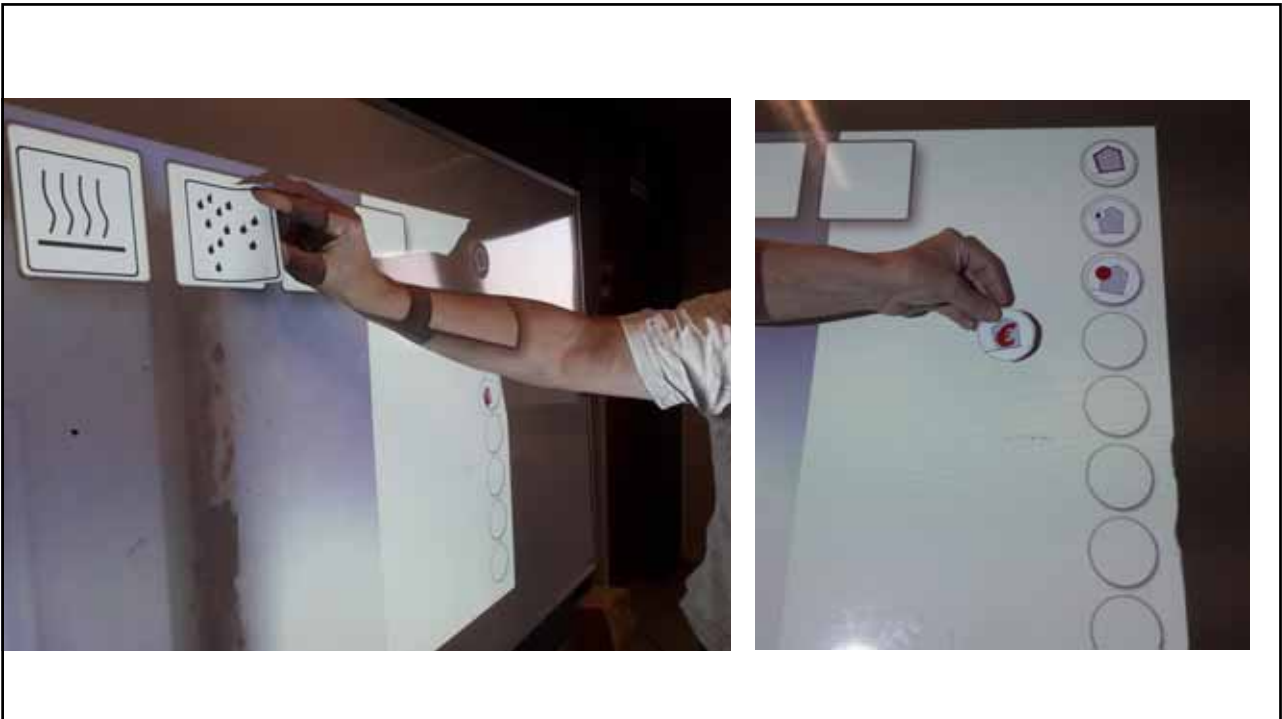


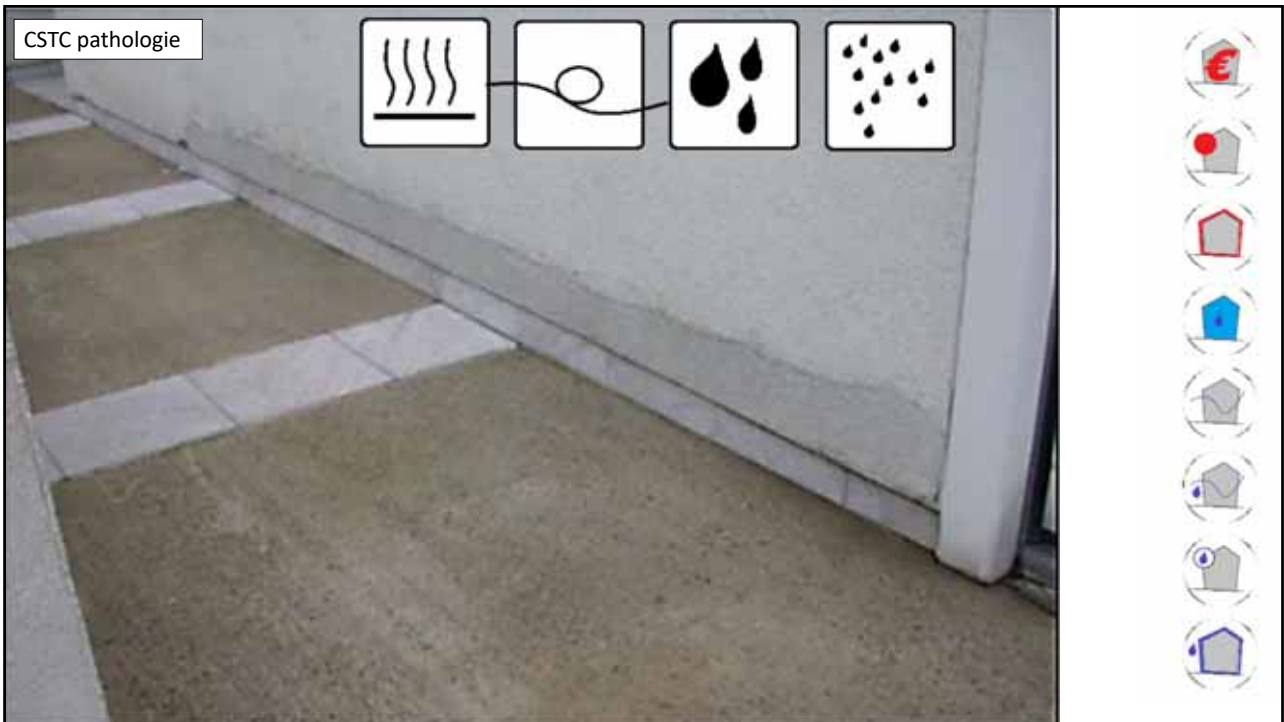
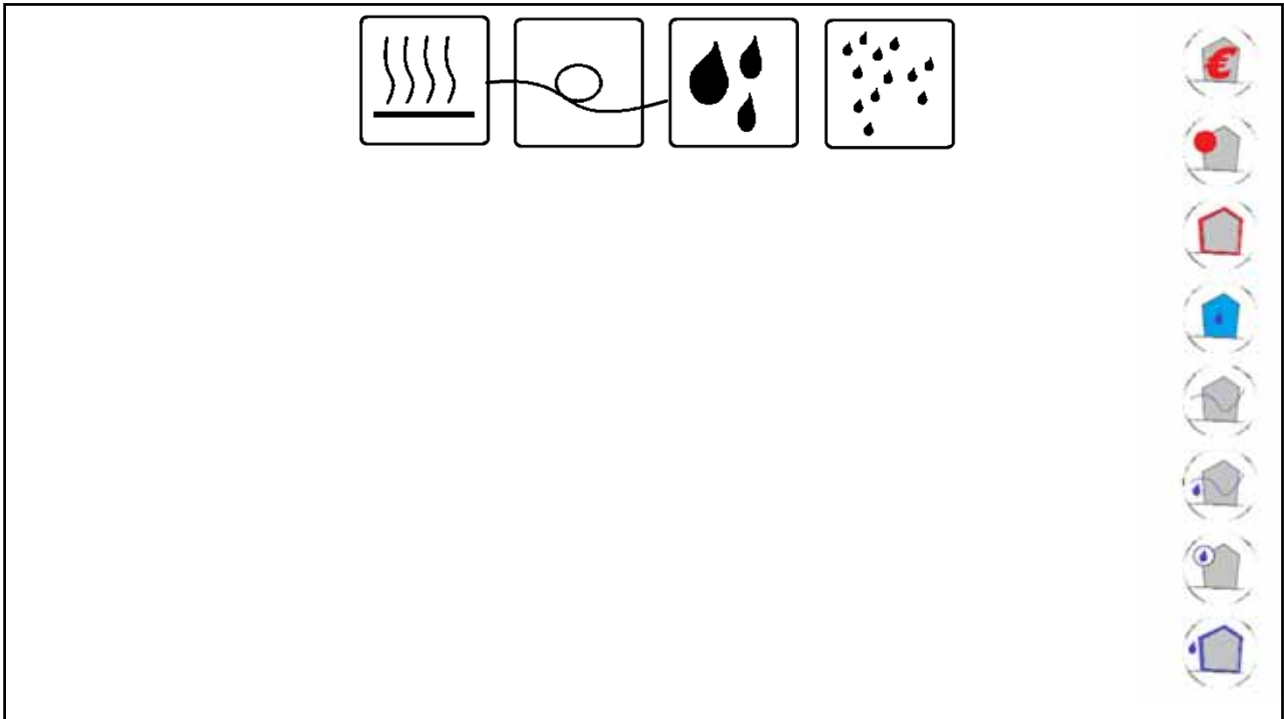
APRES

