



CCRD, OUTDOOR POOL & POOL BUILDING RECONSTRUCTION, BELLA COOLA, BC

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90% Design Development

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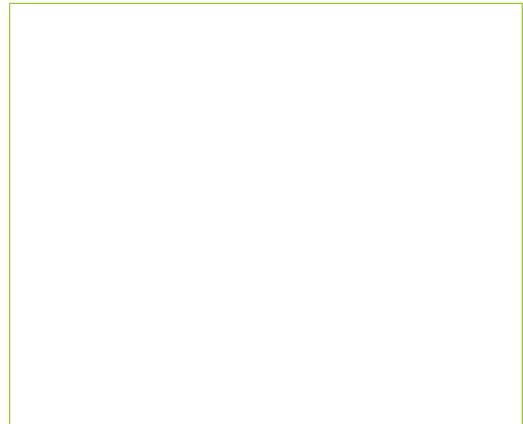
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1. INTRODUCTION

The AME Consulting Group was commissioned by Carscadden Stokes McDonald Architects on behalf of the City of Bella Coola to provide mechanical consulting services for the proposed Centennial Outdoor Pool and Pool Building.

The report aims to outline the foundational design elements for the mechanical systems while highlighting options that align with the specified design criteria. Its primary focus is to furnish the client with comprehensive details and choices as per the latest pool design options and the owner decision matrix.

This report has been prepared by the AME Consulting Group for the exclusive use of Carscadden Stokes McDonald Architects and their design team along with the City of Bella Coola. The material in this report reflects the best judgment of the AME Consulting Group with the information made available to them at the time of preparation. Any use a third party may make of this report, or any reliance on or decisions made based upon the report, are the responsibility of such third parties. The AME Consulting Group accepts no responsibility for damages suffered by any third party as a result of decisions made or actions taken based upon this report.

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2. DECISION GUIDANCE

This section should be reviewed in conjunction with the full report. It summarizes some of the major decisions and indicates AME recommendations:

2.1 Pool Heating System

.1 Option 1: Keep existing pool heater and add 3 more heaters

Pros: Redundancy, able to utilize existing heater, can get rid of heat exchangers

Cons: Will require the most space in the mechanical room, can be costly to purchase three additional units, will require multiple flue system

Option 2: Two Boiler (Carried as separate cost - AME Recommendation)

Pros: Redundancy, less space constraint than option 1, less flue requirements than option 1

Cons: Will take up more space than Option 2, could cost more than Option 1, multiple flues

2.2 Pool Chemical Treatment

.1 Option 1: Accutab (AME Recommendation)

Pros: Lower capital cost than the generator, chemicals can be purchased and stored in bulk, takes up less space than traditional chlorine tanks, requires less ventilation than traditional liquid chlorine and acid system

Cons: Will require regular maintenance (at a minimum once per week), lots of moving parts, chemicals are proprietary and can be expensive, will still require additional chemicals for pH balancing (sodium bisulphate)

Option 2: Chlorine Generator (Carried as separate cost)

Pros: Uses salt and is a relatively safe chemical to handle, requires less ventilation than traditional liquid chlorine and acid system, easy to keep extra parts on site

Cons: Will require regular maintenance, lots of moving parts, will still require additional chemicals for pH balancing (acid)

2.3 Pool Filtration

Multiple Sand Filters (AME Recommendation)

Pros: Redundancy, smaller filters will require less volume for backwash, easy to use with minimal maintenance (except for backwash)

Cons: Will require regular backwashing, volume of water is high and will require a discharge strategy that will most likely require a containment tank and as well, a septic system

2.4 Pool Pumps

Minimum two pumps per pool with each pump sized at code minimum turnover rate. This allows for one pump to be shut down and still main code requirements.

3. DESIGN CRITERIA

The mechanical and plumbing systems will be designed in accordance with the intent of all applicable codes and standards, along with the practice guidelines provided by Engineers & Geoscientists British Columbia. The aquatic systems will be designed to meet or exceed the BC Health Act and BC Pool Design Guide, with consideration of the Model Aquatic Health Code. The following is a list of some of the applicable codes and standards applied for the mechanical design.

