Research on traditional local building culture

Construction details

1. Double Story Building
   - In a densely populated country like Pakistan, where families have just limited space, a double story building helps saving land.
   - The flat roofs lack a proper waterproofing and are built of rare materials.
   - The monolithic earth walls are earth plastered and have to be protected in the case of a flood.

2. Window Openings
   - Rigger window openings, which are not supposed to direct sun provide better comfort and enable a proper air circulation to cool the building down especially at night.

3. Connection roof to bamboo frame
   - The bamboo roof rests on the earth filled bamboo frame structure. A damp proof course on top of the earth filling guarantees that no water comes in.

4. Connection bamboo frame to cob wall
   - The facade of the light bamboo frame construction of the second floor has an overhang to the earth walls of the ground floor.Rain running down the bamboo facade can drop down in front of the earth wall.

5. Cob wall
   - The addition of straw and a horizontal bracing in all corners improves the strength of the monolithic earth walls, especially in the case of an earthquake. Furthermore the straw makes the earth wall more rain resistant.

6. Waterproof foundation
   - Blocks in combination with two moisture barriers prevents damages caused by soaring humidity. Raised more than 60 cm from the ground the earth walls are protected in the case of a flood.

Simplicity and low-tech – one knot for all situations

A very understandable low-tech construction system, which can be copied and further developed by the local artisans, was the precondition to build the school Tipu Sultan Memorial feasible and sustainable. Thus, a simple bamboo knot with a steel dowel and a string beam was taken as the main construction principal for the bamboo construction system of the porch and the top floor. All basic construction elements like posts, beams and ceiling are based on this or are a slightly modified joint. This requires just a small amount of tools like hammer, lini, drill machine and some kind of lashing strips. Most building parts like beams and posts can be preproduced on site, assembled flat on the ground they can be erected, fixed and finally filled with earth. To ensure a long lifespan of the building it was obligatory to treat the locally grown bamboo.

The foundation system of the porch and the top floor is constructed in a light-way bamboo construction system; the ground floor was built out of heavy cob walls, a mixture out of straw and earth. The earth construction technique builds on the locally applied earth building tradition, but is more durable due to the straw micro reinforcement, a waterproof foundation and a proper protection against water from the top. In combination the massive earth construction in the ground floor and the light bamboo frame structure in the top floor enable a two floor building, even in an earthquake area like the Punjab in Pakistan.

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Locally-manufactured cob and bamboo school building, Jar Maulwi, Pakistan

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