Student Design Center

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Introduction

The Student Design Center (SDC) is a multi-use space featuring mechanical equipment and workstations for students to work on their design projects. The current SDC is not large enough for the needs of the campus. Because of this, Trine plans to demolish the old building and build a new, larger one in its place. The new building will be larger than the old one, with several new spaces and an emphasis on sustainable development.

Testing

FNZ performed two soil borings on-site using a hand auger. These samples were then analyzed using four tests: moisture content, Atterberg limits, gradation, and minus 200 washing. These results were then used to classify the soil as “silty sand with trace gravel.

Property	Lab Result
Gravel (% Coarse)	24.2%
Sand (% Coarse)	75.8%
Fines Content	37.0%
Plastic Limit	24.0%
Liquid Limit	41.5%
Plasticity Index	17.5%

Table 1: Soil Testing Results

FNZ performed a site survey using Topcon GPS equipment. The data points were then input into Civil3D to create a base map with contours.

Figure 1: Existing Site Base Map

Building Design

The SDC was designed as a steel frame building as steel is durable, affordable, and sustainable. A framing plan was created in RISA 3D and all calculated loads were applied to the structure.

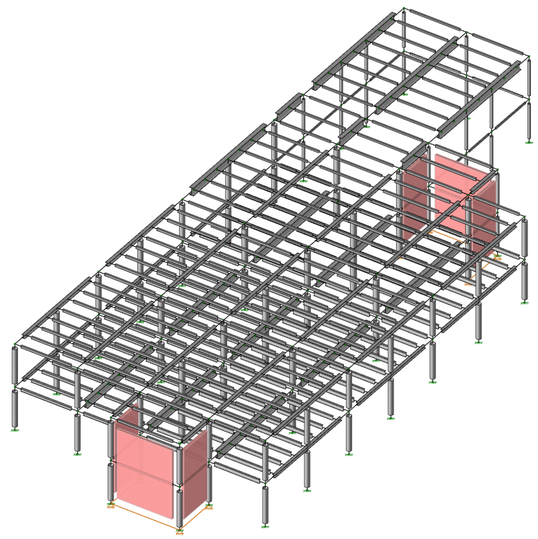

Figure 2: Framing Plan in RISA 3D

The structure was divided into different section sets. An iterative process was used to determine the member sizes needed to meet code requirements. W-Shapes were used for beams and girders and HSS Pipes were used for columns.

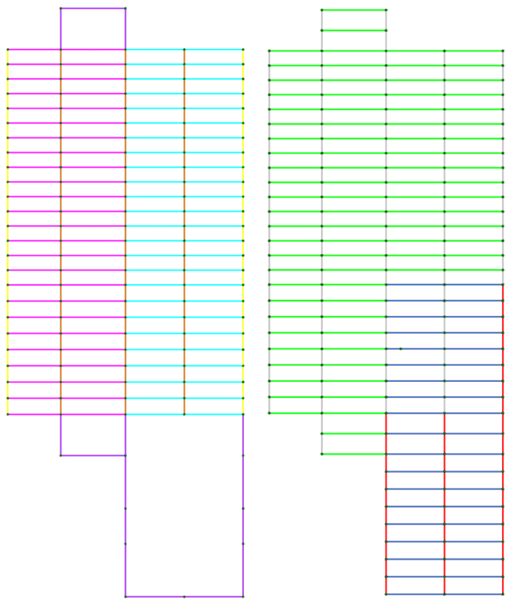

Figure 3: First Floor (Left) and Second Floor (Right) Section Sets

Foundations

Due to high loads, two different foundation types were initially proposed for the SDC: square footings and helical piers. It was determined that square footings, which are cheaper than helical piers, would suffice. Foundation groups were then set in RISA Foundation.

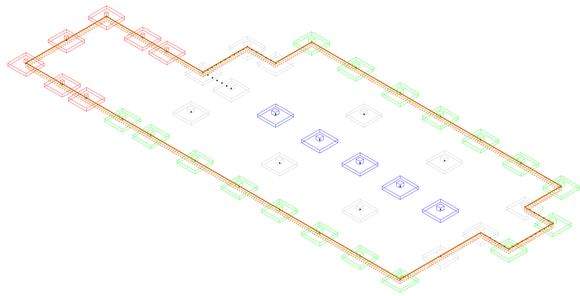

Figure 4: Foundation Layout

Foundation sizing included two steps: determining the base width and the amount of steel reinforcement required. Pedestals for the steel columns to connect to were also designed.

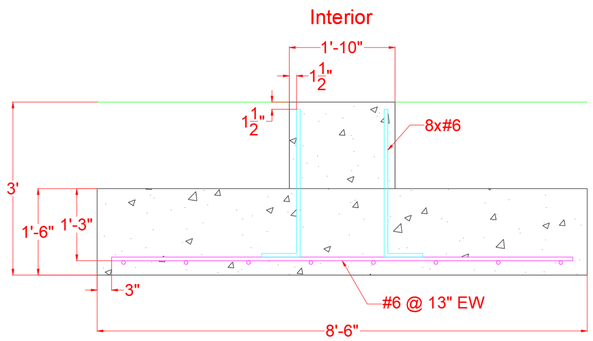

Figure 5: Example of a Square Footing Design

Budget

RSMeans was used to perform an itemized budget calculation for the project. Budgeted items were multiplied by the Fort Wayne index value to calculate the total cost of the SDC project.

Task	Index Subtotal
Structure	$ 1,115,789.38
Foundation	$ 87,027.32
Sustainability	$ 368,225.56
Site Plan	$ 275,482.13
Engineering	$ 15,705.00
Index Total	$ 1,862,229.40

Table 2: Budget Breakdown

Sustainability

The new SDC will feature two sustainable features: solar panels and a green wall. The solar panels will provide enough power to achieve net zero idle energy, meaning that all basic processes used to maintain the building (like lighting and HVAC) are powered by solar energy. An extensive Type 2 green wall will be located on the two stairwell walls as well as the entire westward wall. The green wall consists of climbing hydrangeas supported by wires. This will provide sound dampening, temperature regulation, and stormwater attenuation.

Figure 6: Type II Extensive Green Wall

Site Layout

FNZ performed a grading plan and performed hydrologic and hydraulic analyses to determine the required stormwater storage on site. This storage will be achieved through large storage pipes underground.

Figure 7: Proposed Site Layout with Grading and Storm Sewer