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Sustainable Urban Rehabilitation in Europe

Methodological approach to conservation

Erasmus+

Sustainable Urban Rehabilitation in Europe

3rd Semester

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Methodological Approach to Conservation: Physical Approach

2 ECTS

SH

Sustainable Heritage

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SURE
SUSTAINABLE URBAN REHABILITATION IN EUROPE

UNIVERSIDAD POLITÉCNICA DE MADRID

Sustainable Urban Rehabilitation in Europe

Methodological Approach to Conservation: Physical Approach

1. Introduction to Methodological Approach
2. Geometrical Survey
3. Geometrical Survey: traditional method
4. Geometrical Survey: new tools
5. Material Survey.
6. Mechanical Survey.
7. Damage maps I: degradation problems
8. Degradation types.
9. Damage maps II: fissure and crack problems
10. **Damage maps III: moisture problems**
11. Damage tests on masonry constructions I
12. Damage tests on masonry constructions II
13. Survey, maps and tests on wooden contruction.
14. Archaeology.
15. Stratigraphy.

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Methodological Approach to Conservation: Physical Approach

LESSON 10. DAMAGE MAPS III: MOISTURE PROBLEMS

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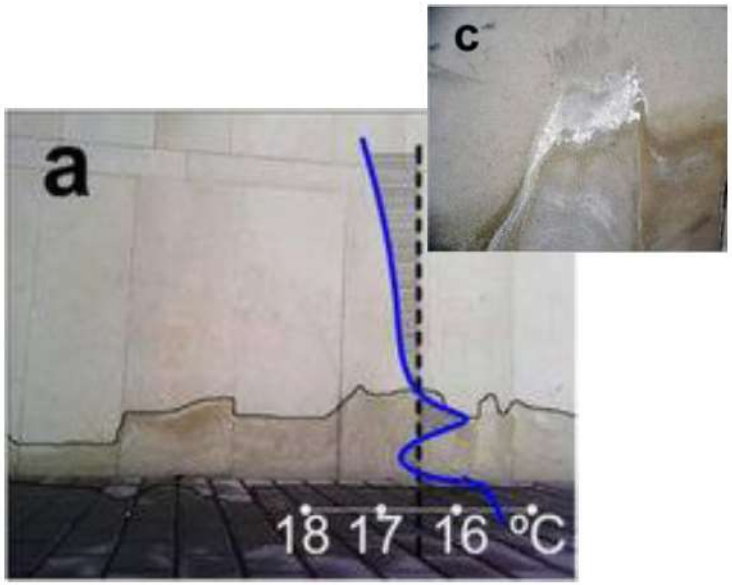
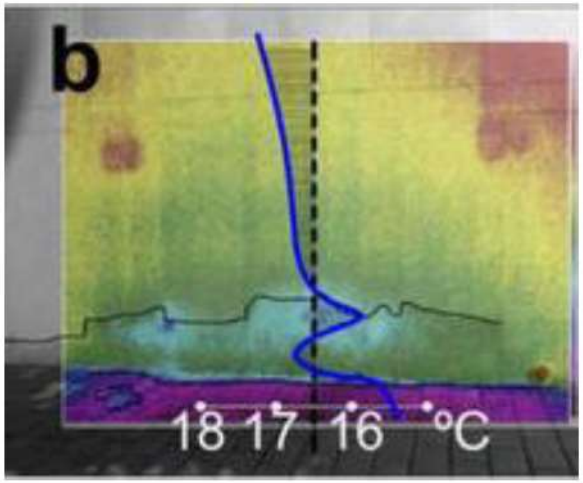
Definition

The survey of humidity, even that deriving from phenomena of rising by capillarity, is generally carried out with the direct method, following the perimeter of the infiltration and leaching zones. Special equipment is available on the market which, supported by the walls, allows to determine their degree of humidity.

