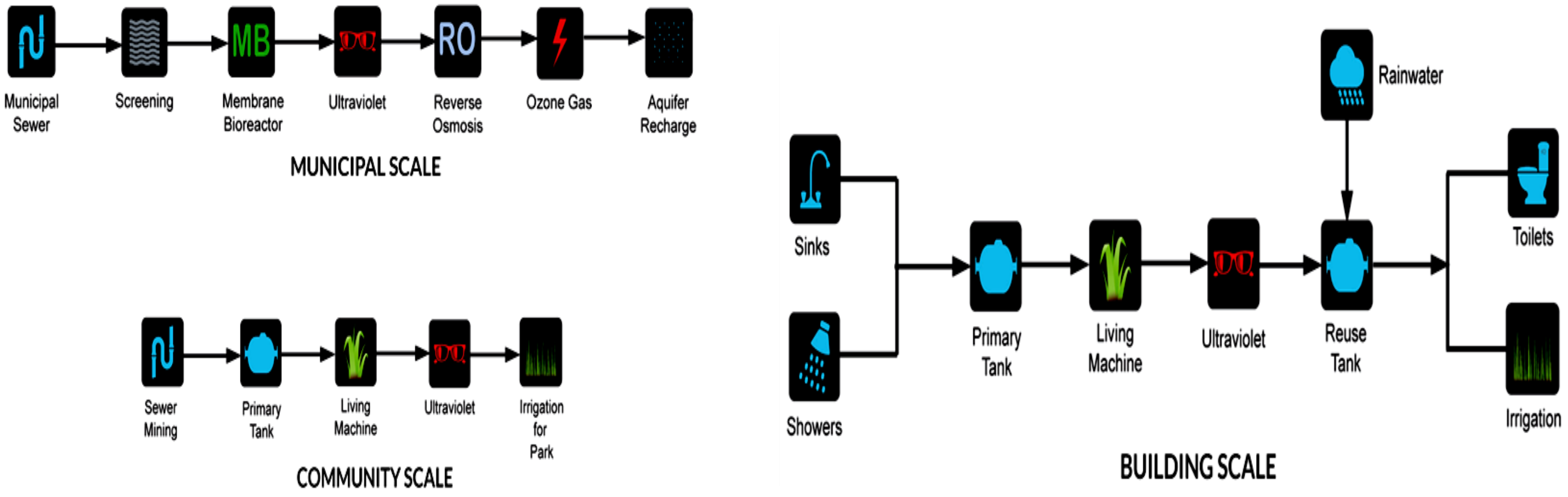


Figure 8.26. Municipal Scale, Community Scale and Building Scale operational implementation of living machines, www.livingmachines.com, 2012.