3.1 Applicable Codes and Standards:

- .1 British Columbia Plumbing Code, current edition
- .2 British Columbia Building Code, current edition
- .3 National Model Energy Code for Buildings
- .4 ASHRAE 90.1
- .5 BC Gas Code
- .6 BC Boiler and Pressure Vessel Act
- .7 American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)
- .8 American Society of Plumbing Engineers (ASPE)
- .9 Sheet Metal Contractors Association of North America (SMACNA)
- .10 Provincial Health Act for Swimming Pools (New Edition)
- .11 BC Pool Design Guide (Current Edition)
- .12 Model Aquatic Health Code (U.S. code used as a standard not a code)

3.2 Plumbing Guidelines

The plumbing system will be designed to the current version of the BC Plumbing Code, with the additional accommodation of filter backwashing and draining of the pools.

3.3 Fire Suppression Requirements

At the time of this report, it has been identified that the fire suppression system will not be required.

3.4 HVAC Design Guidelines

The HVAC system will be designed to meet all requirements in the current version of the BC Building Code and all required ASHRAE Standards: ASHRAE 90.1, Energy Standard for Buildings except Low-Rise Residential Buildings and ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality. The ASHRAE Standards will be updated if required to newer version as indicated in new building codes.

The building heating and cooling loads will be calculated based on the following outdoor conditions specified in the BC Building Code, Appendix C, for the City of Bella Coola.

| Design Temperatures | | |
|---------------------|-------------|-------------|
| January | July 2.5% | |
| 1 % Design | Dry Bulb °C | Wet Bulb °C |
| -18 | 27 | 19 |

The design for the entire facility will include 10% safety factor for all primary heating unless specifically noted otherwise within this report.

At the time of this report, it has been identified that heating and cooling will not be provided for the occupiable spaces.

3.5 Indoor Space Environmental Conditions

It is the understanding at this time of the report that the facility will be shut down during the winter. The plumbing fixtures and the pool mechanical room and relevant equipment will require full winterization.

It is also the understanding that at the time of this report, apart from ventilation requirements, the staff room and the office will also be unconditioned during the summer. There have been no allowances for cooling made for any space at this time.

3.6 Indoor Space Ventilation Rates

Ventilation rates will be provided in accordance with ASHRAE standard 62.1 (Ventilation for Acceptable Indoor Air Quality).

3.7 Pool Design Criteria

.1 Turnover Rates

A pool's turnover rate is defined as the time it takes for its full water volume to be passed through the filtration plant. It is expressed in hours or minutes but can also be expressed as a volume flow rate when the pool's volume is taken into account. Lower turnover rates provide for better water quality, clarity, and a faster response to varying water chemistry.

Maximum pool turnover rates are determined by the BC Guidelines for Pool Design. In AME’s experience, these are maximum values and do not achieve superior water quality. Best practice turnover rates are determined by applying a recommended rate by depth approach for each pool type. Shallow pools, regardless of designation, tend to see concentrated bathers and less water volume per bather, requiring lower turnover than deeper pools.

Hot pools require the lowest turnover rates of all pools. This is due to their high temperature, which encourages biological growth; as well as their propensity for hi bather load.

The following table summarizes the minimum and recommended turnover rates for the facility described in this report.

| Parameter | Code Minimum (h) | Recommended (h) |
|-------------|------------------|-----------------|
| Lap Pool | 6 | 4 – 6 |
| 0-600mm | | n/a |
| 600-1200mm | | 2 |
| 1200-1800mm | | 4 |
| ≥ 1800mm | | 6 |
| Warm Pool | 0.5 | 0.15 – 0.25 |

The filtration rates directly influence the size of the filter, correlating a higher turnover with a need for a larger surface area in both the sand bed and filtration area.

At the CCRD Committee Meeting on January 31, 2024, the committee has requested that the recommended higher turnover rate is maintained for this project. This will allow for additional redundancy should one of the filters or pumps go down.

.2 Pool Operating Temperatures and Heat Up Times

AME recommends designing pool heating systems to generate pool temperatures based on information gathered from numerous facilities. The pool heating system will be designed to maintain those temperatures under normal operating conditions. Facility staff are free to operate their pools at lower rates than those allowed. Should the operator require higher temperatures than noted, the system would take longer to heat up the pool. As such we require final operational temperatures, times in which the pools will be filled to heat, and as well, operational window.