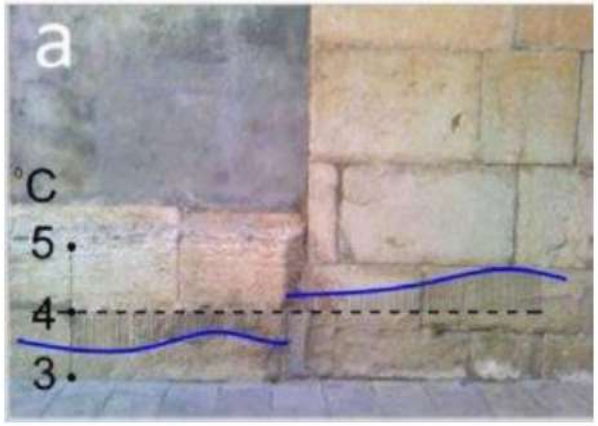
MAP OF DAMAGES: MOISTURE SURVEY

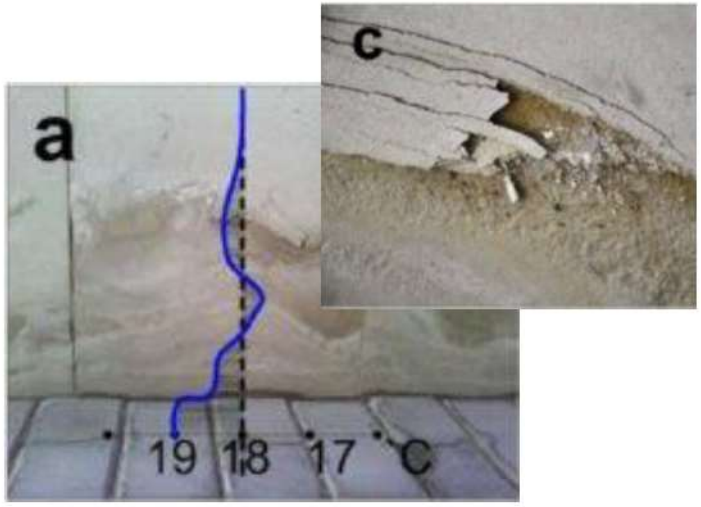
Thermography and moisture
The use of thermovision chambers makes it possible to carry out a very precise mapping of humidity, by detecting temperature differences in the masonry with this method, by detecting the different temperatures of the humid zones, it is also possible to ascertain the direction of the infiltration, especially in the case of capillary ascent. Moisture survey is usually performed by taking into account that the imaging shutters must be between 1:50 and 1:10,

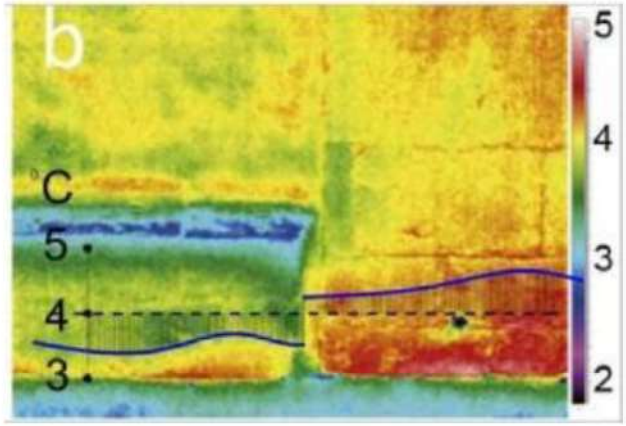


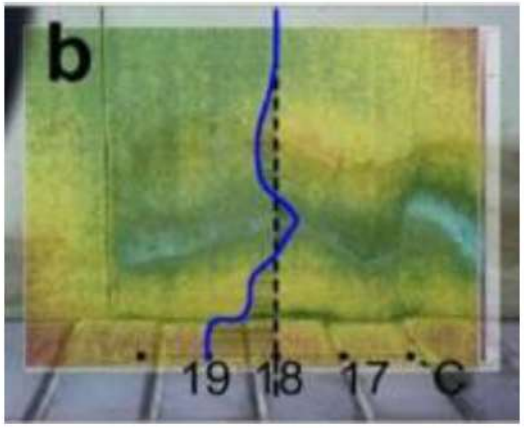


MAP OF DAMAGES: MOISTURE SURVEY



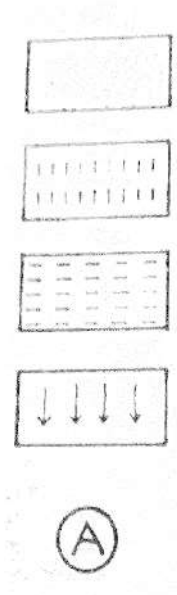






The representation of humidity uses symbologies to highlight the different types, as can be seen in the chapter on the representation of survey.

