Polski Komitet Narodowy Międzynarodowej Rady Ochrony Zabytków ICOMOS

FONDAZIONE ROMUALDO DEL BIANCO

SAPIENZA UNIVERSITÀ DI ROMA

POLITECHNIKA LUBELSKA

UNIVERSIDAD POLITÉCNICA MADRID

SAPERE AUDE VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FONDAZIONE FLAMINIA RAVENNA

Sustainable Urban Rehabilitation in Europe

Historical building adaptation to modern function

Erasmus+

Sustainable Urban Rehabilitation in Europe

3rd Semester

Susana Mora Alonso-Muñoyerro
Ignacio Mora Moreno
David García García
Carolina Hernández Martínez
Camila Burgos Vargas

Historical building adaptation to modern function

3 ECTS

SH

Sustainable Heritage

EC

Elective Courses

Erasmus+

SURE
SUSTAINABLE URBAN REHABILITATION IN EUROPE

UNIVERSIDAD POLITÉCNICA DE MADRID

Sustainable Urban Rehabilitation in Europe

Historical building adaptation to modern function

3 ECTS

SH Sustainable Heritage

EC Elective Courses

01 Introduction to building adaptation
02 Typology: big to big & small to small adaptations
03 Typology: big to small & small to big adaptations
04 Programme: extensions
05 Programme: bubbles
06 Programme: other adaptations
07 Circulations: horizontal circulations
08 Circulations: vertical circulations
09 Enclosure: protective enclosure
10 Enclosure: lightweight roofs, façades and finishings
11 Systems: climatization
12 Systems: fire protection, water supply and evacuation
13 Illumination: natural lighting
14 Illumination: artificial lighting
15 Illumination: lighting systems

Sustainable Urban Rehabilitation in Europe

Historical building adaptation to modern function

3 ECTS

LESSON 11 SYSTEMS - FIRE PROTECTION, WATER SUPPLY AND EVACUATION

Erasmus+

SURE
SUSTAINABLE URBAN REHABILITATION IN EUROPE

UNIVERSIDAD POLITÉCNICA DE MADRID

BUILDING INSTALLATIONS

- VENTILATION
- **FIRE PROTECTION**
- PLUMBING AND DISCHARGE OF WATER
- ELECTRICITY INSTALATION

Fire protection

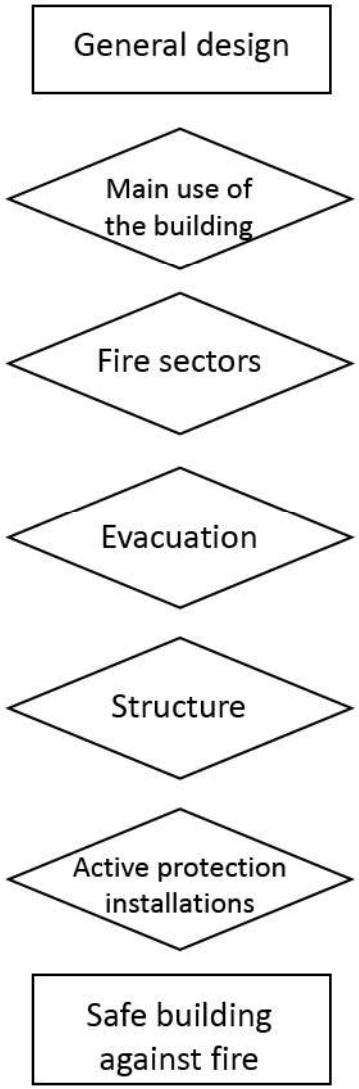
Fire protection is a matter of multidisciplinary and transversal knowledge that affects the building as a whole and its projected process: program layout, structures, construction... The achievement of three objectives must be sought:

- security of persons
- protection of assets
- and continuity of the activities,

having to consider two concepts:

Prevention: Measures to prevent the risk from becoming in accident or sinister, avoiding that, by conjunction of factors, the fire starts.

Protection: Measures designed to prevent the spread or limit its consequences in the event that, despite the prevention, the accident or loss occurs, both in human losses and material losses. All this must go hand in hand with a firefighting plan that includes detection, alarm and extinction systems.



