The Bullitt Center Composting Toilet Case Study

Category: New Construction
Sub-category: Net Zero Water, Net Zero Energy
Material, Technique or Technology: Composting toilets
Project Title: The Bullitt Center (or the Cascadia Center for Design and Construction)
Owner: The Bullitt Foundation
Building Type: Commercial office building
Square Footage: 51,000 sq ft.
Number of Occupants: 166
Builder/Designer: Miller Hull, PAE Consulting Engineers, 2020 Engineering, Schuchart
Construction, Point32 Developers
County: King County
Permitting Officials: City Ordinance: Nouri Samiee, SPU: Mark Jaeger

Permitting Process

2020 Engineering worked with Public Health Seattle King County (PHSKC) as well as the Seattle Plumbing Department to permit the composting toilets. Because the composters were entirely contained within the building, both the fixtures and the composters themselves were permitted through plumbing permits in accordance with the Universal Plumbing Code. The composters are National Sanitation Foundation (NSF/ANSI) certified and are approved for use in Washington state. It would have been much more difficult to permit a non-approved or non-proprietary system. Although it was not difficult in this case, permitting specific toilet fixtures can sometimes be an issue.

Because typical composting systems vent air down through the toilet, through the composter, and out through an exhaust pipe, the toilets do not have a p-trap (a device that prevents the odorous gas in plumbing drains and sewers from rising up through the toilet). This, along with not installing a typical exhaust fan in the bathroom (since we want the air to come into the bathroom rather than out), can be problematic with plumbing and building departments. However the City of Seattle is more supportive of these types of alternative systems; they were open to our justification and allowed it.

Applicable Code Sections

SMC: Seattle Municipal Code
WAC: Washington Annotated Code
KCC: King County Code
BOH: King County Board of Health
• SMC 21.16.040: Requires wastewater side sewer connection, with exemptions allowed: “the Director of the Department of Planning and Development, after consulting with the Director of Seattle Public Utilities, may exempt any otherwise

accessible developed property from connecting to the public sewer system," exemptions like these are allowed conditionally, provided "the property has a currently functioning on-site sewage disposal system as determined by the Director of Health," among other conditions. This code has a number of different regulatory difficulties and levels of bureaucracy for approval.
• SMC 22.206.050 E: Requires toilets to be flush-type and connected to an "approved sanitary sewer or to an approved private sewage disposal system." Micro-flush marine toilets will be used.
• WAC 173-219: Reclaimed water use
• WAC 246-272A-0100: Sewage technologies, including composting. (2) "All types
of sewage technologies must have either standards for use described in this chapter or departmental recommended standards and guidance before the local health officer may permit them."
• WAC 246-272A-0210: Location of the on-site sewage system and minimum horizontal separation distances from other public water systems.
• WAC 246-272 B: Large on-site sewage system (LOSS)
• WAC 246-272B-11501: Design of the LOSS
• KCC 13.24.035: Public Sewer Service: "All development within the urban growth
area shall be served by public sewer service except onsite sewage systems may be allowed temporarily in some parts of the urban growth area in accordance with KCC 13.24.136."
• BOH 13.04.050: Connection to a public sewer
• BOH 13.52.020: Provisions for composting toilets: (B) "Composting toilets and incineration toilets shall be designed, installed, operated and maintained in accordance with the Recommended Standards and Guidance for Performance, Application, Design, and Operation & Maintenance, Water Conserving On-site Wastewater Treatment Systems, July 2007, WA State Department of Health, or as amended and with the registered list. (D) "Sufficient area shall be available for a one hundred percent primary and reserve area. The department may grant a reduction of up to fifty percent in septic tank size, and up to forty percent in installed drainfield size if the compost or incineration system is consistent with this title. In no case, however, shall the tank size be less than seven hundred fifty gallons."

Abstract

The Bullitt Center is a unique, first-of-its kind office building in downtown Seattle at 1501 Madison Street. The building is designed to meet the rigorous standards of the Living Building Challenge (LBC), including Net Zero Energy and Net Zero Water. Working directly with the City of Seattle and their LBC pilot program, new technologies and design elements for sustainability were permitted or allowed through conditional-use permits, variances, and exclusive permissions from the city. Micro-foam-flush marine toilets with an onsite composting system are used to help achieve the Net Zero Water goal and adhere to the

requirements of the city's pilot program.

Narrative

In 2009, a partnership between the city of Seattle and the International Living Building Institute created a pilot program for up to 12 Living Buildings to be permitted under a new city ordinance: SMC 23.40.060: "The purpose […] is to establish a Living Building Pilot Program. The goal of the Pilot Program is to encourage the development of buildings that meet the Living Building Challenge by allowing departures from code requirements that might otherwise discourage or prevent buildings from meeting this standard." This ordinance means that special conditional-use permits or variances were either more easily obtained or allowed by the city.

One intention of the ordinance is to help Seattle code officials understand where current code creates barriers for green design. Code innovations uncovered during the pilot program will help shape future Seattle building codes. This means elements like the composting toilet system, which isn't necessarily against current code, will have a clearer regulatory path for becoming a viable alternative to a traditional sewage system.

The Living Building Challenge requires a project to meet twenty specific imperatives within seven performance areas (or "Petals"): site, water, energy, health, materials, equity and beauty. These are subdivided into twenty Imperatives, each of which focuses on a more specific building or design concept. The two Imperatives relating to this composting toilet system, Net Zero Water and Ecological Water Flow, read (respectively): "100% of occupants' water use must come from captured precipitation or closed loop water systems that account for downstream ecosystem impacts and that are appropriately purified without the use of chemicals... 100% of storm water and building water discharge must be managed onsite to feed the project's internal water demands or released onto adjacent sites for management through acceptable natural time-scale surface flow, groundwater recharge, agricultural use or adjacent buildingneeds."

This came into conflict with KCC 13.24.035, which necessitates a sewer utility hook-up within the urban growth boundary. Working with Seattle Public Utility, 2020 Engineering designed the building to be constructed with both a public sewer line and ten Phoenix R-200 composting units located in the basement. This adds to the overall cost, but is necessary if the composting system fails and as an additional public health safeguard. Micro-flush toilets use 3 ounces of Neponol, a type of foaming biodegradable alcohol, per flush. The composters require minimal maintenance: each unit needs to be "churned" one rotation per day, producing about one 5-gallon bucket of compost per composter per week.

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