MAIN LOAD BEARING STRUCTURE - BEARING MASONRY

STONE MASONRY

CLIMATIC DIMENSION
70-75 cm, irregular shaped
MEDIUM
locally excavated blocks
STONE TYPE
Alternate coarsiness
AGE
before 1200 ca

MASONRY SYSTEM

Name of the old reference wall, a one of the longitudinal mostly loaded walls of the building due to the forces transmitted by the trusses and floors. Mostly founded on the rock, the wall is a semi-massive, rude dry-mortared irregular masonry.

STONE MASONRY

CLIMATIC DIMENSION
50-55 cm, irregular shaped
MEDIUM
locally excavated blocks
STONE TYPE
Alternate coarsiness
AGE
after 1200 ca

MASONRY SYSTEM

Walls that were built in stones and lime mortar. The lower part is built without plaster finishing, so we see the masonry texture. For the higher masonry we assume that in the same masonry type due to some irregularity of the surface, even if is recessed or concavities, literally founded on the rock, the wall is semi-massive dry - oak dry-mortared irregular, coarse.

STONE MASONRY

CLIMATIC DIMENSION
55-70 cm
MEDIUM
probably locally excavated
STONE TYPE
Alternate coarsiness
AGE
around 1800 ca

MASONRY SYSTEM

The wall is covered by a thick layer of lime plaster, but we suppose that the masonry was made in stone, because of its structural duty in very the early, made in stone as well.

For what concerns the partition of the wall, the realization of a stone masonry is made doubts in the not perfectly linearity of the wall and thickness. Cross 11 a wall bearing, it is helping the wall giving an added support.

BRICK MASONRY

CLIMATIC DIMENSION
SECTION ca.
CROSSING ca.

AGE
after 1800 ca
after 1900 ca

MASONRY SYSTEM

Brickwork made with stretcher disposition of elements. Are elements are made in different ages and they colours show the different level of strength.
The building mortar joints are regular (1-2 cm), the dimension of the bricks is 12x25x6 cm. The pattern is strongly damaged.

MASONRY SYSTEM

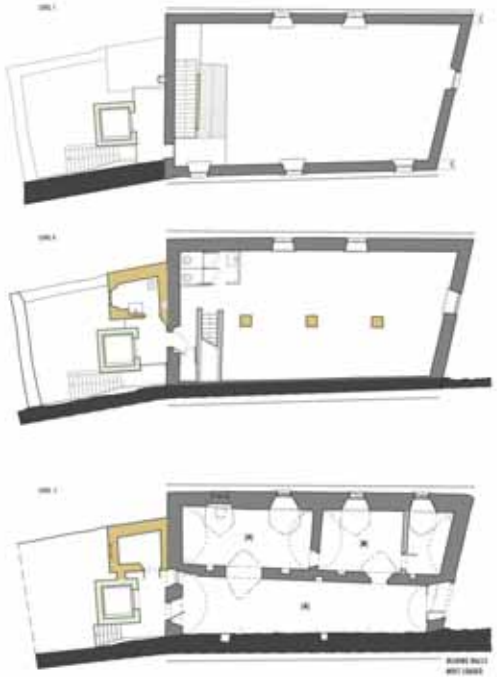
Brickwork made with stretcher disposition of elements.
The building mortar joints are regular (1-2 cm).
The dimensions of the bricks is 12x25x6 cm. The brickwork was probably done after 1900.
The pattern is in strongly bonded.

CONCRETE MASONRY

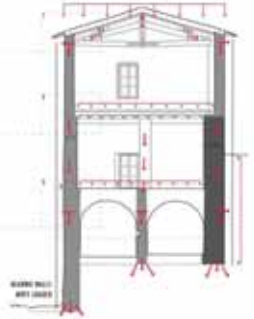
AGE
after 1950

MASONRY

The reinforced concrete was in wrapped in a copper cover. Inside it, a rib is placed which allows to create at last bonds two different beams.



