College of Engineering

R&D Expo

University of North Texas

SENIOR DESIGN

Spring 2025

COLLEGE OF ENGINEERING
Department of Mechanical Engineering

CONSTRUCTION ENGINEERING TECHNOLOGY
Senior Design Abstracts
Spring 2025

157 Aiden Drive at Tuscan Estates

Team Members

Jason Pineda
Raul Cano
Evan McDonald
Jehiel Vazquez

External Sponsors/Mentors

Bryan Rodriguez

Internal Sponsors/Mentors

Aloysius (Al) Attah, Ph.D., P.E.

Abstract

Our senior design project is set in Waxahachie, TX, on a 1-acre lot where we will oversee the construction of a luxurious single-family home within Tuscan Estates. The residence, located at 157 Aiden Drive, is planned to be a 3,000 square foot home, with an estimated completion time of 4 to 5 months.

We have been assigned the task of completing this project report, which includes sections on scheduling, sustainability, marketing, estimating and more. In our project, we are considering sustainable alternatives such as utilizing zip system plywood and blown foam insulation. as well as comparing different building materials and strategies to best fit the market need. Additionally, we are strategically planning features to ensure competitiveness with other builders in the neighborhood.

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Borman Elementary School Replacement Project

Team Members

Dominic Esquivel
Nicholas Carranza
Mason Burke
Benjamin Davis

External Sponsors/Mentors

Kyle Ware
Joeris Construction

Internal Sponsors/Mentors

Dr. Al Attah
Dr. Orlando Bagcal

Abstract

The senior design project for Group 3 of Construction Management is the Borman Elementary School Replacement Project. The project scope includes a land swap with the City of Denton, construction of the new Borman Elementary, demolition of the old Elementary School, and construction of a soccer field on the previously demolished school. The project is government funded through a bond for expansion of the City's school system. Some design features include an ICF wall system for a storm shelter, geothermal mechanical systems, large classrooms and modern features. Some site features include a landscape wall on the plan east end of the Elementary School that poses some construction challenges and problems that can arise. Also, there is no road that immediately circles the new elementary school; therefore 2 separate construction entrances must be monitored, along with the regular traffic during school hours. The schedule for the construction goes from January 2025 to the End of Summer 2026 to allow furniture and equipment to be moved from one building to the next.

DMNB Construction has been tasked with formulating one key deliverable, a full encompassing Senior Design Report that includes a business plan, quality management, BIM, site logistics, budget, schedule, sustainability, value engineering, risk assessment, and safety management. The Borman Elementary School Replacement Project has a number of obstacles and key factors that will be outlined in our report along with the traditional aspects of a construction project.

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Brahman Ranch Project

Team Members

Landen Parkes
Sean Beasley
Saul Gonzalez
Vishnu Deepak

External Sponsors/Mentors

Bridge Homes
Bryan Rodriguez

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Dr. Salar Shirkhanloo, E.I.T.
Dr. Aloysius A. Attah, P.E.

Abstract

Our group's senior design project is the Brahman Ranch Project. It is located in Venus, TX. Brahman Ranch is an up-and-coming custom home community. Bridge Homes has acquired 10 lots here, averaging around 6,000 square feet per lot, and is competing with two other companies in the community. The heated area of the homes will average 2,300 square feet and each home will have an attached garage.

Our group has been tasked with choosing several floor plans and creating a full proposal for one of them. With two competitors in the area with very similar products, we must be able to distinguish ourselves in order to successfully market our homes. Our proposal will consist of an executive summary, market analysis, project management, and risk analysis. A developer has already completed the necessary civil work in the community, so we will not need to worry about that. The floor plans we have selected are in the same style as the plans Bridge Homes has already created, focusing on a modern design with an open concept space. Due to the similarities, our primary focus for scheduling and estimating will be on value engineering and sustainability. The homes will start in the $450,000-500,000 range for homebuyers, and they will take approximately 3-5 months to build.

We will focus on utilizing premium materials, advanced technology, and sophisticated techniques that will ensure durability and sustainability, as well as an aesthetic appeal.

Compass Data Center
Eagle Construction LLC

Team Members

Brianna McCool
Mireya Mullins
Esmeralda Rodriguez
Arturo Villarreal

External Sponsors/Mentors

Brasfield & Gorrie
Lindsey Lauderdale, P.E. LEED AP
Senior Project Manager
Jerry Morgan
Senior Project Manager

Internal Sponsors/Mentors

Dr. Aloysius A Attah, P.E.
Dr. Orlando R. Bagcal, P.E.