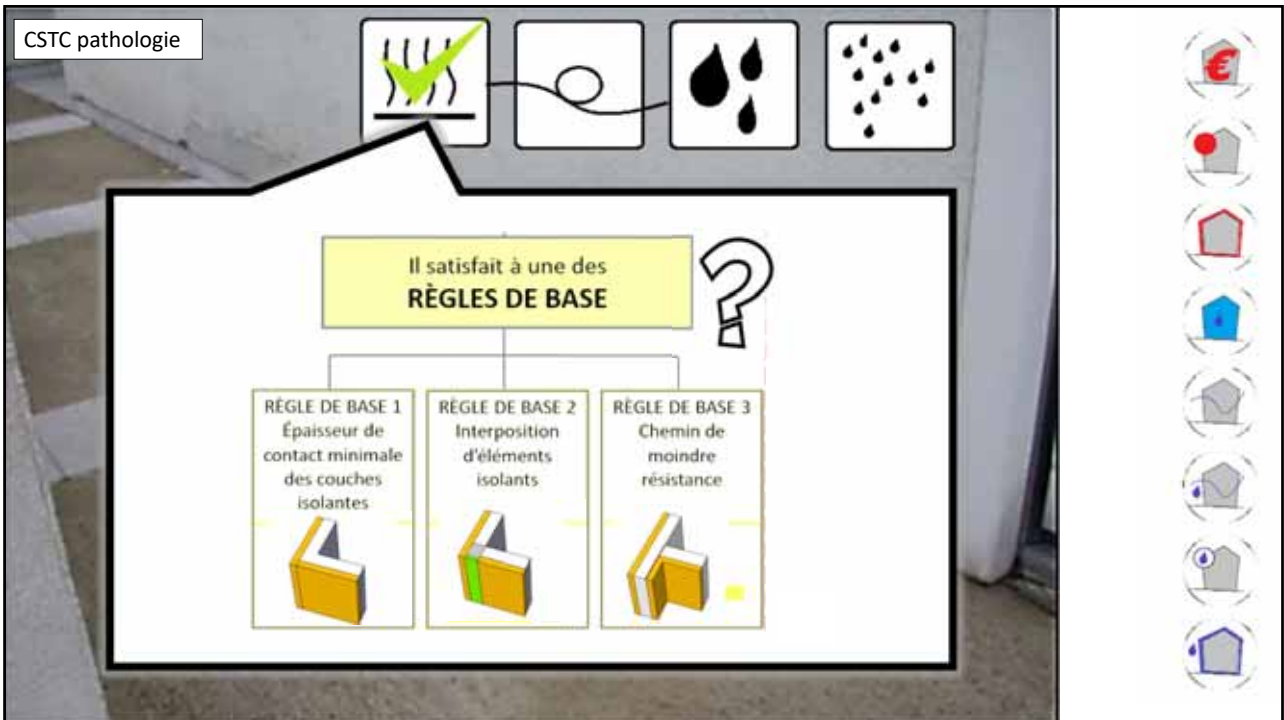
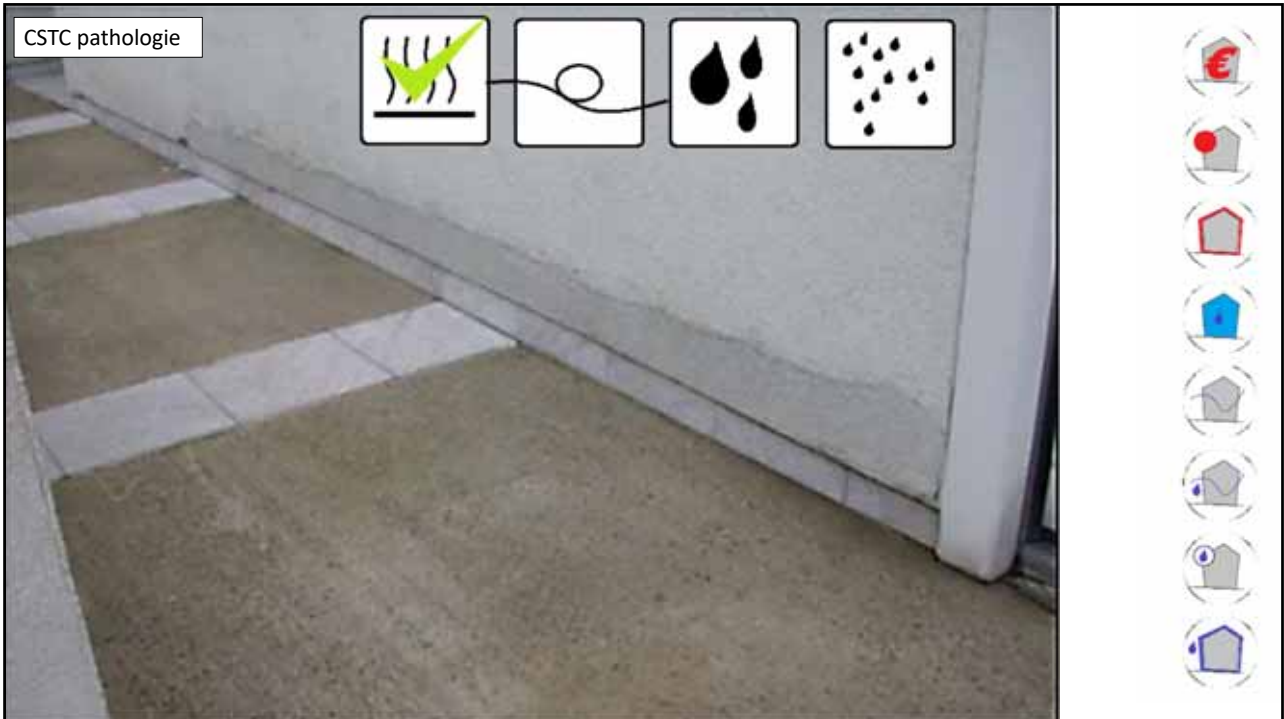





