

## LEED Change Order Cost Analysis for UCSB Donald Bren School of Environmental Science and Management

LEED 1.0 Category	Name of Product or Process	Name of Company or Provider	Green Information	In Base Bid or Addendum	Cost of Greening Change Orders
<b>Sustainable Site Planning</b>					
	“white-cap” roofing	Sarnafil, US	Donald Bren Hall upgraded from built-up-roofing to single-ply thermoplastic roof membrane labeled as a G410 at 4.8-millimeter thickness. It has a solar reflectivity of 83%.	No	\$24,083
	landscaping and planting	Valley Crest Tree Company	Nineteen California sycamore trees were placed around Donald Bren Hall to shade the building and reduce “heat island” effect. The landscape around Bren Hall features native and drought-tolerant plants.	Yes	
<b>Energy Efficiency</b>					
	day-lighting controls	The Watt Stopper	The day-lighting controls detect the amount of natural daylight entering the room and adjust the level of lighting accordingly.	No	\$81,626
	operable windows/HVAC interlock	Wausau Windows and Johnson Controls, Inc.	Operable windows enable load-free climate control by taking advantage of on-site ocean breezes. HVAC interlock uses a sensor that turns heaters off while windows are open, preventing unnecessary heat loss.	No	\$26,901
	automatic control sequences	Johnson Controls, Inc.	Automatic controls on heating and airflow based on permanent CO <sub>2</sub> and air monitors ensure maximum indoor environmental quality with minimal energy use.	Yes	
	photovoltaic panels	PowerLight	The 42-kilowatt system of photovoltaic panels generate seven to ten percent of Donald Bren Hall’s energy needs. The panels lie flat, requiring no roof penetrations.	No	\$11,964 plus donation
	renewable energy	University of California/Arizona Power Authority	Donald Bren Hall is supplied with 31% renewable energy from waste gas from the Arizona Power Authority (APS). This purchased energy, plus the photovoltaic energy produced on site, enable Donald Bren Hall to use over 40% renewable energy.		
	Condensing boiler	Parker Boiler	The boiler was upgraded to an 85%-efficient, low-emission unit that generates all the heating for Donald Bren Hall.	Yes	
	cooling tower	Marley	This unit maximizes the efficiency of the chilled water system, including the cooling tower, chiller, and associated pumps.	No	\$18,624
	water chiller	Trane	Donald Bren Hall’s chiller is connected to the campus chilled water loop. The shared load reduces the Bren chiller’s run time to approximately 15%.	No	\$4,704

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<b>Energy Efficiency continued....</b>					
	full commissioning	EASI Consulting	Donald Bren Hall is the first building at UCSB to be fully commissioned, which occurs when a third party evaluates all mechanical, electrical, and plumbing systems to ensure a building is operating to specifications.		Not part of construction budget
	measurement and verification protocol	EASI Consulting	The Measurement and Verification Plan used during the commissioning process was developed by EASI Consulting to ensure the building operates as designed.	Yes	\$0
<b>Conserving Materials and Resources</b>					
	construction waste management plan	Donald Bren Hall	The goal of the plan was to recycle 75% of the waste generated during the construction of Donald Bren Hall. Ultimately, 100 % of the demolition waste and 93% of construction waste was diverted from a landfill.	Yes	
	occupant recycling	Donald Bren School	The goal of the Donald Bren School was to recycle 75% of its office waste. A waste audit performed in February 2002 revealed that the Bren School recycles 89% of its waste.	Yes	
	fly ash in concrete	Vulcan Materials Company	Fly ash replaces part of the cement used in the concrete mix in Donald Bren Hall. Derived from head impurities in coal, it increases resistance to sulfate and seawater and makes a stronger structure. Fly ash is also cheaper than cement and does not off-gas CO <sub>2</sub> , which is a greenhouse gas. Concrete on first and second floors is composed of approximately 20% fly ash; concrete on the third and fourth floors of approximately 15% fly ash.	Yes	\$87,887
	porous paving	Grasspave <sup>2</sup>	Turf block is a porous paving technology that is made from 100% recycled plastic. It is used in place of asphalt and improves the environment by recharging water tables, absorbing CO <sub>2</sub> , creating oxygen, and reducing “heat island” effect. Donald Bren Hall used these porous turf blocks for the fire road that runs on the north, east, and south sides of the building.	Yes	
	steel and rebar	Nucor, Vista Steel, Tulsa Steel, TAMCO	All steel and rebar used in Donald Bren Hall has 95-100% recycled content.	Yes	

