

## SUSTAINABLE DESIGN

Baird, Hampton & Brown, Inc. (BHB) shares the concern regarding the depletion of the earth's natural resources, and the role the building construction industry can play in energy use reduction and material conservation. Our engineers are experienced in designing sustainable systems for buildings and building sites that can help reduce the impact construction makes on our environment. We are very familiar with ASHRAE Standard 90.1 and incorporating these design standards into our projects. We are also experienced in designing projects to meet the LEED® certification requirements. In fact, BHB is a member of the U.S. Green Building Council and has LEED Accredited Professionals across three disciplines; civil, mechanical, and electrical.

BHB is also familiar with the Executive Orders that have been issued to demonstrate an energy conscious government through leadership in environmental management. We have utilized these same principles where we are able in our everyday designs. We have had multiple projects seek LEED certification, which closely parallels the path the President has instructed us to take in any new Federal project. We are familiar with options that can be used in mechanical and electrical systems to increase the energy efficiency of projects to achieve the required 35% energy savings.

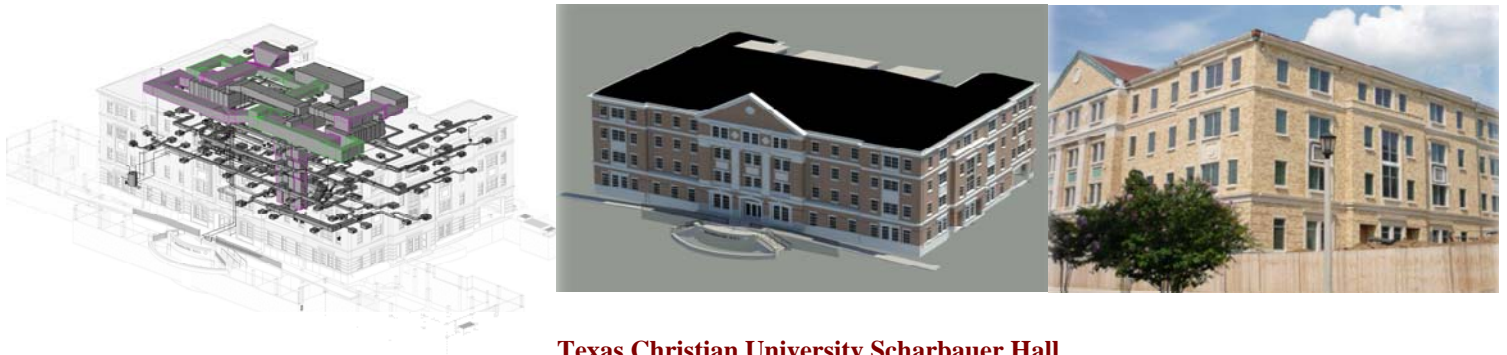
**FEASIBILITY STUDIES / ENERGY ASSESSMENTS** - The team at BHB has worked on projects where the first step is an assessment of the existing conditions and identification of possible improvements. We have experience with detailed studies to identify existing conditions in a building and develop multi-phased construction opportunities to save energy and provide utility cost savings over time. We have also worked on a campus wide project to identify deficiencies in utility distribution and developed a multi-phased construction project to correct the deficiencies and increase the energy efficiency of the system.

**ENERGY CALCULATIONS AND REVIEW** - BHB has over 10 years experience in energy calculations and review. We are very confident that we can provide you with a quick and thorough review of the calculations for this project. We are comfortable with methods and concepts regarding economic and energy calculations, savings and paybacks. We have three registered professional engineers who have participated in numerous energy studies and calculations over the years, including CESA studies for the Corps of Engineers identification and analysis of ECRM's for the State of TX under the LoanStar program. Furthermore, we have completed the energy modeling documentation required for the US Green Building Council's LEED Certification system.

**WATER CONSERVATION** - We are familiar with different technologies available that can be incorporated into our designs to increase the water conservation of the final project. We are also experienced with the design of rain capture and gray water systems for reuse of water where appropriate. We have discussed options with cities and are familiar with options to which local code officials are agreeable.

**UTILITY METERING** - BHB has worked on projects where we have installed meters to study the existing utility distribution in anticipation of future growth. We have hired contractors to install and collect meters, while BHB records the data and analyses it. We are also familiar with submetering requirements in Texas where multitenant buildings are concerned, and have frequently designed projects that utilize digital utility metering within a campus or building and report that data back to an Energy Management System.