Abstract

The Compass data center project in Red Oak, Texas, is a multi-phased, large-scale development led by Jerry Morgan with Brasfield & Gorrie, with architectural designs by Harley Ellis Devereaux. This $1.7 billion project has achieved significant milestones since its inception in 2021. The initial work included site preparation and foundational developments, advancing through various construction phases for buildings 1 to 10. The project's total scope encompasses approximately 2,500,000 square feet, including the core, shell, and interior fit-out stages for the data center facilities.

The UNT Eagle Construction, LLC Team has been tasked with researching alternative methods to meet future data center demands independent of the Electric Reliability Council of Texas (ERCOT) grid system, with nuclear power being the leading option.

UNT Discovery Park E190 Cold Spray Lab

Team Members

Henry Mata
Luis Martinez
Jaime Tovar
Jorge Loya

External Sponsors/Mentors

Batson Cook Construction
Linda Whitman
John Bai

Internal Sponsors/Mentors

Dr. Saman Rashidyan, P.E.
Dr. Aloysius A. Attah, P.E.

Abstract

Our senior design project is the E190 Cold Spray Lab that will be built as an additional room, which will be located in front of UNT Discovery Park, located at 3940 N Elm St, Denton, Tx 76207. The project will start around March 18th, and if everything runs according to schedule, the finishing date should be around May 20th, 2025.

The construction of the new lab will include 3 different areas, the lab (E190) itself, a Spray Booth Lab, and a Mechanical Yard. The purpose of the cold spray lab renovation is to allow the school to use the original laboratory, which will allow students and faculty to test out cold spray coating technologies and methods such as metallic and non metallic coating. Our Senior Design Goal for our Project is to show our understanding of the PPMs we've studied over the past year, which are Quality Management, Site Logistics, Budgeting, Scheduling, sustainability, value engineering/analysis, Risk Assessment, and Safety Planning.

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Frisco ISD
Visual and Performing Arts Center

Team Members

Luis Anaya
Enrique Bustos
Cristian Portillo
Nathaniel Bickhart

External Sponsors/Mentors

Joeris General Contractors
Kyle Ware
Josh Hanson
Brandon Woodbury
Brandon Brashier

Internal Sponsors/Mentors

Dr. Aloysius A. Attah, P.E.

Abstract

The Frisco ISD Visual and Performing Arts Center is located in Frisco, TX. The building includes a two-story, 1,200-seat performance auditorium, two multipurpose labs, fine arts offices, and an art exhibit gallery. Led by Joeris General Contractors, this building began construction in Feb. 2024 and is scheduled to finish by Aug. 2025 with a budget of $55 million. The building will be a collaborative space to expand future-ready learning student opportunities.

CLEN Construction LLC will be a mockup company that has been awarded the job. We will create analysis of the project which includes: business plan, market analysis, logistics and site layout, schedule, safety plan, sustainability, risk assessment, and budget analysis.

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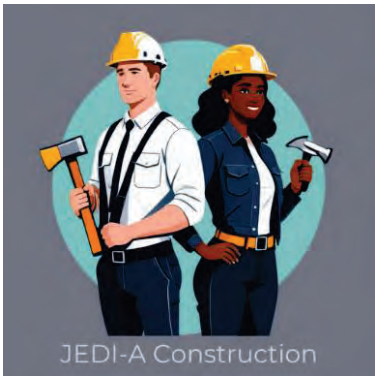


CELINA OWNSBY I
JEDI-A CONSTRUCTION

Team Members

Esther Egbe | John Joiner | Azriel-Selcio Akuete | Isaiah Thompson | Deepu Kuriakose Shaji

External Sponsors/Mentors

TX-Morrow Construction
Breck Landry, APM

Internal Sponsors/Mentors

Dr. Aloysius Attah, P.E.
Dr. Cheng Yu, P.E.

Abstract

Celina Ownsby I is the first of two apartment complexes constructed by TX-Morrow Construction in Celina, Texas. This four-story, wood-framed structure is one of five planned buildings and comprises a total of 367 individual units. Our focus in this project centers on the “framing model,” which serves as the structure system of the building, with JEDI-A Construction as the framing subcontractor for TX-Morrow throughout the project. The scope of our research is to determine best practices for framing, which TX-Morrow can incorporate in future projects.

JEDI-A Construction is tasked with providing a written report detailing the framing process of the project to TX-Morrow. This report will include generated digital and physical models that will go over the general layouts of Celina Ownsby I, while discussing additional subjects such as the contract documents necessary for the framing process, budget, schedule, value engineering and safety practices applied on-site to ensure that the project runs smoothly and without any potential incidents.