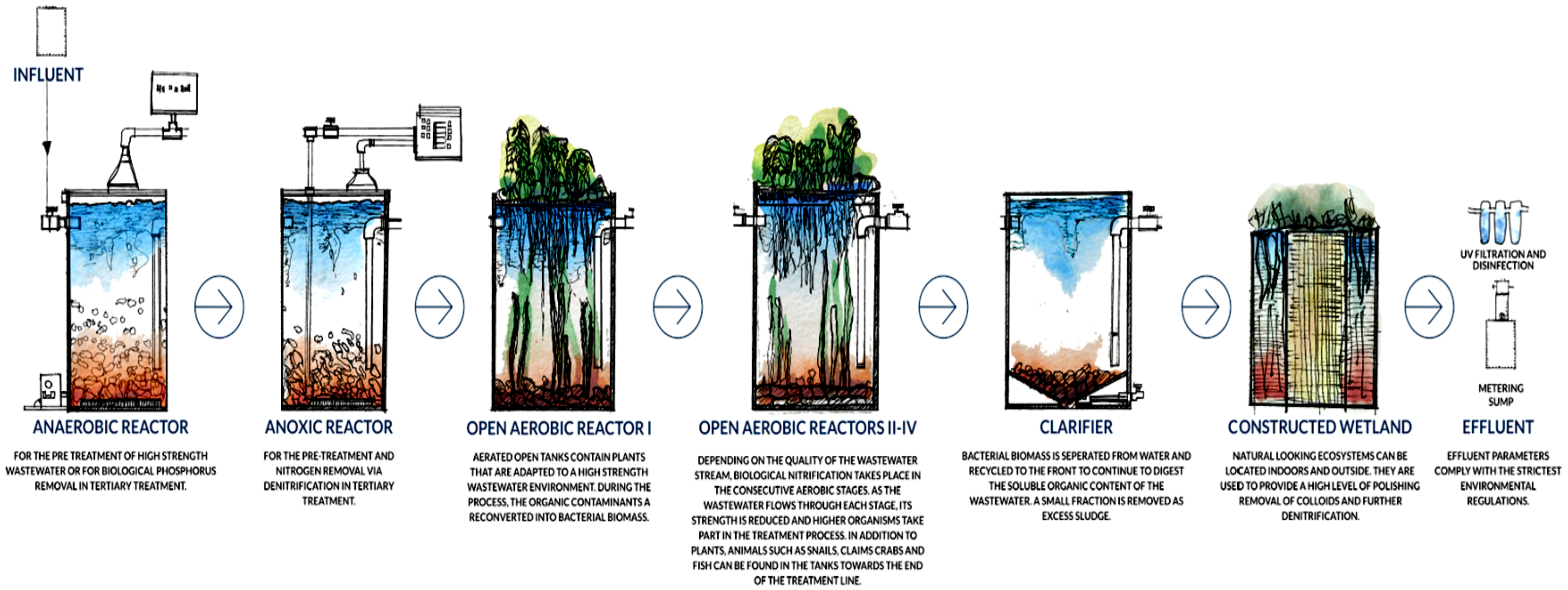


Figure 8.27. Eco-living machines, adapted from www.livingmachines.com, 2012.