**BUILDING INFORMATION MODELING (BIM)** - BHB currently utilizes Revit® MEP building information modeling (BIM) software. This allows us to optimize systems engineering through data-driven system sizing and design allowing us to gain better decision-making and building performance analysis support, facilitating sustainable design. We are able to minimize coordination errors between mechanical/ electrical/ plumbing (MEP) engineering design teams, as well as with architects and structural engineers within Revitbased workflows. We are also able to accelerate decision making through the automated creation of engineering design data and enhanced client communications. We are able to create energy and load analysis and store the results in the model as well as a spreadsheet for easy sharing with team members who don't use Revit.



**Texas Christian University Scharbauer Hall**

**DELIVERING INNOVATIVE DESIGN SOLUTIONS**



## **GEOTHERMAL**

BHB has designed and administered many projects utilizing geothermal HVAC systems, from single-story bank buildings, to two-story offices, to large school buildings. We have experience with drillers and installing contractors and know the analyses that need to take place to ensure a properly designed and function geothermal system. We work with all parties to balance the space required for the well field with the depth and spacing of the wells for the most economical alternative. Well field piping is designed to provide some ability to isolate wells without having to shutdown the entire loop and the associated equipment. Our experience with HVAC equipment ranges from indoor heat pumps to larger rooftop units. Project examples include:

**Durant Toyota Dealership, Granbury, TX** – Survey, Civil and MEP design of the new \$4 M, 27,000 SF dealership. The facility was designed using the latest technology to reduce energy consumption, limit water usage, minimize life cycle maintenance costs, and provide a comfortable, healthier environment for Durant Toyota's customers and employees to include a geothermal system. When combined with the building's energy-efficient mechanical systems, the building is expected to realize a 10.6% energy savings above and beyond what is currently recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers. This is estimated to result in an annual operating cost savings of about \$7,400. LEED Silver Certification is pending.



**Fire Rescue No. 7 Lake Parks Facility, Grand Prairie, TX** – Site/Civil and MEP engineering services for the design of a new \$5 - \$6 M, 20,780 SF facility to house an 11,180 SF fire station, a 1,450 SF police department, a 6,600 SF lake parks administration building and a 1,550 SF lake parks service bay building on approximately 4.3 acres. Geothermal heat pumps, reduced annual energy consumption by 19%, reduced water usage by 35%, increase ventilation rates by 30%. The building was designed to achieve LEED Silver certification.



**Hamilton County Courthouse Renovation, Hamilton, TX** – Through a TX Historical Commission Courthouse Restoration Grant, plans and specifications are being prepared for the comprehensive restoration and adaptive use of the 1878/1931 historic Hamilton County Courthouse. The restoration requirements comply with the Secretary of the Interior Standards on Rehabilitation of Historic Structures. The 24,000 SF, three-story structure is a masonry clad structure with two primary porticoes three stories high with fluted columns. The 1878 courthouse was expanded in place and the architectural style changed from a second empire motif to a classical revival style in 1931. BHB provided the design for all exterior mechanical and electrical systems including new exterior lighting, new domestic water and sewer services to the building, and new sub soil drainage with sump pumps. The exterior phase also included design for the wellfield for the geothermal heat pump system. The new HVAC system utilized a geothermal heat pump system with multiple indoor heat pump units. *National Register of Historic Places; Recorded TX Historic Landmark, State Archeological Landmark.*



**Texas Christian University Admissions Center, Fort Worth, TX** - BHB provided MEP Engineering design services for the \$5-\$6 M TCU Admission Building (currently under construction). A geothermal ground source heat pump system was utilized for heating and cooling. The heat pumps contained high efficiency two-stage compressors with energy-efficient ECM motors for the fans. Energy recovery ventilators were provide to pre-treat the outside and achieve an increased outside air ventilation rate of 30% above ASHRAE Standard 62.1. Low flow plumbing fixtures, including shower heads, were provided to reduce the overall water usage of the building. This building is currently under construction and was designed to achieve LEED Platinum certification. Designed in BIM (REVIT).

**Texas Christian University Olympic Sports Facility, Fort Worth, TX** – MEP Engineering design services for the \$14 M, 47,000 SF Olympic Sports Facility at TCU. A geothermal ground source heat pump system was utilized for heating and cooling. The heat pumps are roof mounted and contained high efficiency digital scroll compressors. Energy recovery ventilators were provided to pre-treat the outside for the Locker Rooms. Low flow plumbing fixtures, including shower heads, were provided to reduce the overall water usage of the building. This building was designed to achieve LEED Silver certification and was designed in BIM (REVIT).