Fire protection: Primark

Rehabilitation with passive protection in Primark Gran Vía

The largest Primark store in Spain and the second at the international level, located at number 32 of the Gran Vía in Madrid, has involved the rehabilitation of an old multi-storey building that has been completely renovated inside to protect against fire. structure of floors with mortar, and establish a good execution of ventilation ducts and smoke extraction, among other objectives.

Fire protection: function

Main use of the building:

- **Residential:** the structural material is very relevant. Wooden constructions tend to expand fire.
- **Hospital:** these building feature the most advanced technologies of the time it was built. The horizontal evacuation is prioritary and essential, so that patients can be conducted into a save place in the same storey
- **Public use building:** There should be implemented additional systems for disabled people (acoustic signals, braille or textured signalling, etc.)
- **Industrial:** every industrial activity has its own conditions.
- **Big volume spaces.** This is the case of malls. It could be necessary to implement openings in the ceiling to release smoke.
- **High-rise:** there are three conditions to consider a building a high-rise: that foremen don't have access from the ground, a high possibility of chimney effect and a height that makes impossible a quick evacuation.

Fire protection: fire sectors

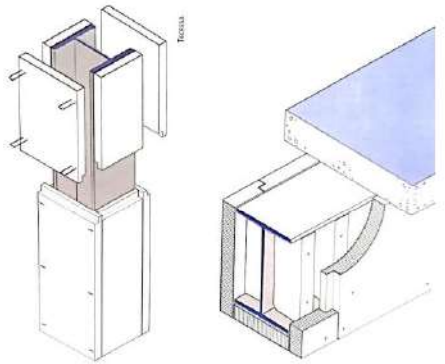
Definition of fire sectors

Compartmentalization in fire sectors is vital to contain the spread of fire and allow time for evacuation and extinction itself. Likewise, the control of fumes generated is of crucial importance, as it is the cause of most of the victims in case of fire. Sectors have the following characteristics:

- Volume of the room where the fire has started: The smaller the room, the faster the flames develop, due to rapid heating.
- Height of the room. The shorter the space is, the faster flames will progress.
- Ventilation. The development of the fire depends on the supply of oxygen. A strongly ventilated space will cause a stronger fire.

For this, Primark opted for the system of ventilation and smoke extraction pipes composed of PROMATECT L500 calcium silicate plate. A system that has up to 5 different fire tests that cover all situations: vertical and horizontal installation, fire attacks from both outside and inside, and full smoke tightness.

Fire protection: Structure protection.



Steel structures

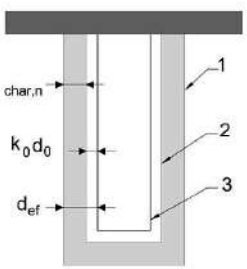
Steel is a great electricity and heat conductor. This, along with the fact that steel loses its resistance at a certain temperature, makes metallic structures catastrophic when it comes to fire. Steel can be protected covering it with intumescent painting or fire resistant sheets.

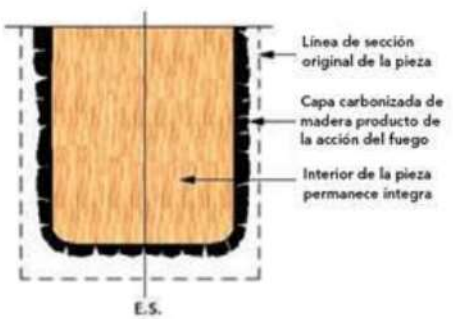
Wood structures

Even though wood is flammable and spreads, wood structures lose resistance gradually and even the burnt structure maintains some strength. Wood can either be protected with foam or fire protection sheet, or oversize the elements.

Concrete structures

Concrete presents good performance against fire. Fire destroys its chemical structure and takes away the reinforcement resistance. The main fire-protection measure is to increase the width of the coating layer.