The table also outlines the heat up times for the various pool types. It is assumed that the pool shutdown and heat-up will take place in late spring (April/May).

| Parameter | Recommended Operating Temperature (°C) | Design Heatup Time (h) |
|-----------|----------------------------------------|------------------------|
| Lap Pool | 29 | 72 |
| Warm Pool | 34.5 | 12 |

4. POOL MECHANICAL SYSTEMS

Pool mechanical systems consist of pool fittings, water features, piping, pumps, filters, chemical treatment, and controls. This section describes recommended mechanical systems and presents options for those subsystems whose selection will have an impact on pool operation and water quality.

4.1 Pool Tank and Fittings

The filtered and treated pool water will return to the pool through floor and wall inlet fittings. The inlet fittings will be spaced such that they achieve the required turnover rates, supply clean water to all areas of the pool and scour the pool bottom to promote suspended solids so they can be picked up from the gutter system. Inlets will be placed primarily on the pool floor to promote upward movement of suspended solids towards the gutters. The intent is to allow a minimum of 90% of the design flow rate to go through the gutter.

To assure uniform flow has been achieved a dye test will be conducted before the pool is occupied. Dye is introduced into the system, which allows the pool commissioning agent to visually check that all areas of the pool are being covered and treated water is being supplied equally throughout the pool. Should the test fail the commissioning agent can adjust the fittings to either increase or decrease flow to improve system design.

The pool water is returned back to the filtration plant via main drains and a gutter system. Main drains collect the water at the bottom of the pool and are sized for 100% of the filtration rate. The drain configuration and piping will be designed to ANSI / APSP-7: 2006 American National Standard for suction entrapment avoidance in swimming pools. Furthermore the specified drains will be ANSI 16 certified to prevent entrapment and entanglement.

One of the options (Option 3 – Bella Coola Pool Owner Decision Matrix – January 4th, 2024) discussed is to have a continuous gutter installed around the pool. The combination of the gutter and the gutter return pipe will be sized to return 150% of the pool water back to a balance tank. The over sizing of the system will allow for capture of the pool water from an instantaneous surge such as a group jumping into the pool all at one time.

The balance tank has three purposes, balance the flow between the main drains and gutter, capture tri-chloramines and as a storage tank to quickly fill the pool. As an outdoor pool, tri-chloramines are much less of a concern as exposure to fresh air will mitigate adverse affects. Facility operators can balance the pool gutter and main drain line through the balance tank. We recommend that a minimum 90% flows through the gutter and the remaining through the main drain. The surge tank and main drain control valves provides this balancing. The water returning from the gutter collects most unwanted substances which derive from the skin and excretion products of swimmers. The balance tank is also used as a storage vessel to help provide a quick fill to the smaller pools.

The other option (Option 2 – Bella Coola Pool Owner Decision Matrix – January 4th, 2024) discussed is to have a surge gutter system that follows a lot of the principles discussed in Option 3 minus the requirements of a surge tank. The proposed concept involves designing a larger gutter system with oversized pipework to manage instantaneous surges without the requirement of the balancing tank. While aiming to eliminate the need for a surge tank for potential cost savings, it's important to note that the associated pipework in this approach might incur higher expenses compared to the standard pipe design of Option 3.

The inclusion of oversized pipework and fittings, depending on the pathway to the mechanical room, can incur significant cost that may offset the total savings realized in a surge tank. Therefore, considering both options until further design review might be prudent, especially in evaluating the overall pathway back to the mechanical room.

The flush gutter with the surge tank option is to be carried as a separate price for costing and the surge gutter shall be used as the base option for costing.

4.2 Pool Piping

Below grade piping shall be concrete encased Schedule 40 PVC, while above grade piping shall be Schedule 80 PVC, with the following exceptions:

- .1 Pool heat exchanger branch lines will be Schedule 80 CPVC.
- .2 Pool fill lines will be Schedule 80 PVC and feature water hammer arrestors.
- .3 Air bubble piping from an air blower will be galvanized steel.
- .4 Chemical feed piping will be high-density polypropylene (HDPP). Double-walled HDPP piping will be used for any chemical piping that is not contained within the chemical storage rooms.
- .5 Piping will be installed around the perimeter of the pools as much as possible with site excavation around the pool perimeters to accommodate the piping. Piping will all be sloped back to the pool tanks for winterization and drainage.