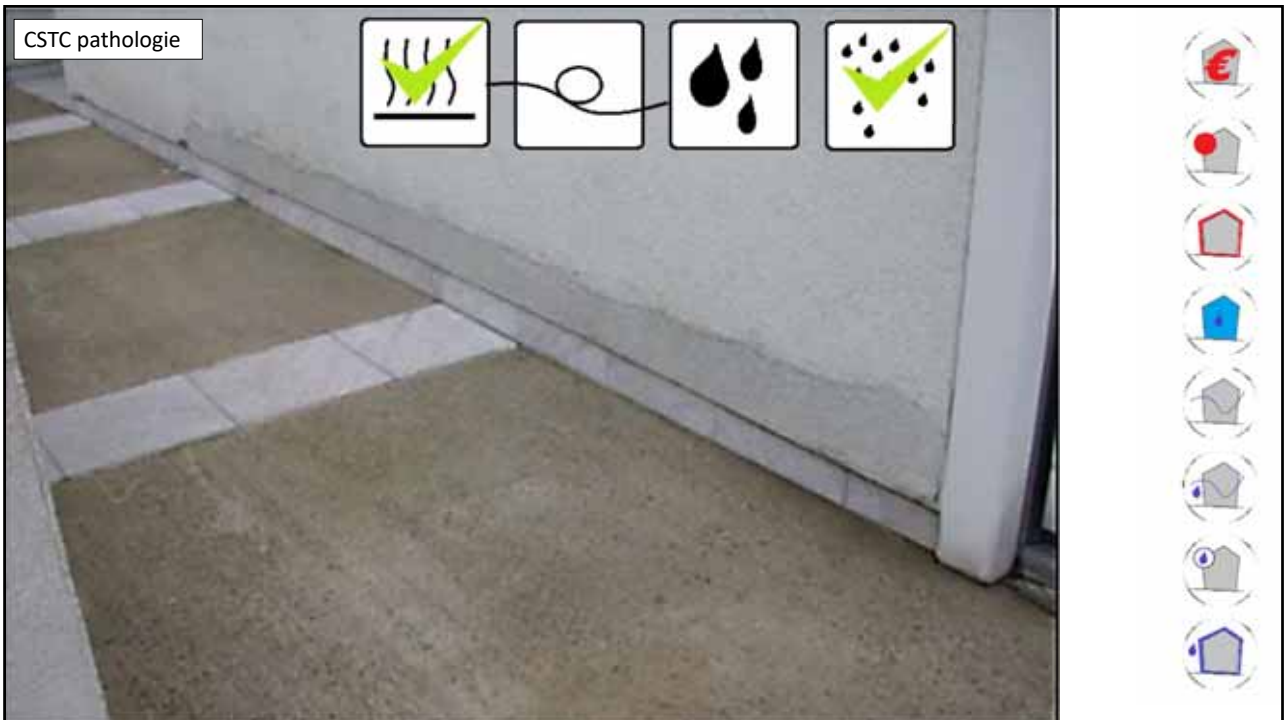
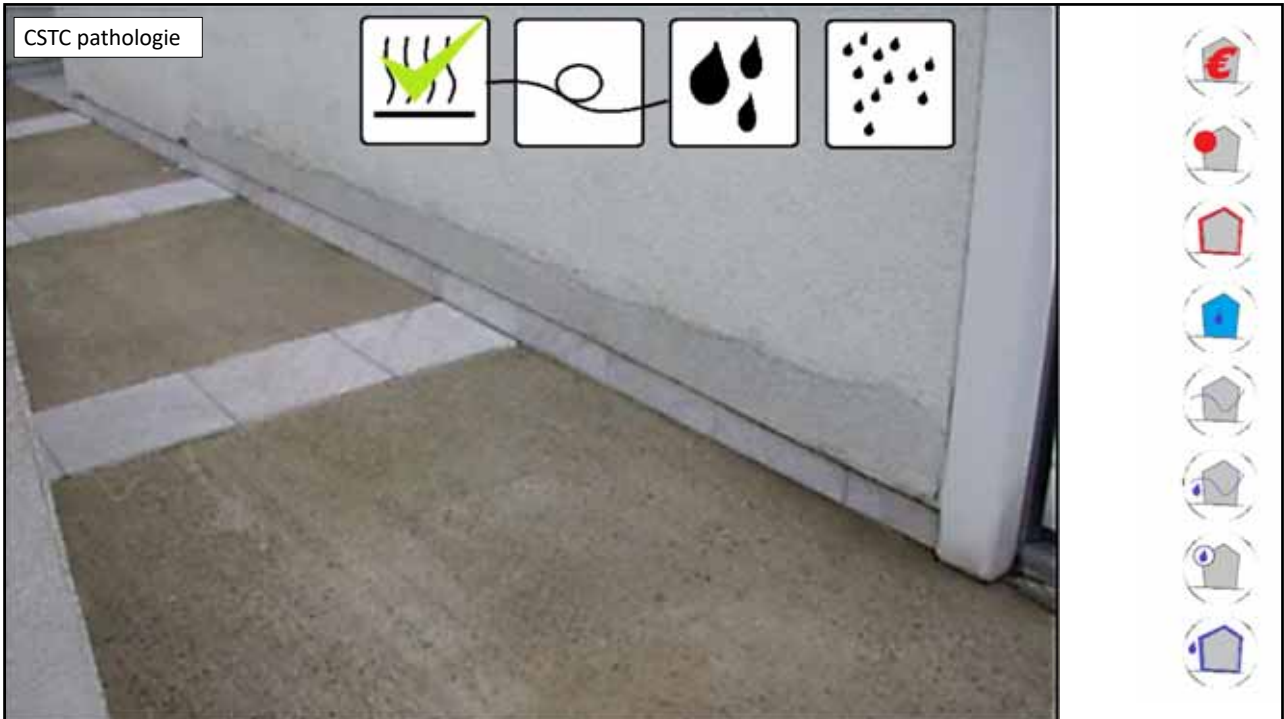



















CSTC pathologie

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Enthalpie h [kJ/kg]

Humidité abs. [gr/kg]

Température [°C]

Courbe de saturation

Humidité relative 100% 70% 50% 30% 10%

T° 20°
60 % HR
12° T° cond.

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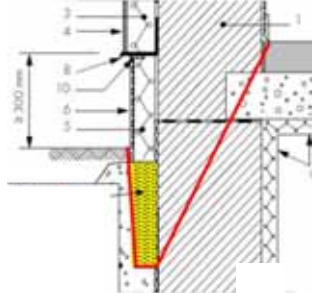
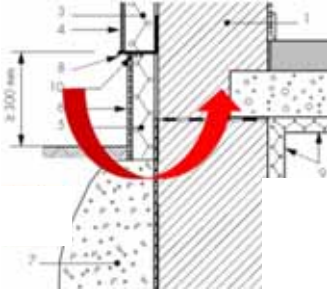

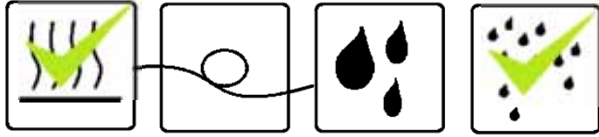
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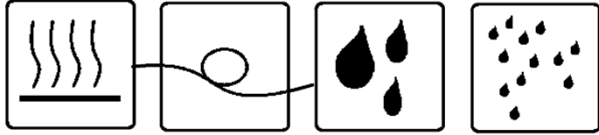

