Teachers Training Course

Co4 Health

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Project Coordination

BGZ Berliner Gesellschaft für internationale Zusammenarbeit mbH

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Building blocks for teacher qualification

(I) Module 1. Building biology

This module covers…

1. Title	**Building biology**
2. Brief description	***The 'Building Biology' module provides participants with basic knowledge about healthy building.*** What building biology is and how it affects buildings and the health of their users.
3. Target groups and **Requirements for participants**	**Target group:** Teachers at vocational schools or training centres for construction trades, construction engineering, construction planning or system planning. **Prerequisites:** Teachers should already have experience and knowledge in the fields of building construction, building physics and the principles of sustainable construction. Participation in the other 'Healthy Building' modules is recommended, but is not a mandatory prerequisite for the other modules.
4. Duration of the module	Length of the learning unit is 90 Minutes as well as 6 hours of independent study to consolidate the knowledge and skills acquired (Videos/Online-Documents; Studies, etc.)
5. Competencies to be taught and acquired	**Participants…** ...are able to explain the difference between ecological and healthy building ...can assess the influence of structural parameters on healthy living ...are able to impart specific knowledge ...select materials and adapt them for student tasks ...are able to develop small training modules and prepare them methodically/didactically **Result of the module**: At the end of the basic course, all participants will be able to develop/create their own simple learning programmes on the subject of building biology for training courses.

6. Organisation & structure of the modules, **speaker** **proposed schedule**	**The basic module** can serve as training for beginners or as further training for teachers. It can be conducted either by a colleague from the education centre or by an external construction expert (e.g. from a construction company that practises healthy building). To facilitate the teaching of the didactic and methodological aspects and their implementation, it is recommended that an educational specialist be assigned to assist the external expert. Organisational structure: The following structure is recommended for the 90-minute learning unit: **Part 1 – General introduction**: overview of course content, formulation of objectives, discussion of course materials **Part 2 – Introduction to the topic** (scope depending on participants' prior knowledge) **Part 3 – Practical examples**, e.g. excursion to a building constructed in accordance with building biology principles (additional time should be allocated for this) or, if time does not permit, practical examples using short films and/or photos of building components in accordance with building biology guidelines. **Part 4 – Development of initial project ideas** for the training programme (different levels or focal points)
7. Content topics/ methodology	Basics for understanding the topic • What is a healthy building? • What is building biology? • Influence of building biology on the quality of buildings and the health of users • The Building Biology Agenda 2025 • *25 building biology guidelines* How can trainees and students be qualified or trained? Learning script, work in small groups, digital communication with lecturers, playful learning assessment (quiz), knowledge transfer with the help of learning videos, tour of a building (building biology assessment of individual building component aspects)
8. Certification, if applicable	Not provided; a certificate of attendance can be issued by the management of the training centre/school/lecturer.

Building blocks for teacher qualification:

(II) Module 2. Moisture comfort

This module covers ….

1. Title	Moisture comfort
2. Short description	The 'Moisture comfort' module provides participants with basic knowledge about moisture comfort and what does it contain.
3. Target group Requirements for Participants+	**Target group:** Teachers at vocational schools or training centres for construction trades, construction engineering, construction planning or system planning. **Prerequisites:** Teachers should already have experience and knowledge in the fields of building construction and building physics. Participation in the building blocks in advance is recommended, but not a mandatory prerequisite for the other modules/building blocks.
4. Duration of the module	Duration of the learning unit: 90 minutes plus 6 hours of independent study to consolidate the knowledge and skills acquired (videos/online documents; studies, etc.)
5. Competencies to be taught and acquired	**Participants...** ... are able to explain how indoor humidity affects buildings and people … knows how to control indoor humidity ... knows the sources of moisture during construction and during the use of the building and how to prevent them ... identify the most common moisture damage in various building materials ... knows the importance of working responsibly ... are able to develop small training modules and prepare them methodically/didactically **Result of the module**: At the end of the basic course, all participants are able to develop/create their own simple learning programmes on the subject of moisture comfort for training courses.
6. Organisation & structure of the module, speaker	**The basic module** can serve as training for beginners or further training for teachers. **The further training** will be conducted either by a colleague from the education centre or by a speaker from a construction company that practises healthy building.

Proposed schedule	However, in-house course management would be advisable, as the orientation and focus, also with regard to didactic and methodological aspects, would be easier to communicate and implement. **Organisational form:** The following structure is recommended for the 90-minute learning unit: **Part 1 - General introduction**: Overview of course content, formulation of objectives, discussion of course materials **Part 2 - Introduction to the issue** (scope depends on the prior knowledge) **Part 3 – Practical examples using** short films and/or photos on the topic under discussion **Part 4 - Development of initial project ideas** for the training programme (different levels or focal points)
7. Subject content / methodology	Basics for understanding the topic • Influence of moisture comfort on the quality of buildings and the health of users • damages caused by moisture sources • Humidity • Moisture sources How can trainees and students be qualified or trained? Learning script, work in small groups, digital communication with lecturers, playful learning assessment (quiz), knowledge transfer with the help of learning videos
8. Certification, if applicable	Not provided; certificate of attendance can be issued by the management of the training centre/school/lecturer

Building blocks for teacher qualification:

(III) Module 3. Thermal comfort

This module covers ….

1. Title	Thermal comfort
2. Short description	The module "Thermal Comfort in Buildings" provides participants with knowledge about how indoor thermal conditions affect human well-being, productivity, and health. It covers definitions of thermal comfort, influencing factors, and practical solutions in the construction field.
3. Target group Requirements for Participants	**Target Group**: Vocational teachers in construction, especially those teaching building physics, indoor climate, or construction technology. **Requirements**: Basic knowledge of building physics and indoor air quality. Prior participation in the sustainable construction module is recommended.
4. Duration of the module	Learning unit duration: 90minutes + 2 hours of self-study (articles, videos, simulations, calculation exercises)
5. Competencies to be taught and acquired	**Participants...** - Understand the basic concepts of thermal comfort (e.g., PMV/PPD indices) - Identify key factors affecting thermal comfort: temperature, humidity, air movement, radiant heat - Evaluate the impact of materials and technical solutions on thermal comfort - Apply thermal comfort principles in teaching and student projects, and develop teaching materials on thermal comfort **Result of the module**: At the end of the basic course, all participants are able to develop/create their own simple healthy building learning opportunities for training.
6. Organisation & structure of the module, speaker **Proposed schedule**	The basic module can serve as training for beginners or further training for teachers. The further training will be conducted either by a colleague from the education centre or by a speaker from a construction company that practises sustainable building.

	However, in-house course management would be advisable, as the orientation and focus, also with regard to didactic and methodological aspects, would be easier to communicate and implement. **Organisational structure: Structure of 90min learning unit** - **Part 1: Introduction to the concept** of thermal comfort - **Part 2: Theoretical background** – PMV/PPD, Fanger's model, standards (e.g., EN ISO 7730) - **Part 3: Practical examples** – thermal imaging, measurements, simulations - **Part 4: Designing learning tasks** – how to integrate thermal comfort into teaching
7. Subject content / methodology	**Key topics** - Air temperature, humidity, air movement, radiant temperature - Influence of clothing and activity level - Impact of building solutions on thermal comfort - Energy efficiency and thermal comfort - Definition of thermal comfort (ISO 7730) - PMV and PPD indices **Learning methods** - Learning scripts and diagrams - Small group discussions - Digital simulations (e.g., thermal environment modeling) - Video examples and case studies - Site visit or virtual tour of a building
8. Certification, if applicable	Not provided; a certificate of attendance can be issued by the management of the training centre/school/lecturer.

Building blocks for teacher qualification:

(IV) Module 4. Volatile Organic Compounds (VOC)

This module covers ….