Presented by the University of North Texas Mechanical Engineering Dept. Senior Design Program

Kerr Hall Interior Renovation - Phase 2

Team Members

Maurice Hester Miles Halton Jay Travier Ahmad Althabit

External Sponsors/Mentors

Batson-Cook Construction
Josh Medrano & Cory Nickodam

Internal Sponsors/Mentors

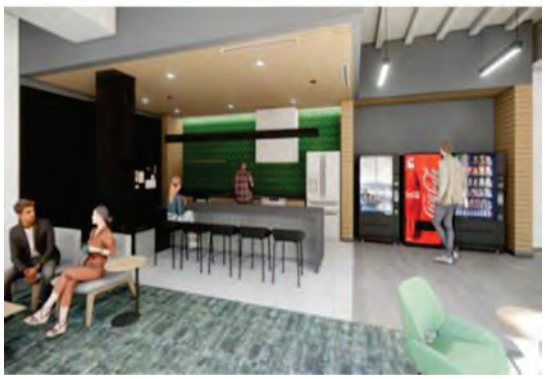
Aloysius Attah, Ph.D., P.E
Saman Rashidyan, Ph.D., P.E

Abstract

Our senior design project is UNT's Kerr Hall interior renovation phase 2. Kerr Hall was built in 1969, and it is a dorm that houses approximately 900 residents. The Renovation is at level one and consists of approximately 3,000 square feet. Phase 2 Renovation consists of demolishing the existing cafeteria area and transforming the space to accommodate a common area, lounge area, community kitchen, laundry room (20 washers/10 dryers), and 4 new restrooms. Also included in the scope of work is the installation of a new air handling unit, and a new electric panel in the mechanical room just south of the existing cafe.

The reason for the renovation is to modernize the building and to accommodate UNT's influx of new students. The scope of work is heavily reliant on mechanical, electrical, & plumbing due to the installation of many new appliances and mechanical systems. The contract value for the renovation is approximately $1.5 million and is set to begin mid- November 2024. It is expected to be completed between late February and mid-March 2025.

Our team will create a detailed report explaining the major aspects of renovating a space on a busy campus. This project will include site logistics, budget, schedule, sustainability, value engineering/analysis, risk assessment, and safety.



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MMODS Construction
Irving Central Fire Station

Team Members

Tramel Middlebrook
Isis Schmidt
Oscar Dominguez
Mayerli Mendoza
Jon O'Pry

External Sponsors/Mentors

CORE Construction
Brent Peterson PM
Madison Ampoe APM
Patrick Surratt SPD

Internal Sponsors/Mentors

Professor Aloysius Attah, P.E.
Professor Orlando R. Bagcal, P.E.
Professor Cheng Yu, P.E.

Abstract

Location: Irving, Texas
Project Size: 10,200 sqft
Project Bid Amount: $7.99 Million
Project Duration: 14 Months
This senior design project compares different approaches to improve the construction, efficiency, and cost of the City of Irving's Central Fire Station. It takes into consideration how to improve sustainability and efficiency while remaining within budget. Studies include new design improvements, optimal systems, and following safety codes. Alternative materials are also looked into with regards to durability and cost. The project is planned to include water-saving devices, low-energy lighting, and recycled materials to achieve maximum LEED certification. It also addresses construction problems and uses Building Information Modeling (BIM) for clash detection during design to prevent them during construction.

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Southern Gateway Park

PEACH TREE LLP

Team Members

Esmeralda Rivera
Francisco Martinez
Jada Ramirez
Juan Guido

External Sponsors/Mentors

McCarthy Building Companies
- Humberto Lopez

Internal Sponsors/Mentors

Dr. Aloysius Attah,
Dr. Shirkhanloo Salar

Abstract

Our Senior Design Project is the Southern Gateway Park located in Dallas TX, the park will span I-35E between Ewing and Marsalis Avenues and will reconnect historic Oak Cliff to the city of Dallas. The park will be built in 2 Phases with phase one encompassing 2.8 acres of the total 5 acres proposed. Phase 1 will include most of the features that were requested for the park, which are the restrooms, playgrounds, Stage pavilion, park drive for food trucks, a bridge to the zoo, and a large lawn area. The overall cost of the park is estimated to be 65 million dollars and is projected to be finished in 2026.

Major deliverables for our company on this project include the sidewalk and driveway/roadway paving, the placement, grading, and embankment of dirt, erosion control, and the placement of drainage and water utilities throughout the park. By incorporating the best available materials and practices, including geofoam and layered foam foundations, the project epitomizes engineering excellence and urban resilience. The projected construction schedule indicates substantial completion within 210 calendar days from the notice to proceed, reflecting very thorough planning and coordination with goals related to community development.