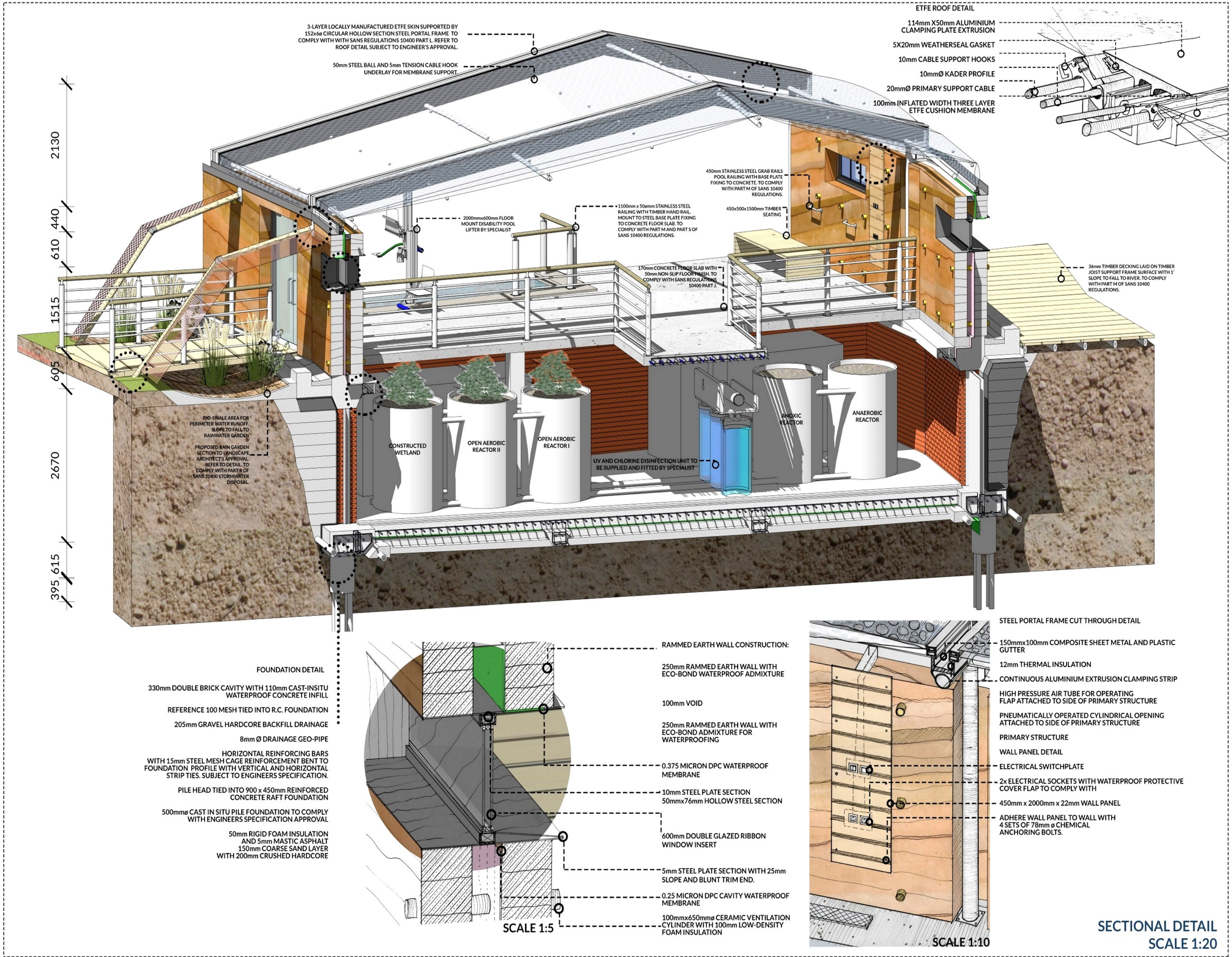


Figure 8.28. Technical iteration 04 - 1:20 Section. Author 2016.