4.3 Pool Pumps



Three-phase, base-mounted centrifugal pumps will be used for the filter pumps and warming pool jet pumps. The pumps will have a protective coating to prevent corrosion from the chlorinated pool water. The pumps will be supplied with VFD's and controlled via a turbidity meter. The speed will range from design flow rate to BC health code minimum flow rate. The adjustable turbidity level will be set to maintain a 0.1 to 0.5 NTU (nephelometric Turbidity Units).

During the CCRD Committee Meeting on January 31, 2024, it was requested that redundancy is provided for the pumps.

Each pool, therefore, will have a minimum of two pumps. Each single pump will be sized based off minimum health code turn-over rates. Should one pump fail the system will be sized to meet the minimum health code turnover rate. The result is that the pool can stay operational with one pump being serviced.

Chemical injection pumps will be plastic, fully modulating digital metering pumps. These will be capable of very precise variable dosing.

Electronic flow meters will be provided to allow the operator to log the flow rates to assure the design always meets the minimum health code. The pumps will vary speed based on turbidity however it will always range from design flow rate to code minimum flow rate from the flow meter signal. This ensures that the pumps are only using the minimum amount of energy required to meet the design flowrate and will continuously adjust the pump speed as the filter loads.

4.4 Pool Water Heating Systems

As of this report, it has been acknowledged that utilizing an electric boiler would pose considerable challenges, rendering it unfeasible for this project. Pool heating will instead rely on a gas boiler, with propane gas being currently accessible on-site through a dedicated storage tank. The amount of propane required shall be based on the pool heater usage and loads will be provided through AME. However, the amount stored on site, and the design of the propane storage tanks falls outside of the scope of the mechanical consultant but should still be considered as an integral component to this project and design.

Between pool heat up and evaporation rate, it has been identified that evaporation rates will require the highest demand based on the table below. It is recommended that the heating system in place is to accommodate the worst case scenario so that there is sufficient heat to the pool.

| Parameter | Evaporation and Make-Up Water Rate (kW) | | | | |
|----------------------------------------|-----------------------------------------|-------|--------|--------|-----------|
| | May | June | July | August | September |
| Lap Pool (based on 29°C/84.2°F) | 225.5 | 204.7 | 186.8 | 174.9 | 166.0 |
| Warm Pool (based on 34.5 °C/94.1°F) | 175.6 | 193.4 | 154.70 | 145.1 | 134.8 |

During the site visit on January 25th, 2024, it was observed that a new pool heater (as of last summer season – 2023) was purchased and installed. The pool heater is sized for an input of 399,000 BTU/Hr (116 kW) with an output of 327,180 (96kW). Given the evaporation load of approximately 400 kW and the space constraint in the mechanical room, it is worth considering decommissioning the existing heater and sizing a new system capable of handling the load. The alternate option is to look at keeping the existing heater and looking at installing an additional 3 heaters. This will give some redundancy but will require additional mechanical room space. AME recommends blending the two options looking at sizing two smaller boilers that will give redundancy but would limit the required space within the mechanical room and should be carried as an alternate pricing to compare.

If a more traditional boiler is selected, plate and frame type heat exchangers using 316L plates will be provided for each individual pool. This material has proven to be an excellent balance between longevity/resistance to corrosion and first costs.

Each individual pool heat exchanger will be sized to meet the peak heating load which has been calculated to be the evaporation rate in May. By sizing the heat exchangers on peak load, they are guaranteed to be large enough to meet the remaining heating demands – make-up water for backwashes, spillover, carryout, and evaporation. The heat exchangers and boilers will be sized based on previous pool heat up loads and operational times.

Boiler options have been attached as part of the appendix. Both options will require individual flue ducting for combustion. Intake air will also be required and can be provided either as an opening on the wall or directly through the roof. In both situations, a manually operated remote shutdown switch or circuit breaker will be required. It is required to be located outside of the boiler room door and marked for easy identification.

Pool heat can be controlled through either a building management system or through certain types of chemical controllers. Return water temperature will be monitored by a digital temperature sensor located downstream of the filtration plant. Heating water flow into the pool heat exchanger will be modulated to maintain pool temperature setpoints. A secondary temperature sensor will be located at the heat exchanger discharge, to act as a hi limit. Should the heat exchanger temperature increase to an unsafe temperature, the heating system will be prevented from delivering more heat to the pool.

