

Toyota Motor Sales Portland Vehicle Distribution Center

Portland, Oregon

Building Type:	Warehouse, Office
Recognition Status:	LEED for New Construction v2.0/2.1 Gold
Completion Date:	2005
Gross Square Footage:	98,000 sq. ft. (9,100 sq. m.)
Total Project Cost:	US\$40 million
Energy Cost Savings:	33% projected
Site Energy Use:	93 kBtu/sq. ft./yr (293 kWh/sq. m./yr) projected
Indoor Potable Water Use:	0 gallons/yr (0 liters/yr) projected
Outdoor Potable Water Use:	0 gallons/yr (0 liters/yr) projected
DOE Climate Zone:	Zone 3 (4500 HDD and 300 CDD)



Water-efficient landscaping
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PROJECT OVERVIEW

The design and construction of the Portland Vehicle Distribution Center (VDC) was motivated by the expiration of an existing lease, the need for a bigger facility, and the growing repair and maintenance bills for the old building (US\$300,000 annually). The new facility is located on an 86-acre (35-hectare) property alongside the Willamette River near downtown Portland, closer to shipping and rail services than the old facility. The warehouse receives and coordinates vehicle delivery to dealerships across North America.

THE BOTTOM LINE

Toyota's new Leadership in Energy and Environmental Design (LEED) Gold Vehicle Distribution Center (VDC) is the latest example of the company's long-standing commitment to strategic environmental operations. Toyota's Real Estate and Facilities Department (RE&F) championed the project with the goal of achieving the highest standards in energy efficiency and building performance. Partially financed by the Port of Portland, the US\$ 40-million project reduced Toyota's energy costs from US\$221,845 to

US\$189,125 per year—even though the new facility now processes more vehicles and is 100 percent wind powered through the purchase of green power. During the first year of operation, a 26.3 percent reduction in energy consumption from 127 kBtu per square foot per year (400 kWh per square meter per year) was recorded, compared to 93 kBtu per square foot per year (293 kWh per square meter per year) at the old building. A recognized leader in both the automotive and green building industries, Toyota routinely champions operational efficiency, rigorous accountability, and cutting-edge technology.



Processing vehicles at Portland VDC
© Rocky Mountain Institute

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“PROCESS GREEN” POLICY GUIDES ALL FACILITY PROJECTS

Since the 1992 launch of its Global Earth Charter, Toyota has successfully integrated numerous company-wide environmental policies. The company charter is supported by a series of five-year environmental action plans, which provide specific environmental goals and targets. The “Process Green” initiative, developed by the Real Estate & Facilities Department, requires the development of an environmental strategy before any new facilities project is undertaken. The three principles of “Process Green” served as a platform for the Vehicle Distribution Center outside Portland. The three principles of “Process Green” are:

PROCURE and use resources in the most environmentally intelligent, cost-effective, and reliable manner possible;

PARTICIPATE in public, private, and professional organizations to share knowledge and accomplishments; and

PAY IT FORWARD to effect a similar shift in the organization and culture of our business partners.

“The facility recycled 96 percent of its materials last year. We only had an average of 6 ounces of waste to landfill per vehicle – that’s about the size of a Hershey bar.”

— Ron Corbin
National Logistics Manager
Toyota Logistics Services



Bioswale along the Willamette River / © Toyota Motor Sales, USA, Inc.

INTEGRATED DESIGN PROCESS BENEFITS ALL STAKEHOLDERS

The design for the Toyota Vehicle Distribution Plant was initiated with an eco-charrette, which brought together key project players to outline goals, devise strategies, and identify potential obstacles. Toyota continued to employ this collaborative approach throughout the entire design process. Integrated design proved successful for both project managers and project team members and a cooperative approach permeated interaction between Toyota employees, the local community, and local government agencies. From the very start, Toyota acknowledged Portland’s commitment to social responsibility and environmental quality and set out to contribute to

the City’s mission. To restore 4,500 feet (1,370 meter) of the Willamette Riverbank, Toyota planted more than 10,000 native shrubs and 500 native trees, converted 7.6 acres (3 hectares) of pavement into permeable landscape, and shielded the surrounding neighborhood and river from industrial activities. By incorporating more than energy efficiency measures into the project, Toyota reduced local opposition and was recognized as an environmental leader in Portland.