CSTC pathologie

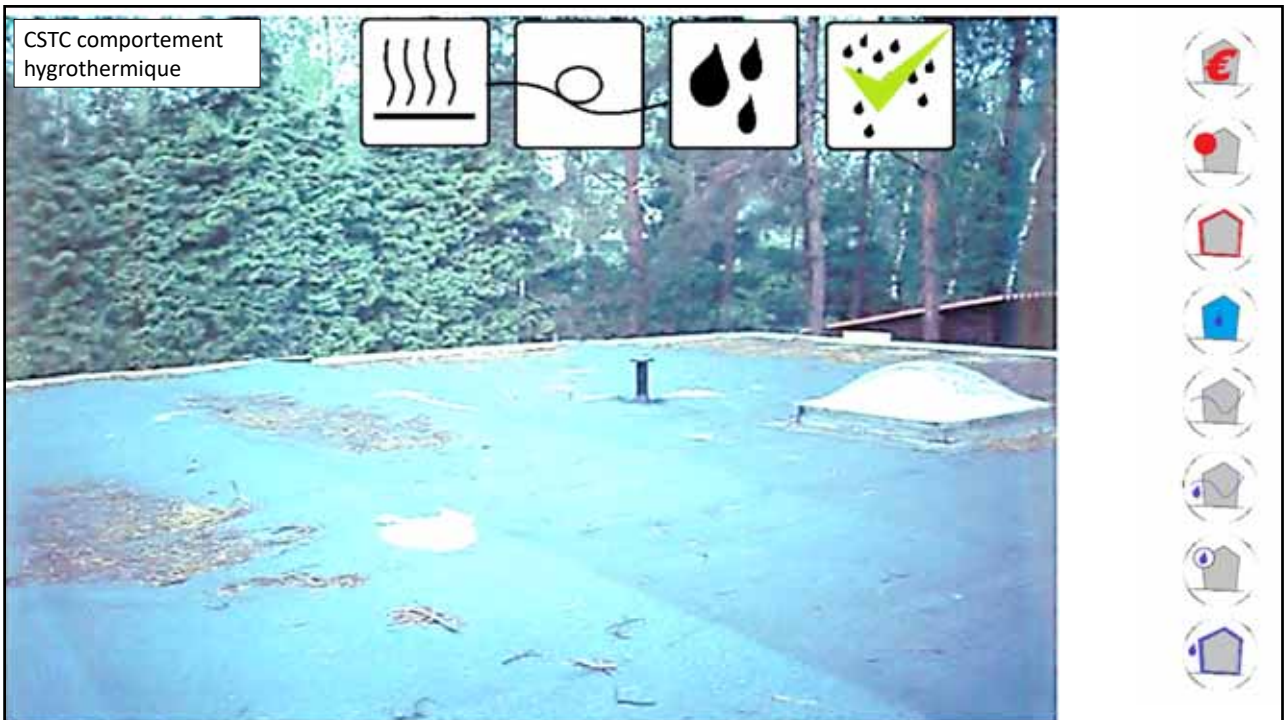
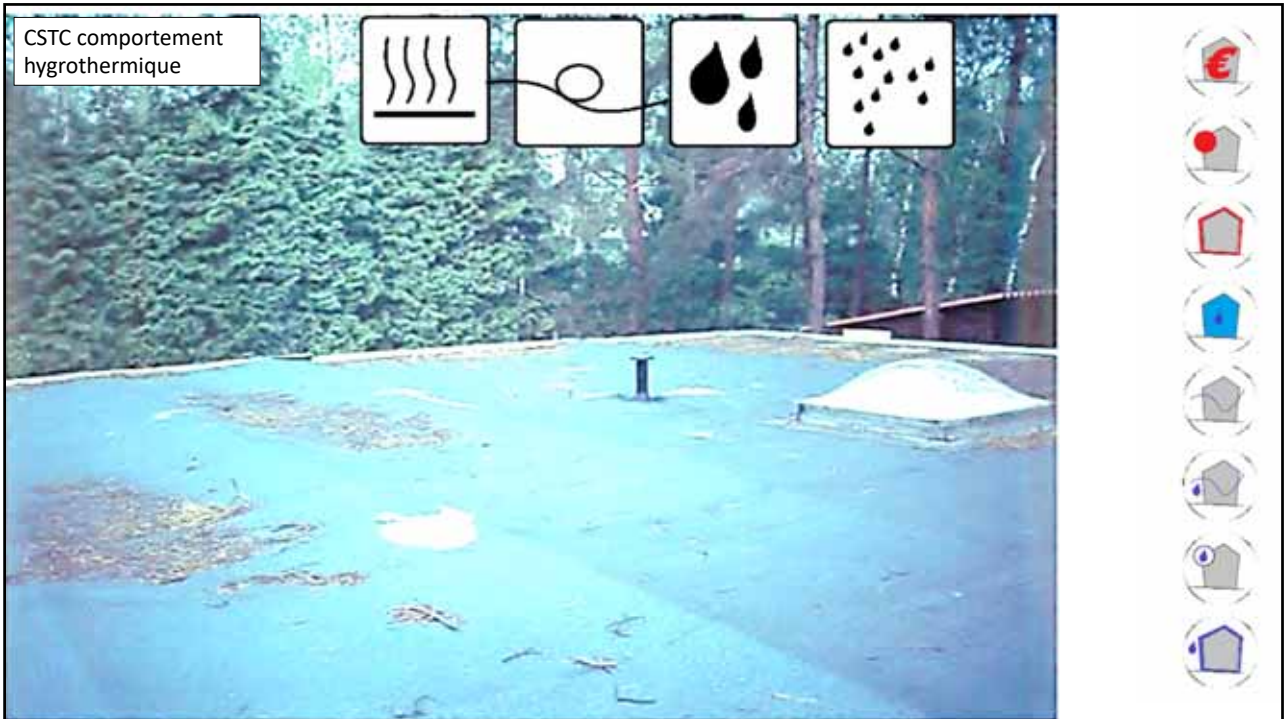
CSTC pathologie



AVANT

APRES





CSTC comportement hydrothermique

Composition du complexe toiture :

1 2 3 4 5

The diagram shows a cross-section of a roof assembly with five numbered layers. A callout box points to a specific icon in the top row, which is a square containing a green checkmark and several black dots. The vertical column of house icons on the right has the top icon highlighted in red.

CSTC comportement hydrothermique

The photograph shows a flat roof surface with some debris and a small structure. The vertical column of house icons on the right has the 3rd, 8th, and 10th icons highlighted in green.

CSTC pathologie

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1 2 3 4 5 6 7 Extérieur

Intérieur

1. Lestage (éventuel)
2. Membrane d'étanchéité
3. Support
4. Lame d'air ventilée
5. Isolant
6. Pare vapeur étanche à l'air
7. Plafond