**Keller Intermediate / Middle School, Keller, TX** – BHB provided MEP engineering design services for the new \$32 M, 188,000 SF Intermediate school. A geothermal ground source heat pump system was utilized for heating and cooling. Energy recovery ventilators were provide to pre-treat the outside and achieve an increased outside air ventilation rate of 30% above ASHRAE Standard 62.1. Low flow plumbing fixtures, including shower heads, were provided to reduce the overall water usage of the building by 30%. The lighting system included a low-voltage relay system and daylight harvesting controls and was designed to reduce the lighting energy by 22% over the baseline case. This building was designed to achieve LEED Silver certification and was designed in BIM (REVIT).

**Tarrant County Academy of Medicine Office and Meeting Facility, Fort Worth, TX** - BHB provided MEP engineering design services for this new \$4.5 M, 25,500 SF, three-story building for the Tarrant County Academy of Medicine. The first level housed administrative offices, warming kitchen and large meeting rooms. The second level provided office lease space. A large corporate Board Room and a doctor's lounge was located on the third level. The HVAC system design was based on utilizing geothermal heat pumps. Due to the small building site, the area available for the wellfield was limited. Therefore the geothermal system was limited to serving the office areas. The geothermal wellfield consisted of 52 vertical wells, 350 feet deep, arranged on 20 foot centers. All wells were looped together utilizing a reverse return underground HDPE piping loop. Although the entire wellfield was piped on a single loop, the loop was configured so that individual branch lines could be isolated in the event that an underground leak should ever develop and need to be isolated and repaired. Inside the building, multiple vertical heat pumps, located in mechanical rooms, are used to produce heating and cooling for each thermal zone. The geothermal system design utilized individual circulating pumps at each heat pump rather than a central pumping system. Because the wellfield maintains a fairly constant condenser water temperature year round, supplemental electric heat was not required at the individual heat pump units.

**Other Geothermal Projects:**

Park Cities Bank, Fort Worth, TX  
Lake Dallas Elementary School, Lake Dallas, TX  
La Quinta Hotel, Gun Barrel City, TX  
Catholic Charities Assessment Center, Fort Worth, TX

McDonwell Elementary School, Colleyville, TX  
All Saints Episcopal School, Fort Worth, TX  
Alliance for Children, Fort Worth, TX  
Public Health Center, Fort Worth, TX

**SOLAR PHOTOVOLTAIC**

As solar energy systems become more affordable from both first-cost and life-cycle cost perspectives, we are finding more Owners are interested in incorporating these systems into their projects. BHB has evaluated many projects for the use of these systems, and our engineers are familiar with system requirements and options. Our project experience includes both photovoltaic panels for electrical system usage as well as solar water heating. Project examples include:



**Temple Housing Authority Frances Graham Hall** - The design was for a 70kw photovoltaic array installed on the roof of the 10 story building. The system supplements the existing building electric system and ties directly into the building main service entrance through an inverter. The system is projected to produce an estimated 97,000 kwh per year with an approximate payback of 8 years.

**Tarrant County Northwest Sub-Courthouse, Lake Worth, TX** – MEP and security systems engineering services for the new three story, 50,000 SF Tarrant County Northwest Sub-Courthouse. Utilized solar water heat and water source heat pump design for supplemental heating. Light harvesting for energy savings and rain water harvesting design was used for a drip sub-soil irrigation system. This building is currently under design to achieve LEED Silver certification.

**WIND**

In an area with a steady supply of wind energy such as Texas, the use of wind turbines is becoming more prevalent. BHB's engineers have participated in project studies for the incorporation of turbines at several locations. Below is a description for a project utilizing a wind turbine as one renewable energy source for a testing lab:

**Lockheed Martin Missiles & Fire Control Micro Grid Power Lab** - This project involved BHB providing the design for a new Lab within Building 037, to support the Micro Grid Lab. The Lab provides testing of various equipment, using a variety of power sources including diesel generators, a wind turbine, and a solar panel array. The Owner picked out the units they wanted, we provided electrical and structural designs to install on the roof of an existing building. These are actually intended to test the remote battery charging for a new class of small military vehicles, but it is a renewable energy source. The schedule for this project was tight due to testing deadlines and budgetary concerns as it supported another project. BHB started the project immediately and hit all of the project milestones on time.



## OTHER SUSTAINABLE PROJECTS

**Texas Christian University Scharbauer Hall, Fort Worth, TX** – MEP engineering design services for the new four-story, \$32 M, 60,000 SF **LEED Gold** Certified building. The overall annual energy usage of the building is expected to be reduced by an estimated 19.3% over the baseline case (41% reduction in water consumption, 33% reduction lighting energy). Designed in BIM (REVIT).

