



Project Description

Building Function:

The Toyota Corporate Real Estate and Facilities consists of 5 three-story buildings connected through a 30 foot high glass atrium, and two Central Plants serving the campus.

- Buildings B1, B2, & B3: Financial Service Center
- Buildings A1, A2: Customer Service

The space consists of 600,000 SF, most of which is open office space. Additionally, there are private offices, conference rooms, copy centers, an automobile showcase, and a cafeteria dining area located on the 1st floor of Building A1.



(Pic 4.1) North Lobby Entrance. A car will eventually be displayed on the outside platform shown.



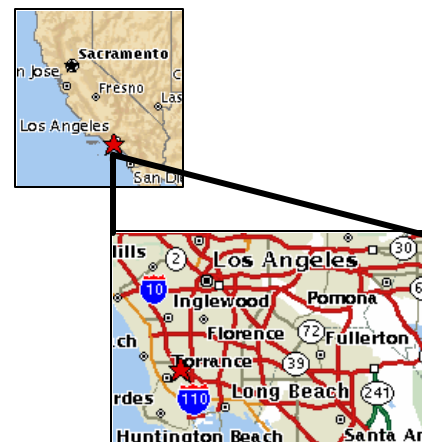
(Pic 4.2) Looking East A1 2nd Floor

Dates of Construction:

- August 1, 2001 - March 1, 2003
- The building will finish in phases.
 - A1 & A2 will be completed in December 2002
 - B1, B2, & B3 will be completed in March 2003

Location

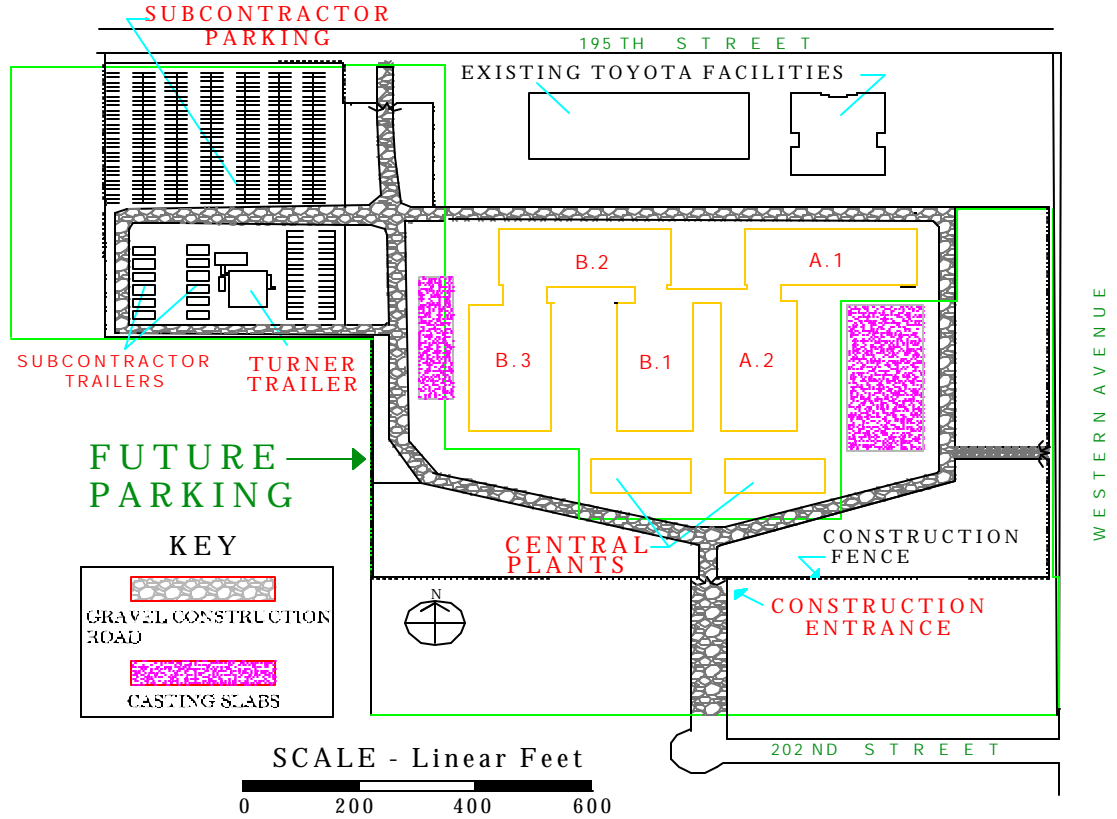
The Toyota Corporate Real Estate and Facilities is located at the southern part of Los Angeles County in Torrance, California. The 50 acre site lies to the west of Western Street, about one half of a mile south of the 405 Freeway, a major thorough-fair of Southern California. This project is an addition to two existing Toyota buildings that currently reside next to the construction site. The green perimeter in the following site plan shows where the future parking lot space will cover for the expected 3,000 employees.



