



SOLUTION FOR RISING DAMP ON THE WALLS

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1.- WHICH TYPE OF MOISTURES CAN BE DISTINGUISHED?

Basically there are three types of moisture that appears on the walls of a building:

Moisture by capillarity



Moisture by condensation



Moisture by leakage





2.- DESCRIPTION OF THE TYPES OF MOISTURES

- **Moisture by capillarity** is the one that climbs up the walls, and also appears between floor tiles by the physical phenomena of capillarity. It is necessary to remove it to avoid its serious consequences.
- **Moisture by condensation** is the one that appears on the upper corners of the rooms, and around doors and windows. Its origin is that the water vapour inside your home is condensed on the walls as the indoor temperature decreases, mainly at night.
- **Moisture by leakage** is caused by water leaks in walls, ceilings, or floors, which are originated by:
 - **Torrential rain** that strikes walls, or cracked roofs,
 - **Groundwater currents** that hit walls or floors
 - **Cracks in water pipes**, which pour liquid onto the walls on which they are embedded.



3.- WHAT TO DO IN EACH CASE?

If you suffer moisture by leaks it is urgent to repair it and it is necessary the urgent intervention of an expert, since the deterioration caused is cumulative, and fast.

If you suffer moisture by condensation which is not in a basement, there are several systems to solve it, as we explain later on.

If you are in a basement, first check there is no moisture that climbs up the walls from ground and then, remove moisture by condensation. In case you detect moisture by capillarity, then first remove this type of moisture, because water from the walls that evaporates during the day can produce condensation at night.



4.-MOISTURE BY CAPILLARITY

Moisture by capillarity is the one that climbs up the walls from ground. This causes the following problems:

- **Painting skipping.**
- **Production of chips.**
- **Continuous maintenance costs.**
- **Mould on the walls.**
- **Rheumatic, asthmatic and allergic diseases.**
- **Depreciation of the housing value.**
Increase of 30% in heating expenses.

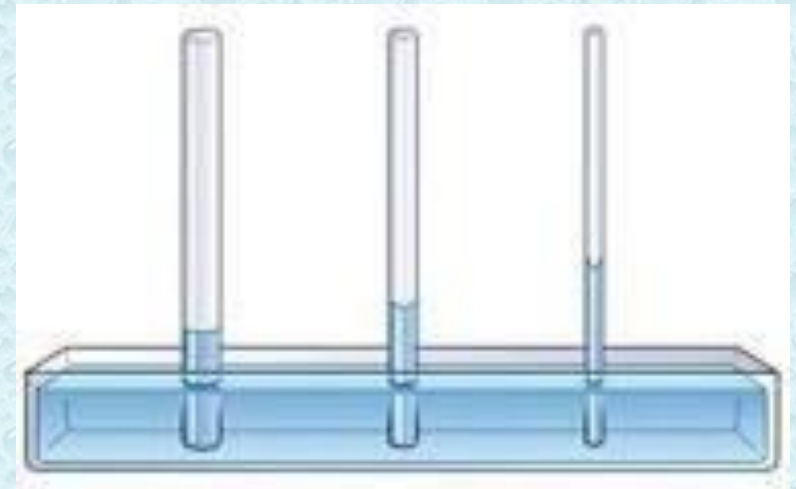


5.- CAPILLARITY

If we place a glass tube of 1mm of inner diameter inside a glass of water, we observe that the water inside it rises a few millimetres by the phenomenon called capillarity. Further information can be found in corresponding section in Wikipedia, where also shows a formula that calculates the height that reaches the water as a function of the diameter of the tube. Thus, it is verified that for a one micron tube the water can ascend up to 14m.

It may seem exaggerated, but in practice there have been noted ascending heights of 7m from the ground, ascending from ground floor to the first floor.

In addition, it is normal to find pores of the order of a few microns in construction materials. And it is proved, that the thinner the pore, the higher the water reaches, provided that there is enough water in the subsoil to ascend.