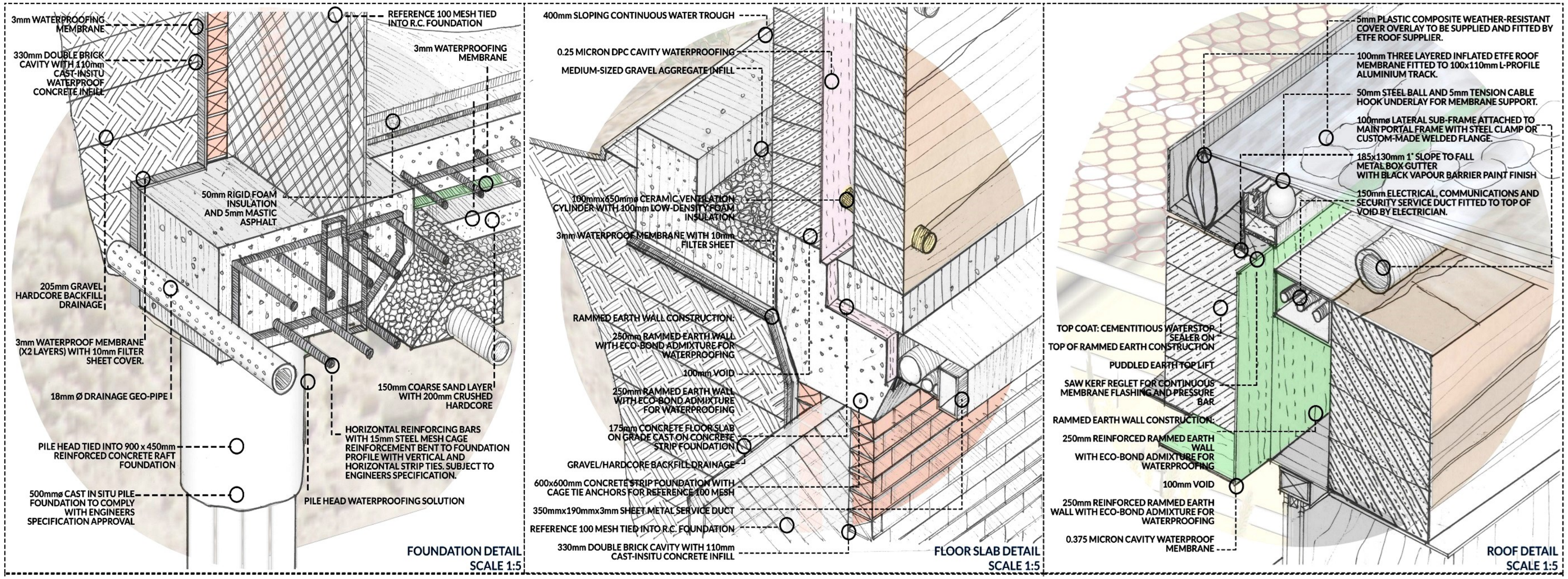


Figure 8.29. Technical iteration 04 - Foundation, Floor and Roof connection details. Author, 2016.

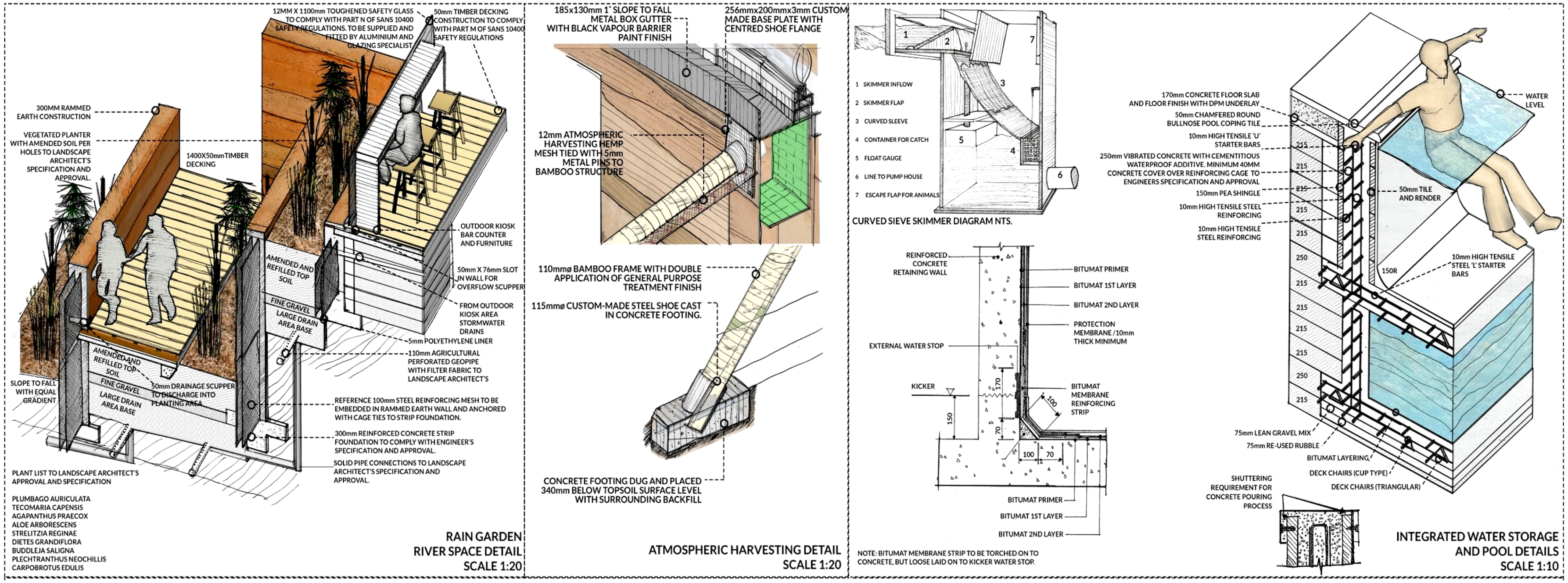


Figure 8.30. Technical iteration 04 - Rainwater garden, atmospheric harvesting and integrated water storage details, Author, 2016.

8.4 SERVICES AND TECHNOLOGIES

8.4.1 WATER, ENERGY, AND VENTILATION

Figure 8.25 demonstrates strategies regarding the building's systemic response to the surrounding context in terms of its integrated water supply system and mixed-use energy supply. A passive ventilation strategy for the internal envelope of the building with the use of evaporative cooling units and integrated wall-mounted ceramic cylinders was explored in technical iteration 04 (see Figure 8.28).