(Fig 4.1) The star shows Toyota's location along the 405 Freeway.



Site Plan



(Fig. 4.2) Site Layout Plan for Toyota's new facilities sitting on 50 acres of land.

LEED Features

In this construction project, Toyota has chosen to pursue a *Leadership in Energy and Environmental Design (LEED) Gold Award* developed by the United States Green Building Council. This award is earned by accumulating a certain amount of points from what currently is the LEED 2.0 Version. The ratings are Certified, Silver, Gold, and Platinum. The LEED features for which Toyota desired to build are summarized below.



(Pic 4.3) The LEED United State Green Building Council Symbol

Sustainable Sites:

- Erosion & sedimentation control during construction; Alternative transportation of on-campus shuttle, provided bike racks and shower facilities; Landscape and interior design used to reduce heat island; Highly reflective and low emissivity ENERGYSTAR roof



Water Efficiency:

- Water landscaping efficiency using reduced flow sprinkler heads; Reclaimed water used for irrigation; Low flow plumbing fixtures

Energy and Atmosphere:

- Full Building Systems Commissioning; System and Energy Management manual developed to enhance operation procedures; Independent post-occupancy review; CFC reduction; elimination of HCFC and Halon

Materials and Resources:

- Recycle 98% of all construction materials; Use of materials containing recycled content; Over 25% of products were manufactured within 500 miles of Torrance; Use of certified wood to manage forests

Indoor Environmental Quality:

- Environmental tobacco smoke control; carbon dioxide monitoring; developed construction indoor air quality plan; protection of HVAC system during construction (controlling pollutant sources, proper housekeeping, proper scheduling, coordinating wet and dry activities); baseline test conducted prior to occupancy; use of low emitting materials; Indoor pollution and chemical pollution source control (catch dirt at entryways); temperature and humidity monitoring system to provide thermal comfort; 75% of space in the building is provided with a view to the outdoors.

Innovation and Design Process:

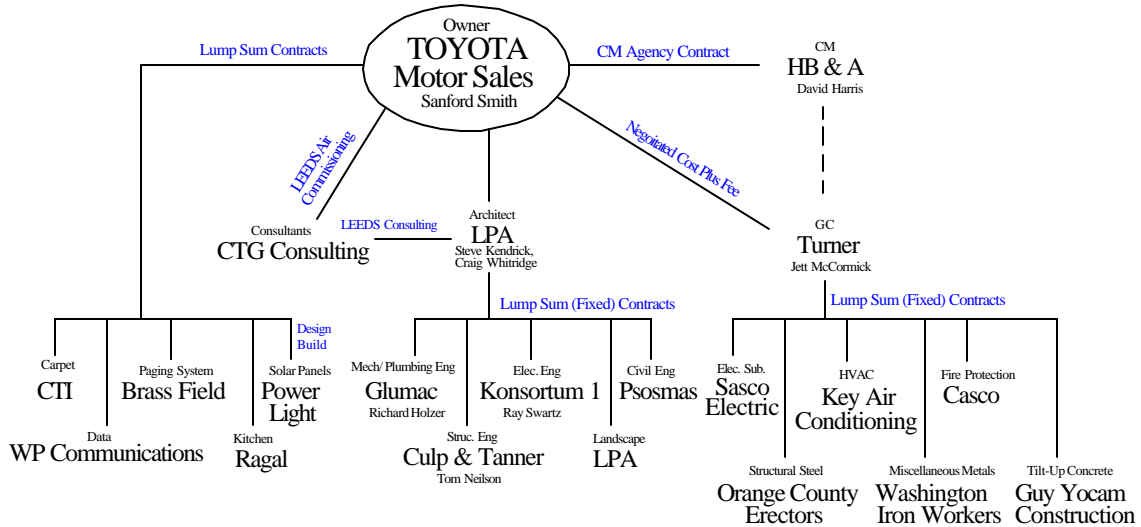
- Advanced recycling program for non-traditional items; Environmental Education of public and associates through presentations and printed media; LEED Accredited Professional