Fire protection: Active protection installations

Some of these installations are:

- Emergency lighting and signals
- Fire extinguisher
  - Water,
  - Water Mist
  - Water Spray
  - Foam
  - Dry Powder
  - Carbon Dioxide ('CO2')
  - Wet Chemical
- Ventilation

Carbon Dioxide Fire extinguisher

BUILDING INSTALLATIONS

- VENTILATION
- FIRE PROTECTION
- **PLUMBING AND DISCHARGE OF WATER**
- ELECTRICITY INSTALATION

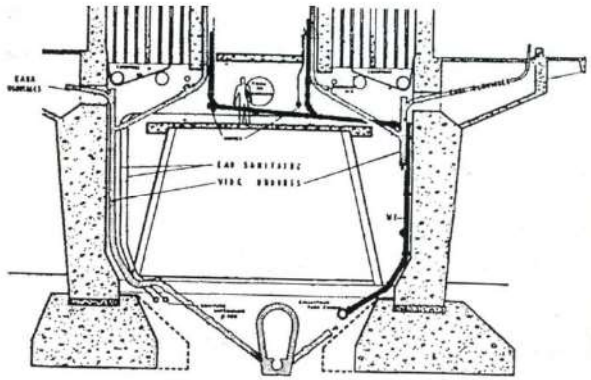
Plumbing

Prefabrication of sanitation facilities.

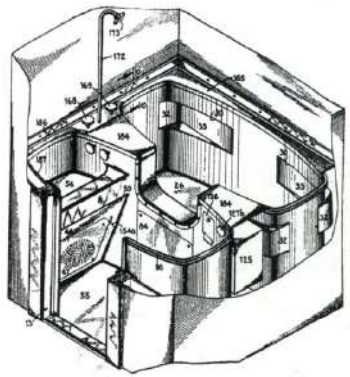
One may think of the plumbing as apparently simple installation, which occasionally cause some damage and that has no space for evolution. Nothing further from reality.

Nowadays any change in plumbing require breaking and changing finishings, changing pipes, etc. Prefabrication processes represent an opportunity for the building of sanitary installations (bathrooms, sinks, washbasins).

The optimization of the benefits of plumbing and sanitation facilities, together with the implementation of prefabrication in construction, generating solutions of prefabricated toilets. Commercial systems have been developed for the assembly of the plumbing and sanitation network usually associated with dry-mounted partition walls.



Technical space in the Unité d'Habitation, Marsella. (Le Corbusier 1952). Sanitary, plumbing, electricity and waste disposal installations.



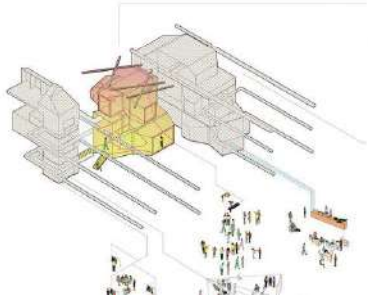
Prefabricated Bathroom unit.
Buckminster Fuller, 1938

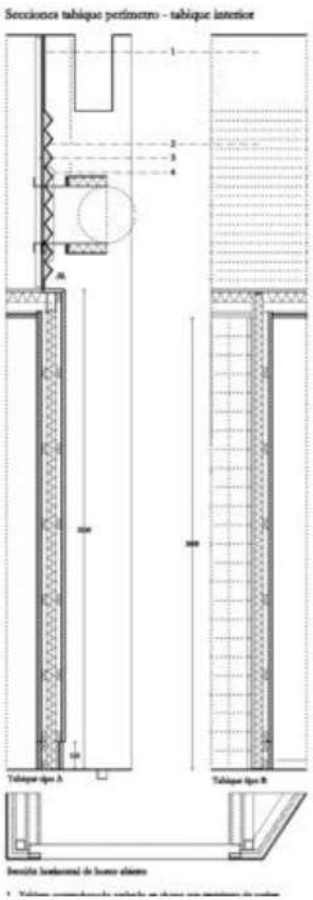
Bathroom unit.
F. J. Sáenz de Oiza, 1970