8.4.2 ATMOSPHERIC HARVESTING AND RAINWATER COLLECTION

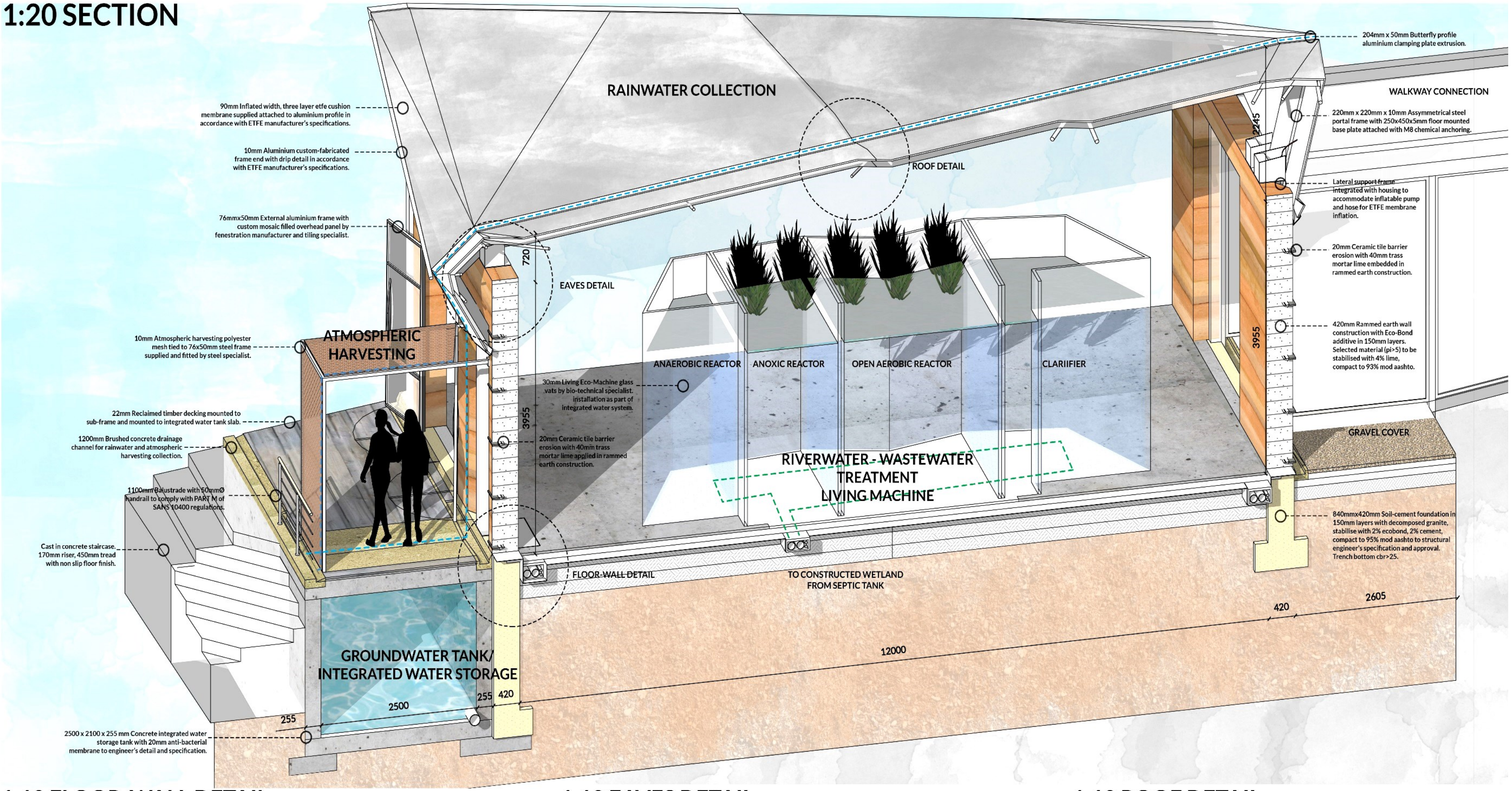
Atmospheric harvesting nets attach to the building's periphery (see Figure 8.31). The design of these harvesting nets is based on the design used by the Warka Water Project (Warka Water, 2015) which has been developed and built (see Figure 8.24) as a continuous pilot project in Ethiopia and tested in Rome's urban public spaces (Warka Water, 2015). The design uses biomimetic strategies derived from nature, such as a recyclable hemp mesh. A 30m² section of this material is able to yield an annual average of 50 to 100 litres of water in a day, provided the annual outdoor relative humidity is in a range between 50% and 80% (Warka Water, 2015).

