



DOHALAND DCP



Concept & Location

Musheireb, Heart of Doha is a massive 35-hectare site which will transform the architectural centre of Qatar’s capital city, recreating a way of living that is rooted in Qatari culture.

The Musheireb development is being undertaken by Dohaland which is a subsidiary of the Qatar Foundation for education, science and community development lead by Her Highness Sheikha Moza Bint Vasser.

The Musheireb project will be a shining example of Qatar’s progress in the region, and will bridge the gap between the historic Doha of the past, and the leading, global metropolis it is today. The project recreates the highlights of Qatar’s traditional architecture and urban planning work as well as develops a sustainable and beneficial community of the future.

The Musheireb will revitalise the historic core of Doha itself, giving families the opportunity to live in beautiful homes and enjoy the benefits of a strong, well-served local community. The project aims to bring about a complete transformation of the urban landscape of Doha, and will be at the forefront of the massive expansion that Qatar will undertake, in preparation for the Football World Cup in 2022.

Salient features of planned development include organic courtyard patterns, townhouses (which will be arranged as ‘fireej’ clusters, each sharing a communal majilis and courtyard garden), retaining the historic street pattern including the famous Kahraba street and the line of the old Wadi.

Mushreib is designed to comply with leading energy efficiency and sustainability standards, and will maximize the adoption of the latest in sustainable technology, combined with traditional techniques of climatic design such as shading structures, wind catchers and massive construction. High levels of eco performance will be achieved with minimum wastage and low levels of pollution.

Given Dohaland’s focus on sustainability and environment, the District Cooling System is a vital part of the strategy to provide an energy efficient approach to the Musheireb project. The qualitative advantages of the system are perceived in terms of better comfort, better reliability, and maximized convenience. It provides better quality of cooling, maximum cost effectiveness, capital cost elimination, space saving, decrease in sound pollution, and importantly, is environmentally friendly.

As Dohaland’s target is to build the first sustainable downtown regeneration project, they decided to build an energy efficient district cooling system, achieving the highest LEED certification. DSE was selected to commission, install, and test the district cooling system for the entire project.



Scope of Work

The Musheireb Development area requires a high capacity district cooling network, comprising two centralized district cooling plants, to produce a thermal energy in the form of chilled water and supply the chilled water to the buildings through a piping network.

Dohaland commissioned DSE to design, build, install and operate the district cooling system. There are two district cooling plants, each plant with a cooling capacity of nearly 30,000 TR, provided by electrically driven chillers.

The scope of work being undertaken by DSE includes:

- Mechanical, electrical and support equipment and systems for two independent central cooling plants.
- An interconnected sidewise reticulation network located connecting 59 energy transfer stations.
- Cooling tower make-up and blow down pipelines from PR1 to PR2.
- Water treatment plant using TSE water for the cooling tower make-up and development irrigation, water feature and toilet flushing for the development energy transfer station (ETS).
- P/C control panels, instrumentations programming, testing & commissioning.
- Operation and maintenance of the district cooling system for a period of seven years, with a design life of 25 years for sea shore installation.

DSE's team on site is responsible for the design and engineering development, plant and material selections procurement, installation, commissioning and performance validation of

mechanical and electrical chilled water process plant for the district cooling system.

DSE's scope also covers the design and construction of a chilled water reticulation network including valves and valve chamber details, the design and construction of complete Mechanical Electrical and Plumbing (MEP) building services for the plants, the testing and commissioning of the Plants as well as the operation and maintenance of the district cooling plants for a minimum period of five years.

Challenges

The Heart of Doha DCP project has proved to be a unique learning experience for DSE, as it encountered and overcame interesting challenges in the initial stages itself.

One of the major challenges is creation of an energy efficient district cooling system, which primarily depends on electrically driven chillers. This contradiction was the main aspect of consideration for DSE throughout the concept design, detailed engineering studies, equipment selection stages, right up to the adoption of construction methodology.

Another challenge was to regulate the usage of water during construction for the cooling tower make-up, as part of DSE's commitment to conscious sustainability.

Return Delta T from the building and partial load consumption is another perennial challenge for DCP projects in the Middle East, which DSE was able to face by leveraging its strong experience in DCP projects, all over the world.



DSE Innovation

From a design perspective, the central chilled water plant consists of MV electrically driven chillers for producing chilled water at 4.5 degree Celsius laid out in a series-counter flow arrangement. The chilled water system consists of primary / secondary pumping arrangement with a separate primary and secondary water pumps. The secondary pumps are driven by a variable frequency drive.

The cooling tower make-up water is provided from the TSE water polishing plant. The package control systems had to be included with a control interface to allow monitoring and controlling the system. DSE is also responsible for undertaking the chemical treatment system for all the internal plant room piping and the reticulation network.

To reduce construction time, DSE decided to move all the equipment to the basement except for the cooling tower which is located at the ground level. These led to efficient space utilization, as well as ease the movement of the teams at work.

The challenge of delivering a LEED compliant, energy efficient and sustainable district cooling system spurred DSE to usher in several innovative methods.

One of the major decisions undertaken was to select super efficient Mitsubishi chillers that brought about a significant effect on the system efficiency, as chillers typically consume 70% of the electricity required for any Cooling plant. DSE also adopted efficient equipments, pumps and applied special internal cooling methods to boost pumping efficiency.

District cooling plants tend to consume a lot of water for the cooling

tower make-up. DSE designed a Reverse Osmosis water treatment plant to treat the TSE water and use the water produced for cooling tower make up. The Reverse Osmosis plant has 90% recovery which is great from a recycling perspective. The plant recycles water from the cooling tower to the Reverse Osmosis plant for re-treatment. The water generated can then be used for irrigation, water release and sewage requirements for the entire development.

To eliminate the Delta T problem faced in DCPs, DSE has pioneered a new control design and philosophy using modern Smart control valves known as Electro-mechanic Flow Metering Control Valves (EFMFCV). The new control design has successfully addressed all challenges and has been able to improve design efficiency while ensuring that the end user receives the required supply temperature regardless of the load partial consumption.

Apart from this, another area DSE is focusing on is Acoustic Analysis of the DCPs. The noise generated by district cooling systems proves to be a disruption to the local communities, and one of DSE's targets was to reduce this element. DSE employed advanced Acoustic Studies using the latest computer modeling technologies to analyze noise levels and develop noise reduction solutions in the identified areas.

The unique combination of DSE's storied experience, technological strength, design competence and technical knowhow have resulted in brisk progress that is well set to deliver the client's vision for an energy efficient District Cooling Plant that will lie at the Heart of Doha's most prestigious development for years to come.