HUMIDITY CAUSE



Capillary ascent

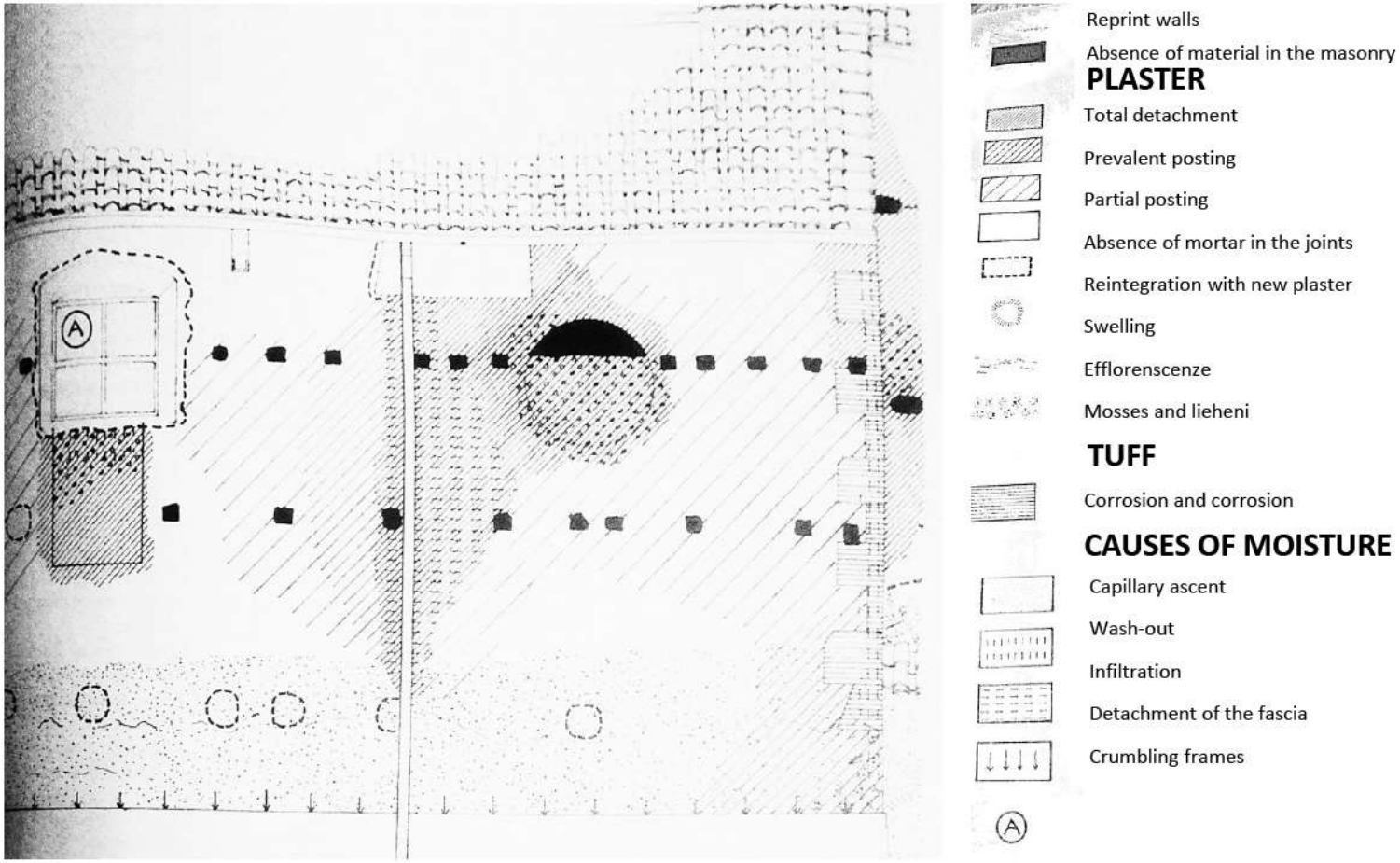
Wash-off

Infiltration

Surface detachment

Window in poor condition

MAP OF DAMAGES: MOISTURE SURVEY



Map of damage: deterioration and moisture

MAP OF DAMAGES: MOISTURE SURVEY

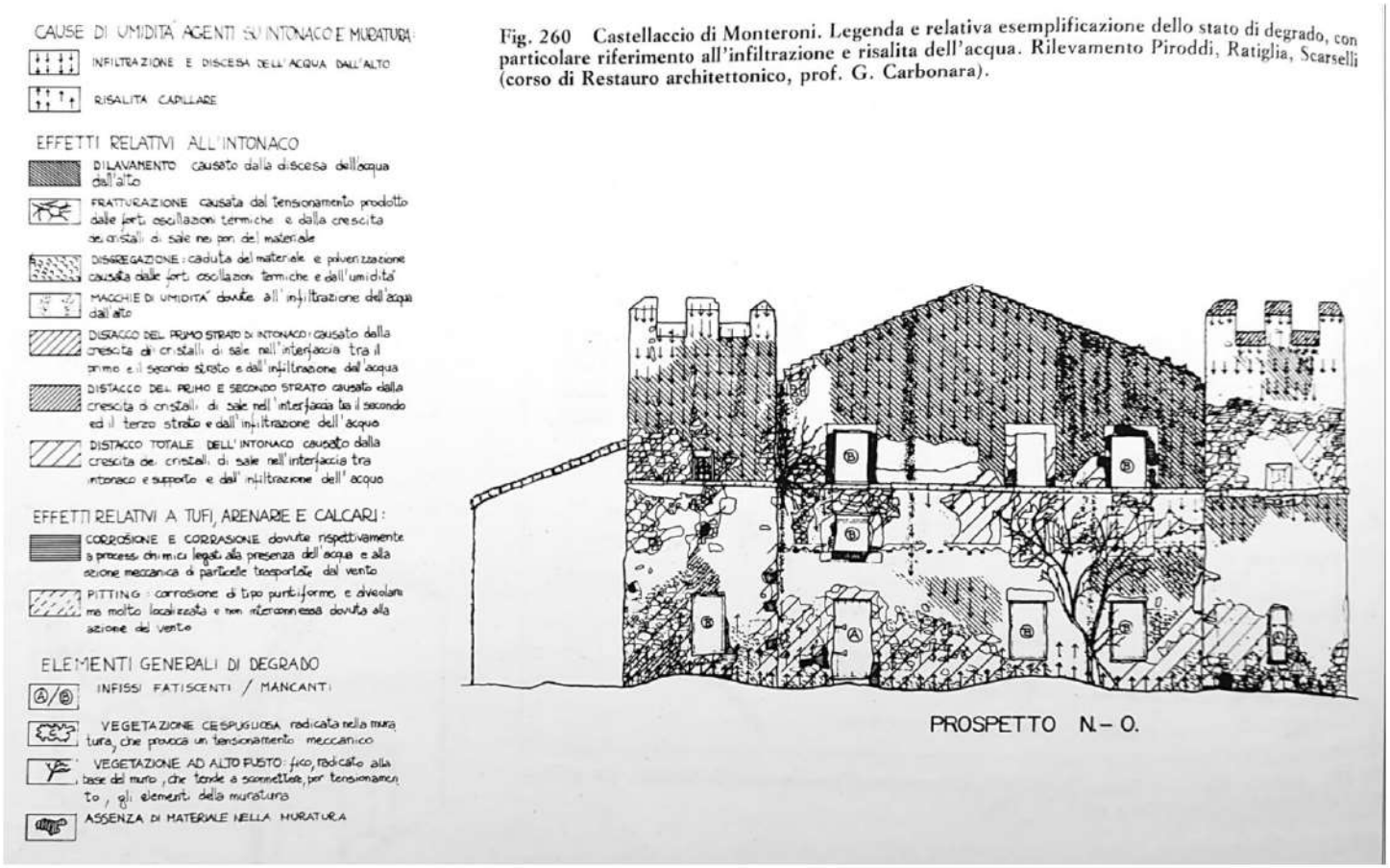


Fig. 260 Castellaccio di Monteroni. Legenda e relativa esemplificazione dello stato di degrado, con particolare riferimento all'infiltrazione e risalita dell'acqua. Rilevamento Piroddi, Ratiglia, Scarselli (corso di Restauro architettonico, prof. G. Carbonara).

MAP OF DAMAGES: MOISTURE SURVEY

EFFETTI RELATIVI A TUFI, ARENARIE E CALCARI:

CORROSIONE E CORRASIONE dovute rispettivamente a processi chimici legati alla presenza dell'acqua e alla azione meccanica di particelle trasportate dal vento

PITTING: corrosione di tipo puntiforme e alveolare ma molto localizzata e non interconnessa dovuta alla azione del vento