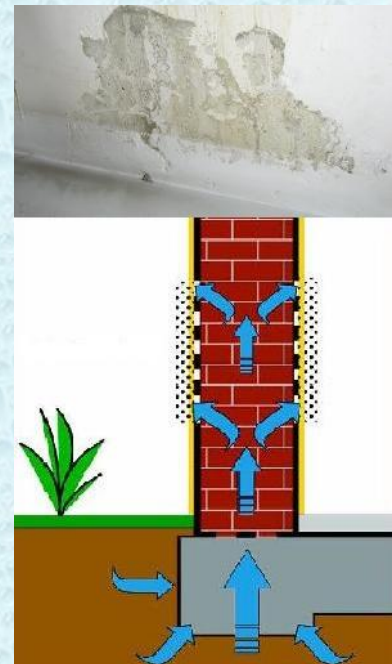


6.- GENERAL CONSIDERATIONS ABOUT RISING DAMP

In general, moisture by capillarity requires an amount of water from subsoil to continue its progress. All measures to avoid water in the subsoil are positive.

If possible underground currents are observed, it is advisable to divert them to the exterior by making a pit with a drainage outlet.

- Another good practice is to put a layer of coarse gravel underneath the building foundation to create a barrier without capillaries.
- Another practice is to build up a small promontory to get water away from the building.
- An ancient practice is to build on pillars, which can be waterproofed. This is used in single-family homes in Florida. Also, this was known in Asturias as famous warehouses (hórreos) to store animals feed..





7.- SOLUTIONS FOR MOISTURE BY CAPILLARITY

Moisture by capillarity is found in all the countries all over the world, either deserted ones like Algeria, and Saudi Arabia, or countries with humid environment like Canada, Norway, Great Britain, etc.

In the last thirty years several methods have been applied to remove this type of moisture:

- **Fixing painting plates, ceramic or marble tiles, or waterproofing layers up to where the moisture arrives.**
- **Injection of Waterproofing Resins.**
- **Location of Environmental**
- **Dehumidifiers, Placing washers of walls or foundations**
- **Drainages in the subsoil**
- **Installing Electro-Osmosis equipment with Cables**
- **Installing Passive Systems taking advantage of terrestrial magnetism.**
- **Placing Wireless Electro-osmosis**
- **Installing the Electro-Physical System**



8.- PLATES, CERAMIC OR MARBLE TILES, OR WATERPROOFING LAYERS

Fixing painting plates, ceramic or marble tiles, or waterproofing layers up to where the moisture arrives is only hiding the problem, since moisture continues deteriorating the wall, and after a certain time will appear above where it has been covered.



Besides with the heat it is normal, that mould appears behind the plates, and that has serious consequences for health, originating rheumatic, asthmatic and allergic diseases.



9.-THE INJECTION OF WATERPROOFING RESINS

- **The injection of waterproofing resins** is a routine system followed by many construction professionals, but it has many drawbacks.
- Holes of 12mm should be made in the wall every 12cm at the level of the socket, a matter that affects the aesthetics and the solidity of the wall structure.
- This method is not applicable neither on old walls with irregularities, nor those constructed with blocks or bricks with holes or cavities. In this case, a lot of waterproofing resins are required and they accumulate in the cavities. Thus, it is practically impossible to make a layer that prevents the rise of moisture by capillarity.
- In case of walls built using solid bricks, it is possible to accomplish a waterproofing layer by injecting into the bonding mortar. This prevents moisture from going up there, but the professionals know very well, that water always finds alternative ways, and you will begin to have moisture by capillarity in other walls of the house. This implies waterproofing all the walls and assuming high costs due to materials and labour hours.
- Moisture that climbs up the walls before applying the waterproofing layer can only be removed by evaporation from the walls. The wall cannot be painted or restored until it is totally dried, and that can take more than 4 months.
- Another problem which is not solved by this method is the moisture that climbs up between floor tiles or thin walls of separation whose bricks barely reach 4cm or moisture that climbs up below the row of holes made.