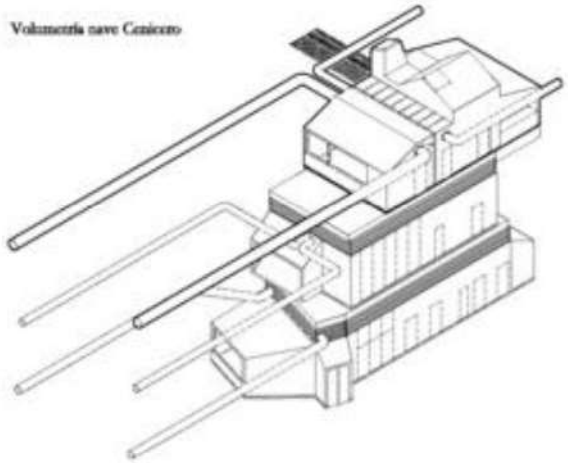
Plumbing

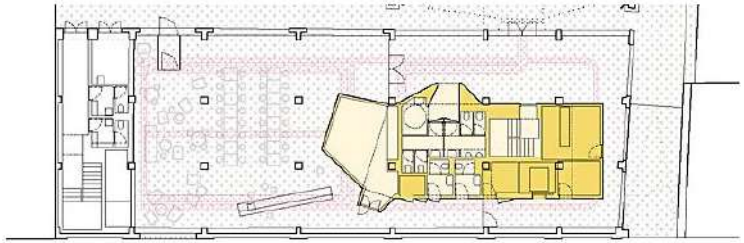
Sanitation facilities and building adaptation

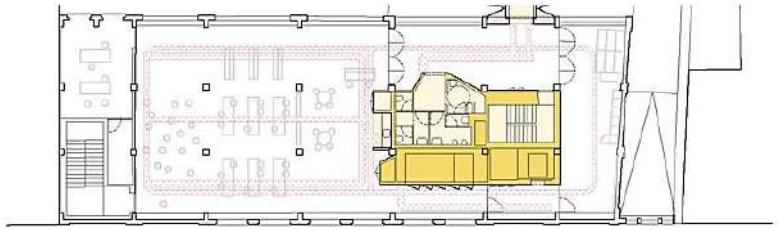
Medialab Prado, Madrid







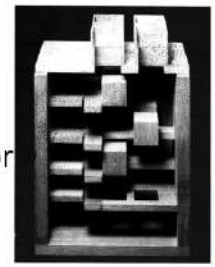


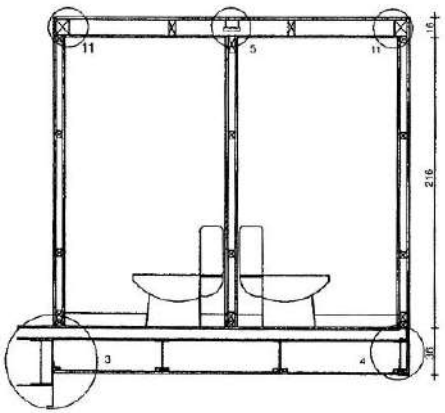


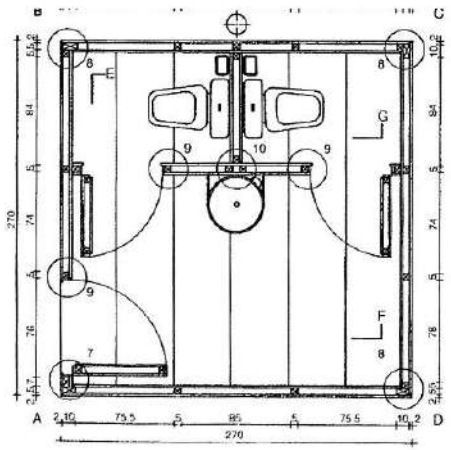
Plumbing

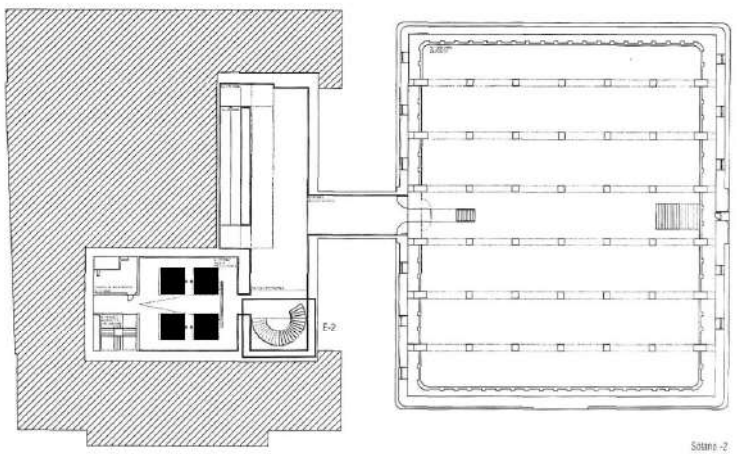
Sanitation facilities and building adaptation

