Washroom Design in the Green Building

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Team Mosaic is providing recommendations for the implementation of an environmentally-friendly washroom for the Green Building. Background research showed that redesigning the toilet fixture yielded the greatest environmental benefit.

Team Mosaic generated several toilet concepts that were based on existing technologies, including dual-flush, alternative flushing liquids, composting, and waterless toilets. To evaluate the concepts, the toilet was divided into its main subsystems: exit system, bowl, and user interface. Then, the various concepts were evaluated for their suitability for each subsystem, using both customer and end-user requirements. Subsequently, a series of experiments were undertaken to help select the best materials for the pipe network and toilet bowl interior’s surface. As expected, no single existing solution best satisfied all three subsystems. Instead, a hybrid concept involving the greywater recirculation concept paired with dual-flush technology represented a realistic solution that could be implemented in the Green Building and readily adopted by end-users.

The proposed solution combines an off-the-shelf dual-flush ceramic fixture with innovative improvements developed by the design team. The first improvement involves connecting the toilets to a greywater holding tank, which stores disinfected water collected from the sinks until it is used for flushing. The sink water collects in a 40L stainless steel greywater holding tank, from where a 1/25 hp pump forces the water into the toilets through an 11m pipe network. A second recommendation involves applying a thin coating of stainless steel on the interior surface of the toilet bowl to prevent waste adhesion and reduce the volume of water required for flushing.

The expected capital cost of the system for six toilet fixtures in four bathrooms, on two storeys is $2,000 compared to $600 for traditional public toilet fixtures. Although the cost of the installation is greater than a traditional system, it will bring operating savings of approximately $50 per year. However, the real benefit lies in the positive impact of water conservation since approximately 60,000L of water can be reused.