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<b>Conserving Materials and Resources continued....</b>					
	exterior building insulation	Thermafiber	Thermafiber consists of spun mineral fibers and has a recycled content of 60%. It is noncombustible, asbestos-free, moisture-resistant, non-corrosive, and mildew- and vermin-proof. It is exceptionally durable, and resistant to temperatures up to 2,000 °F.	Yes	
	interior building insulation	John Mansville Fiberglass	The Sound Shield fiberglass used for interior insulation has an R-11 value. It contains 18% post-consumer re-melted glass and 7% pre-consumer recycled glass for a total of 25% recycled content.	Yes	
	roof insulation	John Mansville Fiberglass	Thermal Shield SSK25 with a R-19 value and 25% recycled content was used for the roof insulation.	Yes	
	fireproofing	Monokote MK6	The fireproofing in Donald Bren Hall has 20% recycled content and covers all the structural steel throughout the building. It is made from gypsum, polystyrene, common cellulose, and recycled newsprint and contains no asbestos or mineral fibers. It is also HCFC-, HFC-, and CFC-free.	Yes	
	tree grates	Neenah Foundry Company	The tree grates, located in the courtyard, are made from 100% recycled metals.	Yes	
	wood benches	Sylvania Certified, LLC	The benches in the courtyard of Donald Bren Hall are Forest Stewardship Council (FSC)-certified Ipe (pronounced ee-pay) wood. Ipe wood is an extremely dense, tight-grained wood that has a high natural durability. The planter box benches are FSC-certified teak hardwood.	Yes	
	glass mulch	Glass Garden	Recycled glass was mixed into the concrete in the courtyard area and also used as mulch in the courtyard planter box.	Yes	
	gypsum board	USG	The gypsum board used for dry wall is made from 27% recycled content of corn/wheat starch, waste paper, recaptured gypsum, and natural gypsum.	Yes	
	ceiling tiles	USG	The ceiling tiles contain 74% recycled content, which includes slag, cornstarch, waste paper, recaptured gypsum, and damaged ceiling tiles.	Yes	

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	ceiling suspension system	USG	The ceiling grid, which holds all the ceiling tiles in Donald Bren Hall, contains 25% recycled aluminum.	Yes	
	“renewed” carpet	Milliken	The 10-year-old carpet tiles selected for use were “super cleaned,” re-dyed, and then placed in Donald Bren Hall. The carpet is PVC-free and has already off-gassed, thus improving air quality. By installing re-used carpet, Donald Bren Hall kept 14 tons of carpet out of landfill.		
	linoleum	Armstrong World Industries	Linoleum is a renewable product that has been available for hundreds of years. It is made from all-natural products, including jute, rosin, linseed oil, and natural pigments. When light hits the linseed oil, it oxidizes and produces a natural antibiotic, which inhibits any bacterial growth. Linoleum also does not off-gas any VOCs. Linoleum is used in the laboratories and hallways of Donald Bren Hall.	No	(-\$66,909 for deletion of vinyl composition tile)  \$140,889
	rubber flooring	To Market	The rubber flooring is made from 100% post-consumer recycled tires. It is very durable, ergonomically friendly, and stain-resistant. It also has low to no VOCs and does not promote microbial or fungal growth.	Yes	
	cork flooring	To Market	Cork flooring is a renewable and natural product made of 100% cork. A cork tree sheds its cork every seven to ten years, so there is no need to destroy trees in order to use this product. It is resistant to mold and mildew, hypoallergenic, very durable, and an excellent thermal insulator.	Yes	
	laboratory doors	Weyerhaeuser	The laboratory doors in Donald Bren Hall are made from certified sustainably harvested maple wood.	Yes	
	lab casework	Fisher Hamilton	Sixty million tons of wheat straw waste are produced in the U.S. each year. Instead of burning it, manufacturers are using it to make wheat board as a substitute for particle board, which contains formaldehyde. The lab casework in Bren Hall is made from 95% recycled hulled wheat husks. This wheatboard is an emissions-free board (EFB).	Yes	