1. Title	Volatile Organic Compound (VOC)
2. Short description	This session provides construction teachers with up-to-date knowledge on Volatile Organic Compounds (VOC), their sources in construction materials, and their effects on human health and indoor air quality. Participants will explore strategies to minimize VOC exposure in both construction practice and teaching.
3. Target group Requirements for Participants+	**Target group:** Teachers at vocational schools or training centres for construction trades, construction engineering, construction planning or system planning **Prerequisites:** Participants should already have a basic understanding of building materials, indoor climate, and occupational health and safety issues. Participation in the building blocks in advance is recommended, but not a mandatory prerequisite for the other modules/building blocks.
4. Duration of the module	Duration of the learning unit: 45 minutes plus 1 hour of independent study to consolidate the knowledge and skills acquired (videos/online documents; studies, etc
5. Competencies to be taught and acquired	After completing the session, participants will be able to: ... explain what Volatile Organic Compounds (VOC) are and identify common sources in construction ... understand the short- and long-term health impacts of VOC exposure ... recognize how construction material choices affect indoor air quality … select and recommend low-emission materials for teaching examples … integrate the topic of VOC and healthy indoor environments into teaching practice ... are able to develop small training modules and prepare them methodically/didactically **Result of the module**: At the end of the basic course, all participants are able to develop/create their own simple Volatile Organic Compound learning opportunities for training.
6. Organisation & structure of the module,	The basic module can serve as training for beginners or further training for teachers.

speaker **Proposed schedule**	The further training will be conducted either by a colleague from the education centre or by a speaker from a construction company that practises healthy building materials. However, in-house course management would be advisable, as the orientation and focus, also with regard to didactic and methodological aspects, would be easier to communicate and implement. **Organisational form:** The following structure is recommended for the 45-minute learning unit: **Part 1 - General introduction**: Overview of course content, formulation of objectives, discussion of course materials **Part 2 - Introduction to the issue** (scope depends on the prior knowledge). VOC definition, sources and effect on human health **Part 3 – Practical examples** using short films and/or photos on the topic under discussion. Review of M1-labeled materials and low-emission alternatives. **Part 4 - Development of initial project ideas** for the training programme (different levels or focal points)
7. Subject content / methodology	• Definiton and classification on VOC • Common VOC compounds and sources in construction materials • Health impacts: short- and long-term effects • Emission classes and labelling (e.g., M1, EU Ecolabel • Strategies to reduce VOC emissions: material selection, ventilation, education • How can trainees and students be qualified or trained? Learning script, work in small groups, digital communication with lecturers, real-life examples playful learning assessment (quiz)
8. Certification, if applicable	Not provided; certificate of attendance can be issued by the management of the training centre/school/lecturer

Building Blocks for teacher qualification:
(V) Module 5. Electrosmog

This module covers…

1. Title	Electrosmog
2. Short description	The 'Electrosmog' module provides participants with knowledge about how electrosmog is generated, how it affects building users, and what effects it has on their health.
3. Target group Requirements for Participants	**Target group:** Teachers at vocational schools or training centres for construction trades, construction engineering, construction planning or system planning. **Prerequisites:** Teachers should already have experience and knowledge in the field of building construction, building physics and basic knowledge of electrical engineering. Participation in the other modules is recommended, but is not a mandatory prerequisite for the other modules.
4. Duration of the module	Duration of the learning unit: 90 minutes plus 6 hours of independent study to consolidate the knowledge and skills acquired (videos/online documents; studies, etc.)
5. Competencies to be taught and acquired	**Participants...** ...are able to identify the health effects of electrosmog on building users ...know the difference between electric fields, waves and electric radiation ...acquire knowledge about possible measures to reduce radiation ...are able to impart specific knowledge on the subject of electro smog ...select material and adapt it for student assignments ...are able to develop small training modules and prepare them methodically/didactically **Results of the module:** At the end of the basic course, all participants will be able to develop/create their own simple learning materials on the topic of electrosmog in buildings for training purposes.

6. Organisation & structure of the module, **Speaker** **Proposed schedule**	The basic module can serve as training for beginners or as further training for teachers. It can be conducted either by a colleague from the education centre or by an external construction expert (e.g. from a construction company that practises sustainable construction). To facilitate the teaching of the didactic and methodological aspects and their implementation, it is recommended that an educational specialist be assigned to assist the external expert. **Organisational structure:** The following structure is recommended for the 90-minute learning unit: **Part 1 – General introduction**: overview of course content, formulation of objectives, discussion of course materials **Part 2 – Introduction to the topic** (scope depending on participants' prior knowledge) **Part 3 – Practical examples**, e.g. excursion to a sustainably constructed building (additional time should be allowed for this) or, if time does not permit, practical examples using short films and/or photos of construction situations in sustainably constructed buildings. **Part 4 – Development of initial project ideas** for the training programme (different levels or focal points)
7. Subject content / methodology	Basics for understanding the topic What is electrosmog? • Causes and definition • Effects on health • Measures for reduction How can trainees and students be qualified or trained? Learning script, work in small groups, digital communication with lecturers (review, collection of problem areas, etc.), playful learning assessment (quiz), knowledge transfer with the help of learning videos, tour of a building with exemplary learning situations on the topic of electrosmog
8. Certification, if applicable	Not provided; a certificate of attendance can be issued by the management of the training centre/school/lecturer.

Building blocks for teacher qualification:
(VI) Module 6. Ventilation System (Air & Heating)

This module covers …

1. Title	Ventilation System (Air & Heating)
2. Short description	The "Ventilation System" module provides participants with basic knowledge about the correct microclimate in the home, which is essential for people's health and wellbeing.
3. Target group **Requirements for** **Participants+**	**Target group:** Teachers in a department or subject area at a vocational training centre for construction trades, construction technology, construction planning or system planning. **Prerequisites:** Teachers should already have experience and knowledge in using the thermal cycle, heat pump efficiency and types, types of air conditioning. Participation in the building blocks in advance is recommended, but not a mandatory prerequisite for the other modules/building blocks.
4. Duration of the module	Duration of the learning unit: 90 minutes plus 2 hours of independent study to consolidate the knowledge and skills acquired (videos/online documents; studies, etc.)
5. Competencies to be taught and acquired	**Participants**... ... are able to explain how the different types of ventilation system affect buildings and people … knows how to control the temperature and comfort ... knows the sources of moisture during construction and during the use of the building and how to prevent them ... identify the most common equipment for ventilation used in various building ... knows the importance of working responsibly ... are able to develop small training modules and prepare them methodically/didactically **Result of the module**: At the end of the basic course, all participants are able to develop/create their own simple healthy building learning opportunities for training.
6. Organisation & structure of the module, **speaker** **Proposed schedule**	The basic module can serve as training for beginners or further training for teachers. The further training will be conducted either by a colleague from the education centre or by a speaker from a construction company that practises sustainable building. However, in-house course management would be advisable, as the orientation and focus, also with regard to didactic and methodological aspects, would be easier to communicate and implement. **Organisational form:** The following structure is recommended for the 90-minute learning unit:

	Part 1 - General introduction: Overview of course content, formulation of objectives, discussion of course materials **Part 2 - Introduction to the issue** (scope depends on the prior knowledge) **Part 3 – Practical examples** using short films and/or photos on the topic under discussion **Part 4 - Development of initial project ideas** for the training programme (different levels or focal points)
7. Subject content / methodology	Basics for understanding the topic • Influence of ventilation systems on the quality of buildings and the health of users • damages caused by wrong sources • quality of the air • How can trainees and students be qualified or trained? Learning script, work in small groups, digital communication with lecturers, playful learning assessment (quiz), knowledge transfer with the help of learning videos
8. Certification, if applicable	Not provided, *certificate of attendance*, can be issued by the management of the training centre.

Additional Content:

THE CONCEPT OF WELL-BEING

The correct domestic microclimate is essential for people's health and well-being, and the best technique to achieve it is air conditioning, which allows you to regulate the temperature, ventilation and humidity within a room, unlike heating which simply increases the winter temperature in the rooms.

The feeling of well-being depends not only on the temperature, but also on the degree of relative humidity of the air, the movement of air in the room and the temperature of the walls that surround it.