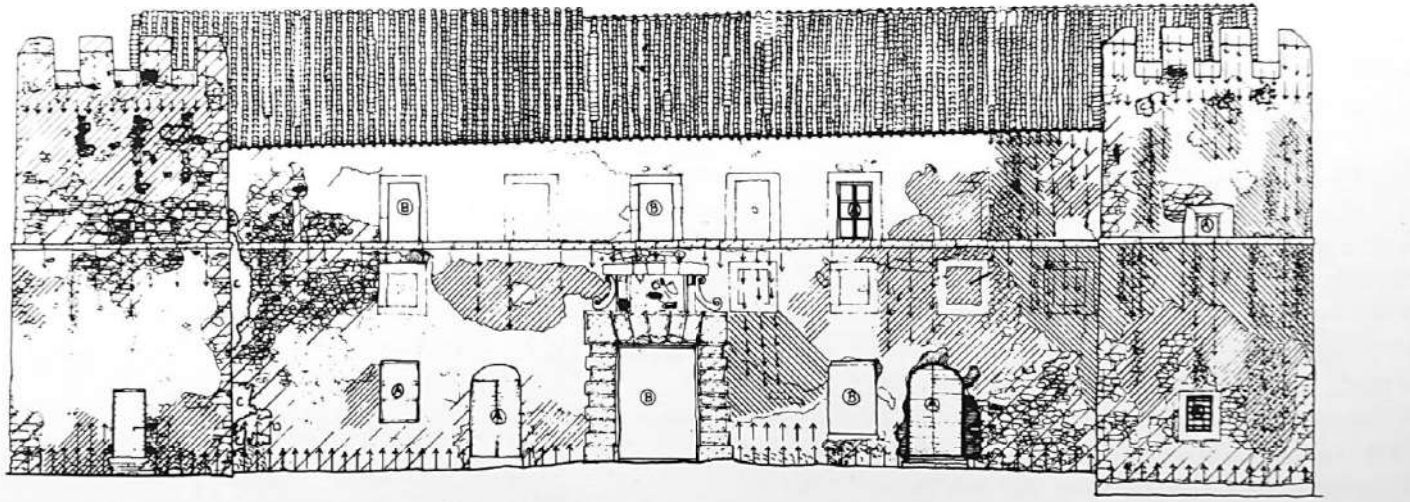
ELEMENTI GENERALI DI DEGRADO

Ⓐ/Ⓑ INFISSI FATISCENTI / MANCANTI

VEGETAZIONE CESPUGLIOSA radicata nella muratura, che provoca un tensionamento meccanico

VEGETAZIONE AD ALTO FUSTO fico, radicato alla base del muro, che tende a scannettare per tensionamento gli elementi della muratura