Project Delivery & Project Team:

The project delivery system of the project is a negotiated Cost-Plus Fee contract with Turner Construction. HB&A acts as an owner's representative (CM Agency). Most contracts with subcontractors are fixed (lump sum), but in some instances, a specialty contractor is used. This is the case with Power Light, who holds a design-build contract directly with Toyota for the solar panels. A unique feature of the Project Delivery is the involvement of *CTG Energetics Consulting*, who of which holds two contracts for the Toyota job. CTG is responsible for overseeing the LEED



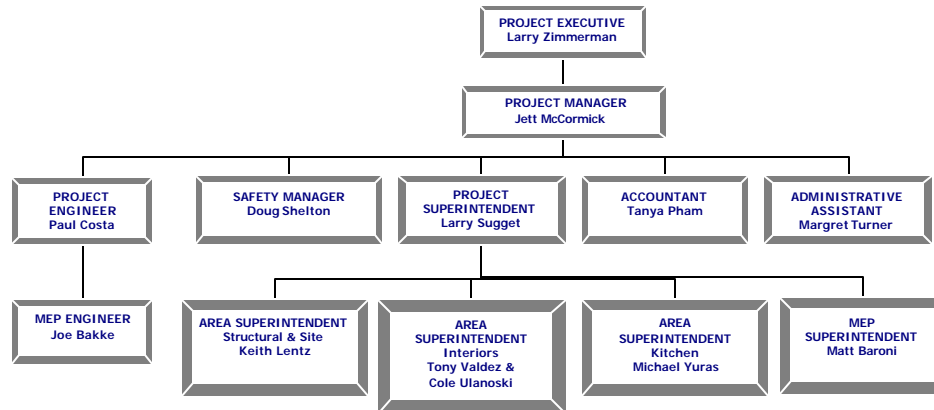
(Leadership in Energy and Environmental Design) Commissioning for Toyota as well as the consulting for LPA Architecture on their sustainable design.



(Fig 4.3) The organizational chart of the project's delivery system is shown above

Turner Project Delivery and Staff:

Turner plays the role of a GC (General Contractor) on the project directly taking the risk by holding the contracts. In turn, they have a full time safety manager, which allows them to manage the risk, and who also is a LEED Manager devoting time to two very significant aspects of the project for the owner. It is necessary to also have 4 superintendents in order to cover the entire building footprint and construction during the process.



(Fig 4.4) The organizational chart of Turner's team is shown above for the Toyota Project.



Systems Overview

Electrical System:

The most unique feature of Toyota's electrical service is based on what is called the "Exit Strategy." To provide a more sustainable and changeable campus, Toyota separated the 5 buildings into two separate electrical (and mechanical) services. The two services are provided by Central Plants A & B. This will provide the ability one day to sell two or three of the five buildings along with one of the Central Plants. There are two main transformers, one for each electrical service, and a main switchgear in each of the five buildings. The main transformers provide service at 480Y/277 V and step down to 208Y/120 V when necessary for lighting and receptacles. Each electrical service is capable of backfeeding to the other Central Plant. Thus, if one service fails, the other can sustain the entire Toyota Campus. There is a back-up generator ready if necessary, but it will not sustain service to the entire campus. It will keep main building functions running such as the Call Center and the emergency systems. Another highlight to the electrical system is the use of renewable energy. Toyota will contain the largest array of Photovoltaic Panels in California when the building is completed. Each roof's area is covered by 50% to obtain 10-15% of the building's energy need during the day, approximately 650,000kwh per year. The power companies in California are required to buy back the energy not used on the weekends, thus reducing the total monthly power bill. The payback of the photovoltaic is a minimal 3 years.