In general, the following are considered average values of optimal well-being:

■ air temperature of 20 °C;

■ relative humidity of 40-60%;

■ Air velocity of 0.1-0.2 m/s;

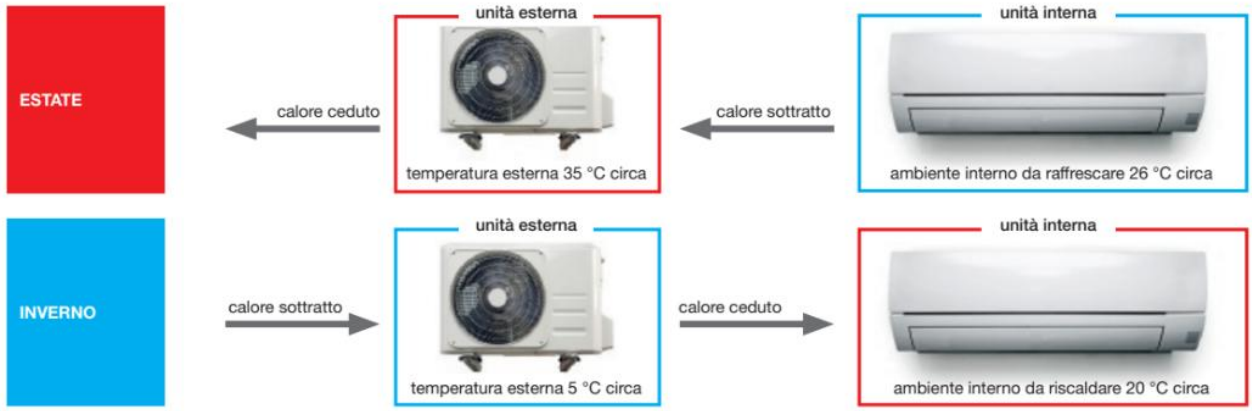
■ Wall temperature of 15-20 °C.

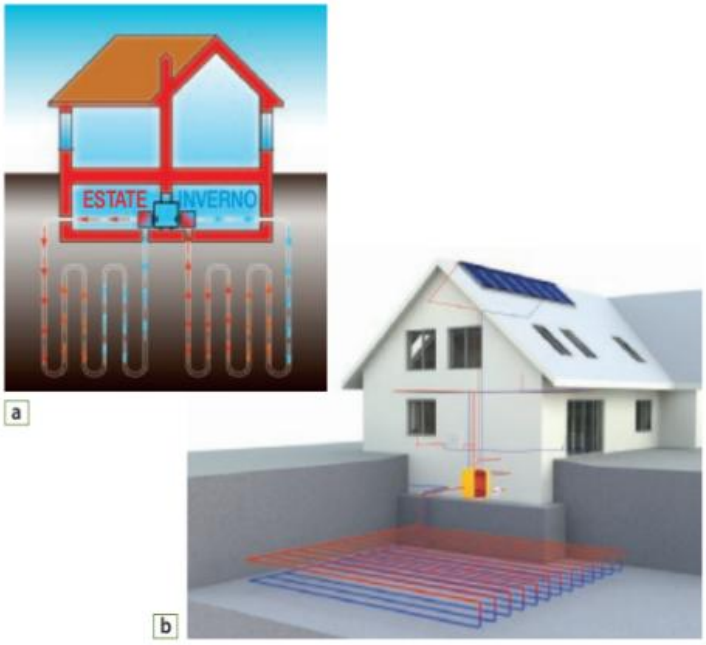
However, it is difficult to determine which environmental conditions correspond to a feeling of well-being, because the feeling of well-being is subjective.

HEAT PUMP

Before delving into the description of modern systems that adapt the microclimate of the rooms to the needs of people's well-being, it is good to introduce and understand how the heat pump works, which is a very cheap heat generator, now commonly used in all types of heating systems. The heat pump is a machine comparable to a refrigerator that works in reverse, because instead of cooling by subtracting heat, it transforms a cold source into heat, passing a refrigerating fluid, composed of chemical mixtures of various types, from the vapor state to the liquid state with low electricity consumption.

The transformation process is called thermal cycle and can also take place in the opposite direction, considering the internal environment as a cold source and transferring the heat to the outside: in this case the heat pump is called a reversible cycle and, thanks to its double ability to supply or withdraw heat, it is of great importance because it allows you to create integral air conditioning systems.





Types of heat pumps

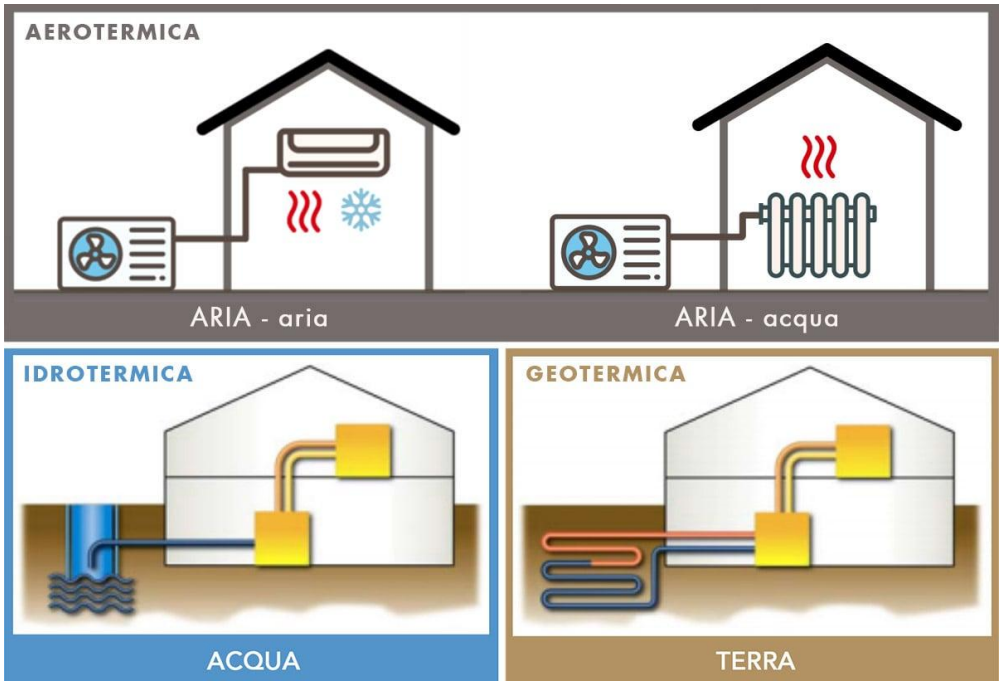
Depending on the cold source you use and the fluid you get at the end of the thermal cycle, heat pumps can be air-to-air, air-to-water, water-to-water, or ground-to-water.

■ The air-to-air heat pump, or direct expansion heat pump, is used in normal air conditioners. The air taken from the cold source is fed into an outdoor unit that acts as a compressor, heats it and transmits it to the air terminals (split).

■ The air-to-water heat pump transforms the air taken from the cold source into hot water and transmits it to the supply terminals of heating systems or domestic hot water. It is often equipped with a small electrical heating element to speed up the air heating process (hybrid heat pump).

■ The water-to-water heat pump uses water drawn from a mass of water (aquifer, river or lake) and is more efficient than those that draw heat energy from the air. However, its installation is expensive and the availability of an aquifer is not always possible.

■ The ground-to-water heat pump draws thermal energy from the ground, but it has significant installation costs and it is not always possible to easily access geothermal sources.



Thermal Cycle Phases and Heat Pump Efficiency

The heat pump is basically made up of four devices through which the refrigerant fluid passes from the liquid state to the vapor state and vice versa, consuming only the electricity necessary for the compression phase.

The four devices are:

■ the evaporator, which transforms the refrigerant fluid into low-pressure steam;

■ the compressor, which heats the steam by compressing it and transferring it to the condenser;

■the condenser, which allows the condensation of the fluid, which releases the heat acquired with the compression phase into the environment;

■ the expansion (or lamination) valve, which brings the fluid back to low pressure and conveys it to the evaporator, restarting the cycle.

Heat pump efficiency

The efficiency of a heat pump depends essentially on four factors:

■ the type of refrigerant used;

■ the system for transferring thermal energy from the cold source to the pump;

■ the climatic conditions of the environment from which the refrigerant is taken;

■ energy losses from the thermal cycle.

AIR CONDITIONING SYSTEMS

Air conditioning systems are the most complete form of control of the environmental microclimate in all seasons. Especially if powered by a reversible cycle heat pump, like all those on the market, and even more so if you have renewable sources of electricity (photovoltaic). These systems are economically competitive compared to traditional heating, particularly in the "mid-seasons".

The terms "air conditioning system" and "air conditioning system" are often considered synonymous, but in reality they refer to systems with different characteristics.

■ The air conditioning system has only the function of introducing fresh (or hot) air through a fan, affecting humidity only indirectly, and is mainly used in industrial environments.

■ The air conditioning system, on the other hand, in addition to regulating the temperature, also modifies the humidity of the environment and is the one used in residential buildings.

Both types of systems are equipped with filters to eliminate bacteria and impurities in the air and most of them have a reversible cycle heat pump. Household appliances on the market are often improperly called air conditioners, but in reality this term only indicates those that are integrated with an air exchange device, called **CMV** (controlled mechanical ventilation).