ASSENZA DI MATERIALE NELLA MURATURA



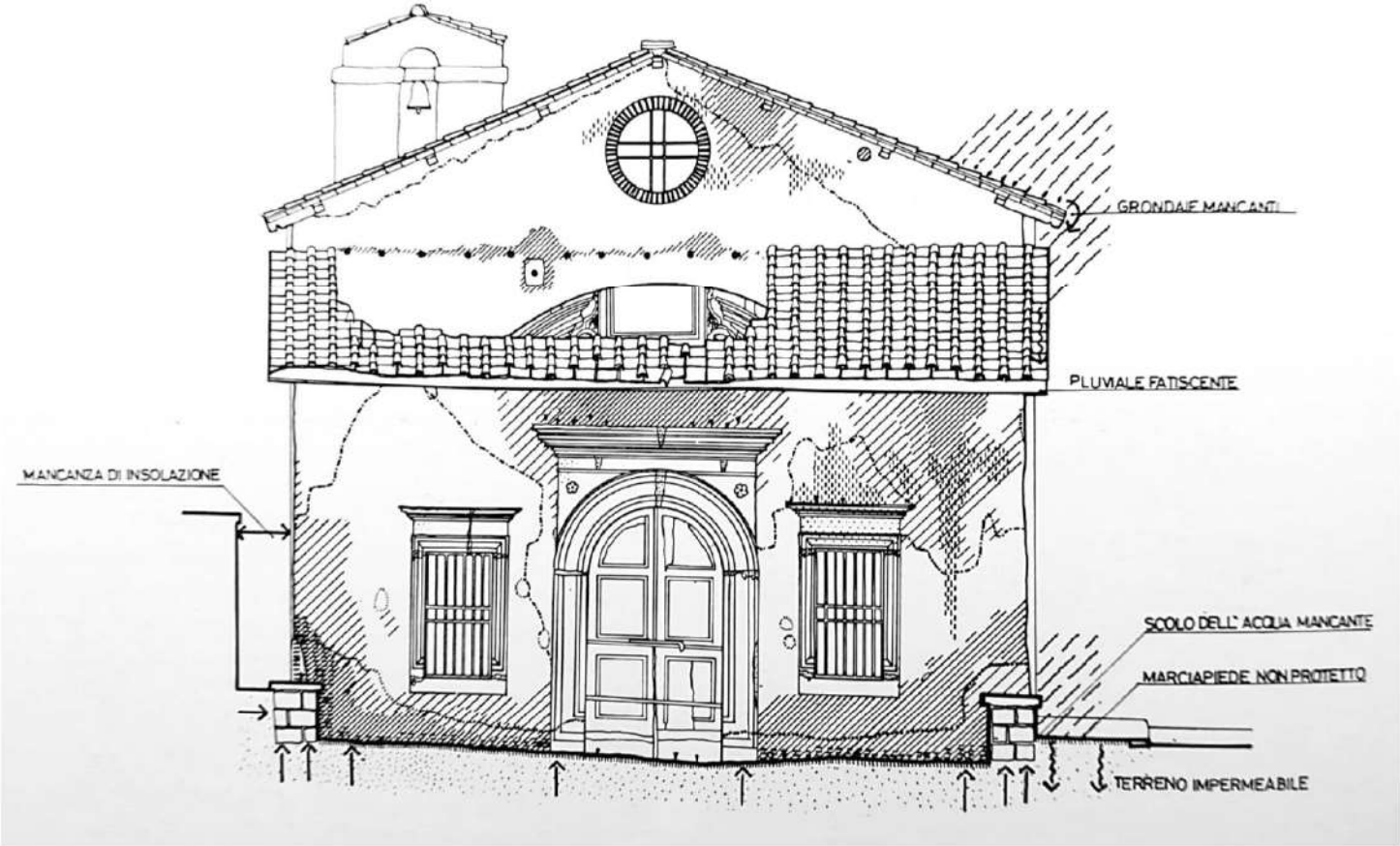
PROSPETTO S.-O.

0 0,5 1 2 3 4 5 6 7 8 9 10

SCALA 1:100 METRI

MAP OF DAMAGES: MOISTURE SURVEY

It is essential that, before survey on site, we proceed to identify and perimeter the various areas where moisture is present and classify them depending on whether it is a capillary ascent, washout or infiltration.



