Acoustic Certification of buildings: fulfilling CasaClima Nature Protocol and Recent Italian classification of non-serial buildings

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Introduction

The CasaClima Nature protocol [1] in force since 2010 was modified in April 2012 introducing passive acoustic requirements for buildings which are stricter as compared to the National Act in force (DPCM 5/12/97 [2]). Moreover an extended on-site measurement of the results at work is also required.

Here follows the comparison with the recent national technical standard UNI 11444 [3] referring to methods for the acoustic classification of non-serial buildings.

We conclude proposing a method of analysis of both the project and the state of things at the construction site, allowing to satisfy both protocols in order to obtain double certification and maximize the client's comfort.

Present state of Things

DPCM 5/12/97

For the sake of brevity only the case of residential buildings will be discussed here. In Italy the DPCM 5 /12/ 97 is still in force, stating that sound isolation and service equipment noise limits should be respected by the end of construction.

According to this act no final inspection or field-measurement is compulsory, such control can be compelled by the regional and the local governments (but few do at the present time).

The above-mentioned act was the first national act passed referring to the subject under discussion. It has several limits (it is expressed in few pages), yet it has also given great technical impulse to the building trade in Italy in the last 15 years.

Unfortunately it has also been the cause for several civil lawsuits between buyers and builders. In 2008 and 2009 the Government tried to stop such lawsuits, yet, as the act is still effective, numerous civil disputes are still going on.

At the moment, if we refer to the rare field measurements, the choice is to go on with testing small samples (one or two rooms in the whole building). Yet most measurements only take place in the case of a contentious procedure.

UNI 11367 regulation

In 2010 a national standard was introduced (UNI 11367 [4]) in order to overcome the limits of the previous act (DPCM 5/12/ 97), but no legal value has been granted to it, yet.

Such regulation is important as it helps classify serial buildings from an acoustic point-of-view, it is based on extended field measurements and underlines clear protocols for the sampling of a building according to homogeneous groups of technical elements.

It also specifies two methods of measurements to check service equipment noise, while earlier methods were still disputed. A Lid parameter is now introduced for equipment of uneven use (ex. drainpipes, lifts, etc.) and a Lic parameter for equipment of even use (i.e. air conditioning, etc.).

The recent protocols

In the present article we shall give particular result to two recent technical protocols, which, in our view, are useful from a practical point-of-view because they are connected with actual measurements at the building yard and because they offer very practical indications to engineers preparing field measurements.

The UNI 11444 regulation was published in May 2012, it completes the previous UNI 11367, and offers clear norms to test and acoustically classify non-serial buildings. It follows technical limits and definitions already mentioned in UNI 11367 : 2010.

Such regulation is interesting because buildings, in Italy, are often small as well as complex, with flats quite different from one another (buyers like to make changes to the original project, even during construction).

As this new regulation is strictly connected with a selection of critical elements it allows the acoustic engineer to reduce the number of acoustic tests during field inspection if the goal is to obtain a minimum class.

We underline here that the two UNI standards we mentioned above are nowadays only technical regulations : they have not been enforced by an act yet, so they are classified as voluntary norms and, as such, they still haven't found much application yet. An updating of the national law has been expected for the last three years, but nothing has happened .

The CasaClima Nature protocol was developed during the year 2011 and became official in 2011. As from April 2012 passive acoustic requirements were introduced and improved. At the moment, approval for the introduction of the above protocol is being discussed by the Bolzano Province Self- Governing Body.

The approval would become a rule for the new buildings and for extension works of existing buildings in order to obtain cubature bonuses.

In the rest of the country this is still a voluntary technical protocol that can be followed to carry out plans and projects

that not only respect national acts but also have a low impact on natural resources and on man.

The protocol indicates the limits of acoustic isolation and equipment noise to be respected at the end of works and also obliges to measure what has been obtained following certain rules that will be analysed later.

Description	Index	DPCM 5/12/97	UNI 11367 UNI 11444 class III	Casaclima Nature versione 1.4
Facade insulation	D2m,nT,w	40	37	40
Airborne sound insulation	R'w	50	50	50
Impact sound insulation	L'nw	63	63	58
Even use equip. noise	LAeq (Lic)	35	(32)	(32)
Uneven use equip. noise	LASmax (Lid)	35	(37)	(35)

Table 1: Sound isolation and equipment noise limits

The CasaClima Nature protocol is the first acoustic regulation to be carried out in the Bolzano Autonomous province, it is a bridge between the national Act (that is then automatically respected and clarified) and the future.

The UNI 11444 regulation, later defined as UNI, is based on the building elements having the most critical technical characteristics and offers a clear method to identify them.

What in fact is proposed is to identify the different living units (apartments, terraced houses) with elements having greater chances of low acoustic requirements so as to classify them thoroughly and reach a definition of minimal acoustic class that can be extended to the building.

The CasaClima Nature protocol, later defined as Nature protocol, offers a more practical approach and the acoustic engineer is required to point out the living units that are more exposed to noise.

Such small technical requirement in fact includes all the UNI specifications on building elements check as it establishes to control the function of different areas and the external acoustic situation.

Both require a project of the field measurement campaign and allow to start by testing a small number of living units in the building : while the UNI regulation underlines that this is just a way to obtain a minimum class value (everything should be tested to obtain maximum certainty and maximum certification values) , the Nature protocol underlines that it is enough to overcome the limits in a good percentage of living units, particularly in the ones that are more exposed to noise.

Due to the different approach the UNI standard allows for a 10% sampling of the living units to be actually tested, while the Nature protocol requires the 20%.