The choice of the type of system to be installed in residential buildings sometimes depends on many factors, including:

■ the requirements of regional regulations, which may limit the use of autonomous systems to small buildings or not grant concessions to the transformation of centralized systems into autonomous systems;

■ the constraints of the condominium regulations, which may prohibit detachment from the centralized condominium system;

■ practical considerations, such as difficulties in setting up individual dwellings or economic (purchase, installation, maintenance costs, etc.).

The standards require that all systems be installed by companies able to issue a certificate of conformity and that those centralized, or serving particular environments, are sized by qualified technicians according to the volume of air to be treated, the thermal load and many other factors, such as heat loss, solar gains, number of people, electrical loads, lighting type and so on.

The standards require that all systems be installed by companies capable of issuing a certificate of conformity and that centralized systems are sized by qualified technicians according to the volume of air to be treated, the thermal load and many other factors, such as heat loss, solar gains, number of people, electrical loads, type of lighting

CENTRALIZED AIR CONDITIONING SYSTEMS

Centralized air conditioning systems serve entire buildings and can be air or refrigerant When these systems are able to deliver hot or cold air, depending on the season, they are called integral systems.

Integral centralized systems are essentially composed of:

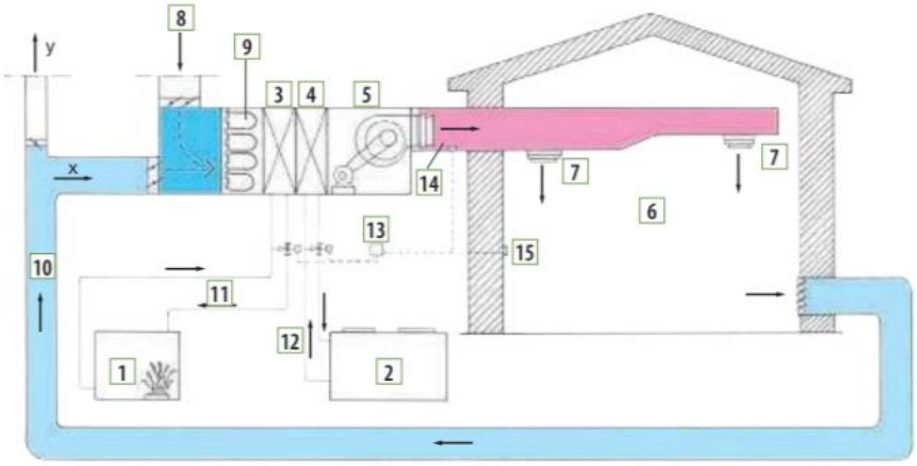
■ boiler , which heats the air in the winter seasons and which is often supplemented or replaced by a heat pump. For summer post-heating, necessary to bring the temperature to the values suitable for transfer to the environment, it is used with a small hot water coil;

■ refrigeration unit (or chiller), for summer cooling;

■ air coil, which includes filters, humidifier and fans to push and suck in air;

■ exchange, heating and cooling coils, powered by hot or cold water depending on the season;

■ Properly insulated ducts or pipes that convey air or refrigerant to the dispensing terminals.



1 caldaia
2 refrigeratore
3 batteria riscaldante
4 batteria refrigerante
5 ventilatore
6 ambiente
7 diffusore
8 aria esterna
9 filtri
10 aria ripresa, che viene in parte espulsa (*y*) e in parte ricircolata (*x*)
11 acqua calda
12 acqua refrigerata
13 centralina di controllo
14 sonda sul canale
15 termostato ambiente

FAN COIL UNIT (FAN COIL)

A popular air dispenser in the air conditioning system is the fan coil, better known as a fan coil. It is an apparatus in which the air, pushed by a

passes through a coil in which water flows, which can be hot for winter heating or cold for summer cooling and which is then introduced into the room through adjustable fins arranged in the upper part of the appliance. It can be two-pipe or four-pipe: in the two-pipe fan coil unit, the water travels the same circuit in winter and summer, while in the four-pipe fan coil there are two separate circuits for winter and summer operation

Distribution channels

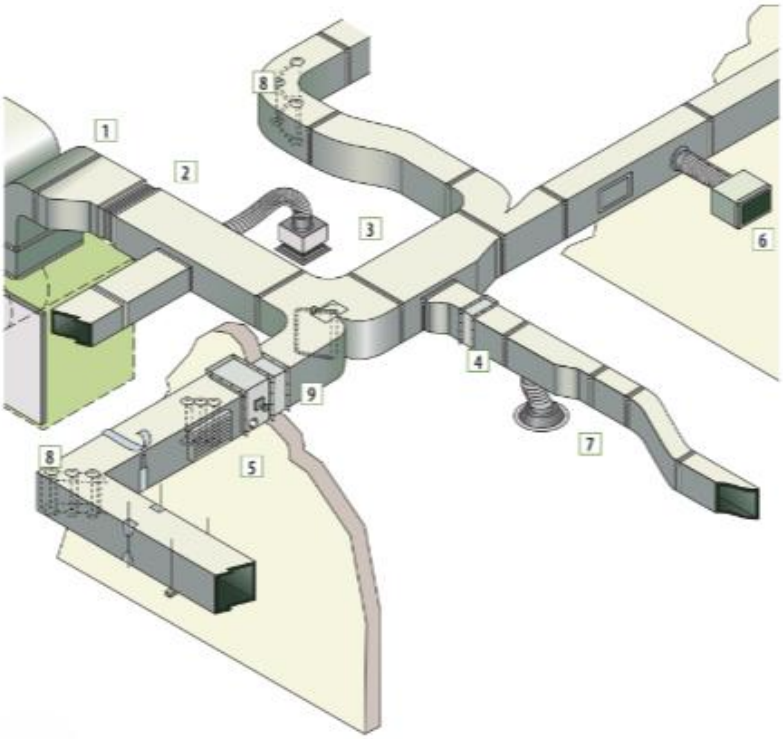
The air brought to the desired temperature (hot or cold) travels through a network of channels joined together with bayonet connections or flanges, which are generally made of 8/12 mm thick galvanized steel sheet and sized according to the flow rate and speed of the air.

The latter must not exceed 6÷7 m/s and be reduced in the rooms to no more than 2÷3 m/s. The ideal shape of the channels is circular but often the rectangular one is preferred, more practical and economical, with a ratio between the sides not exceeding 1/4 to avoid the formation of vortices between the fluid threads (lamination).

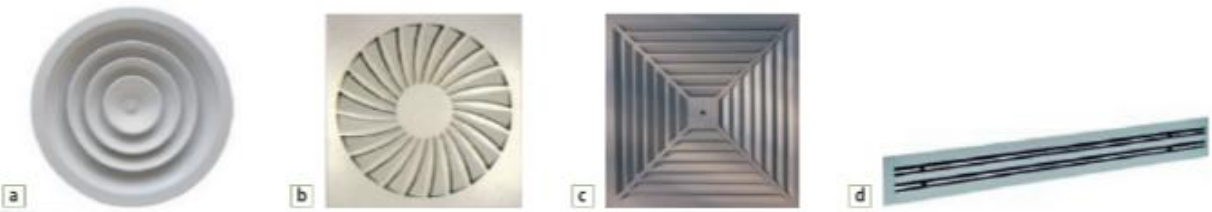
The air coming from the ducts is introduced (or extracted) from the rooms through vents or by means of diffusers, also called anemostats.

The air temperature at the time of entering the room should be between 35 and 45 °C in winter and between 15 and 20 °C in summer, because lower temperatures would produce annoying cold sensations. The vents are installed on the vertical side of the ducts and the most common are grille, used above all for air intake, with fixed or adjustable fins. To facilitate adjustment, they can be equipped with calibration dampers.

Speakers commonly used in housing are those installed in the suspended ceiling and can be circular, square or linear. Linear ones are the most suitable for ceiling distribution along continuous lines (e.g. along corridors) but the choice often depends on aesthetic or practical considerations. Some speakers also have adjustable cones



Canali di distribuzione dell'aria in un impianto di condizionamento.



Tipi di diffusori: circolare (*a*), quadrato elicoidale (*b*), quadrato (*c*) e lineare (*d*).

