Project Summary

This project presents a comparative study between two HVAC systems, namely the Variable Refrigerant Flow (VRF) system and the Air-to-Water Chiller system, for Sabat Wedding Hall in the West Bank. The main objective of the study is to determine the most suitable air-conditioning system based on energy consumption, operating cost, initial cost, and technical performance.

The study began by analyzing the building characteristics, climatic conditions, occupancy, and cooling requirements. The cooling load was calculated manually and verified using Carrier HAP 6.2. The final cooling load adopted for the design was approximately 22.5 TR. Based on this load, both HVAC systems were designed to provide the same required cooling capacity.

The results showed that the VRF system performed better in terms of energy efficiency and cost. The estimated annual energy consumption of the VRF system was 10,982.97 kWh/year, compared with 13,115.7 kWh/year for the Air-to-Water Chiller system. This represents an estimated energy saving of approximately 16.26%. At an electricity price of 0.7 NIS/kWh, the annual operating cost was estimated at 7,688.08 NIS for the VRF system, compared with 9,180.99 NIS for the chiller system, resulting in an annual saving of about 1,492.91 NIS.

The initial cost comparison also favored the VRF system. The estimated initial cost was approximately $21,309 for the VRF system, while the Air-to-Water Chiller system required approximately $46,605.4. The higher chiller cost is mainly due to additional components such as pumps, chilled-water piping, FCUs, ductwork, insulation, and other mechanical equipment.

Overall, the study concludes that the VRF system is the more suitable HVAC solution for Sabat Wedding Hall. Its ability to adjust cooling capacity according to the actual load makes it particularly appropriate for a wedding hall where occupancy and operating conditions vary significantly. However, the study also recognizes that chiller systems may be more suitable for larger buildings with high and relatively constant cooling demands.