Introduction: (Slide 4)

This project is about an existing 1 million gallon steel water tank that was constructed in 1969. After decades of use, the steel tank is now due for inspection. So in 2022, GHD designed a new 3 million gallon prestressed concrete water tank to replace the existing one, which the construction is set to be completed in June 2025.

Project Location (Slide 5)

The project is located in Tamuning, Guam, across from the Home Depot building as shown on the map.

Project Statement (Slide 6)

For our project, we will be utilizing GHD's design for the new 3 million gallon concrete water tank. However, due to prestressed concrete being outside the scope of work for UOG's engineering curriculum, we will be creating an alternative design for our capstone project. This alternative design will consist of four aspects which we will cover in the later slides.

Objectives (Slide 8)

Our capstone project will consist of four objectives: analysis and design, complex analysis, risk analysis, and sustainability.

Design Methodology Title (Slide 9)

And now we will discuss how we will accomplish our objectives

Design Methodology Codes

Throughout our project, we will be utilizing various codes and standards, one notably being ACI. Additionally, we have other references, including the one we learned within our curriculum from our academic advisor, Dr. Hong, which we used for designing reinforced concrete structures and steel construction. In addition to these, we will be utilizing various programs to check our hand calculations, including ETABS and Tekla Tedds.

Column (Slide 22)

For column design, we will utilize a fixed pinned connection with a height of 47 feet. We have a total of 16 columns with 4 different designs. However, for this example, we will go over the middle columns B2 and 3, and C2 and 3, as indicated in the figure in green. Due to the large height of the column and our analysis based on the axial and moment forces, the column is considered slender, giving a cross-sectional area of 28 x 28 inches squared. Additionally, because shear walls brace our frame, we consider our columns as nonsway.

Final Design Column (Slide 23)

After our design of the columns, we compared our hand calculations with ETABS for the required cross-sectional area and steel area. Please note that the comparison between hand calculations and ETABS was similar, except for the required steel area for shear force, mainly due to shear force not being required based on the ACI codes. However, this is uncommon in practice, and even though ties are not required, the minimum steel area for shear force was used, which may have caused different results between the hand calculations and ETABS design.

Final Design & Cross Section (Slide 24)

For the final design and cross-section of the middle column in consideration, the figure is shown on the right.

Final Design & Cross Section (Slide 24)

As for the rest of the column cross sections for the other three designs, they are shown in the figures as shown. Please note that the cross sections for these columns are larger than the previous column design due to the design of the shear walls being 30 inch thick.