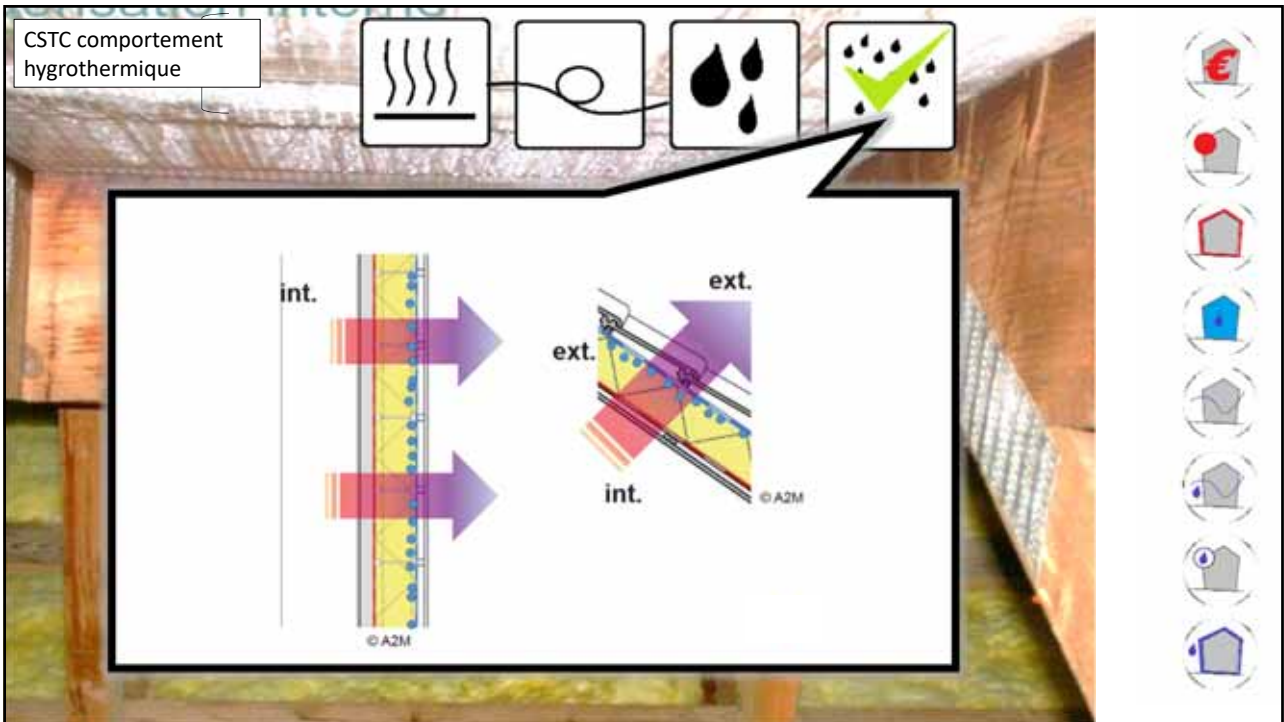
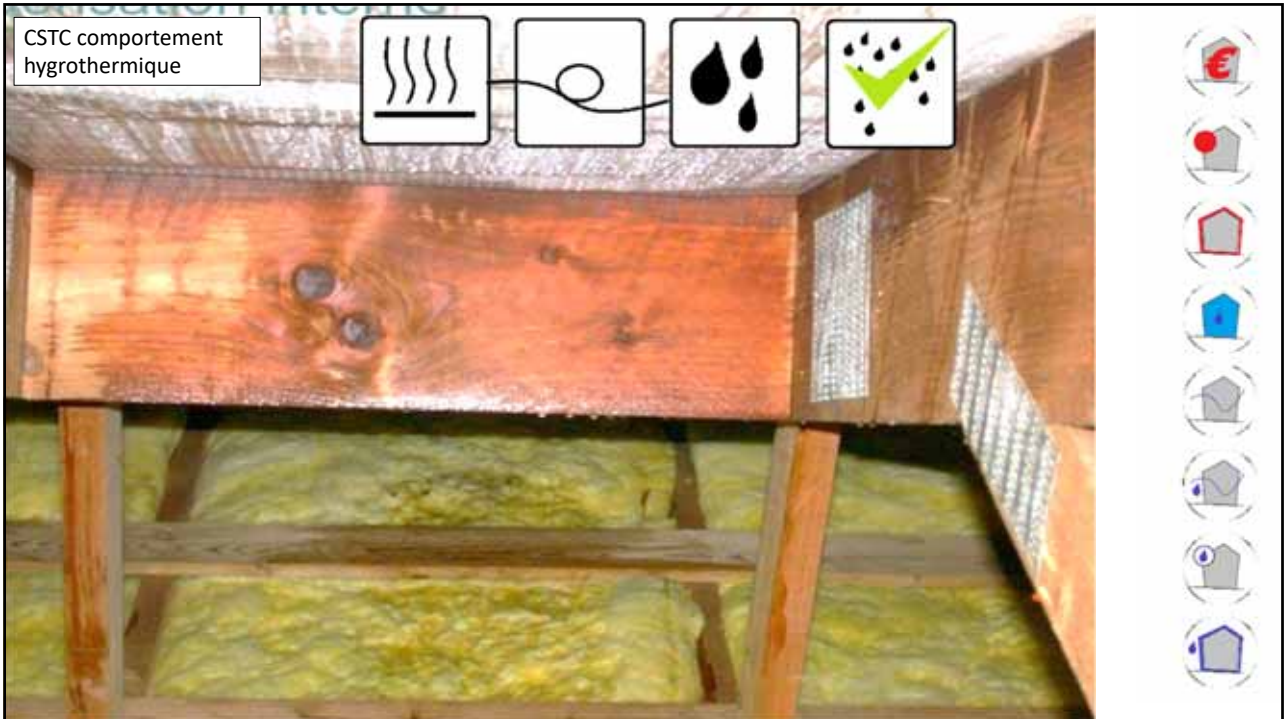
AVANT