Rehabilitation of the Montehermoso, Palace. Vitor









BUILDING INSTALLATIONS

- VENTILATION
- FIRE PROTECTION
- PLUMBING AND DISCHARGE OF WATER
- **ELECTRICITY INSTALATION**

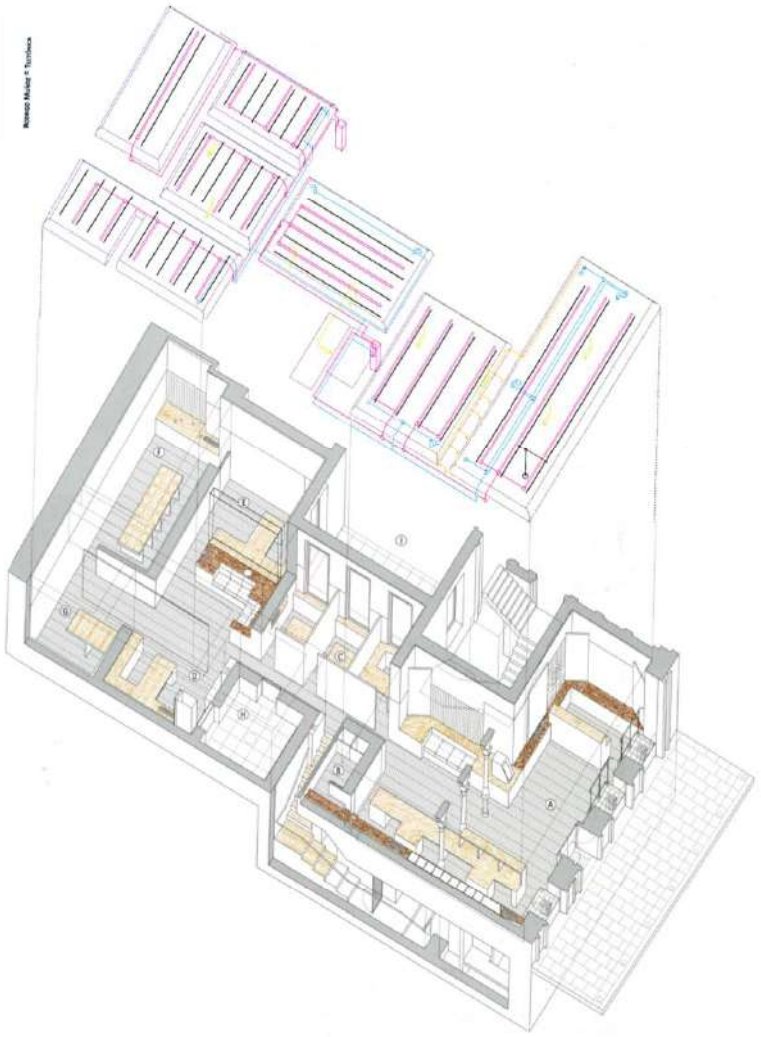
Installations

New office for the Caja de Arquitectos, Madrid

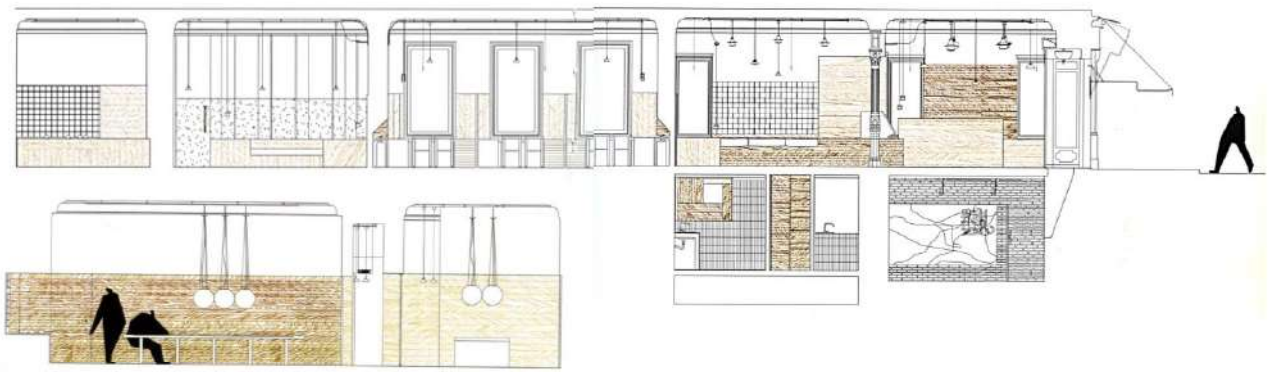
Luís Martínez Santa-María

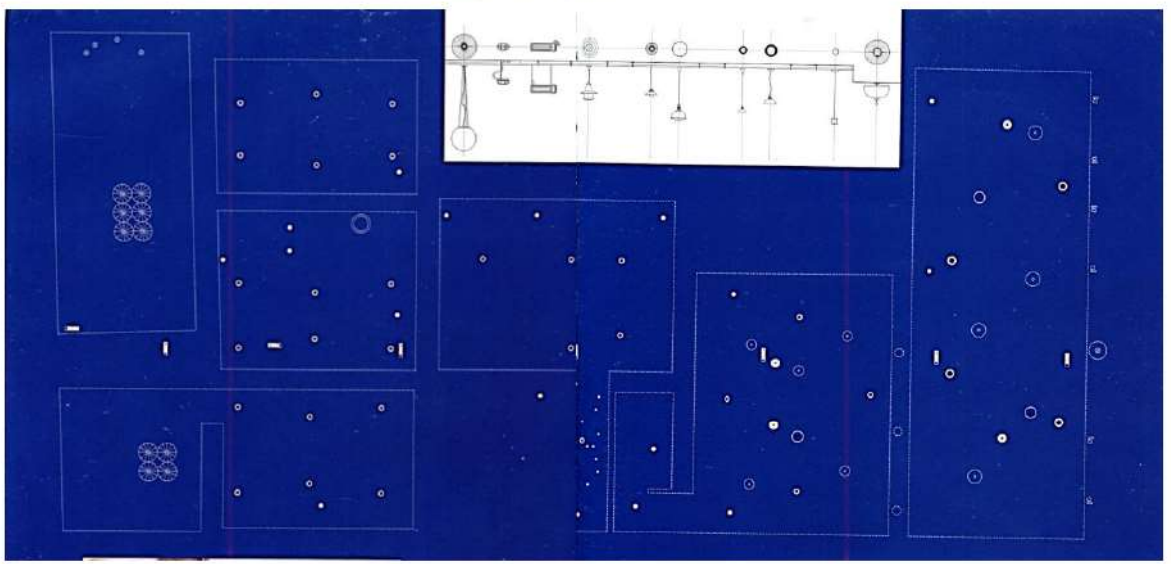
Ceiling installations

- Hanging bars
- Electricity
- Security
- Firefighting
- Emergency light



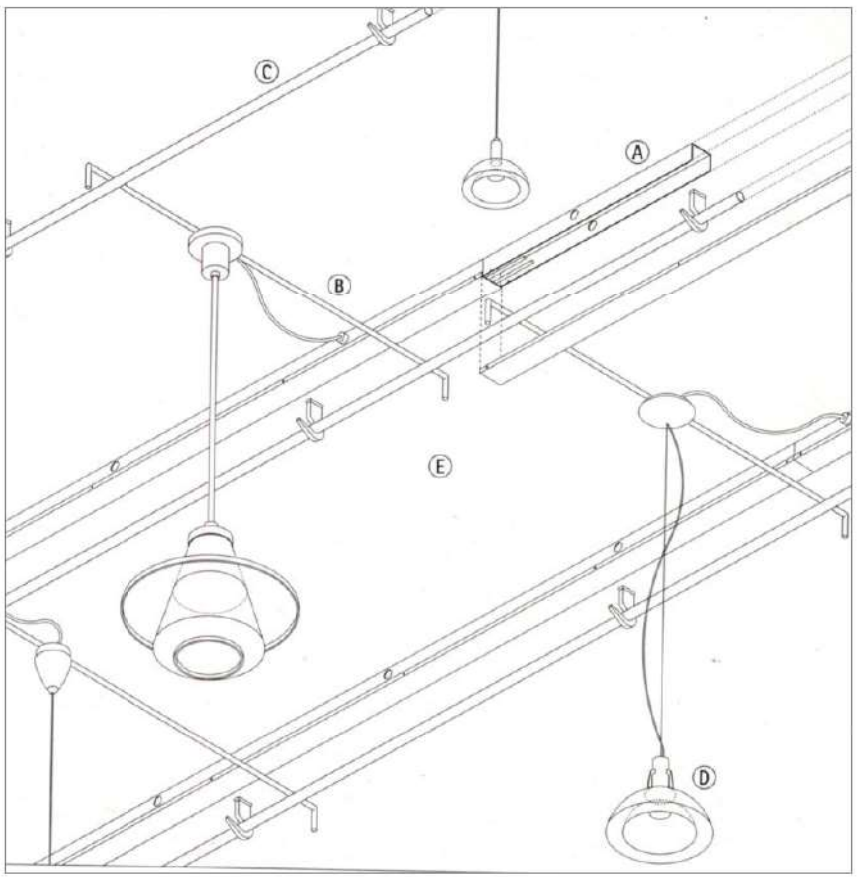
Lighting installations

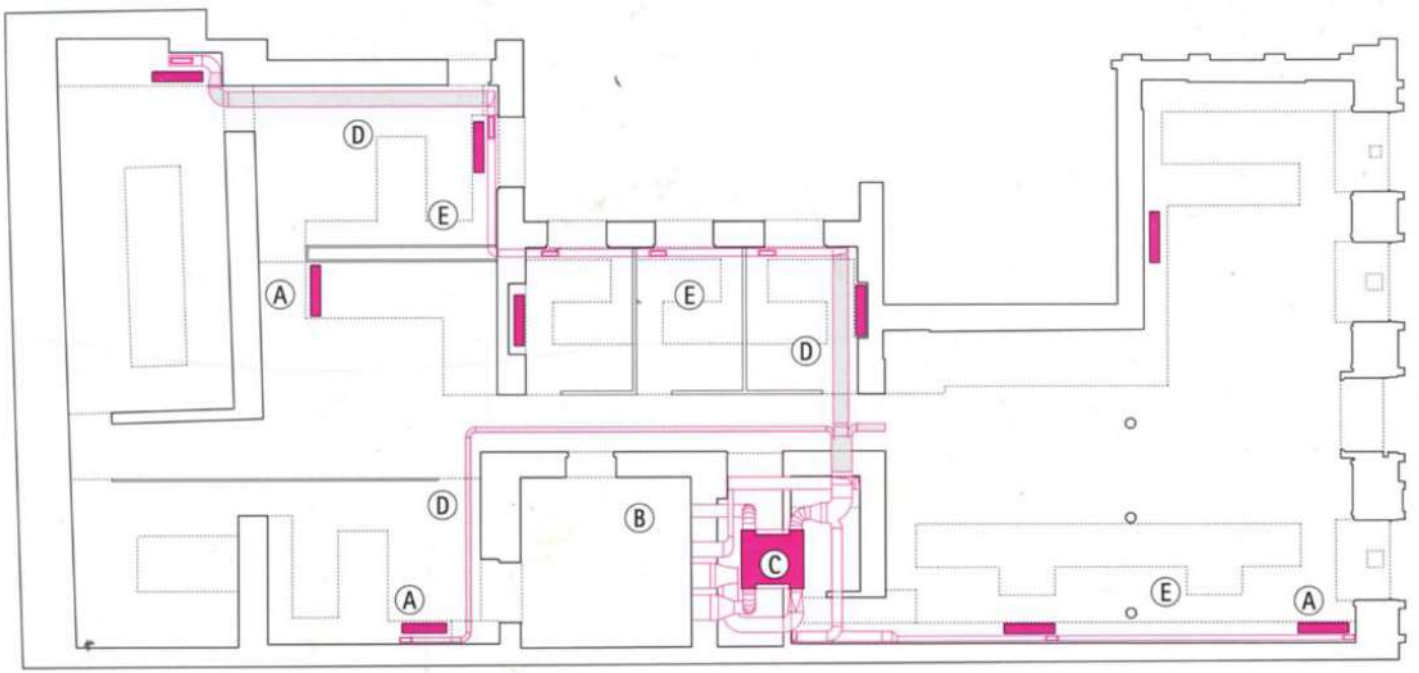




