Oregon Health & Science University's (OHSU) Center for Health & Healing (CHH) is not only the largest LEED Platinum building in the country, but is also the most complex LEED Platinum project to date, with a myriad of complex functions contributing to its success. The design team was challenged to utilize all of the site's assets of solar access, views, rainfall and bioclimatic forces, while recognizing the future growth of the area. This single-block urban site will eventually be surrounded by high-rise buildings and urban infrastructure.

Pioneering the new South Waterfront neighborhood, a redevelopment of a 140-acre former industrial site along Portland's Willamette River, CHH serves as a model of growth for this area. The design of CHH is shaped by the master plan for the Central District of the South Waterfront, which includes dense commercial, institutional and residential projects as well as a riverfront greenway, public trail systems and parks—all targeting green solutions to urban challenges. A very public ground floor is anchored by an atrium, which marks the threshold and gives a civic presence at an important intersection. A three-story wellness center, home to CHH's physical therapy departments, rests below eight floors of clinical space, including an outpatient surgery suite and MRI labs. Opening to a rooftop garden, the building's top four floors house research labs and educational spaces. The lower terminus of an aerial tram connects CHH to OHSU's main campus on Marquam Hill; parking is available in a three-story underground garage, and the Portland Streetcar runs directly in front of the building.

OHSU saw the building as a way to redefine their relationship with patients, by embodying the notion of health and healing. The architectural solution is a dignified composition of materials, which overlaps functions, uses top-down research and strives to demonstrate environmental measures. This project will set a pattern for growth in this district as an example of what integrated design with high standards of quality can accomplish on a conventional budget.

LETTER

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A Green Beginning to a New Community

Brief
The Oregon Health & Science University (OHSU) Center for Health & Healing (CHH) is truly a green beginning to the South Waterfront community. As an internationally recognized project among the urban landscape—inherent with its USGBC LEED Platinum Certification—the building sets a new standard in the design industry. Not only is the CHH the largest LEED Platinum building in the world, but it is also the most complex LEED Platinum project to date, with myriad of overlapping and complex functions contributing to its success.

South Waterfront – "Pioneering a New District"
Pioneering the new South Waterfront neighborhood, a redevelopment of a 140-acre former industrial site along the Portland, Oregon's Willamette River, CHH serves as a model of growth for this area.

The first phase of the South Waterfront community is a residential neighborhood called The River Blocks, which also includes an extension of the main OHSU campus. The design of CHH is shaped by the master plan for the Central District of the South Waterfront, which includes dense commercial, institutional and residential projects as well as a riverfront greenway, public trail systems and parks all targeting green solutions to urban challenges. Strategically situated on 38 acres along the Willamette River's west bank, this development is setting the precedent for innovative design in Portland.

It was clear from the beginning that OHSU's first building in the area, the Center for Health & Healing, would be a vital step in creating the new Portland neighborhood.

In keeping with the developer's goal to reduce the neighborhood's environmental impact, the District offers unrivaled access to multiple modes of transportation, including streetcar, aerial tram, bus and walking/biking trails.

The new medical office building connects to OHSU's main Marquam Hill campus by way of an Aerial tram, the lower terminus of which connects to the buildings north side. The Portland streetcar extension, which connects to the metro system, runs directly in front of the building.

Architecture – Goals and Solution
The layout and configuration of the 400,000 sf, 16-story facility maximized its relationship with the main campus and the City, while also staying connected to the natural world, by participating with the extensive green spaces along the restored riverbank.

The primary design goals were to provide for cutting–edge health and wellness technology in an environmentally sustainable building. The building's location is conducive to attracting both business people from the area and downtown, as well as, residents from the new up-scale housing in the district. The facility will provide healthcare in a top-down structure from research, educational, clinical diagnosis and treatment to rehabilitation and life-health prevention with the wellness component.

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Early in the development of the architectural solution, words were gathered to express the aspirations that would manifest themselves into the built form.