MAP OF DAMAGES: MOISTURE SURVEY

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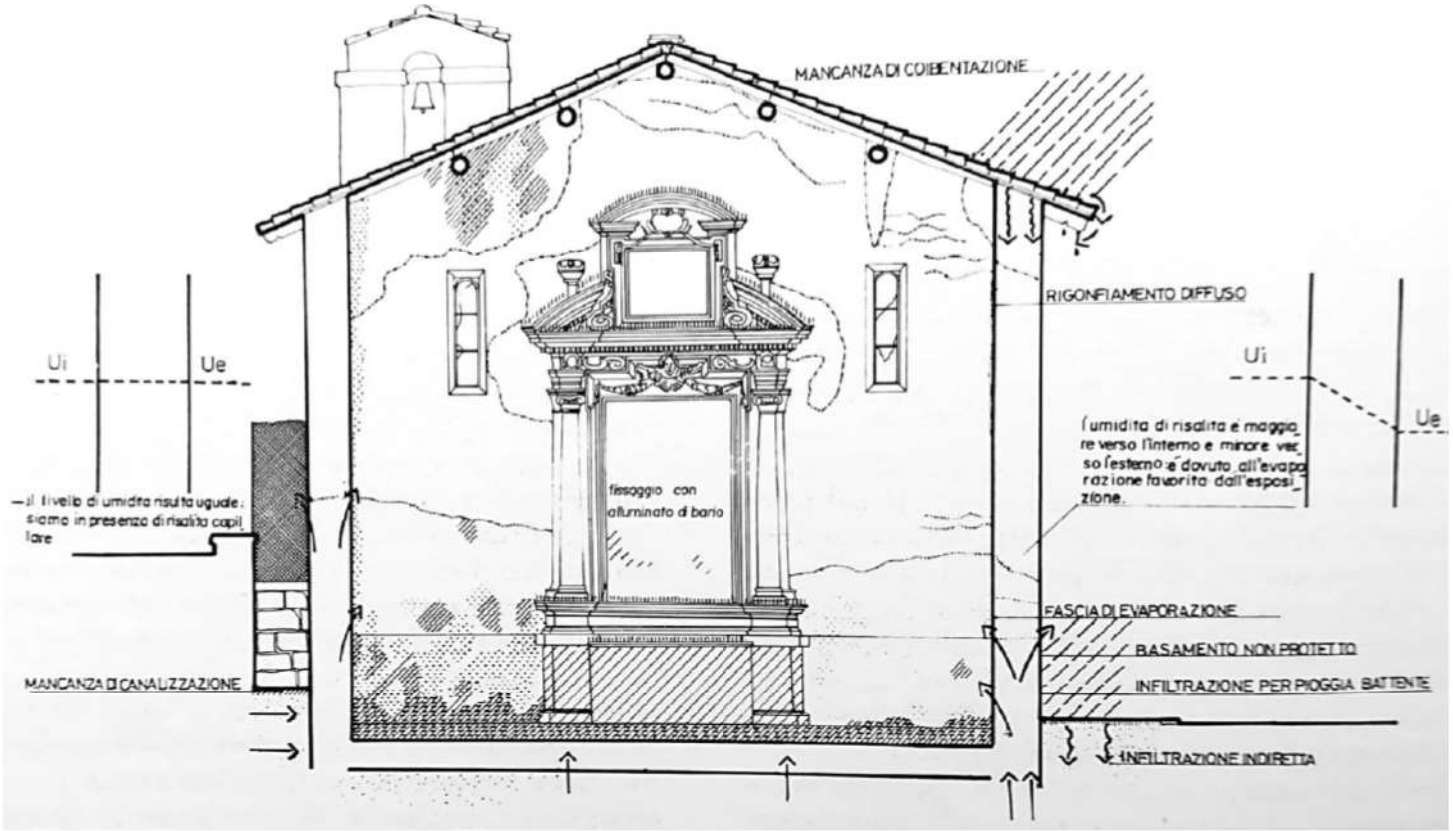
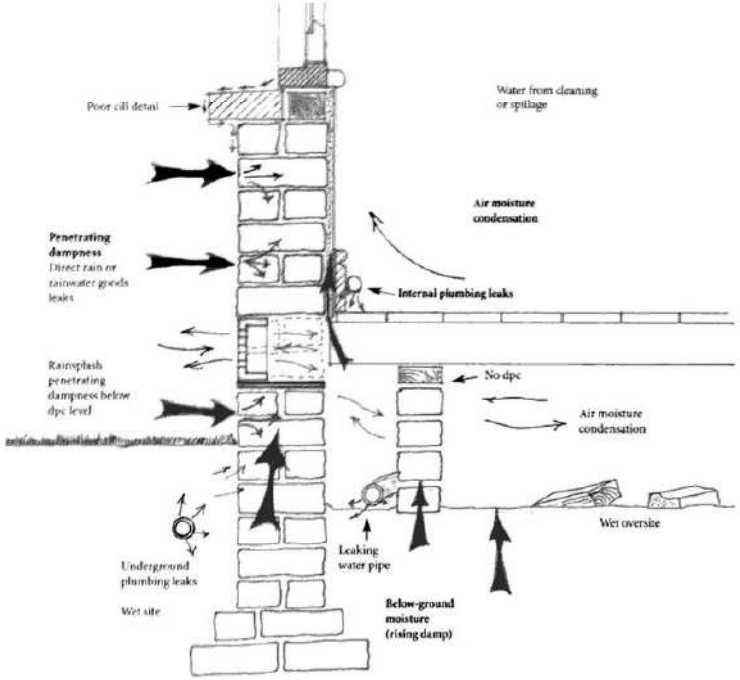


Causes of dampness

- Penetrating dampness
- Bellow ground moisture – capillarity
- Air moisture condensation
  - Interstitial condensation
  - Superficial condensation
- Internal plumbing leaks – accidental dampness

Penetrating dampness

They are the result of the penetration of water from the outside into the enclosure due to rain. The water penetrates the interior or simply fills the surface pores without deepening the element, depending on the porous structure of the material, the water pressure and whether it is combined with wind. Therefore, these humidities can be both internal and external. In general, water can access through its porous structure, preferably by holes greater than 0.5 mm. By the presence of cracks or fissures (of capillary constitution), constructive joints, or if the sores between bricks are not completely filled with mortar due to poor execution of the wall.