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Energy Star-compliant roof
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BUILDING USE CHALLENGES CLASSIC GREEN SOLUTIONS

At the new Toyota Motor Sales VDC building, energy consumption has been reduced by 33 percent and water consumption by 75 percent compared to a typical building of the same size and function. Energy savings were accomplished through the use of efficient HVAC systems, occupancy sensors, skylights, energy-efficient fluorescent lighting, and high-performance glazing and insulation. A heat-recovery system captures waste heat exhausted from the process shop to heat incoming fresh air. Also, quick-closing process doors and demand-control ventilation were used to help reduce energy use. Finally, a busway power utility distribution system was introduced to minimize redundancy while providing processing flexibility for electrical power usage. A dramatic reduction in water use was achieved through the use of rainwater harvesting, low-flow faucets, and the elimination of a permanent irrigation system.

The project encountered numerous design barriers along the way. On the energy side, modeling energy reductions proved challenging given the high energy-intensity of a vehicle-processing environment. Despite the fact that the design case building had significantly higher than typical operating requirements for lighting, ventilation, and power utility requirements, the building still achieved a 33 percent reduction in annual energy costs as compared to the base case code-compliant building.

ENERGY MANAGEMENT SYSTEMS ALLOW FOR SUPERIOR RESOURCE TRACKING

All too often, building managers are presented with a building to manage, operate, and improve without the necessary tools or training. At Toyota, the Facility Integrated Resource Management (FIRM) program provides building managers with the ability to make informed decisions about energy management and upgrades. The FIRM program has several components including real-time utility meter monitoring, building automation systems, utility pivot tables, project justification forms, measurement and verification reports, and treasure hunts. The system's "Energy 1st Software" relays information including peak demand and hour-by-hour natural gas consumption for any connected meter. It also allows the user to set "energy alarms," alerting building managers to excessive energy demand or consumption. The FIRM program also includes Building Automation and Control Networks-compatible (BACnet) systems, which allow building operators to maximize energy efficiency while still meeting

users' operational requirements. Another component of the program is Utility Pivot Tables, which track energy usage, costs, and emissions. These portfolio-wide tables, easily searchable by facility type, form Toyota's database for all energy-related information.

Two key documents, an Energy-Efficiency Justification Form and an Energy Project Measurement & Verification Report, help ensure projects are both cost-effective and deliver results. These efforts provide Toyota facility personnel with the information and resources to measure and verify optimal building performance at the Portland Vehicle Distribution Center.

"Our commitment to green building really stems from an expansion of the Toyota Global Earth Charter. In that, we've been challenged to look at everything that we do and try to reduce its impact on the environment."

— Sanford Smith
Corporate Real Estate Manager
Toyota Motor Sales USA

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INDOOR ENVIRONMENTAL QUALITY KEY TO CORPORATE MISSION

One of Toyota's highest commitments is to ensure the health and satisfaction of its employees. As such, the development team implemented proactive measures to manage air quality during construction. To protect the HVAC system from dust and other airborne pollutants, ductwork was sealed during transportation, storage, and installation. This step not only guaranteed the integrity of the system for permanent building occupants, it also protected construction workers from unnecessary hazards. In addition to these measures, construction house-keeping was increased to ensure indoor air quality. Likewise, depending upon the climate and stage of construction, fans were used to introduce fresh outside air into the site. Upon completion, the new VDC building went through a two-week flush-out period to improve air quality prior to occupancy. In addition, to avoid moisture absorption, ceiling tile and carpet installation was delayed until the building was watertight.

A comfortable, high-functioning work environment is more conducive to employee satisfaction and productivity. Therefore, Toyota chose to specify composite woods that were free of volatile organic compounds (VOCs), and only used those adhesives, sealants, paints, and carpets that contain minimal amounts of VOCs. Operable windows allow fresh air to circulate throughout office and break areas unaided by mechanical systems, and 96 percent of the regularly occupied spaces have views to the outside. All building mechanical systems are monitored by Toyota's Facility Integrated Resource Management system. This innovative system continuously evaluates and optimizes lighting quality, thermal comfort, and ventilation. The result is a building that enhances worker experience and reduces negative environmental impacts.



Installation of rainwater-harvesting storage tank / © Toyota Motor Sales, USA, Inc.

PROJECT TEAM

Owner:

Toyota Motor Sales, USA, Inc.

Architect:

MNB Architects/Engineers

Mechanical Engineer:

CBG Consulting Engineers

High Performance Consultant:

Green Building Services

Lighting Design:

MNB Architects/Engineers &

CBG Consulting Engineers

Structural Engineer:

MNB Architects/Engineers

Civil Engineer:

MNB Architects/Engineers

Landscape Architect:

Greenworks, P.C.

Commissioning Agent:

Engineering Economics, Inc.

Construction Manager:

HB&A Construction Managers

Contractor:

Owner (multiple prime contractors)

SOURCES

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