- **Technology** – The building would employ the highest level of technology, and develop new technology from within.
- **Science** – The programs within the building would explore, define, and use science to define future medicine and wellness practices.
- **Health** – A paramount goal of the building, and the practices within.
- **Movement** – More of an architectural descriptor, but also a play on words of activity, health and wellness.
- **Barometer** – The building should express to the outside, to the public, the temperature, the air and the climate within the building's expression or environmental solution.

The building façade is tailored to its exposure. The north elevation, for instance, frames views toward to the city and the river and becomes the area of waiting in the diagram of the interior layout. The North side of the building also scales its massing to the pedestrian creating lush gardens of volume and graphic interest, cognizant of views from the tram, from above within the building and from neighboring buildings. The south elevation of the building is thought of as the "machine" of the building. It integrates Photovoltaic panels into the sunshades to reduce mechanical load of the building and creates electricity at the same time—a good story told and realized by many. The top two floors give architectural expression to thermal collector, while also providing access to gardens. The south elevation of the building sets up a tapestry to allow personalization, without compromising the aesthetic of the building. The lab functions, private offices and mechanics create a chaos to the façade that has to be embraced rather than forced. This elevation expresses the idea of Technology, Science and Barometer. The short East and West elevation celebrate health and movement by the ability to see the stairs and the movements within. The stairs are the emergency egress stairs for the building, and while in most buildings the lights within the stairs are left on, in this building we appealed to have them turned off; instead, they are equipped with occupancy sensors. When one enters the stairs in the evening, a group of three floors turns on. As you move up or down another grouping of three floors of lights turn on, while the ones behind you time out and turn off. This, when seen over time, creates a movement and almost a thermostatic reading to the stair towers.

The choice of stone was to give the building a durable, solid and earthy tectonic quality that would reflect the institutional typology of the medical practices and University within. Clear glass was used throughout, to capture as much daylight and view as possible. Metal panel, fritted glass and mullion extensions create shadows and reflections within the façade to animate it, and they help organize the façade into a larger urban scale, letting the building solution become more legible from a distance.

The interior development concentrated on modular room sizes, for flexibility. Opportunities to expose patients to exterior light, fresh air and views are maximized with the waiting areas along the north perimeter of the building. A color and materials palette was selected, builds upon the buff-yellow granite of the exterior building skin and creates a warm neutral background for accents, which provides variety and manages choices in the clinical areas. Low VOC paints and adhesives

give the building a clean and fresh feel. FSC-Certified Hemlock was used in places, where information was given. This way materials and color were used to help define way finding.

SUSTAINABLE DESIGN OBJECTIVE

All parties involved saw an opportunity to create a high performance building that would be a model of ecologic and civic responsibility. The design team was challenged to achieve 60% energy savings below code, reduce the M/E/P capital costs by 25%, capture and reuse 100% of rainwater on site, reduce potable water consumption by 50%, treat all sewage on site and reuse that water. This building has twelve major integrated design features, involving architecture and other disciplines working together creatively. Two of the most interesting include the rainwater/groundwater reclaim system, which actually performs six different functions, and the rainwater/fire suppression storage tank that serves four different roles. The multiple uses of single systems are the intelligence this building enjoys, to reduce equipment and fuel loads.

ENVIRONMENTAL AWARENESS

The team studied rainfall and groundwater flows, which informed the rainwater harvesting, treatment system and thermal storage capacity. Wind and solar access were modeled to evaluate building orientation, massing and on-site energy generation using PV, Solar Thermal and the potential for wind turbines. The east-west orientation of the building maximizes solar access. The large diurnal temperature range in the summer allows for pre-cooling the building mass with outside air at night. Future development was studied using CFD models to simulate the microclimates created by adjacent buildings. Photovoltaic panels with integrated sunshades were positioned by shading studies, and the unobstructed top floors were identified for solar thermal use.