TCU Athletics Human Performance Center

Team Members

Jori Foote
David Rendon
Saul Leija
Benjamin E. Hammond Narcisso
Cesar Martinez

External Sponsors/Mentors

Linbeck
Jose Cavazos

Internal Sponsors/Mentors

Dr. Aloysius Attah

Abstract

The TCU Athletics Human Performance Center Renovation and Expansion Projects is a $50 million donor-funded project that will include two new facilities and the renovation of two others. The project began in February and is scheduled to be completed in July 2025. The projects, which will support all 515 TCU student-athletes in the 22-sport program, include the renovation of the existing Bob Lilly Performance Center, Development of a Restoration and Wellness Center, Construction of a new state-of-the-art Football Performance Center and expansion of the entryway to the TCU football facilities.

The 10,000-square-foot Restoration and Wellness Center will include a cryo lounge, hydro massage and red-light therapy. The first addition is a new, two-story addition that connects to the Sam Baugh Indoor Practice Facility and Bob Lilly Performance Center (both previously built by Linbeck). The first building addition will include weight rooms, nutrition center, multi-purpose spaces for recruiting, balconies that overlook the indoor practice field, and a tech studio showcasing the latest GPS and analytical data used for elite athletic training. The second addition is the Athletic Restoration and Wellness Center that will connect to the Justin Center and will include equipment storage, a 100+ player spray area, recovery pools, cool rooms, spa-like areas with a nap room, sensory deprivation and infrared therapy areas, as well as a fuel bar. The third component of the HPAC is a renovation to the existing performance center. This space will be modernized to include new flooring, ceilings, lighting, A/V wall, weight room equipment, and branding.

The new Football Performance Center will include 20,000 square feet of strength and conditioning space, conference rooms and technology centers that connect the Sam Baugh Indoor Practice Facility and the Morris Practice Fields.

UTA Life Science Building Addition
Taco & Hammer Construction , LLC.

Team Members

Carlos Velasco
Carlos Borrego
Jannie Zambrano
Alejandro Ramirez

External Sponsors/Mentors

Quinn L. Shoop

Hensel-Phelps

Internal Sponsors/Mentors

Dr. Zhenhua Huang
Dr. Aloysius Attah

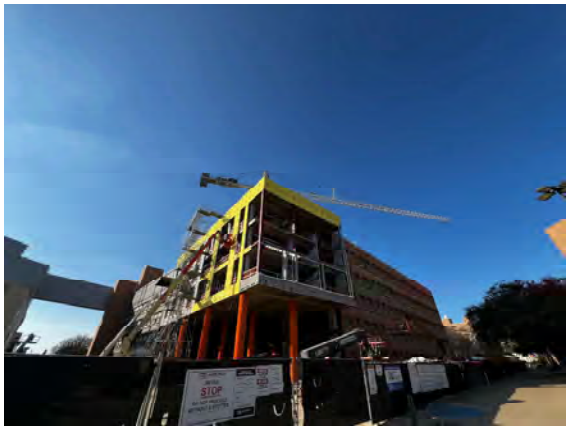
UNT Department of Mechanical Engineering

Abstract

Our team's senior design project is the UTA Life Science Renovation and Expansion project currently under construction by Hensel Phelps. Their team consists of a Project Manager, Project Engineer, Superintendent, Field Engineers, Estimators, Schedulers, and Safety coordinators. The architects on this project are Zimmer Gunsul Frasca Architects LLC. The school is being renovated for the State of Texas, the owner of the university.

The scope of this project includes various renovations and additions to existing systems within the building. The project began construction in January of 2024 and the date of completion is November 2027 after 37 months of construction. Overall, about 67% of the building will be renovated, costing $149 million. This will require the relocation of the M.E.P systems and the demolition of parts of the building. Our group is focusing on Area B of the project which includes the addition of a new building section that encompasses new offices, social areas, test rooms, focus/meeting rooms, break rooms, and walkways. Being a completely new building we will have to complete the concrete foundations, slabs, structural concrete columns and beams, framing, and both interior and exterior finishing.

Our project team will be creating a project report. The exact section of the project we will report on is Area B (Floors 3-6), which is the southern building addition. The sections covered will include Logistics and Layout, Budget, Schedule, Sustainability, Value Analysis, Risk Assessment, Safety Plan, Business Plan, and Computer Modeling programs such as BIM.



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