10.- ENVIRONMENTAL DEHUMIDIFIERS



Environmental dehumidifiers remove the water in the environment by condensing it into a container that must be emptied frequently. This type of apparatus eases the evaporation of walls, but they do not prevent the water from climbing up through them. This system helps the water to flow through the pores of the wall, so the problem continues.

11.- WALL OR FOUNDATION AERATORS

- Wall or foundation aerators have been used in some cases to try that water from the walls and foundations evaporate outwards.
- Holes are drilled every 40cm on the wall and a porous ceramic tube is introduced to absorb the moisture so that the water is directed towards the outside by evaporation.

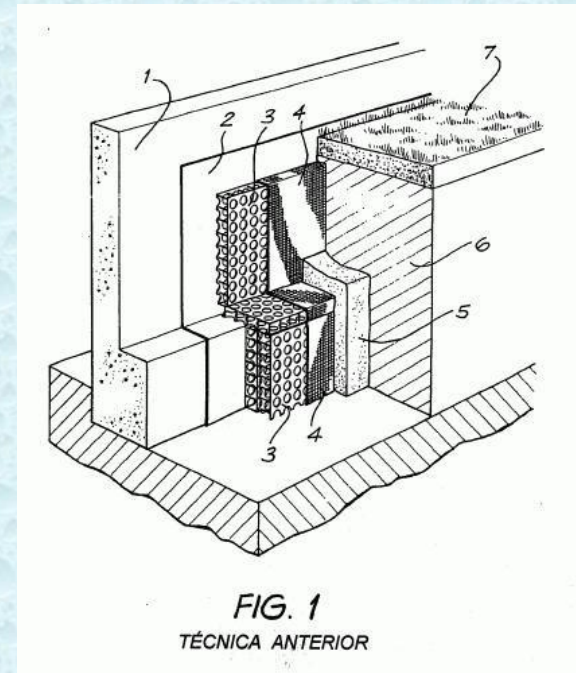


- This system is just a palliative for moisture, but it does not solve it. Over time the dissolved salts in the water plug the pores of the ceramic tubes so that it affects the performance. Apart from the aesthetic problem of drilling holes in the walls, the results after two years are not satisfactory as the capillary continues to act between adjacent holes.

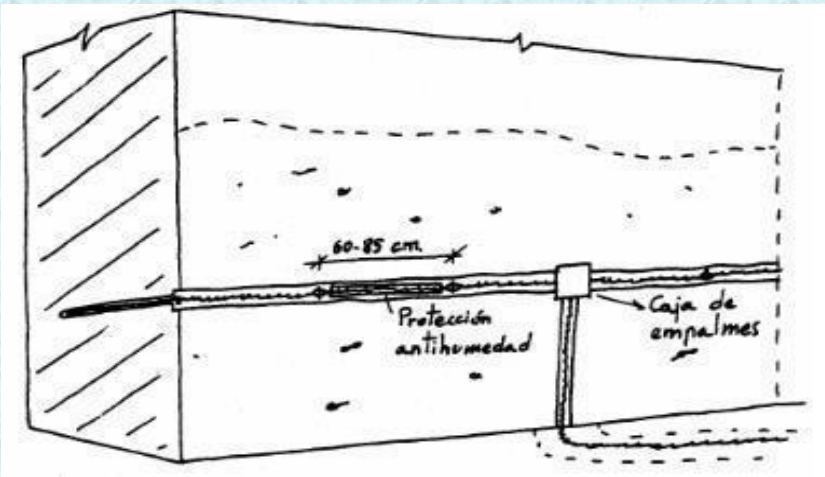
12.- DRAINS IN THE SUBSOIL

Drains in the subsoil to move out the water that accumulates below the building.

This system is palliative for moisture by capillarity. This solution is not complete, because there are usually areas in the subsoil that are difficult to drain, depending on the structure of the underground waterproofing layers.



13. ELECTRO-OSMOSIS WITH CABLES



Electro-Osmosis with Cables is a solution that reverses the rise of water on the walls, but has the disadvantage that a cable must be inserted in the wall along all the rooms. This represents opening regattas and the restoration of walls after cable installation.