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	ceramic tiles	DalTile	The floor tiles in the bathrooms have 10% recycled content of broken tiles and glass.	Yes	
	toilet stall partitions	Santana	The stall partitions in the bathrooms are made of up to 90% recycled plastic. This plastic is very durable.	Yes	
	recycled glass counter tops	Counter Production	The counter tops in the bathrooms and kitchen areas are composed of 80% post-consumer recycled glass.	No	\$29,452
	recycled and re-used furniture	Steelcase	The furniture in Donald Bren Hall has 60% recycled content and is recyclable. The painted furniture has a powder-coat finish that eliminates as many VOCs as possible when produced. The upholstered furniture uses CFC-free foam and fabrics made from plastic bottles. Re-used furniture came from areas the Donald Bren School previously occupied on campus.	Yes	
	biodegradable fabrics	DesignTex	The fabrics used in Donald Bren Hall are 100% biodegradable, and some contain recycled content. The fabrics are produced with no ozone-depleting chemicals or carcinogens, and are some of the most environmentally friendly fabrics made today.	No	\$6,814
<b>Safeguarding Water</b>					
	automatic faucet/flush valves	Sloan	Infrared-activated water faucet and single-flush valves were installed in the bathrooms of Donald Bren Hall to minimize water waste. Each flush uses only 1.6 gallons of water.	No	\$51,704
	waterless urinals	Waterless, LLC	Based on campus usage statistics, waterless urinals will save about 40,000 gallons of water per year, per urinal. Ten urinals are installed in Donald Bren Hall.	Yes	
	cooling towers	Baltimore Air Coil Company	Drift eliminators attached to the cooling towers prevent evaporation and allow water conservation.	Yes	
	reclaimed water	Goleta Sanitary District	Donald Bren Hall uses reclaimed water for landscape irrigation and in the first floor toilets.	No	\$65,784

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<b>Indoor Environmental Quality</b>					
	system filters	Donald Bren School	Filters used during construction were changed out prior to tenant occupancy of Donald Bren Hall. Another set is stored in the building for a future change-out.	No	\$5,852
	air monitoring systems	Johnson Controls, Inc.	Throughout Donald Bren Hall there are permanent air monitors for CO, CO <sub>2</sub> , VOCs, and particulates.	No	\$95,627
	paint	ICI Dulux	The paint used in Donald Bren Hall has zero to low VOCs. It meets EPA standards and surpasses the 2005 air-quality lead-free standards.	Yes	
	indoor mats	Milliken	Floor mats are placed in the entrances to the laboratory wing in order to extract 60-70% of the particles from foot traffic, thus reducing the amount of foreign particles entering the building. This enhances the indoor air quality of Donald Bren Hall and gives the users a healthier and cleaner environment to work in.	Yes	
<b>Design Excellence</b>					
EX01 Credit 1	LEED-certified design	Zimmer, Gunsal, Frasca	A certified LEED designer from ZGF oversaw the Donald Bren Hall project at all times.		Not in construction costs
EX02 Innovation Credit 2	innovation credit	Flack + Kurtz	There are three lab exhaust stacks on the roof of the building, sized in three levels—small, medium, and large—to meet the amount of the lab exhaust produced. This staging upon demand reduces energy consumption.	No	\$87,392