Appendix C

GREEN BUILDING AND SUSTAINABILITY DESIGN APPROACH AND FEASIBILITY STUDY REQUIREMENTS

Design Approach

The following are specific recommendations intended for consideration and, where feasible, inclusion in the design. Additionally, it is advised that consultants, in collaboration with the City of Winnipeg, undertake site visits to various indoor pools owned and operated by the City of Winnipeg before the initiation of design work.

1. Reduce Heating, Cooling, and Lighting Loads through Climate-Responsive Design and Conservation Practices:
    a. Use passive solar design; orient, size, and specify high-performance, energy efficient windows (e.g. U-0.24 including frame); and locate landscape elements with solar geometry and building load requirements in mind.
    b. Use high-performance building envelopes; select walls (clear field effective value of R-30 or higher), roofs (clear field effective value of R-40 or higher), and other assemblies based on long-term insulation, air barrier performance, and durability requirements. Eradicate thermal bridges to the greatest extent possible.
    c. Arrive at the optimum glazing ratios. This involves dynamic thermal modelling to ensure the optimum for energy savings, to limit overheating and to achieve optimum daylight levels. Thermal modelling should be carried out into 2080 future climate scenarios.
    d. Maximum overall building glazing ratios as per National Energy Building Code (NECB) 2020, article 3.1.1.6 (Winnipeg 29%). The use of floor-to-ceiling curtain walls is not permitted.
    e. To safeguard the privacy and security of individuals using the pool, carefully consider the location of pool glazing with exterior public walkways.
    f. Take advantage of 'free' energy savings through thermal zoning. Strategically position cooling zones to the north, allowing hot zones to harness solar gain to the south. Introduce buffer zones in between to create a cascading effect between the temperature zones.
    g. Ensure that the separate temperature zones are sufficiently thermally separated between each other. For example, placing a cooling zone right next to a pool zone should be avoided.
    h. Explore the utilization of higher-quality materials as a strategic approach to achieving lower maintenance costs.
    i. Consider an integrated landscape design that provides deciduous trees for summer shading, appropriate planting for windbreaks, and attractive outdoor spaces.

2. Specify Efficient HVAC and Lighting Systems:
    a. Incorporate energy-efficient HVAC equipment and systems, with a preference for utilizing a heat pump system in the design.
    b. Use lighting systems that consume less than 0.09 watt/square metre overall for ambient lighting.
    c. Use Energy Star® approved energy efficient appliances.
    d. Implement strategies to minimize evaporation rates. While increasing the pool area's relative humidity can effectively reduce evaporation, it's essential to be mindful of potential condensation on walls and surfaces. Building a high-performance envelope would reduce the risk of internal condensation, which allows the pool hall to operate at a slightly higher relative humidity.
    e. With reduced evaporation, ventilation air change rates can also potentially be reduced as less dry air is required to deal with the latent load.
    f. Explore extracting air from the pool area at both high and low level to promote the collection of potentially harmful gases from close to the pool surface.
    g. Ensure pre-heating of ventilation by utilizing a solar wall or incorporating mechanical heat recovery.
    h. Divert useful heat gain energy from high activity areas into heating the pool water and other parts of the building. Potential strategies could include the use of heat pumps which can deliver heat and cooling simultaneously.
    i. Explore how various pool filtration systems can contribute to additional energy efficiency gains.
    j. Consider using a water source heat pump to recycle the waste heat from the backwash water to top up the water heating. In addition, once the heat is taken out of it, the backwash can be recycled to flush the building's toilets.
    k. Explore options for drain heat recovery, ensuring that both supply and wastewater piping are properly aligned to optimize effectiveness.
    l. Run the energy model using a future weather file (for the year 2080) to ensure the predicted cooling loads do not exceed the proposed designs equipment capacities.

3. Optimize Building Performance and System Control Strategies:
    a. Employ energy modelling early in the design process.
    b. Use sensors to control loads based on occupancy, schedule and/or the availability of natural resources such as daylight or natural ventilation if applicable.
    c. Employ ventilation -controlled systems, meaning that fans slow down when there are fewer people.
    d. Consider the use of modular components such as boilers or chillers to optimize part load efficiency and maintenance requirements.
    e. Use a comprehensive, building commissioning plan throughout the life of the project.