MAIN AND SECONDARY LOAD BEARING STRUCTURE - STRUCTURAL BEHAVIOUR



FOUNDATIONS

The portion of building in which the masonry is sensitive by the old embassies wall. It's clearly visible that is founded directly on the rocky soil.
Instead we cannot assume that all the masonry walls have the same foundation technique.

MASONRY VAULTS

CLIMATIC DIMENSION
55-70 cm
MEDIUM
probably locally excavated
STONE TYPE
Alternate coarsiness
AGE
after 1200 ca

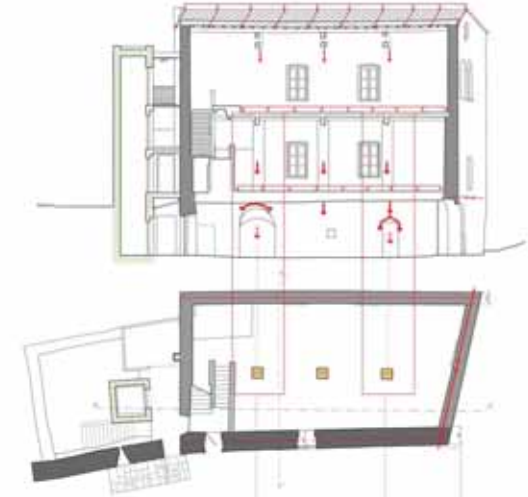
DETAILS OF VAULTS' SECTIONS

MASONRY SYSTEM

Barrel vaults built with stone and lime mortar.

For the long years, they are covered with a thin and fine layer of plaster. You can connected with the old embassies wall, systems 1 and 2 (1) is missing it in some spots, from these trials we can understand kind and dimensions of the wall shaped stones (15-40 cm) (kind of).

In the smaller rooms the trace of the extradosso is strongly visible into the very thick layer of plaster. Stones are not visible (kind 0K).



A very clear example is visible from the above.

Two arches in the ground floor are placed exactly over two openings in the basement, increasing the load on the two weakest point of the bearing masonry at 2 level.
From the shape of the piers and the height of the wooden floor seats over them, which is not their order, we can assume that these vertical elements were placed in the first time contact with the situation to give some additional support for the floor.
Instead to help the structural behaviour of the building, it creates a strong discontinuity of loads.

Till early 20's it no cracks are present , but we suggest to keep the situation checked in order to timely notice and time some more some possible structural problems will occur.

Due to the horizontal stresses exerted by the vaults, the two stone loaded walls are kept together from a tie rod passing through the masonry.

INTERVENTION AND OBSERVATION

INTERVENTION ON THE PERLINS
A double "L section" (2"x3). Bi-LAM) connected each other helping the PERLIN staying togheter so the wood had some structural problems. In our opinion the wood looks some without any structural problems so this solid-section causes useless and excessive increase the load on the TRUSSES.

PROPOSED INVESTIGATION
Nondestructive investigation for testing the health of the wooden beam

PLANKING CHARACTERISTIC
Reused PLANKING, mainly undecorateable by the darker part of some planks.

Presence of a second NEW PLANKING, on top of the old one (information given by the municipality and also visible thanks to the irregularity of some old planks that allow to see in between of two different planks)

WALL PERPEDS JOINT
Presence of a metal bar in all TRUSSES working as a passive support for the TRUSS in case of particular wood cut to heavy/ductile.
Reused ELECTOR, under-thickness by the "hole" in the beam the beam gradually used formerly in another way (not edge in the pictured) absence of the small gap between the TRUSS and the WALL, generally present to avoid the deterioration of the truss.

PROPOSED INVESTIGATION
Nondestructive investigation for testing the health of the wooden beams (possibly in the wood) in the part of the beams inside the wall.

INTERVENTION ON THE TRUSSES
All the TRUSSES present a wooden element joint with a metal screw, helping the PERLIN and sliding on the ELECTOR. Moreover in this way the roof starts as a unique structure avoiding the possible rotation of the TRUSSES in case of heat/liquids.