AUTONOMOUS AIR CONDITIONING SYSTEMS

Stand-alone air conditioning systems serve a few rooms or a single dwelling and can be compact or have separate units.

Compact stand-alone air conditioners are contained in a single device installed in a room and are mainly used where it is forbidden or difficult to place the part containing the compressor, which is the noisy element of air conditioning systems, on a balcony or hanging from the masonry.

Compared to air conditioners with separate units, these are penalized above all by three negative characteristics:

■ they must necessarily be installed against an external wall in which holes must be drilled;

■ they are noisier, even if newer models reduce noise levels to acceptable values;

■ generally air condition only one room, with the exception of some models that also air condition the adjoining room.

Stand-alone air conditioners with distinct units consist of an outdoor unit that contains the compressor and one or more indoor units (splits) that can serve different rooms.

The outdoor unit is connected to the splits by copper pipes that transfer the refrigerant fluid and must be carefully insulated to prevent condensation from forming.

CONTROLLED MECHANICAL VENTILATION

The advantages of ventilation

Ventilation, whether natural or mechanical, achieves the exchange of air in confined spaces. Through ventilation it is possible to keep parameters such as air temperature, relative humidity, and pollutant concentration under control. The sizing of the ventilation system must be carried out in such a way as to meet the conditions of well-being for the occupants of the confined space. It therefore emerges that ventilation and well-being conditions are closely linked. Modern technologies allow the creation of increasingly thermally insulated environments, with solutions that effectively make buildings watertight containers. In this way, without appropriate air renewal, confined spaces would be unlivable due to the lack of indoor air quality requirements. With the increase in air pollution in cities, the simple operation of opening the windows is unreliable from the point of view of correct air exchange, as there is no control of the amount of air exchanged or the concentration of pollutants present in the environment. It is therefore often useful to use special air exchange systems

Natural ventilation

The natural ventilation of buildings is achieved through openings in the building envelope: chimneys, windows or roof openings, exploiting the chimney effect, temperature and pressure differences, differentiated solar radiation, the presence of other aspirants or ventilation towers. In old buildings, infiltrations through the fixtures guaranteed to some extent a change of internal air, while in new buildings, to reduce heat loss to the outside, the introduction of more efficient fixtures means that infiltrations are very limited. The most common system consists of opening the windows; The effectiveness is greater if the windows are placed on opposite sides of the room. It can take just a few minutes to change the air.

Detriments:

- lack of control of the air flow rate,
- lack of control over the quality of fresh air (possible presence of pollutants),
- possible increase in noise in the environment,

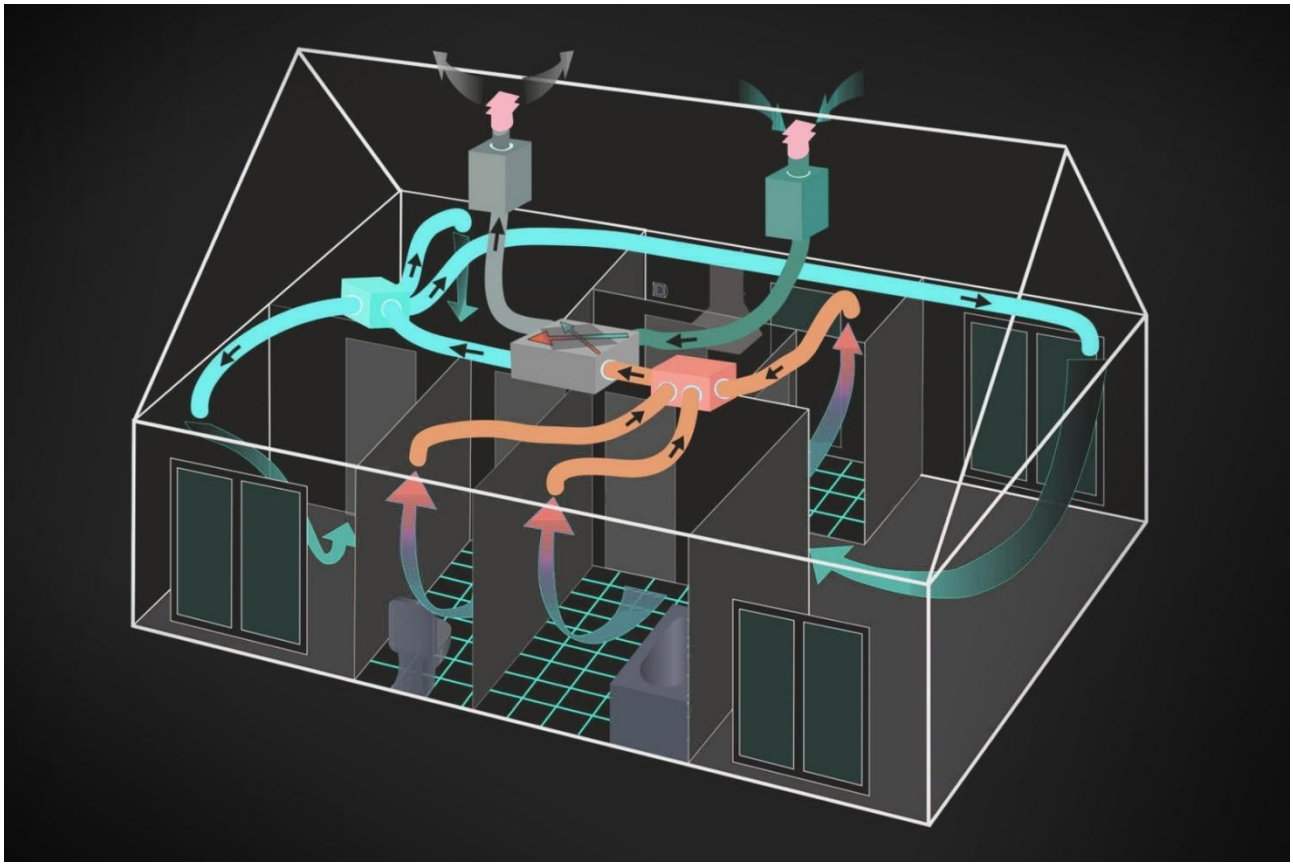
- possible discomfort caused by drafts,
- the need for integrated design,
- little versatility,
- loss of energy in the cold season,
- Intake of air that is too hot in summer or too cold in winter

MECHANICAL VENTILATION

To overcome the lack of flow control, a disadvantage inherent in natural ventilation, it is possible to design a mechanical ventilation system that guarantees the correct air exchange in the rooms. In these systems, the air flow is guaranteed through the use of one or more fans. We can distinguish between systems without or with ducts. The former consist of placing one or more fans on the wall or ceiling. In the simplest case, we will have one or more extraction fans and a series of openings that allow the flow of air into the room. The openings can be replaced by intake fans, usually positioned on opposite walls to the extraction ones. Plants of this type are often built in industrial environments. Sometimes it is not possible to place fans on a wall: in these cases, ducts are used that convey the air to the inlet or return terminals. In residential and commercial settings, the preference goes towards ducted systems that have the advantage of having the fan in a remote position, with advantages in terms of silence in the rooms. A mechanical ventilation system allows the following advantages:

- calibrated dosages of fresh air
- control of air currents,
- absence of external noise and limitation of internal noise,
- control of indoor air quality,
- containment of heat loss,
- possibility of energy recovery through heat exchangers,
- minimization of technical shafts.

There are two types of Controlled Mechanical Ventilation: single flow and double flow.



SIMPLE FLOW

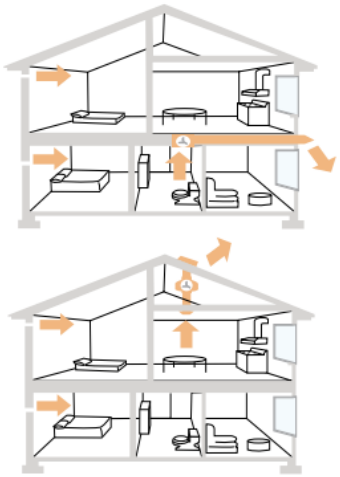
Systems of this type extract air from the environment and convey it outside through ducts of various lengths. The fan is usually located in a remote position from the environment. The shooting is carried out through special slits positioned on the perimeter walls or on the fixtures. In residential settings, suction usually takes place in "humid" environments (kitchen, bathrooms, laundries...) while the intake takes place in the living room and bedrooms. In administrative buildings, the intake takes place in the offices and the extraction from the corridors through grids placed on the ceiling and connected to the expulsion duct; The duct can be brought to the roof where the fans are normally located.