**Sherwin Williams Retail Store, Sasche, TX** – MEP engineering services for the design of a 5,000 SF Sherwin Williams Store utilizing three high efficiency packaged rooftop units and low flow plumbing fixtures. This project achieved **LEED Silver** Certification.

**Tarrant County Subcourthouse in Arlington, TX** – MEP engineering services for the three-story, \$10 M Tarrant County Southeast-Sub Courthouse that includes a satellite courtroom and associated support areas; a community meeting room and administrative offices. The building achieved **LEED Silver** certification and is the first building in Arlington, first building for Tarrant County and the first Courthouse in TX to achieve LEED certification. The implementation of sustainable design on this project reduced the annual energy consumption by 38.6%, resulting in an annual cost savings to the Owner of 21.8% on energy bills.

**Tarrant Regional Water Annex, Fort Worth, TX** – Survey and Site/Civil design for the new \$8.5 M, 26,000 SF Annex for the Tarrant Regional Water District used to house the Engineering and IT staff. The annex achieved **LEED Gold** certification. The annex utilized local and recycled materials with high-performance mechanical systems and exterior glazing along with stormwater quality, porous paving, fencing and tree preservation. A new ADA accessible sidewalk connector was designed to connect the existing Headquarters to the new Annex across the levee.

**Client Confidential (International Coffee Retailer), Austin, TX** – MEP engineering services for the tenant improvement of an existing 1,441 SF shell space achieved **LEED Silver** and was awarded the **Austin Energy Green Building 3 Star Rating**. Mechanical design included high-efficiency, 2-stage, roof top units providing improved humidity control in addition to energy savings. The mechanical controls included outside air and carbon dioxide sensors. Low water consumption plumbing fixtures were provided to reduce overall water use by 30 percent. The lighting system included a low-voltage relay system and daylight harvesting controls. The user desired to keep the flexibility of their prototype track lighting concept. A current limiting panel incorporated into the design allows the use of track lighting while limiting power consumption to the number of heads needed to illuminate art work and retail displays.

**Miller Company New Corporate Office & Warehouse, Grapevine, TX** – Survey and Site/Civil engineering services for a 1.4 acre parcel to house a new \$1.5 M, 8,600 SF corporate office & warehouse for the Miller Company designed to achieve LEED certification. Since this property fronts a state highway, a TxDOT driveway and storm drain permit was required. Survey services included boundary and topographic surveys along with preparation, submission and processing of the one lot plat. Engineering services included a drainage analysis and plans for site development, paving and dimension, traffic control, grading / drainage, erosion control and utility (water & sewer). Details included site and paving along with utility and other miscellaneous details.

**Central TX College Nursing Building, Killeen, TX** – MEP and fire protection engineering design services for the \$17 M, 82,000 SF building designed to achieve LEED Silver certification. The building will include an interior two-level atrium and have a lower level of Nursing Education training components, including intelligent electronic training mannequins and will consist of 35,000 SF of classrooms and an upper level of 35,000 SF of Nursing Education classrooms, and 12,000 SF of administration space for Metroplex Hospital (non-healthcare space). Electrical distribution consisted of two underground electric service entrances, one serving the West Building and one serving the East Building. Lighting consists of energy-efficient fluorescent, controlled in accordance with Energy Codes. Mechanical systems consist of two chillers for a total capacity of 260 tons, with four variable air volume air handling units. Five package rooftop units serve the hospital administration building. Two gas-fired boilers are joined with the two chillers to provide four-pipe hydronic system. The building HVAC controls will be connected to the campus-wide control system.