4. Solar Ready Roof Design:
    f. The roof must be designed to be structurally capable of accommodating the additional loads of a solar PV system. It should be free of obstructions such as self-shading on the

south facing portion e.g. from rooftop units, to maximize sun exposure. The roof and potential location of a solar PV system should be included in roof plan tender drawings.

g. At minimum the following is required to incorporate "solar ready" principles:
    i. Designating the area of the roof for future solar PV and making it structurally sound to support it;
    ii. Place HVAC or other rooftop equipment on the north side of the roof, to prevent future shading;
    iii. Provide necessary conduits from roof to enable future electric and communications connection requirements.

Feasibility Studies

<u>Solar Photovoltaic (PV) Panel Feasibility Study</u>

Prepare a solar photovoltaic feasibility study which will include the following:

1. Conduct a shading study incorporating existing and permitted building heights and other obstructions;
2. Provide an estimate of the maximum PV system size, and system production using accepted industry solar PV design software and provide that software report as an attachment to the study;
3. Provide a preliminary layout of the potential system taking into account the set-back from roof edges, mechanical equipment and roof drains;
4. Conduct GHG savings analysis;
5. Provide life cycle costing analysis with net present value (NPV) over a 40-year evaluation period and a payback year if applicable. Current Manitoba Hydro rates are to be used, while discount and escalation rates will be provided by the City of Winnipeg. Operations, maintenance and replacement costs are to be considered. Provide a spreadsheet with the analysis in an attachment to the study

<u>Solar Wall Feasibility Study</u>

In colder climates, the utilization of an Energy Recovery Ventilator (ERV) for recovering energy from the pool area can pose challenges, such as the risk of freezing during winter months. Exploring the implementation of a solar wall may offer a more viable alternative.

Prepare a solar wall feasibility study which will include the following:

1. Evaluate the proposed installation site for the solar wall, taking into consideration factors such as solar exposure, available space, shading, and potential physical obstructions that may impact the solar wall's performance.
2. Analyze local climate data to gain insights into the solar resource potential of the area. This includes examining average daily and seasonal sunlight hours, as well as temperature variations that may influence the solar wall's effectiveness.

3. Determine the specific heating requirements of the pool area. Understand the energy consumption patterns for heating and identify the extent to which the solar wall can offset this load.
4. Provide a preliminary layout of the potential solar wall, considering the site-specific conditions and potential obstacles that may impact its design and performance.
5. Estimate the initial costs associated with the installation of the solar wall system. This should encompass equipment costs, installation expenses, and any additional considerations necessary for optimal functionality.
6. Conduct a Greenhouse Gas (GHG) savings analysis to quantify the environmental benefits associated with the implementation of the solar wall system.
7. Provide life cycle costing analysis with net present value (NPV) over a 40-year evaluation period and a payback year if applicable. Current Manitoba Hydro rates are to be used, while discount and escalation rates will be provided by the City of Winnipeg. Operations, maintenance and replacement costs are to be considered. Provide a spreadsheet with the analysis in an attachment to the study

<u>Swimming Pool Hall Glazing Study</u>

Ensuring optimal energy savings, preventing overheating, and achieving ideal daylight levels are principal considerations for this project.

Prepare a swimming pool hall glazing study which will include the following:

1. Analyze the local climate to understand the impact of solar radiation, temperature variations, and seasonal changes on the building's thermal performance. This will influence the optimal glazing ratio.
2. Perform a daylight analysis to determine the amount of natural light reaching different areas of the pool area. Consider factors such as light levels, distribution, and potential glare.
3. Use energy modeling software to simulate the building's energy performance with different glazing ratios. Evaluate the impact on heating, cooling, and lighting energy consumption. Thermal modelling should also be carried out into 2080 future climate scenarios.
4. Avoid the use of floor-to-ceiling curtain walls. In addition, to safeguard the privacy and security of individuals using the pool, carefully consider the location of pool glazing with exterior public walkways.
5. Evaluate visual comfort by considering factors such as glare, direct sunlight penetration, and potential thermal discomfort due to excessive solar heat gain.
6. Analyze how different glazing ratios align with sustainability goals, such as achieving green building certifications or reducing the building's overall environmental impact.
7. Conduct GHG savings analysis to quantify the impact associated with three distinct glazing scenarios.
8. Provide life cycle costing analysis for the three scenarios, with net present value (NPV) over a 40-year evaluation period and a payback year if applicable. Current Manitoba Hydro rates are to be used, while discount and escalation rates will be provided by the City of Winnipeg. Operations, maintenance and replacement costs are to be considered. Provide a spreadsheet with the analysis in an attachment to the study.