8.4.3 ECO-LIVING MACHINE

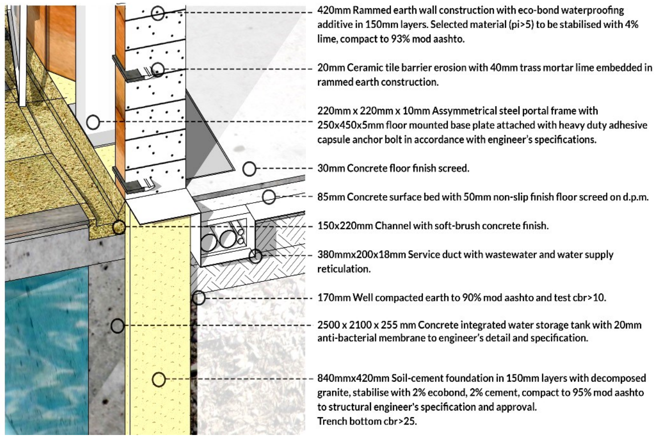
Living machine technologies provide a synthesised bio-engineering solution that is supported by ecological wetlands research (Lohan & Kirskey, 2012). The scale of such a technology is determined by the requirements for water supply that ranges from a building, community or urban scale. Such a system uses plant-based bacteria to feed on passing microbial masses from the building's grey water system (Lohan & Kirskey, 2012). Water purification configurations remove harmful effluent, biological toxins, and floating solids from polluted water.

The purification series occurs over several stages (see Figure 8.27). Water is circulated through a linear cycle of anaerobic, anoxic, and clarifier tanks. The interior tank lining is a plant covered textile membrane with support shelves. "The applied water purification methods typically include physical treatment (filtration, sedimentation, and distillation), biological treatment (slow sand filters or biologically active carbon), chemical treatment (flocculation and chlorination), and treatment through the use of electromagnetic radiation (UV light)" as explained by Lohan & Kirskey, (2012).

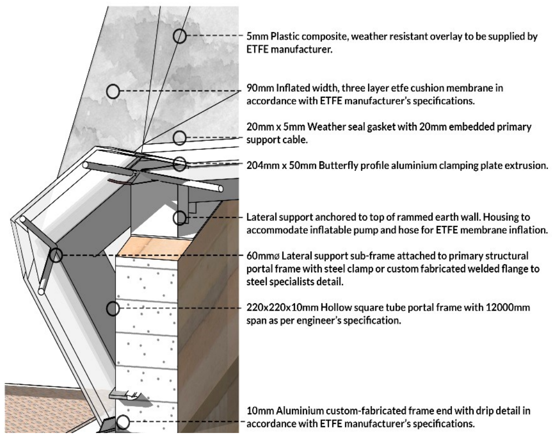
1:20 SECTION



1:10 FLOOR-WALL DETAIL



1:10 EAVES DETAIL



1:10 ROOF DETAIL

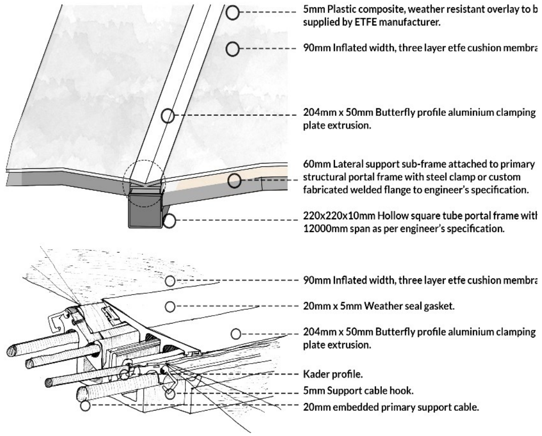


Figure 8.31. Final technical iteration (iteration 05) - 1:50 Section. Author, 2016.