4.5 Swimming Pool Filtration

The filtration system is responsible for providing water clarity and assisting in the chemical balance in the pool tanks. The filtration system requires the most labour and attention of all the pool maintenance tasks; and is typically both the largest piece of mechanical equipment and the largest consumer of water in the facility.

The current existing filter is a vertical sand filter that will require replacement. Given the available footprint and ease of maintenance, a series of vertical sand filters can be installed for this project. Filters will be sized based on the recommended turn over rates and council has requested (CCRD Committee Meeting on January 31, 2024) that multiple smaller filters per pool is the preference.

It is also worth noting that currently, the backwash of the sand filter is going through a local gravel pit. There is no sanitary system that can currently accommodate the existing backwash water on site. During the CCRD Committee Meeting on January 31, 2024, there was discussion about providing a retention tank and an attached septic system. It is anticipated that the backwash volume of one filter will require a 3000 to 4000 -gallon retention tank. In an encased tank, chlorine can take anywhere between 1 to 5 days to evaporate. To avoid having a larger tank, it is recommended that the filter backwash is staggered to allow for proper chlorine evaporation prior to distribution through the septic system.

.1 Vertical Sand Filters



Research from James Amburgey, Ph.D., P.E., Associate Professor of Civil & Environmental Engineering from the University of North Carolina has proven that you require a minimum of 800-mm filtration bed to achieve adequate filtration. As such we have not considered horizontal filters.

A vertical pressure vessel consists of an influent supply header that diffuses the water over the filter bed evenly. The water passes through the filter media and is collected in a lower header called under drains. The media can consist of gravel bed with sand, fine sand or glass beads. To further improve the filtration process, flocculant and carbon is also recommended. Both have a minor cost premium over the traditional sand-bed media.

A single lever handle will connect multiple valves to allow the filter to move from filtration to backwashing. This simplified process minimizes the potential of closing off a valve and causing filter damage.

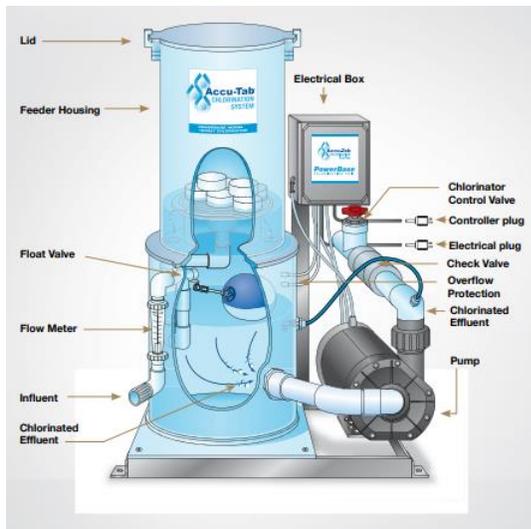
Recommended filter media is activated glass with flocculant injection. Filters will have enough vertical height to accommodate a 1.2m minimum media bed depth.

4.6 Chemical Disinfectant

The following section outlines a few options for chemical disinfectants.

.1 Calcium Hypochlorite (Accutab Photo) – Base design option and costing

The calcium hypochlorite system operates on a briquette/tablet form and is clean, odour free, very reliable and safer to handle than liquid chlorine. The system is made entirely out of PVC therefore resistant to corrosion. The feed system utilizes the principles of erosion and requires minimal maintenance.

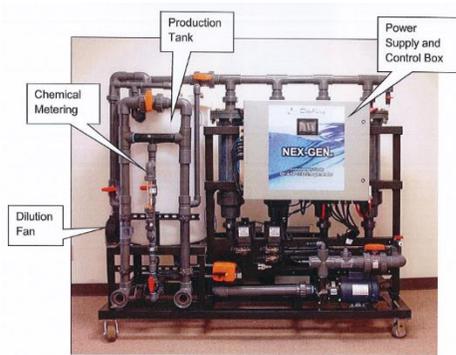


The calcium hypochlorite system is pH neutral however we it will still need sodium bisulphate for pH control. The cost of chemicals is very expensive and the added chemicals in the briquettes are dissolved in the water which increases the TDS within the pool. If liquid chlorine is difficult to obtain, you can bulk purchase chemicals (one full year at a time) to help reduce cost as the shelf life is longer than liquid chlorine and can be stored on site.

It is important to keep in mind that the chemical is proprietary to the feeder itself. However, overall, the system and it's components are generally the same and operate under the same principle.