Advantages:

- air flow control,
- possibility of integration with natural ventilation,
- independence from inconstant weather phenomena or random behavior of the occupants,
- adaptability to seasonal climatic conditions,
- limitation of noise in the environment,
- control of the air speed in the room

Detriments:

- cost of the installation and its management,
- impossibility of controlling the quality of fresh air,
- loss of energy in the cold season,
- Too hot air enters in summer.



DUAL FLOW

A double flow system mechanically provides both the supply and return of air in the room. Extraction takes place as described for a single-flow plant. The intake is also carried out through ducts and vents, with a circuit separate from the previous one. The fresh air is pushed by a fan along the duct and is distributed into the room by diffusers. The air flows in and out are coordinated by a regulation system. In more complex systems, fresh air can be treated before it is released into the room, i.e. filtered, cooled or heated, humidified or dehumidified. Finally, with dual-flow systems, it is also possible to recover energy from the exhaust air through the heat recovery units.

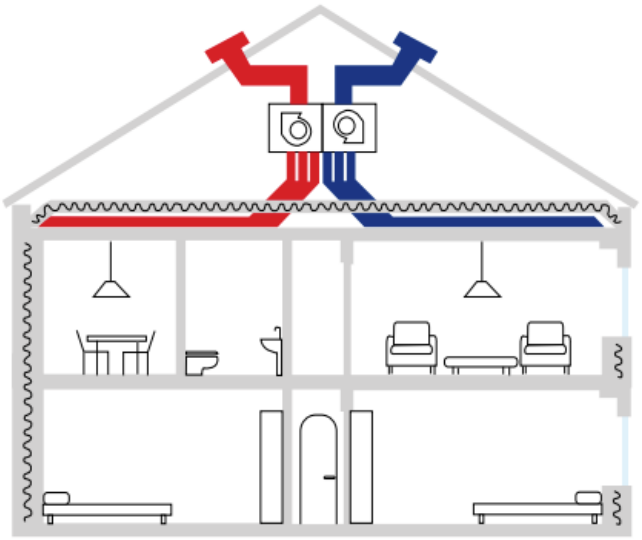
Advantages:

- air flow control,
- possibility of combining a heat recovery unit,
- possibility of integration with natural ventilation,
- independence from inconstant weather phenomena or random behavior of the occupants,

- adaptability to seasonal climatic conditions,
- limitation of noise in the environment,
- possibility of control over the quality of the fresh air,
- control of the air speed in the room.

Detriments:

- cost of the system and its management



HEAT RECOVERY

A heat recovery unit is a double-flow ventilation unit: that is, it provides for the introduction of "clean" air into the room to be treated and at the same time the extraction of stale air from the environment itself. The two flows exchange heat inside the machine itself (or rather inside the heart of the machine itself, the exchanger) so that the warmer flow gives up part of its thermal energy to the colder one

In its typical configuration, the energy recovery unit is not a heat generator or an air cooler, therefore it must be used to integrate a heating and/or air conditioning system.
The machine is mainly made up of the following components: Envelope - in addition to having the function of housing the various components of the machine, it provides acoustic insulation of the same: it can be made of galvanized sheet metal, plastic-filmed sheet metal, in simple or double paneling or plastic materials. Acoustic insulation can be applied inside in order to reduce the radiated noise. Fans - impose movement on the air: there is an intake fan (flow from outside the room to the inside) and an exhaust fan (flow from inside the room to the outside).

Heat exchanger

It is the heart of the recuperator. This is where the heat exchange between the inlet and exhaust flows takes place. There are various types of swap packs.

Filters: filters are usually inserted inside the machine that have the purpose of protecting the fan motors from any dust, but above all to filter the air both introduced and expelled.

The advantages of heat recovery units:

- they are dual-flow units, so they renew the ambient air;

- thanks to the filters on the machine, the pollutants introduced into the environment are kept under control;

- pre-heat or pre-cool the fresh air by recovering thermal energy at no cost from the extracted air, energy that would be lost in a ventilation system without heat recovery (with consequent economic waste and environmental damage);

- thanks to energy recovery, it is possible to size the heating and air conditioning system appliances (boilers, air conditioners, roof-tops, water coolers, etc.) in a smaller way; - reduce the wear and tear of heating system equipment; - Over time, the system gradually pays for itself.

Sources

- PROGETTAZIONE COSTRUZIONI IMPIANTI 1_ CASA EDITRICE SEI_CARLO AMERIO/MARIAPAOLA VOZZOLA
- PROGETTAZIONE COSTRUZIONI IMPIANTI 2_ CASA EDITRICE SEI_CARLO AMERIO/MARIAPAOLA VOZZOLA
- PROGETTAZIONE COSTRUZIONI IMPIANTI 3_ CASA EDITRICE SEI_CARLO AMERIO/MARIAPAOLA VOZZOLA
- https://www.heltyair.com/
- https://www.buderus.com/
- https://www.viessmann.it/
- https://www.vortice.it/

Building Blocks for teacher qualification:

(VII) Module 7. Sustainability Principles

This module covers…

1. Title	Sustainability Principles
2. Short description	The module 'Principles of Sustainable Construction' provides participants with knowledge about what distinguishes a sustainable building from a conventionally constructed building, and what effects building materials have on environmental protection and the health of users.
3. Target group Requirements for Participants	**Target group:** Teachers at vocational schools or training centres for construction trades, construction engineering, construction planning or system planning. **Prerequisites:** Teachers should already have experience and knowledge in the field of building construction and building physics. Participation in the other modules is recommended, but is not a mandatory prerequisite for the other modules.
4. Duration of the module	**Duration of the learning unit:** 90 minutes plus 6 hours of independent study to consolidate the knowledge and skills acquired (videos/online documents; studies, etc.)
5. Competencies to be taught and acquired	**Participants...** ...are able to assess the environmental impact of building materials and evaluate the influence of building physics parameters on healthy living ...know the difference between environmentally friendly and sustainable construction ...gain knowledge about the use of sustainable materials in practical construction scenarios ...are able to solve problems with sustainable materials ...are able to impart specific knowledge on the subject of sustainable construction ...select materials and adapt them for school tasks ...are able to develop small training modules and prepare them methodically/didactically **Result of the module:** At the end of the basic course, all participants will be able to develop/create their own simple learning opportunities on the topic of sustainable building principles for training courses.
6. Organisation & structure of the module,	**The basic module** can serve as training for beginners or as further training for teachers. It can be conducted either by a colleague from the education centre or by an external construction expert (e.g. from a construc-

	tion company that practises sustainable construction).
Speaker	To facilitate the teaching of the didactic and methodological aspects and their implementation, it is recommended that an educational specialist be assigned to assist the external expert.
Proposed schedule	**Organisational structure:** The following structure is recommended for the 90-minute learning unit: **Part 1 – General introduction**: overview of course content, formulation of objectives, discussion of course materials **Part 2 – Introduction to the topic** (scope depending on participants' prior knowledge) **Part 3 – Practical examples**, e.g. excursion to a sustainably constructed building (additional time should be allowed for this) or, if time does not permit, practical examples using short films and/or photos of construction situations in sustainably constructed buildings. **Part 4 – Development of initial project ideas** for the training programme (different levels or focal points)
7. Subject content / methodology	**Basics for understanding the topic** • What is a sustainable/green building? • The three pillars of sustainability • Guidelines for sustainable buildings • Quality seal/certificate for sustainable buildings • Life cycle/service life of buildings/building materials • CO^2 footprint of buildings/building materials • Material passport How can trainees and students be qualified or trained? Learning script, work in small groups, digital communication with lecturers (review, collection of problem areas, etc.), playful learning assessment (quiz), knowledge transfer with the help of learning videos, tour of a sustainable building.
8. Certification, if applicable	Not provided; a certificate of attendance can be issued by the management of the training centre/school/lecturer.