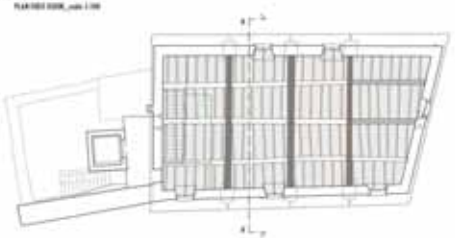
Considering this state-section we can assume that during the last conservation the upper part of the roof it has been totally rebuilt or at least disassembled and replaced.

FLOORS DISPLACEMENT
All TRUSSES present a Floors displacement with maximum displacement between 7 and 9 cm.

To solve this problem, as readily common in the past, it has been added a steel chain between the KING POST and the TRUSS ARM.

ROOF STRUCTURE

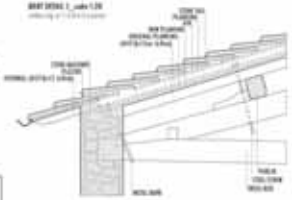
PLAN ROOF SCALE 1:100



In the SECTION A-A the PLAN and the ASSONOMETRIC VIEW shows the roof-span present in our part of the castle is a WOOD TRUSSED ROOF with three TRUSSES. It is a common roof-span that present some structural problems mainly in the TRUSS 2ND where we have in FLOOR DISPLACEMENT in all the houses.

SECTION A-A_ scale 1:100

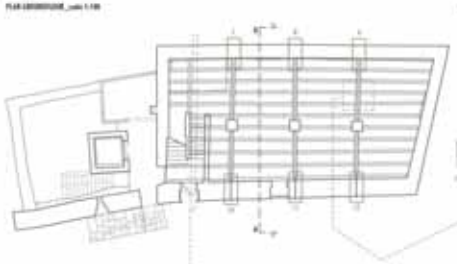
ROOF DETAIL 1_ scale 1:20



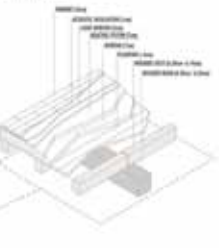
ASSONOMETRIC VIEW

CEILING STRUCTURE

PLAN CEILING SCALE 1:100



ASSONOMETRIC VIEW



SECTION A-A_ scale 1:100

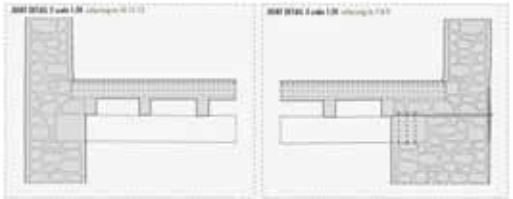
SLOPE DETAIL_ scale 1:10

CEILING MAPPING SCHEME with CEILING OPENINGS_ scale 1:50

CEILING INTERVENTION

In the last time-worked, in order to allow the SLOPE for thrusted people, the ceiling has been modified as it's evidential with small grey in the column and in the section above. That part they have CLOSED to support part of the slopes. The new JOISTS are poor regimen with ROOF TOOL TILES. The lower part of the slopes is in small support for a wooden structure that is lying itself on the floor.

JOINT DETAIL 2 scale 1:20 reflecting to 1:10



Even the two details above as well as from the pictures it's clearly visible the presence of TRUSS on the east facade of the building corresponding to each MAIN BEAM of the ceiling. But TRUSS lacks the MAIN BEAM and opening.
We can suppose that where TRUSS was present also in the east facade and therefore we just removed in the nearby. Infact on the west facade we have just a really few trace of plaster that allow to see the TRUSS and some same choice of the masonry. On the east facade instead we have a thick plaster that might cover the TRUSS.
The presence of these TRUSS confirms that we have same structural elements on the western portion given by the TRUSS.

PROPOSED INVESTIGATION

Nondestructive methods to check the presence of the TRUSS on east facade as for sure that they haven't been built away in the last intervention.