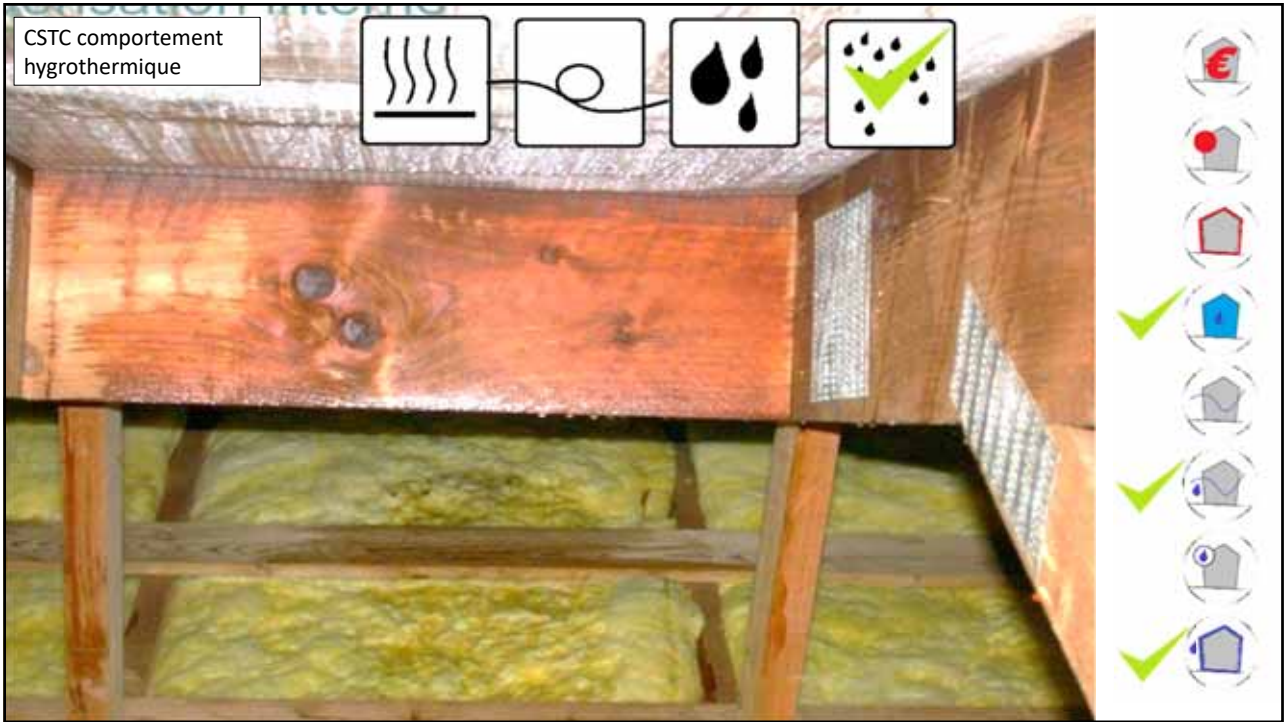
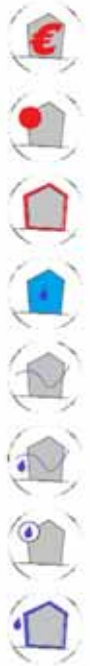
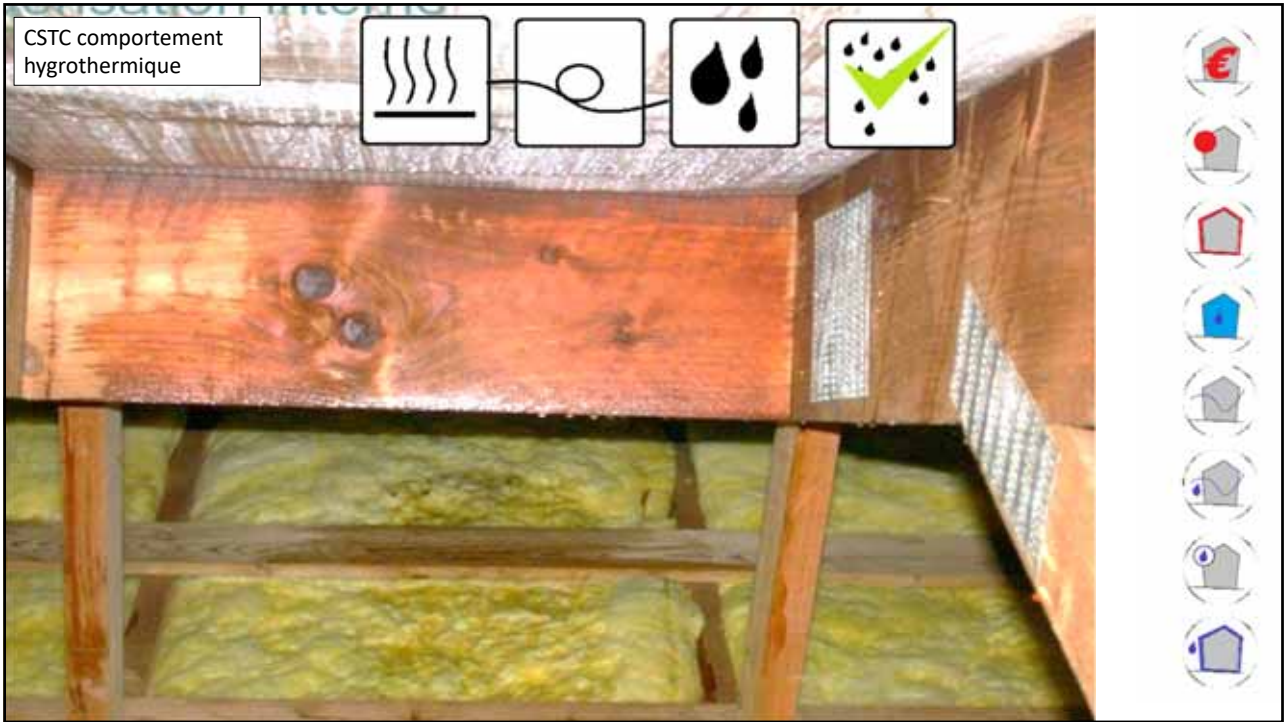
1 2 3 4 5 Extérieur

Intérieur

- 1: lestage (éventuel)
- 2: membrane d'étanchéité
- 3: isolant
- 4: pare-vapeur
- 5: support

APRES





CSTC comportement
hygrothermique

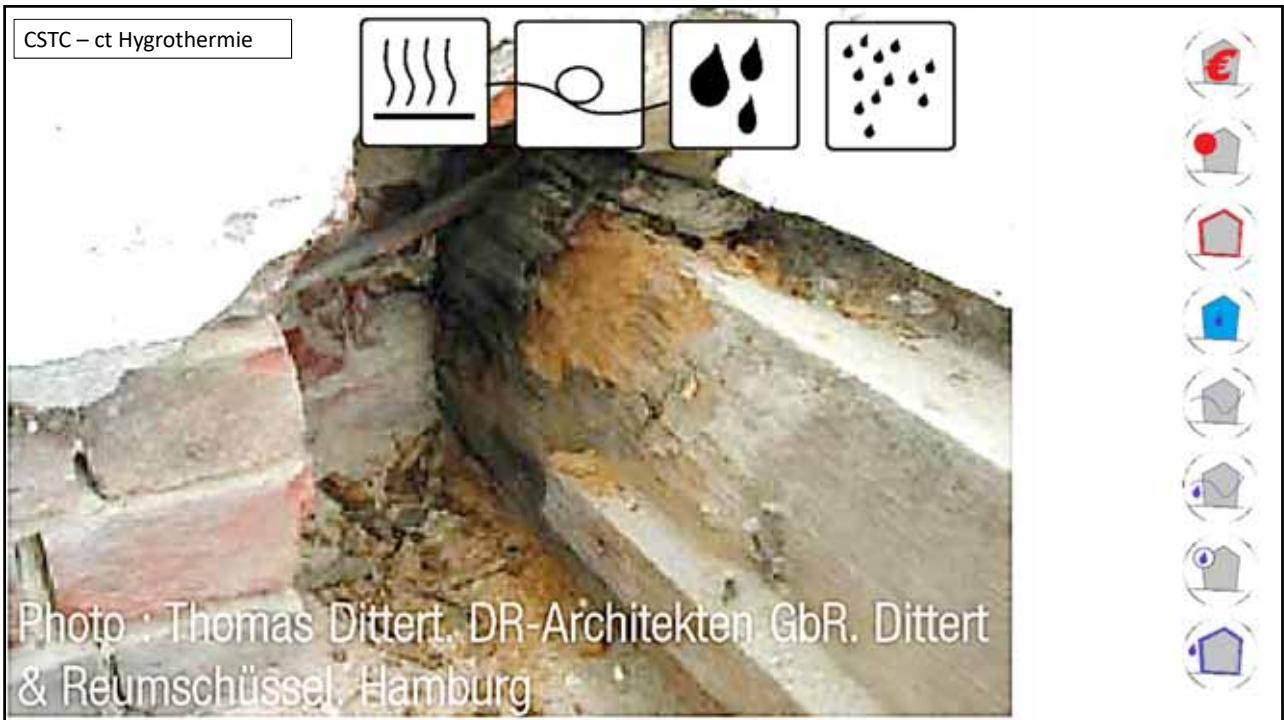
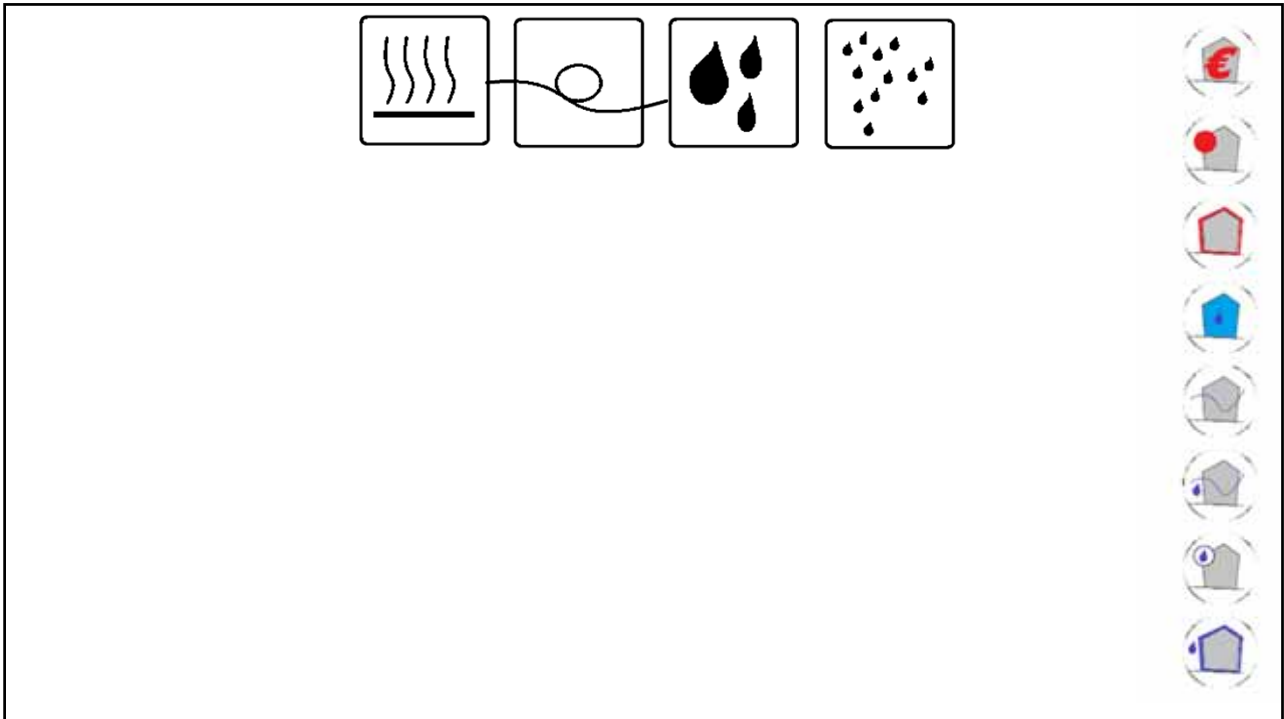
Architecture & Climat