Analysis of differences

Approaches to the project of measurement campaign are different : in the case of the UNI standards we must refer only to the technical characteristics of the building (its stratigraphy, geometrical dimensions, technologies – a departure from the existing rules is only allowed for attics). In the Nature protocol instead it is useful to start considering the project from the same analysis as above , without leaving out the external acoustic environment of the building, as well as the function of the rooms close to those that are being tested (i.e. trade centers, shops, bars, offices, common areas with continuous passage of people).

Even if, at a first reading, the Casa- Clima Nature protocol requirements seem to be short they can actually be described as a set including all the technical obligations to be found in the recent UNI 11444 regulation.

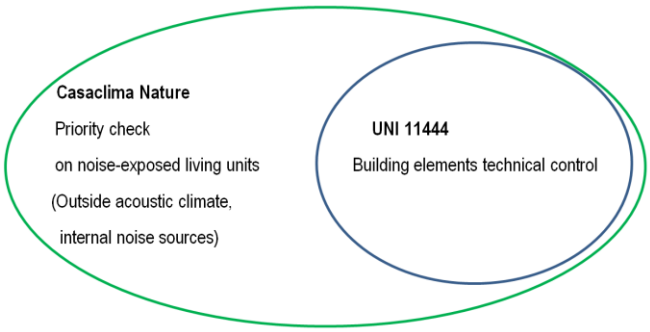

Figure 1: Casaclima Nature protocol is a set including UNI 11444

A project of the field-measurement campaign is always needed. It must refer to the location plan and follow an on-the-spot investigation. The final test report will motivate the choices made by the acoustic engineer. The points of contact and differences are here listed in order to reach a synthesis.

Analysis of Façade insulation

According to the Nature protocol all technical characteristics of outside walls must be checked, as required by the UNI regulation, but façade walls that are most exposed to outside noises must be checked and chosen when tests are made (an outside wall facing a wood will not probably suffer from noise problems while a wall facing a square or a noisy street will).

The Nature protocol always requires to check the master bedrooms (giving priority to rooms for sleeping). And this is also the only requirement in one-family buildings.

Both the protocols require to control the roof if the attic has living units, this is the only case where the UNI standard specifies information about the external acoustic situation: it wisely requires to test the roof facade only if there are sound sources above the roof level.

Analysis of wall and floor insulation

Together with monitoring all the technical aspects of the different elements in the building, as listed in the UNI regulation, the worst conditions of exposure shall be pointed out in order to satisfy the CasaClima Nature protocol criteria. They are :

- living units having bedrooms exposed to several service equipment and living rooms;

- living units exposed to common rooms or trade centres (i.e. shop, bars, area with heavy transit of people, etc.), if they are present in the building.

The UNI norms require to test partitions dividing from common rooms, this is useful if these spaces are large enough to allow measurements and if they are actually used.

Analysis of impact sound insulation

The Nature protocol imposes strict limits for the impact sound insulation as it requires that Lnw be equal to 58 dB which is near to class II of the UNI regulation. We underline that in both cases a control of the lateral sound-treading between different house-units is required.

In the project analysis we shall follow the technical requirements to be found in the UNI regulation and priority will be given to master bedrooms and living units near trade centers, offices, common areas with heavy transit of people.

Analysis of service equipment noise.

Together with checking the technical aspects of the elements present in the building, listed in the UNI regulation, in order to satisfy also the criteria in the Nature protocol, the worst conditions of exposure shall be pointed out : these are living units having bedrooms exposed to several service equipment or near technical rooms.

Project of the field-measurement campaign.

The field-measurement target selection becomes primary and must be discussed and well explained in the final technical report describing the results.

We underline that if the obligations required by the CasaClima Nature project are respected this fact allows a control of the UNI 11444 protocol, but not the opposite. In any case it is recommended a control of the construction phases to ensure best practices.

The suggestions that can be given here to the acoustic engineer in order to satisfy both protocols and maximize the final comfort of the inhabitants are:

- Surveying the building site in order to compare the project with the state- of-things.(Taking photos in case of dissimilarities, critical points).

- Separating living unit groups that were built with different technologies (i.e. floors in masonry from floors in wood based technologies), treat each group as if it were a different building.

- An analysis of the acoustic provisional project immediately checking the elements that can be actually tested in the building-plan (applicability limits within the technical norms).

- Using four different colours for the most important parameters to identify the construction elements to be measured (fixtures can be put together).

- Underlining the most critical aspects in the building following UNI 11444 suggestions (ex. outside walls with many windows).

- Pointing out receiving rooms in the building plan : underlining where master bedrooms are and excluding bathrooms, accessory areas like corridors, rooms smaller than 9 m^2.

- Pointing out all the different sources of internal noises (technical and noisy rooms, living rooms close to bedrooms) as well as external ones.

- Pointing out the worst rooms and the worst living-unit: these will be the first to be considered and it will be the reference for classification with UNI 11444.

- Selecting at least 20% of the living units.

- Defining which elements are to be checked and, if possible, minimizing the receiving rooms (in order to diminish measurements of reverberating and finish testing the largest number of elements in the worst living units).

References

[1] Protocollo CasaClima Nature v 1.4

[2] DPCM 5/12/97 - Determinazione dei requisiti acustici passivi degli edifici.

[3] UNI 11444:2012 – Building acoustics – Acoustic classification of building units – Guidelines for the selection of building units in not serial building systems

[4] UNI 11367:2010– Building acoustics – Acoustic classification of building units – Evaluation procedure and in situ measurements