This system does require regular maintenance and parts need to be cleaned appropriately to ensure that the injection lines and the system itself remains clean. Otherwise, this system can be prone to clogging which would result in water quality issues.

.2 Site Generated Sodium Hypochlorite (Nexgen) – To be carried as a separate price for cost comparison

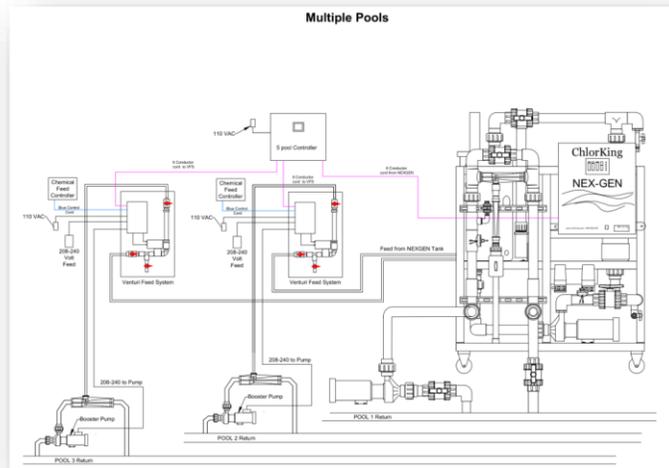


This skid-mounted, factory assembled on-site sodium hypochlorite generator can produce up to 60 pounds of equivalent chlorine per day. The systems use swimming pool water to feed the generator and uses a venturi feed system to distribute chlorine into the pool as required. The system manufacturers bleach continuously from a salt vat stored at concentration levels between 5,000 – 7,000 PPM and mixes it with pool water to develop the chemical process to make the bleach. No fresh water is required. This also eliminates the requirement of high salt and TDS levels in the pool.

On a call for chlorine from the chemical controller the by-pass turns on. Water flow through an injector which draws sodium hypochlorite from the storage vat and is injected into the pool. The system is pH neutral thus no further chemicals are required to balance the pool.

One generator will be able to service multiple bodies of water with a separate venturi feed system for each pool. The skid is modular in design which allows the operators to disassemble and replace parts (as required) with relative ease.

The chlorine generator is able to convert 1 lb of chlorine from 3lbs of salt. Generally, about 3 months after the pool has been filled, the consumption will drop to about half. (Note: This will be drastically different for the hot pool as it will most likely be dumped more frequently than the other two pools). The generator is capable of producing 60lbs of chlorine in a day which equates to approximately 24,300 lbs of salt for 6 months. However, it is not expected that the pools will require the full 60lbs per day and once the pool configuration is decided, the size can be modified as required.



It is worth noting that the onsite sodium Hypochlorite feed system falls under Pest Control Products Act (PCPA) and Regulations. In Canada, pest control products require registration under the PCPA. This includes pool and spa sanitation chemicals and devices that generate these chemicals on-site.

This option will provide a system that is easy to maintain with chemicals that require less ventilation than other options.

4.7 Chemical Controllers



The water chemistry control system shall provide continuous monitoring and control of sanitizers, oxidizers, pH, ORP, free chlorine, total chlorine, combined chlorine, temperature, system flow rate, total dissolved solids (TDS), turbidity and water chemistry balance calculations. The controller shall manage a VFD on the recirculation pump with a programmable Fireman Cycle feature, which automatically turns off the Heater prior to shutting off the recirculation pump. The controller shall abort VFD turndowns upon declining water chemistry, and increase the circulation rate to satisfy minimum flow requirements of a heater, Or UV system.

The control system shall provide automatic control of the filtration system including backwash operation. It is recommended that remote access via WIFI is pursued for this location so that assistance for trouble shooting maybe provided remotely.

The chemical controller will be provided with an interface to the Building Management System if preferred. This will allow the BMS to monitor and log pool chemical levels, chemical dose rates, and overall chemical usage over time. Trend logs can be reviewed for historical levels, should it be required.