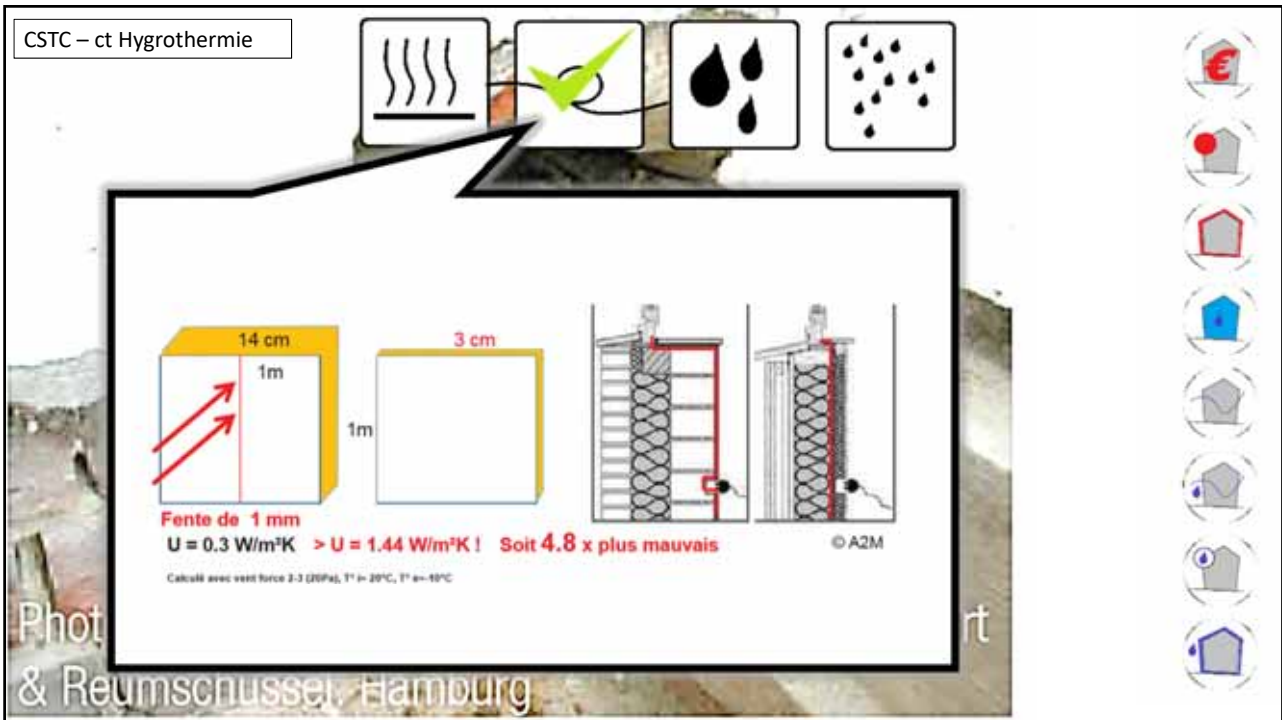
1. Lattes
2. Contre-lattes
3. Sous-toiture
4. Isolant (remplissage partiel)
5. Charpente
6. Pare-vapeur
7. Finition du plafond

AVANT

1. Lattes
2. Contre-lattes
3. Sous-toiture
4. Isolant
5. Charpente
6. Pare-vapeur
7. Finition du plafond

APRES





CSTC – ct Hygrothermie



Photo : Thomas Dittert, DR-Architekten GbR, Dittert & Reumschüssel, Hamburg

Four icons at the top: a wavy line representing heat, a green checkmark, two black droplets representing water, and a cluster of black dots representing mold.

A vertical column of eight house icons on the right side, representing different building types or standards.



Photo : Thomas Dittert, DR-Architekten GbR, Dittert & Reumschüssel, Hamburg

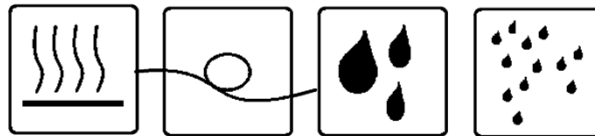
Four icons at the top: a wavy line representing heat, a green checkmark, two black droplets representing water, and a cluster of black dots representing mold.

A vertical column of eight house icons on the right side, representing different building types or standards. The first six icons have a green checkmark overlaid on them, indicating compliance with the criteria.

Diagram illustrating a building construction process with icons for heat, a green checkmark, water droplets, and rain. A photograph shows a room under construction with wooden framing and insulation. A cross-section diagram shows a brick wall, insulation, and a window frame with labels 1, 2, and 3. A vertical column of icons shows a sequence of house icons with various symbols (€ symbol, red dot, red outline, blue outline, grey outline, blue dot, blue circle) and green checkmarks.

Diagram illustrating a building construction process with icons for heat, a circle, water droplets, and rain. A vertical column of icons shows a sequence of house icons with various symbols (€ symbol, red dot, red outline, blue outline, grey outline, blue dot, blue circle).