8.5 GREEN RATING AND REVIEW

8.5.1 SBAT RATING - SOCIAL

Given the programmatic response of the intervention, the inclusion of the building in its context, and the building's proposed accessibility to the general public, this provided a good social benchmark for the project (see Figure 8.32).

8.5.2 SBAT RATING - ENVIRONMENTAL

If the swimming pools are reduced in terms of their water footprint and the requirements regarding water usage, the revised design would be able to increase its water supply yield to the surrounding context with fresh groundwater, while the building itself would be able to recycle its internal water supply. The environmental benchmark accounts for the use of the Eco-Living Machine and contributes towards the environmental SBAT rating (see Figure 8.32).

8.5.3 SBAT RATING - ECONOMIC

The building construction should be economically viable (see Figure 8.32), reflected by the usage of rammed earth construction as a local material, by the position of the project relative to the urban condition, and by the use of locally sourced energy in the surrounding context.

8.5.4 REVIEW

In order to meet the minimal quota of the building's water usage (see Figure 8.33) in the therapy pools and other areas, eco-living machine technologies and groundwater storage should be integrated with conventional building services (see Figure 8.34). The proposed system should integrate water purification, storage, and distribution systems.

Due consideration is required to the systemic strategy of reducing the building's water consumption. As previously mentioned, living machines contribute towards recycling water in a building's internal water use. The systemic water strategy for the building also needs to be seen in its regenerative capacity supply to the surrounding buildings and landscape, and to replenish groundwater levels substantially.

The regenerative water cycle by Esteban Matheus, (2011) as previously outlined in Chapter 3, confirms the use of this strategy for a building's integration with the water cycle.