TCU Scharbauer Hall



Tarrant County Subcourthouse



Tarrant Regional Water District Headquarters & Annex



Miller Company Corporate Office





SUSTAINABLE PROJECT MATRIX

PROJECT	SUSTAINABLE DESIGN GOAL	PHASE	COST	SIZE	DETAILS	ARCHITECT
Central TX College Nursing Building	LEED Certified	Under Construction	\$17 M	82,000 SF	Lighting consists of energy-efficient fluorescent, controlled in accordance with Energy Codes.	Freese & Nichols
Durant Toyota Dealership	LEED Silver	Constructed	\$4 M	27,000 SF	Used geothermal ground source heat pump system for heating and cooling. Reduced annual energy consumption by 10.6%, annual operating cost savings of \$7,400.	TMA I CHL
Fire Station No. 7 / Lake Parks Facility, Grand Prairie	LEED Silver	Under Construction	\$6 M	20,780 SF	Used geothermal ground source heat pump system for heating and cooling. Reduced annual energy consumption by 19%, reduced water usage by 35%, and increased ventilation rates by 30%.	Komatsu
International Coffee Retailer	<b>LEED Silver ACHIEVED, Austin Energy Green Building 3 Star Rating ACHIEVED</b>	Constructed	Unknown	1,441 SF	Low water consumption plumbing fixtures were provided to reduce overall water use by 30 %. The lighting system included a low-voltage relay system and daylight harvesting controls. A current limiting panel was incorporated to allow the use of track lighting while limiting its power consumption to the number of heads needed.	CMA
Keller Intermediate / Middle School	LEED Silver	Under Construction	\$32 M	188,000 SF	A geothermal ground source heat pump system was utilized for heating and cooling. Energy recovery ventilators were provide to pre-treat the outside and achieve an increased outside air ventilation rate of 30% above ASHRAE Standard 62.1. Low flow plumbing fixtures, including shower heads, were provided to reduce the overall water usage of the building by 30%. The lighting system included a low-voltage relay system and daylight harvesting controls and was designed to reduce the lighting energy by 22% over the baseline case. Designed in BIM (REVIT).	Hahnfeld, Hoffer, Stanford
Miller Company Office & Warehouse	LEED Certified	Designed	\$1.5 M	8,600 SF	Site considerations included pervious pavement and capture and reuse of rain water for irrigation. Furthermore, a storm water interceptor was considered to separate floating debris and settle out solids.	GSBS Batenhorst
Sherwin Williams Retail Store	<b>LEED Silver ACHIEVED</b>	Under Construction	Unknown	5,000 SF	Utilized three high efficiency packaged rooftop units and low flow plumbing fixtures.	Quorum



PROJECT	SUSTAINABLE DESIGN GOAL	PHASE	COST	SIZE	DETAILS	ARCHITECT
TCU Scharbauer Hall	<b>LEED Gold ACHIEVED</b>	Under Construction	\$32 M	60,000 SF, Four-story	Utilized low water consumption plumbing fixtures to reduce the water usage by more than 41% over the conventional plumbing fixtures. The building envelope design was coordinated with the Architect to help reduce energy costs. The indoor lighting system was designed to reduce the lighting energy by 33% over the baseline case. The overall annual energy usage of the building was reduced 19.3% over the baseline case. Designed in BIM (REVIT)	Hahnfeld, Hoffer, Stanford
TCU Admissions Building	LEED Platinum	Under Design	\$6.7 M	13,000 SF	A geothermal ground source heat pump system was utilized for heating and cooling. The heat pumps contained high efficiency two-stage compressors with energy-efficient ECM motors for the fans. Energy recovery ventilators were provide to pre-treat the outside and achieve an increased outside air ventilation rate of 30% above ASHRAE Standard 62.1. Low flow plumbing fixtures, including shower heads, were provided to reduce the overall water usage of the building. Designed in BIM (REVIT).	Hahnfeld, Hoffer, Stanford
TCU Olympic Sports Facility	LEED Silver	Under Design	\$14 M	47,000 SF	A geothermal ground source heat pump system was utilized for heating and cooling. The heat pumps are roof mounted and contained high efficiency digital scroll compressors. Energy recovery ventilators were provided to pre-treat the outside for the Locker Rooms. Low flow plumbing fixtures, including shower heads, were provided to reduce the overall water usage of the building. Designed in BIM (REVIT).	Hahnfeld, Hoffer, Stanford
Tarrant County Sub Courthouse in Arlington	<b>LEED Silver ACHIEVED</b>	Constructed	\$10 M	50,000 SF, Three-story	Reduced annual energy consumption by 38.6%, annual cost savings of 21.8% on energy bills. 1st Courthouse in TX, 1st building in Arlington and 1st building for Tarrant County to be LEED Certified.	LBL
Tarrant County Sub-Courthouse in Lake Worth	LEED Silver	Under Construction	\$15 M	50,000 SF	Utilized solar water heat and water source heat pump design for supplemental heating. Light harvesting for energy savings and rain water harvesting design was used for a drip sub-soil irrigation system.	LBL
Tarrant Regional Water Annex	<b>LEED Gold ACHIEVED</b>	Constructed	\$8.5 M	14,000 SF	Utilized local and recycled materials and exterior glazing along with stormwater quality, pourous paving, fencing and tree preservation.	Gideon Toal