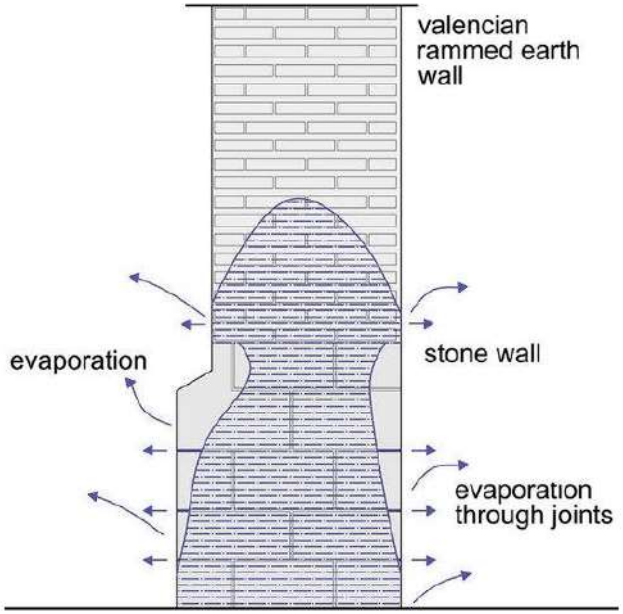


Bellow ground moisture – capillarity

When we introduce a tube in water we see how the latter rises. This is because the force of cohesion between their molecules is less than the adhesion of the liquid with the material through which it rises. The water will continue to rise until the surface tension with the tube balances with its weight.

In building, this phenomenon causes water to rise through the pores of the materials that are in contact with the ground.

These humidities can appear well because the height of the water table has varied and now the foundation is in contact with the water, or because of the accumulation of water at this point because the slope of pavements or screeds is nonexistent, insufficient or has been deformed, between other causes.



Bellow ground moisture – capillarity

It can be identified because it is located at the base of the enclosure and follows a line more or less parallel to the ground. *The height of this line will depend* on *the material and how the wall is coated*.

- *Why does it depend on the material?* That the liquid rises to a greater or lesser extent is determined mainly by the diameter of the pore of the material of which it is composed. The smaller the radius, the higher the water rises on the element.
- *Why does it depend on the coating?* It will also depend on how easy it is to have access to the open air, which favors its evaporation. For example, in the case of exposed brick, the water that rises through the wall is able to evaporate earlier, due to its direct contact with the air, than if it were coated.

Bellow ground moisture – efflorescence

Sometimes the humidity is accompanied by white spots on the surface of the material. This is because the water drains salts from the lime of the foundation, mortar, brick, etc. and upon evaporation, the salts are deposited on the surface. The appropriate thing would be to do an essay to know what type of salts are to give an adequate treatment.

When the crystallization of the salts takes place inside the enclosure, the increase in volume that this phenomenon entails produces the breakage of the material. This phenomenon is called crypto-florescence.

Air moisture condensation

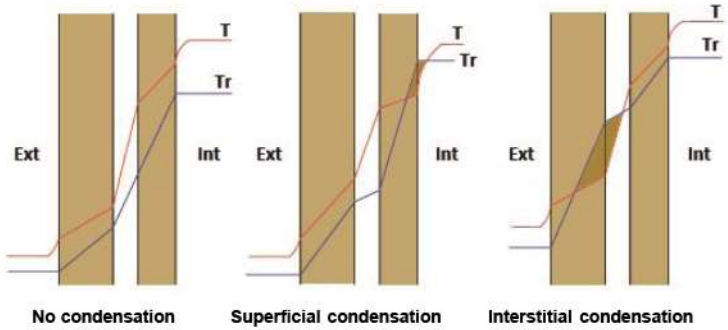
The humidity of condensation occurs because at a certain moment the enclosure of an enclosure is saturated with water vapor until reaching the point of condensation, in which the water vapor passes into liquid water. It is usually due to a drop in temperatures.

The vapor will go through the different materials that normally make up the facade and will lose pressure to the outside, but in turn the temperatures will decrease. It may happen that during this process the temperature reaches the dew temperature.

Depending on the point of the path where that temperature is reached, we can distinguish between two types of condensation: superficial and interstitial.

Air moisture condensation

- **Surface condensation:** it will be characterized because inside the enclosure there will be a high humidity and may be associated with the appearance of fungi. This excess may be caused by the high production of steam in premises and as a consequence of poor thermal insulation.
- **Interstitial condensation:** that which, as we have seen, is inside the wall. The manifestation of this type of humidity will be stains to the outside, possibly accompanied by efflorescence, fungus, detachments.



Superficial condensation

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