LIGHTING

The original store had a system of steel track hanging from the ceiling along each space. On these were supported other crossbars from which hung the exposed lamps. In this way, they could be lowered, exchanged or moved without difficulty. The system was complemented with a parallel duct with small plugs that served each lamp. The author has sought to keep alive the memory of the previous use of the premises while preserving this system, which brings to its new function the flexibility of placement of the luminaires and the possibility of complementing the lighting in each area if necessary without any work. Many original lamps were refurbished and carefully cleaned



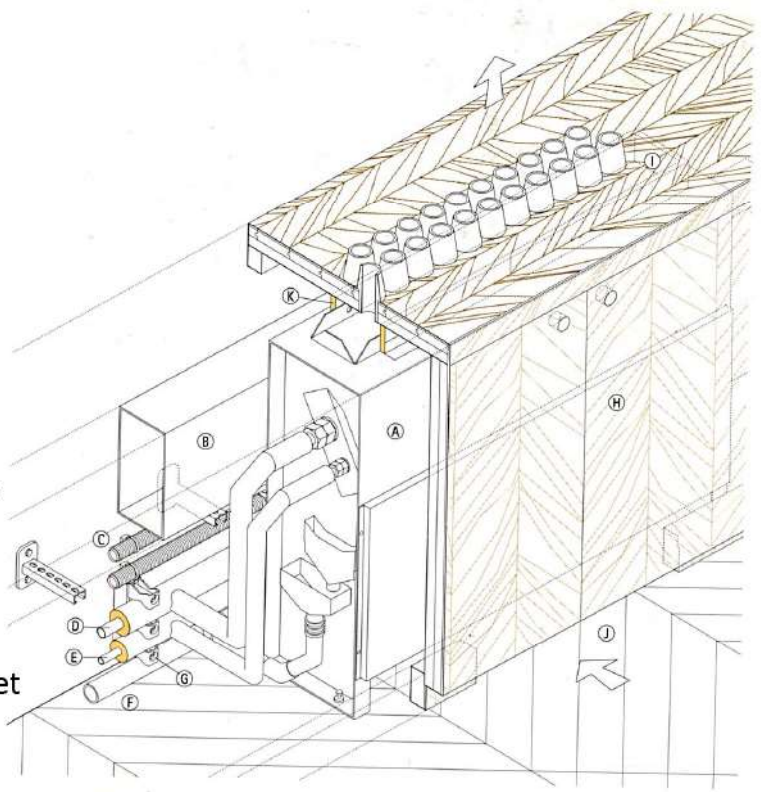


Air conditioning installation

A. Floor evaporator unit.
B. Condensing unit on deck.
C. Enthalpy recuperator in false ceiling.
D. Ventilation duct under the platform (in gray).
E. Concealed ventilation duct in furniture.

Socket section

A. Floor evaporator unit.
B. Air renewal duct.
C. Electrical channels.
D. Gas line covered by insulating shell.
E. Line of liquid coated by insulating shell.
F. PVC pipe for condensation drainage.
G. Fastening rail with clamps.
H. Furniture made of DM boards and veneered with pine base and e = 3 mm finish in wenge or iroko pieces.
I. Trunk conical walnut nozzle for drive.
J. Slot on base for return.
K. Conduit between machine and delivery outlet of high density glass wool coated on both sides of aluminum.



Project "SURE - Sustainable Urban Rehabilitation in Europe"
implemented in frames of Erasmus+ Programme
Key Action 2: Strategic Partnership Projects
Agreement n° 2016-1-PL01-KA203-026232

This publication has been funded within support from the European Commission.

Free copy.

Co-funded by the
Erasmus+ Programme
of the European Union