Landscaping and civil engineering design increased the amount of pervious area in the site and structure with green roofs, pervious hardscape and vegetated stormwater treatment. With over 50% of its roof vegetated, CHH has reduced its site impervious area by over 25%, successfully limiting the heat island effect, stormwater runoff and creating habitat. Stormwater runoff from the streets and sidewalks adjacent to CHH is collected and treated in a regional bioswale, providing habitat adjacent to the river.

RESOURCE EFFICIENCY

Energy

Analyzing data, heating, hot water and lighting proved to offer the most significant energy cost savings. Sunshades and stair tower ventilation were placed according to daylighting and energy model results, helping reduce cooling loads and downsizing the mechanical system by 30 tons, helping offset first costs.

Doubling up of functions informed a number of integrated design strategies; the most significant is the rainwater/groundwater reclamation system, which performs six different functions: toilet flushing, cooling tower make-up, irrigation, radiant cooling, microturbine inlet cooling and stormwater detention. Other strategies include combining garage ventilation fans with atrium smoke evacuation fans, timed egress

analysis of atrium to reduce smoke control exhaust and chilled beams for radiant cooling that reduced duct runs.

According to the Energy Trust of Oregon, this building sets the record for the greatest number of strategies integrated into a facility.

Innovative on-site energy production strategies:

- A Central Utility Plant provides combined heat and power for 30% of the building's demand. This captures 80% of the source fuel energy, instead of the typical 33% from grid-supplied power. Waste heat is then stored for radiant heating.
- 60kW Building-integrated solar electric panels on the building's south-facing sunshades.
- A large solar air heating system, using low-iron glass in front of the south-facing wall of levels 15 and 16, assists in pre-heating domestic water.
- All heat not used is either stored in the building mass or the mass of the wellness lap pools or therapy pools.

Water

The design team looked for ways to use the half million gallons of water that fall on the site in a year and minimize the amount of wastewater entering the city sewer. The 5 million gallons of total water use and high water fees made rainwater harvesting and reclamation financially viable. Rainwater is harvested and stored in a 22,000-gallon fire-suppression tank and used for flushing toilets and urinals in the building core, for cooling tower make-up and for irrigation. The tank is used as a non-potable cistern and is circulated through the building's radiant slab to cool parts of the building. Wastewater is then treated by an on-site membrane bioreactor to tertiary standards and reused for these non-potable functions again. The combination of demand reduction, harvesting and reclamation produces a reduction in potable water demand of 61% over a similar building.

Materials

Three most important material choices were structural steel, cladding and low-emitting finishes.

Materials with high recycled content include structural steel, metal framing, metal stairs, aluminum curtain wall members, ceiling tiles, agrifiber door cores and cabinet cores. 58% of the wood on the project was FSC-Certified, and all composite woods were made with urea formaldehyde-free adhesives. 65% of the materials are sourced from within 500 miles, including a large number of products that are designed to reduce environmental impacts and promote human health.

SOCIAL RESPONSIBILITY

With over 2,000 visitors per day, CHH forms the nexus of a new neighborhood. It forms the central transit station for the district, provides a public gathering place and presents a recognizable "face" and a "front door" to the neighborhood and nearby OHSU campus. An extension of the streetcar connects the building and district to the downtown core, and the new aerial tram connects to the main OHSU campus.

Unlike many institutional buildings, CHH is open to the public and provides a neighborhood café, day spa and membership access to the extensive wellness

center. The atrium functions as a public gathering place – a living room – and has become the primary civic building in the district.

This project also proves that the integrated design process—in which goal setting for sustainable design starts early, during programming and conceptual design and involves the entire design team—allows innovated strategies to develop when was most economical to incorporate them into the building design. The building itself is a new paradigm to integrated and environmental design with a very complex set of problems and a beautiful and complex architectural solution of form and function.

None of the Center's extraordinary results could have been achieved without a strong integrated design effort. The aspirations of a project this large and complex would not have happened without the collective vision and spirit by the team, to create a healthy building and help people maintain a healthy lifestyle.