This system only makes sense in the construction process of the building, but its technology has been surpassed during the last 10 years.



14.- THE PASSIVE SYSTEMS TAKING ADVANTAGE OF TERRESTRIAL MAGNETISM

The Passive Systems taking advantage of terrestrial magnetism appeared about 7 years ago. Since they do not consume energy, their effects are very slow (more than 2 years) and located around the equipment. Its installation is simple and you only have to align them in the direction of the magnetic pole.





15.- WIRELESS ELECTRO-OSMOSIS



- Wireless Electro-osmosis is an improvement because it is not necessary to insert cables in the walls, although it normally needs grounding to assure its good operation.
- Transmission is good by the air and the surface of the walls because it is used radio frequencies, but it does not penetrate well inside thick walls. Consequently, drying time can reach more than 2 years and its consumption is around 10W.



16.- ELECTRO-PHYSIC SYSTEM

Considering that water molecules are small dipoles, and that all negative poles have to be oriented upwards so that water climbs up walls, the electro-physical system emits an electromagnetic signal that depolarizes water molecules and rejects them to the subsoil, up to 50cm below the ground.

The advantage of the system is that transmitted signals are audio-frequency signals, which are transmitted very well through thick old walls and even better if they are wet. Thus, action is focused where there is moisture, either on the floor or on the walls.



17– FEATURES OF THE ELECTRO-PHYSIC SYSTEM

- It is manufactured for different action radius ranging from 6m to 30m, and several equipment may overlap the effect to cover very large extensions.
- The equipment is preferably installed on a humid wall, and consumes only 0.7W, in other words, it consumes in a year less than a TV in one day.
- Its installation is simple. It is not required works, neither noise nor dust. You only need to drill two fixing holes with a 6mm drill bit, and it is fixed to the wall as if it was a picture.
- A convincing proof that the system works satisfactorily is nearly 18.500 systems sold during the last years successfully, without any claim.
- This equipment is internationally certified, both in electrical and magnetic safety, as well as its safety for the health of animals and plants.



18.- ADVANTAGES OF HS-221



- Equipment manufactured in Spain by a high technology Company that guarantees delivery in 24 hours after placing the order and immediate response to technical questions.
 - Physical knowledge of capillarity phenomena, how it works and which is the solution.
 - Usage of low frequency waves, that are better transmitted through walls.
 - Minimum consumption of 0,7W. Although it is connected continuously, its consumption in 1 year is lower than a television in 1 day.
 - 15 years of guarantee giving back your money after a year if you are not happy with the results .
-
- Only approved equipment according to CE, FCC and ICNIRP standards. Last one refers to safety of transmitted waves for the health of people, animals and plants.



19.- MAXIMUM COVERAGE SURROUNDING THE EQUIPMENT: **TECHNICAL FEATURES**

MODEL	m2	LxAxG en cm	kg
HS-221P	50	29,5x22x4,5	1,9
HS-221A	100	29,5x22x4,5	1,9
HS-221B	150	29,5x22x4,5	1,9
HS-221C	200	29,5x22x4,5	1,9
HS-221	300	29,5x22x4,5	1,9
HS-221D	400	29,5x22x4,5	1,9
HS-221M	1250	29,5x22x4,5	2,2
HS-221X	2500	30x23x4,5	2,3

The red LED indicates that voltage is coming.
The green LED indicates that it works correctly.
At the end of the drying it only leaves on the wall from 3% to 6% moisture by weight.
The 2nd column facilitates the selection of the appropriate equipment depending on the m2 of floor area.

TENSION 100-240 VAC
POWER 0,7W

Supply 12VDC
Brms MAX 0,505uT



20.- THE DRYING PROCESS OF THE WALL

The drying process of the wall depends on the constitution of the wall and if it is below the level of the surrounding soil.

The solid and thick walls made with bricks, or concrete blocks, dry faster than old walls in which there are stones, sand, and cement, although in no case will the drying exceed one year. Normally after a month of installing the HS-221 you can see that it has the smell of moisture and the humidity has receded.