Building Blocks for teacher qualification:

(VIII) Module 8. Acoustic Comfort

This module covers…

1. Title	Acoustic Comfort
2. Short description	The module 'Acoustic Comfort' provides participants with knowledge about what acoustic factors can affect the health of users, and what materials can be used to improve the acoustic comfort of users of buildings.
3. Target group Requirements for Participants	**Target group:** Teachers at vocational schools or training centres for construction trades, construction engineering, construction planning or system planning. **Prerequisites:** Teachers should already have experience and knowledge in the field of building construction and building physics. Participation in the other modules is recommended, but is not a mandatory prerequisite for the other modules. Teachers should have a good grasp of the English language to allow for a full understanding of the topic.
4. Duration of the module	**Duration of the learning unit:** 90 minutes plus 6 hours of independent study to consolidate the knowledge and skills acquired (videos/online documents; studies, etc.)
5. Competencies to be taught and acquired	**Participants...** ...know how sounds and infrasounds affect people's health …know the different aspects of acoustic comfort ...are able to identify issues affecting acoustic comfort of users of buildings ...can identify the necessary materials for improving acoustic comfort of a living environment ...are able to select materials and technologies for acoustic insulation and anti-vibration protection ...are aware of the regulatory framework surrounding acoustic comfort in Italy ...know that acoustic comfort is not only protection from outside noise, but also maintaining acoustic privacy ...are able to develop small training modules and prepare them methodically/didactically …understand the balance between selecting sound-absorbing materials while ensuring their sustainability and the importance of installing the material in the correct way

	Result of the module: At the end of the basic course, all participants will be able to develop/create their own simple learning opportunities on the topic of acoustic comfort for training courses.
6. Organisation & structure of the module, Speaker **Proposed schedule**	**The basic module** can serve as training for beginners or as further training for teachers. It can be conducted either by a colleague from the education centre or by an external construction expert (e.g. from a construction company that works with acoustic aspects of construction). To facilitate the teaching of the didactic and methodological aspects and their implementation, it is recommended that an educational specialist be assigned to assist the external expert. **Organisational structure:** The following structure is recommended for the 90-minute learning unit: **Part 1 – General introduction**: overview of course content, formulation of objectives, discussion of course materials **Part 2 – Introduction** to the topic (scope depending on participants' prior knowledge) **Part 3 – Practical examples**, e.g. excursion to a firm focused on acoustic comfort (additional time should be allowed for this) or, if time does not permit, practical examples using short films and/or photos from construction situations installing sound-absorbing materials in new buildings as well as in renovations **Part 4 – Development of practical ideas** for the students to implement (different levels or focal points)

7. Subject content / methodology	**Basics for understanding the topic**
	• four key aspects of acoustic comfort in living environments
	  ○ adequate insulation from noise from other environments or from outside;
	  ○ acoustic privacy, i.e. that there is no fear of being heard or disturbing others;
	  ○ internal acoustics of the room: not too reverberant, nor too "absorbent";
	  ○ Low indoor plant noise level.
	• Sound-absorbing materials and the specific benefits or flaws of certain materials
	• The importance of sound insulation in living environments
	• Some knowledge of the legislation surrounding acoustic comfort in Italy

	How can trainees and students be qualified or trained? Work in small groups, digital communication with lecturers (review, collection of problem areas, etc.), playful learning assessment (quiz), knowledge transfer with the help of learning videos, tour of, for example, an opera house or another building with particular acoustic qualities, testing acoustic comfort through playful activities.
8. Certification, if applicable	Not provided; a certificate of attendance can be issued by the management of the training centre/school/lecturer.

Additional Content:

What is acoustic comfort?

By "acoustic comfort" in construction we mean that level of well-being that derives from the internal (and external) sound environment that is perceived as adequate: not too disturbing, with good intelligibility, without excessive reverberation or annoyance from external or plant noise.

https://www.gemacht.it/

In particular, for living environments, it is useful to evaluate four key aspects:

- adequate insulation from noise from other environments or from outside;
- acoustic privacy, i.e. that there is no fear of being heard or disturbing others;
- internal acoustics of the room: not too reverberant, nor too "absorbent";
- Low indoor plant noise level.

Why sound insulation is important in construction

Some main reasons:

- Better quality of life for occupants: reduction of noise disturbance promotes rest, concentration, health.
- Real estate value: good acoustic comfort is perceived as a valuable feature in a home or residential/tertiary building.
- Regulatory compliance and reduction of disputes: if the building does not comply with acoustic requirements, there can be disputes, complaints, depreciation.
- Integration with sustainable construction: acoustic comfort is part of the environmental and health performance of the building.

https://italignum.com/comfort_acustico/

What are sound-absorbing materials?

Sound-absorbing materials absorb a large part of the sound energy that hits them and reflect the remaining part, because they have a high sound absorption coefficient thanks to the friction encountered by the sound waves that penetrate their pores, transforming themselves into thermal energy. The best

sound-absorbers are very light, flexible, with an open-cell structure (glass fibre panels, rock wool and wood fibre panels).

Lightweight closed-cell materials (expanded polystyrene, polyurethane foam, etc.) have lower sound-absorbing properties. On the other hand, rigid, compact materials with a smooth surface (glass, metals, etc.) are not sound-absorbing.

https://www.rockwool.com/

Sound-absorbing panels

In indoor environments, sound-absorbing materials are often used in false ceilings, consisting of pre-painted metal panels, equipped with very minute surface holes, and a felt of sound-absorbing material. They can come in various shapes and sizes and are supported with devices that allow them to be quickly assembled and disassembled. In rooms separated by movable walls, it is very common to use modular panels installed under the ceiling, at a distance such as to leave a cavity for the ducting of the systems.

https://www.lantirumore.it/

There are also sound-absorbing panels that can be laid as decorative wall coverings, to aesthetically improve the interior of a space as well as improve the acoustic insulation of the environment.

https://www.idfdesign.it/

The acoustic insulation of the internal walls is carried out with sound-absorbing felts and plasterboard panels anchored to a metal frame.

The most commonly used materials are high-density glass fibers, expanded vermiculite or polyurethane foam.

https://www.isover.it/

https://www.poliuretano.it/

Legislation and benchmarks in Italy

Main standards and documents

- The framework law on noise pollution: Law no. 447 of 26 October 1995.
- D.P.C.M. 5 December 1997 "Determination of the passive acoustic requirements of buildings" – defines the minimum values for buildings and real estate units.
- UNI 11367 "Acoustics in construction – Acoustic classification of building units – Procedure for assessment and verification on site". It is voluntary for private buildings, but mandatory in many public contracts.
- UNI 11296:2024 "Acoustics in construction – Installation of windows and other façade components – Criteria aimed at optimizing façade acoustic insulation..." – in force from 3 May 2024.
- Decree of 23 June 2022 (Minimum Environmental Criteria – CAM) which introduces minimum criteria for acoustic comfort for public buildings.

Some reference values (examples)

From the Decree and CAM 2022 for public buildings:

https://www.diasen.com/

- Normalized façade sound insulation D_{2m,nT,w} ≥ 40 dB
- Apparent soundproofing power R'_{w} ≥ 53 dB
- Normalized impact sound pressure level L'_{n,w} ≤ 58 dB
- Plant noise levels: L_ic ≤ 28 dB (continuous systems), L_id ≤ 33 dB (discontinuous)
- Normalized sound insulation of vertical/horizontal partitions D_{nT,w} ≥ 53 dB

What does "passive acoustic requirements" mean?

These are the minimum performances that the building, or rather its components (walls, floors, facades, windows, systems), must have to contain noise generated inside, between real estate units, from the outside, and from systems.

https://www.acusticanicastro.it/

Acoustic certification

• For private buildings, certification according to UNI 11367 is currently voluntary, although it can be requested or requested by the building in the transaction phase.

• For public procurement and public buildings, the MECs make it binding or strongly recommended.

https://biblus.acca.it/certificazione-acustica

Technical solutions & materials to improve acoustic comfort

Some areas of intervention

1. Insulation of facades and partitions to the outside – to reduce external noise (traffic, activities, infrastructure) entering the building. For example, the UNI 11296:2024 standard dictates criteria for the installation of windows and doors for the purpose of acoustic insulation.
2. Insulation between housing units and internal partitions – walls, false ceilings, floors must have adequate soundproofing power to avoid the transmission of noise between units.
3. Insulation from installations and footfall sound – floating substrates, screeds, special slabs, elastic supports for machinery or systems contribute to acoustic comfort. For example: Regupol Comfort 5 + Edilteco system for floor sound insulation.
4. Sound absorption / indoor acoustics – not only eliminate noise, but manage the sound inside: avoid echoes, too long reverberations, improve intelligibility. Panels, sound-absorbing materials, special false ceilings are used.

https://www.cir-ambiente.it/

Good design practices

- Noise analysis in the design phase: evaluate internal and external sources, transmissions through structures.
- Choice of materials not only for performance (dB) but also for installation, construction detail, sealing, continuity.
- Be careful with installation: even a good poorly installed material can lose effectiveness (e.g. windows and doors, gaskets, connections).