Mechanical System:

The mechanical cooling system equipment, located in the Central Plant, is comprised of seven 450 ton direct fired (natural gas) Absorption Chillers manufactured by Sanyo Mcquay and four cooling towers capable of 3900 G.P.M. In response to a call for mechanical cooling, isolation valves open. The lead condenser water pump will start within the cooling tower while a VFD (Variable Frequency Drive) modulates the fan to maintain a condensed water supply of 80 degrees. The heating water system is composed of seven 2000 MBH capacity boilers also located within the Central Plants. The boilers are enabled when the temperature outside is below 80 degrees. In each system, the lead chiller or boiler (along with the leading pump) is enabled first and circulates the primary service loop. If the design temperature cannot be kept, another chiller or boiler is enabled. The secondary loops of each system serve the air handling units. There are two on each building with a capacity air supply of 65,000 cfm and a capacity of cooling 2500 MBH. The air handlers will operate on a programmed occupancy





schedule, the fans starting and running continuously during occupied hours. If when the building requires cooling and the outside air temperature is below the return temperature, an economizer damper will open to a position that will provide the supply air temperature and significantly reduce building energy. As outside temperatures rise, the economizer is used in its minimum position. Air is provided from the air handling units to individual zones within each building controlled and modulated through VAV (Variable Air Volume) Boxes with coil reheat.



Lighting System:

The lighting system constitutes mostly indirect pendant *Linear* fixture. T5 standard lights are used while energy efficiency measures are taken into account. Motion sensors are on every floor and provide the ability to turn the lights on and off when daylight is sufficient. Photocells outside control the exterior lighting

Structural System:

The structure is made of Tilt-up Exterior and Interior Cast-In-Place Concrete Panels braced by steel flange beams to allow 45' x 22.5' bays of open space of no column supports. The building's structure allows for heavily enforced seismic considerations. A special roof was designed for additional weight of 6 lbs/SF to account for Solar Panels.





Owner Background

Environmental Action by Toyota Motor Sales USA:

Toyota Motor Sales USA is at the forefront of the leading car manufacturers in the world. The company is committed to Lean Production, Innovative Design and Research, Education, and prides itself by taking the responsibility to use the highest of environmental technologies.

In October of 2000, Toyota devised a Global Earth Charter, which outlines its commitment to the environment throughout its manufacturing operations around the world in an *Environmental Action Plan*.

"We intend to be proactive in our environmental efforts rather than just striving to meet regulations. We want to set clear standards so that we can continuously improve environmental performance,"

--Kevin Butt, head of TMMNA's Environmental Affairs Department.

Toyota's *Environmental Action Plan* sets specific targets to achieve by 2005:

- Reduce electric and natural gas usage by 15 percent per unit
- Reduce VOCs by 30 percent per unit
- Reduce hazardous waste disposal at landfills by 95 percent per unit
- Reduce water usage by 15 percent per unit

The North American plan is part of Toyota's Global Earth Charter, which outlines its commitment to the environment throughout its operations around the world.

Also as part of the plan, Toyota is challenging its North American-based suppliers to adopt environmental standards. "Toyota has a unique relationship with its suppliers," said Teruyuki Minoura, TMMNA president and CEO. "We are known for expecting them to share our high quality standards. Now we are asking them to join us in becoming environmental leaders." As part of the Toyota Supplier Environmental Program, approximately 500 suppliers who provide parts, materials and components directly or indirectly to Toyota are required to obtain certification.



Environmental Action by the Toyota Real Estate & Facilities Dept:

The Global Earth Charter establishes caring for the earth a priority and the *Toyota Motor Sales Real Estate & Facilities Department (RE&F)* is aligning with this corporate objective. As an organization, the RE&F department recognizes that buildings have a large and lasting impact on the environment. As a result, RE&F has embarked on a journey towards sustainable design and development. This journey is known as **Process Green**.