After 4 months it is observed that The wall is practically dry and can be restored, but the drying process continue with time.

With the drying of the wall their appears white spots, corresponding to the salts contained in the binders of the building materials, which when dissolved by water appear on the surface when evaporating part of the interior water.

When these salts dissolve, spalls are produced on the wall, due to lack of effectiveness of the agglomerates when losing the salts.





21.- FINISHING THE DRYING, REMOVING THE MOLD, AND RESTORING THE WALL

In a wall with humidity when it warms up mold is produced, which reproduces by spores and spreads through the moist parts, and is the cause of respiratory diseases.

There is a solution to eliminate mold, which consists of spraying on the wall mold with a mixture of one part of bleach with three of water, using gloves and goggles.

When the wall has dried before painting and restoring, you have to eliminate salts from the surface, with anti-salts products that Dissolve, or scratch or ring the wall. This is fundamental for the restoration, since the salts prevent the restoration of the mortars and paintings to the wall.

Repairs must be done with a mortar to the lime to allow the wall to have porosity and do not retain the little water left on the wall.

The interior paint must also be breathable using silicate paint so that no moisture retention occurs.



22.- CONDENSATION HUMIDITY

Moisture due to condensation is generated inside a house because of:

- Breathing of animals and plants.
- Steam from cooking food
- Showers and baths
- Washers, dryers, and dishwashers
- Stoves made of butane, or paraffin



This warm humid air accumulates in the upper corners of the rooms, and as the temperature decreases mainly at night, it deposits droplets of water on the colder walls, and around doors and windows.



23.- MORE ACCESSIBLE SOLUTIONS

Whenever possible by Meteorology, ventilate the house every day for at least 15 minutes.

Use the kitchen extractor to evacuate the cooking steams.

Use the bathroom extractor after use.

Place the washer and dryer in one place so that they extract the released steams.

Use the kitchen extractor when unloading the dishwasher.

Avoid butane and paraffin stoves, because they emit water steam. Use chemicals that absorb moisture like silica gel, it is only a temporary palliative, but not a solution.





24.- POSSIBLE ECONOMIC SOLUTION



A complement to the previous measures is the installation of a fan of blades on the roof of problematic rooms.

The best way to eliminate humidity by condensation is that it does not occur.

As moisture by condensation mainly accumulates in the upper part of the rooms, an economical solution is to place a fan on the roof, which can be obtained by

less than € 100, choosing direction of rotation "winter", which sends the upper air down.

It is possible to homogenize the temperature of the room, increasing the temperature above ground level by more than 2°C.

Removing the air continuously normally prevents condensation to a great extent.

These ceiling fans at low speed are very quiet, and can be installed in bedrooms or other rooms that can be problematic, helping to consume less heating.

Although they must be connected continuously, at slow speed their consumption is very small.



25.- SOLUTION FOR MILD OVERPRESSURE

When some of the above measures are not applicable because of having a cold climate and humid, the only solution is the systems that generate a slight overpressure.

These equipments consist essentially in:

- A fresh air intake from outside
- Particle filter that can prevent the entry of pollen
- Silent power fan
- Resistance to preheat the inlet air
- Air entry into the interior of the house through the upper part of a room, and preferably above a heating radiator
- Exit to the outside of the renovated air through a grid that can be located on the top of a roller blind at the other end of the house.

It is advisable to renew the air in the house every 2 hours at the most, managing to eliminate the moisture by condensation in a month, although it is advisable to keep it running at a slow speed, to avoid that problems with moisture by condensation reappear.

The power of the machine will be conditioned by the volume of air to be renewed.





26.- MOISTURE BY FILTRATION



The problem in the construction is that the buildings make movements when they settle, they cause cracks and breaks in the water pipes, and waterproofing.

The moisture from leaks in a water pipe must be repaired by a professional, so that it locates the break or crack of the water pipe and seals it.

In the case of leaks or leaks on roofs or terraces, you must first try to locate the filtration point, to be able to seal it, and although this is normally difficult, only as a last solution has to redo the waterproofing. Another problem that appears when the rain laterally hits a wall of a building, filtering water inside. In this case it is necessary to waterproof the outer wall or place protection plates so that the rain does not fall directly on the walls.