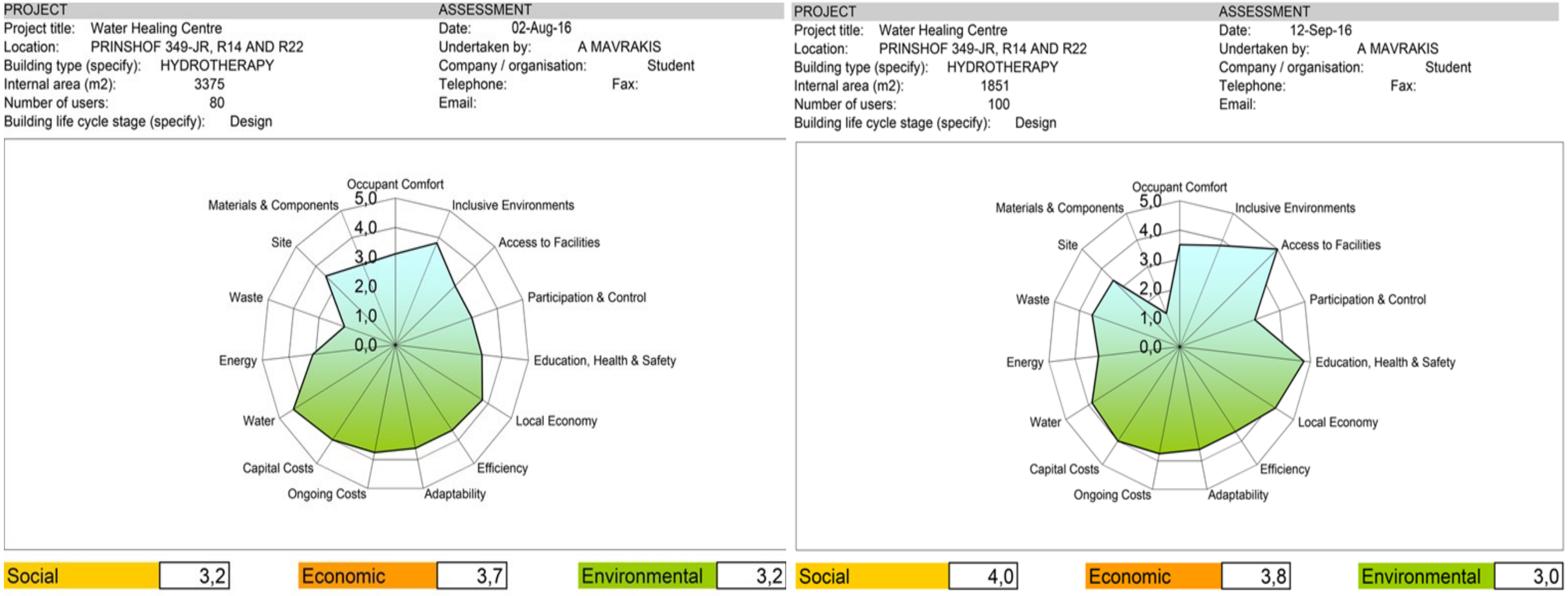


Figure 8.32. SBAT comparison between iteration 01 and iteration 04, Author, 2016.

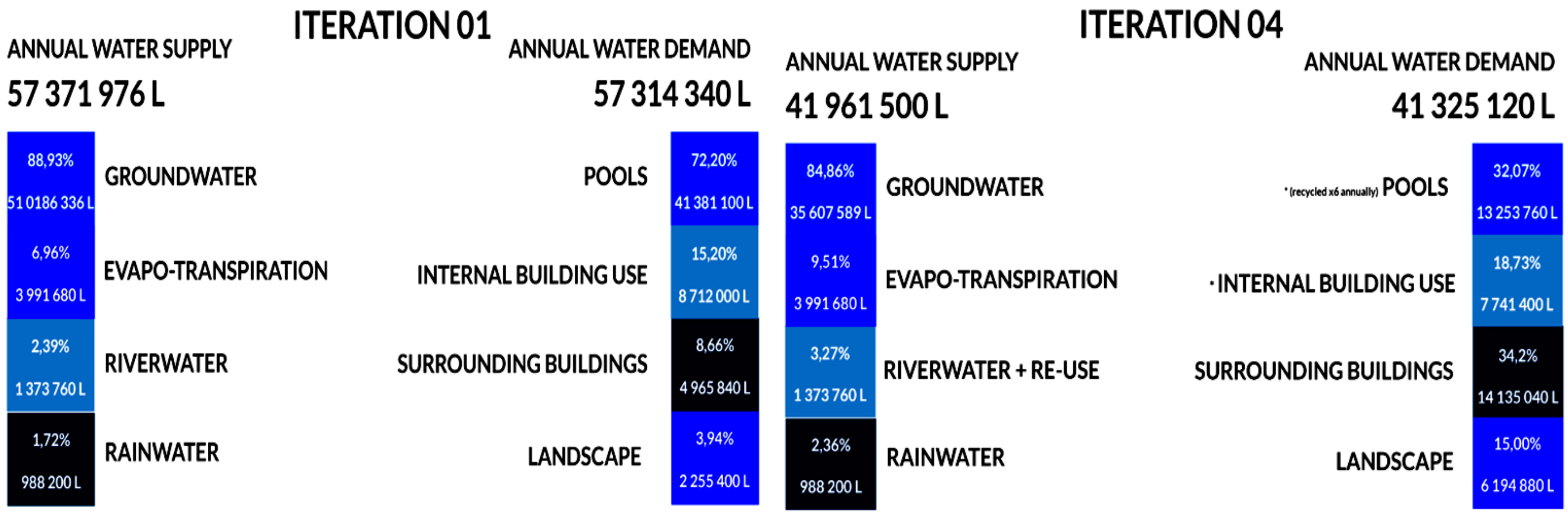


Figure 8.33. Water calculation comparison between iteration 01 and iteration 04, Author, 2016.