The RE&F department has created **Process Green** “to demonstrate environmental leadership by utilizing practices, processes, and products that are sustainable, address end use cost, and meet business needs in a socially responsible manner.” To realize this policy, the RE&F department has a specific Environmental Strategy that consists of the following components:

- Procure & use resources in the most environmentally intelligent, cost effective, and reliable manner possible.
- Participate in government and professional environmental and associated organizations and programs to share knowledge and accomplishments
- Assist in Government Relations in advocating Toyota’s Environmental policies and strategies with state and federal legislatures.

Knoll Incorporated, a company that will supply furniture to the new Corporate Real Estate and Facilities Building in Torrance, is an example of a furniture supplier making positive changes to the way they do business as a result of Toyota’s Process Green.

“At Knoll we are always exploring cleaner, safer, more cost-conscious manufacturing methods. Toyota has inspired us to further articulate our long-standing environmental programs and, with their encouragement and support, we have re-energized our focus on such “green” initiatives as life cycle analysis and LEED certification. We are fortunate to share with Toyota this commitment to preserving our environment.”

--Nancy Lindeman, Knoll, Inc.



Owner Expectations:

The Real Estate & Facilities Department of the Toyota Motor Sales USA is in the process of consolidating their various building leases to one corporate headquarters facility. They govern the idea of having their some 3,000 employees all in one location. This will establish unity and importance among all employees while having an optimal working environment provided by its sustainable design.

The **schedule** is the driving force of this project. Toyota lease contracts for other facilities are due to end by September of 2003. Toyota desires ample time to re-locate materials and employees from their old facilities to their new one. Under the time allotted for design and construction, three story tilt-up concrete panels with steel framing were chosen to provide erection that could take place within days. This system of construction established the most cost-effective erection of the shell/core. The skeleton also allowed for large open office workspace within each floor, another building feature Toyota desired.

The **cost** of the new facility under the established budget is also critical for Toyota. The established budget was produced by accumulating the annual amount of money currently paid to lease out all other spaces. Toyota's lone payment needed to be within this amount in order to reduce substantial extra costs to the department. The building team worked well to establish costs savings and implemented \$5 million of Value Engineering Ideas from \$8 million proposed.

Safety issues had little to do with Toyota's original company. It wasn't until Turner Construction stressed their corporate ideas on a strict safety approach in their Proposal Presentation, that Toyota embraced the idea of safety on their site. Given that Toyota has to pay for any accidents or safety failures, the rigid safety policy has become the benchmark for Toyota's future projects. Turner has a full-time Safety Manager on-site.

Toyota's commitment to **quality** is exuberated through the efforts of attaining the *Gold Leadership in Energy and Environment Design (LEED) Award*. This award is based on the Green Building Council Rating System, a national standard for developing high-performance, sustainable buildings.



Exemplary conditions are met for the building in the following areas:

- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovative & Design Process

Sanford Smith, the National Real Estate & Facilities Developer for Toyota, stressed that Commissioning and the Project Close-Out Phase were of the utmost importance to his satisfaction. He refers to the issue by titling his explanation the “Done-Done Speech.” This holds the concept that the Construction Phase and Operating Phase of a building’s life are two completely different situations and combining the two phases effortlessly is the topmost goal. Sanford stated,

“Starting and running a project is easy, it’s the end of the project that becomes the most difficult to master. The Punch lists for Project Close Out, Lean Releases, and Operational & Maintenance Manuals; getting all these and finishing what is started is the most important component of the Construction Phase to me.”

The best way he could describe the two phases becoming one was,

“Construction is the building of a continuum.”

Continuum broadly means: a compact set which cannot be separated into two sets neither of which contains a limit point of the other (such as the set of rational and irrational numbers). In this case the end of construction slowly molds into the operation of the building, neither of which have a beginning and end. The two phases are incorporated into one another and are viewed as one phase through Sanford’s outlook.



Estimate Summary:

A breakdown of the building construction costs are provided in the figure below. Each line item is a separate Bid Package.

Cannot disclose on Web

Original Cash Flow Schedule:

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