CONCLUSION



FLUX de CHALEUR

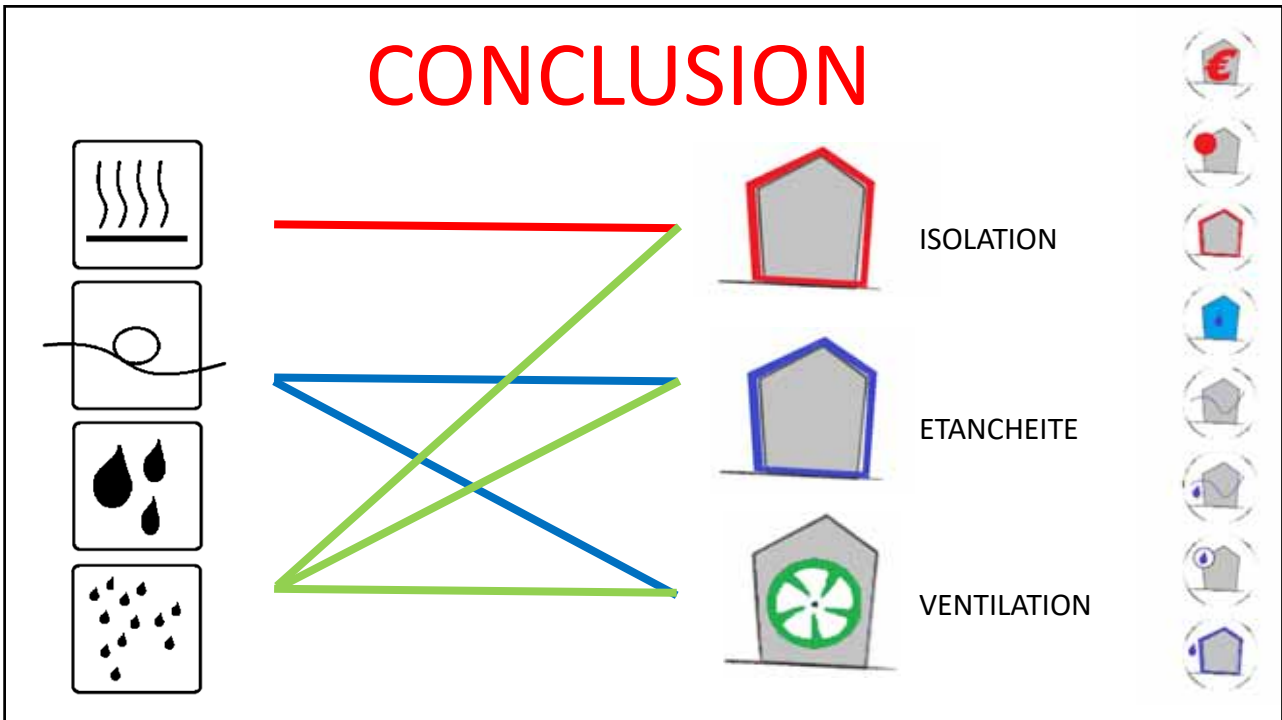
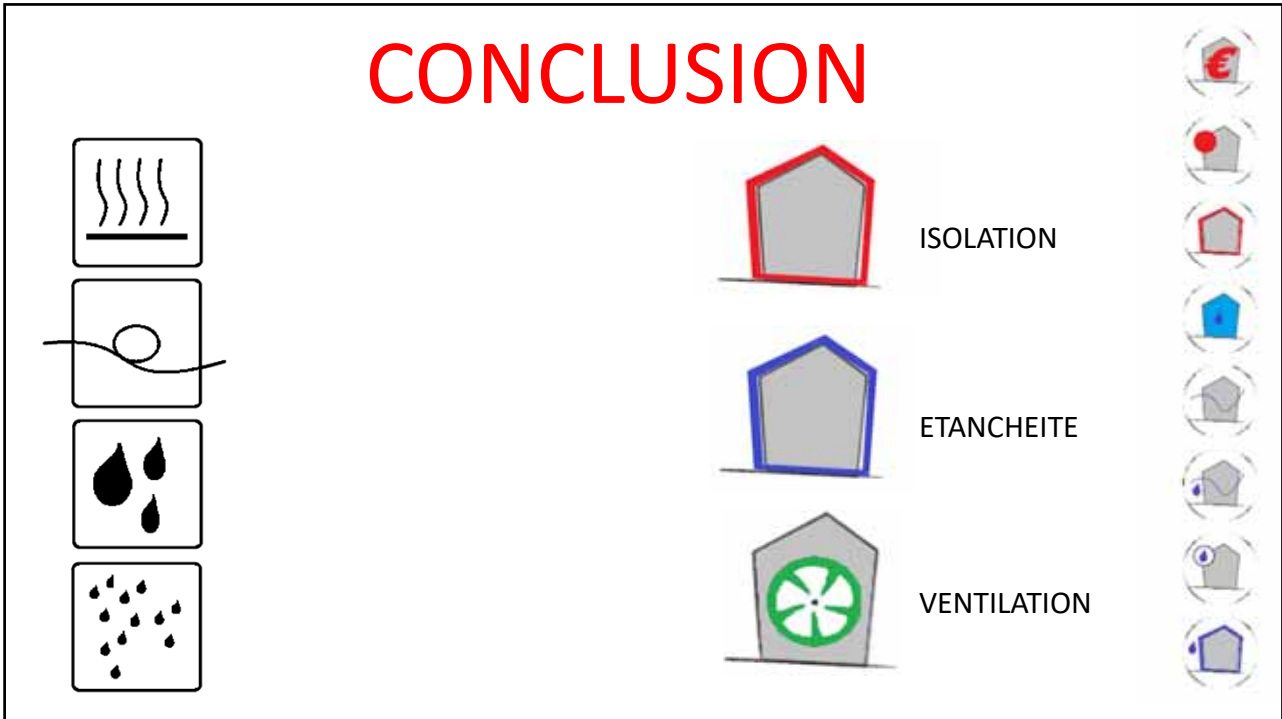
This diagram illustrates heat flux. It features a square icon with wavy lines above a horizontal line. To its right are three square icons: a wavy line with a circle, two large black water droplets, and a cluster of small black raindrops. On the far right, a vertical column of eight house icons is shown, each with a different colored dot (red, grey, red, blue, grey, grey, grey, blue) on its roof.

FLUX d'AIR

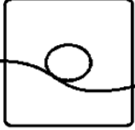
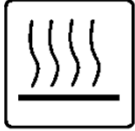
This diagram illustrates air flux. It features a square icon with a wavy line and a circle. To its right are two square icons: two large black water droplets and a cluster of small black raindrops. On the far right, a vertical column of eight house icons is shown, each with a different colored dot (red, grey, red, blue, grey, grey, grey, blue) on its roof.

FLUX d'HUMIDITE - Liquide

FLUX d'HUMIDITE - Vapeur



CONCLUSION



Pour une enveloppe performante :

- Connaître les principaux **paramètres hygrothermiques** des matériaux composant chaque élément.

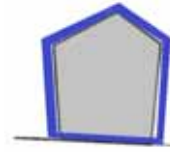
- Voir l'impact de chaque élément sur le **complexe** dans lequel il s'insère.

- Dans le cas de configurations à risque, vérifier le comportement hygrothermique de la paroi à l'aide de **logiciels dynamiques**, tout en gardant à l'esprit les **principes de conception!**

- Une bonne **mise en oeuvre** est essentielle!



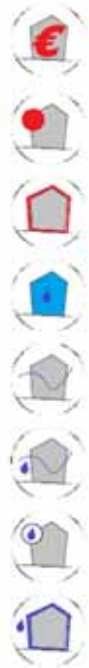
ISOLATION



ETANCHEITE



VENTILATION



OBJECTIF du WB

- S'approprier la PATHOLOGIE BOX

OBJECTIF du WB

- S'approprier la PATHOLOGIE BOX
- La pathologie BOX est flexible
Elle s'adapte:
- ✓ au niveau de connaissances des stagiaires
 - ✓ au formateur
 - ✓ à la matière

OBJECTIF du WB

Pour faire évoluer la « pathologie BOX »,
vous pouvez envoyer vos éventuelles
illustrations à l'adresse suivante:

« laurent.challe@forem.be »