- Integration with other aspects of the project (thermal insulation, ventilation, visual comfort): acoustic solutions must often be coordinated with other services.
- On-site verification: final acoustic tests (soundproofing, footfall, façade measurement) to certify that the building meets the declared requirements.

https://www.isover.it/soluzioni/controsoffitto-ad-alte-prestazioni-termo-acustiche

Examples of materials / solutions

- Plasterboard panel + cavity with acoustic insulation for supports on partition walls. For example: the "DIAMANT® PHONO" sheet by Knauf, soundproofing power 55 dB.

https://knauf.com/it-IT/p/prodotto/lastra-diamant

- Floating substrates specific for impact sound insulation (such as Regupol / Edilteco) that also address aspects of dimensional stability, hygrometry, durability.

https://www.edilteco.it/

Considerations for the future

- Renovation of existing buildings: older buildings often do not meet modern acoustic requirements; Intervening can be complex and costly.
- Integration of acoustic comfort + energy efficiency + sustainability: solutions must be "multifunctional", not only acoustic, but also thermal, ecological, durable.
- Innovation in materials: for example, recent studies on acoustic metamaterials (although still in the research field) to improve acoustic insulation with reduced thicknesses.
- Greater sensitivity of clients, users and the real estate market: acoustic comfort is becoming more and more a criterion of choice.
- More widespread verification and certification: even if in the private sector acoustic certification is voluntary, the trend is towards a greater demand for transparency and performance.

Textbooks used for research

•PLANT CONSTRUCTION DESIGN 1_ PUBLISHING HOUSE SEI_CARLO AMERIO/MARIAPAOLA VOZZOLA

•DESIGN OF PLANT CONSTRUCTIONS 2_ PUBLISHING HOUSE SEI_CARLO AMERIO/ MARIAPAOLA VOZZOLA

•DESIGN OF PLANT CONSTRUCTIONS 3_ PUBLISHING HOUSE SEI_CARLO AMERIO/MARIAPAOLA VOZZOLA

Building blocks for teacher qualification:

(IX) Module 9. Safe and healthy work environment on construction sites

This module covers ….

1. Title	Safe and healthy work environment on construction sites
2. Short description	The 'Safe and healthy work environment on construction site' is a practical training course designed for vocational subject teachers in construction-related fields. The course equips educators with essential knowledge and skills to identify workplace hazards, apply health and safety regulations, and foster a safety-first culture among students. Through interactive exercises, real-world scenarios, and regulatory insights, participants learn how to supervise practical sessions responsibly and respond effectively to emergencies.
3. Target group Requirements for Participants+	**Target group:** Teachers in a department or subject area at a vocational training centre for construction trades, construction technology, construction planning or system planning. Prerequisites: Participants should meet the following requirements before enrolling in the course: • **Professional background** Vocational subject teachers or instructors working in construction-related fields (e.g., masonry, carpentry, electrical installation, building technology). • **Basic knowledge of construction processes** Familiarity with typical construction site activities, tools, and materials. • Understanding of educational safety responsibilities Awareness of the teacher's role in supervising practical sessions and ensuring student safety. • **Language proficiency** Ability to read and understand safety regulations and training materials in the course language (English or Polish). • **Access to practical training facilities** Participants should have access to a workshop or construction site where practical exercises can be observed or conducted.
4. Duration of the module	**A total of 8 hours**, comprising 2 theory hours and 4 practical hours of 45 minutes each, and 2 hours of individual exercises to consolidate acquired knowledge and skills (videos/online doc; studies, etc.).

5. Competencies to be taught and acquired **(these must be specified for each module)**	**Knowledge-based competencies** • Understanding key health and safety regulations relevant to construction sites • Recognizing common workplace hazards (e.g., falls, electrical risks, chemical exposure) • Knowing the roles and responsibilities of teachers, students, and site managers in ensuring safety **Practical Competencies** • Conducting risk assessments before practical sessions • Supervising students during hands-on activities with attention to safety protocols • Responding appropriately to accidents and emergencies • Using and verifying personal protective equipment (PPE) • Documenting incidents and safety procedures accurately **Behavioural and pedagogical competencies** • Promoting a safety-first mindset among students • Modeling safe behavior and enforcing safety rules consistently • Facilitating student-led safety discussions and hazard identification • Creating a classroom culture that encourages reporting and responsibility **Result of the module: Upon successful completion of the module, participants will:** • Be able to plan and conduct safe practical training sessions in construction-related subjects • Demonstrate confidence in identifying and mitigating risks on-site • Serve as safety role models for students and colleagues • Contribute to a stronger safety culture within their school or training institution • Receive a certificate of participation (optional, based on program design)
6. Organisation & structure of the module, **speaker** **Proposed schedule**	The basic module can serve as training for beginners or further training for teachers. The further training will be conducted either by a colleague from the education centre or by a speaker from a construction company that practises sustainable building. However, in-house course management would be advisable, as the orientation and focus, also with regard to didactic and methodological aspects, would be easier to communicate and implement.

	Organisational form: **1 day with 8 units of 45 minutes** each including individual work to consolidate the skills learned. • **Theory Session 1.** Participants are introduced to the fundamentals of health and safety on construction sites. This includes legal responsibilities of teachers, students, and employers, as well as the importance of supervision and hazard awareness. • **Theory Session 2**. Focus shifts to common construction hazards such as falls, electrical risks, and mechanical injuries. Participants learn about personal protective equipment (PPE), site regulations, and how to conduct basic risk assessments. • **Practical Session 1.** Participants engage in hands-on exercises including photo analysis, hazard identification, and scenario-based discussions. They work in small groups to evaluate unsafe behaviours and propose corrective actions. • **Practical Session 2.** This session includes role-play activities, simulated emergency responses, and supervised walkthroughs of a training site or workshop. Participants apply safety principles in realistic settings and receive feedback from the trainer. • **Individual Work 1.** Each participant completes an accident report template based on a fictional or real scenario. They also fill out a safety checklist and reflect on their role as a safety leader in the classroom. • **Individual Work 2**. Participants take a short quiz to assess their understanding of the module content. They also create a personalized safety action plan for their own teaching environment and share key takeaways with the group.
7. Subject content / methodology	**Subject Content** • Legal framework and responsibilities – overview of national occupational safety and health (OSH) regulations, including the roles of teachers, students, and employers. • Common construction hazards – identification and analysis of risks such as falls, electrical hazards, mechanical injuries, chemical exposure, and poor ergonomics. • Personal Protective Equipment (PPE) – types, correct usage, and teacher responsibilities in ensuring PPE compliance. • Accident prevention and emergency response – procedures for preventing incidents, responding to accidents, and completing accident reports. • Safety culture and pedagogical leadership – strategies for promoting safety awareness, modelling safe behaviour, and fostering a culture of responsibility among students.

	• Practical risk assessment and supervision – conducting site walkthroughs, identifying unsafe behaviours, and applying corrective actions in real-time. **Methodology** • **Interactive lectures** – short theoretical inputs supported by visual aids, real-life examples, and group discussion. • **Scenario-based learning** – analysis of realistic case studies and photos to identify hazards and propose solutions. • **Hands-on practical exercises** – group activities simulating construction site situations, including PPE checks, risk assessments, and emergency drills. • **Individual reflection and application** – completion of accident reports, safety checklists, and personal action plans to reinforce learning. • **Peer learning and feedback** – participants share experiences, evaluate each other's solutions, and reflect on their teaching practices. *This methodology ensures that participants not only understand safety principles but are also prepared to apply them confidently in their own classrooms and workshops.*
8. Certification, if applicable	Not provided, certificate of attendance, can be issued by the management of the training centre.

Conclusion

This teacher training course serves to impart the knowledge needed to successfully teach competences related to healthy building practices.

The project partners collaborated heavily on this product and thus produced a training course that serves not only teachers in one country, but instead can be used by teachers all over the EU who are willing and able to incorporate more healthy building competences into their classes.

This course is accompanied by further material, such as the learning units and the learning scenarios. Together, they serve to enable vocational training and education institutions to be able to train teachers as well as students who have future-oriented healthy building competences.