In buildings placed on slopes, it is the case that an underground current directly affects a wall of the house, filtering water inside. In this case, the best solution is to drain the current of water to the outside without affecting any wall.

Currently there are materials that prevent the entry of outdoor water, waterproofing the interior of the house.



27.- HOW TO MEASURE THE MOISTURE IN THE WALLS?

Measure humidity according to German DIN standards. The German DIN standard proposes a system to perform this measure in a direct way to know the moisture inside the walls.

This method involves making a hole in the wall to at least half of its thickness with a power drill, but low speed with a 20mm drill bit, taking into account to collect all the material that is extracted from the wall.

This material is weighed immediately with a precision balance of 0.1g divisions.

The extracted material is dried to weigh it again. Obviously the weight difference is the water that existed in the sample, and allows to calculate the amount of water per kg of existing construction material and the corresponding percent.



28.- DISADVANTAGES OF THE MOISTURE MEASUREMENT SYSTEM DIN

- The measurement is an average of what is found on the needle, and does not detect if there are moisture pockets inside, not knowing what moisture exists around the point of drilling.
- While it is drilled, the extracted material is heated and, as a result, part of the water found can be evaporated, affecting the precision of the measurements. To study the evolution of moisture in a building would be convenient to do at least 3 measures in time, starting one from start, another after 6 months, and one after one year.
- The aesthetic impact is considerable and can only be pierced in discrete points or behind furniture or household appliances.
- This drawback limits us to an extensive study of the distribution of humidity in a building, because it will represent many holes at different heights.

29.- MEASURING MOISTURE BY ELECTRICAL RESISTANCE



A method used for each measurement point, consists of nailing two pieces of duralumin on the wall, a couple of centimeters apart and that penetrate the wall about 4cm.

The resistance between the two points is measured and thus there is an indication of the moisture up to 4cm from the inside of the wall.

One obvious drawback is the presence of these inserts in the wall, distributed throughout the house, and that they have to remain installed until the control is finished. which can reach up to more than a year. The drawback is that the white powder on the surface is conductive and is giving a wrong riding.

The variation of the moisture in the walls is reflected in the readings, although moisture is only measured up to 4cm deep. For surface moisture electrical resistance meters are used that have two very sharp steel tips that push against the surface of the wall, penetrating a couple of mm into it. The advantage of this method is that it does not leave any signs in it and the walls can be read multiple times without time and aesthetic problems.



30.- MEASURE MOISTURE BY CAPACITIVE METHODS

Another method to measure the moisture in the walls that is based on measuring the dielectric losses that exist in the walls.

The sensor is basically a metallic ball that is supported on the wall and measures moisture up to 4cm deep.

It has the advantage that it does not leave signs on the wall and allows multiple readings in a little time, without the need for specialized technicians.

But of course, in thick walls we do not know the situation inside and the low resistance of the salt gives errors



31.- MEASURING THE MOISTURE WITH THERMOGRAPHIC CAMERAS

Thermographic cameras offer the best solution to measure the moisture in the walls, since they record the temperature of the walls with great precision, and consequently where the water accumulates and in what quantity. Until now, the thermal cameras cost at least € 1000 but devices that can be attached to an iPhone or Android that cost around € 300 have already appeared, and will be marketed this year by the Flir house, the Flirone model, and by Mu optics.



The coupling of captors to mobiles, or tablets, allows us in this case to have a thermal radiography of the walls, which greatly facilitates following the evolution of the drying of a wall, memorizing data that later we can pass to a PC for processing.



32.- CONCLUSION

The problem of moisture in the walls can be more complex than it seems at first glance, but if you know the mechanisms by which they originate, the solution is feasible without spending a fortune.

Obviously many of the solutions you can do yourself, but it is advisable to help a professional in the case of moisture condensation and leaks.

HUMITAT STOP offers to help you with any problem of moisture, and we can recommend good professionals in your area.



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