4.8 Pool Automatic System Control Strategy

- .1 Thought must be given to the operator control strategy for the pool mechanical systems. The pool circulation pumps, filters, heating system, and chemical treatment system will operate with a degree of automation under normal operation, via the BMS or internal equipment programming. Typically, this equipment is fully disabled and restarted only through manual operator involvement.
- .2 Pool Controls are summarized as follows:
 - .1 A digital flow meter will be connected to all filtration systems that are supplying water to the pool. The Filtration pump flow meters (1/pool) will be interfaced with the BMS system to allow trend logging of the pool turnover rates.
 - .2 TDS Control: With a conductivity/TDS sensor, the controller shall provide selectable control of TDS through simultaneous draining of water prior to filtration and addition of fresh make-up water.
 - .3 Pump Variable speed drives will be BacNet compatible to confirm the speed of the drive and send information to the BMS or the chemical controller on any system failures.

- .4 A Flow switch (1/ pool) downstream of the filters will send an alarm to the BMS on loss of flow. The BMS will close the pool heating valve, shut down the secondary pumps as well as lock out the chemical controllers.
- .5 Two temperature sensors will control the amount of heat is delivered to the pool. The upstream temperature sensor will control the two-way heating water control valve via BMS. The downstream temp. Sensor will shut down the two-way control valve and send a Hi-level alarm on unsafe temp conditions.
- .6 Turbidity meters will modulate the pump speed from design flow rate down to code minimum flow rate.
- .7 The Pool Chemical controllers are a stand-alone control system which controls the amount of Chlorine residual and pH that gets added to the pool to maintain pool chemistry. This system will also have a BacNet interface to allow operational staff to trend log the system as well as trouble shoot remotely. It is also recommended that WIFI is provided for these units to allow for further troubleshooting capability.

5. PLUMBING SYSTEMS

5.1 Service Requirements

The building will be fully serviced with connections coordinated with the City of Bella Coola as well as to the localized septic tank. Preliminary analysis indicates that the following site services are required. Piping connections for the mechanical contractor will extend to 1.0 metre from the building. Systems will be designed such that gravity drainage is maximized.

- .1 100mmØ sanitary service for plumbing fixture discharge. We anticipate the worst case in both scenarios to be about 34.5FU. The plumbing fixture discharge was previously captured through the existing septic system and anticipate that this will be the case again and the septic consultant should be consulted for the updated load.
- .2 100mmØ Pool Drainage (Sanitary) – Depending on the allowable drainage rate, a one day (24 hour) drain rate will be approximately 94gpm (187.5 FU). If the drain rate is too high, the drainage rate can be increased. A two day drain rate (48 hours) will be at 47gpm (94 FU). The drainage connection for the pool is currently unknown but is most likely done through the backwash feature of the pumps/filter and is being discharged into the gravel pit. If a containment tank is utilized, gradual discharge will need to be considered.
- .3 150mmØ storm service: The storm system will be drained by gravity where possible and some portion of the building storm system may be pumped.
- .4 150mm Ø drain tile along the new building, and the new pool will most likely be required based on the geotechnical report. Pool depth to be confirmed by arch.
- .5 At the time of the report, it has been discussed that a fire protection service is not required.
- .6 The existing incoming water line is 3/4" which will provide approximately 12 to 21 gpm based on incoming pressures and allowable flow as indicated in the plumbing code.

Assuming the best case of 21 gpm, this will take approximately 3.5 days (80 hours) to fill the lap pool and about 14 hours to fill the hot pool. If worst case of approximately 12 gpm is taken into account, the lap pool fill will take 6 days, and the warm pool will take about 24 hours. It is also anticipated that during evaporation load, that the pool will require approximately 4 gpm for make-up water. Along with this, and the plumbing load of the building, it is suggested that the incoming water line be increased to a minimum 1-1/2" if possible.

5.2 Plumbing Distribution

- .1 The domestic cold-water system will consist of:
 - .1 Water entry station complete with water meter or as per the city's requirements. At this stage, there is no water meter inside or outside of the building.
 - .2 Central Backflow prevention.
 - .3 Central pressure reducing valve (dependent on incoming water pressures).
 - .4 Distribution system to the building's DHW tanks.
 - .5 Distribution system to service individual fixtures.
 - .6 It is not expected that domestic water booster pumps will be required at this time. To be confirmed with the city water pressure data.
- .2 The domestic hot water system will consist of:
 - .1 Existing electric domestic hot water storage tanks
 - .2 Distribution system to service individual fixtures.
- .3 Fixtures located in the change rooms to remain as is. New fixtures to be added for the universal change room only

5.3 Storm Drainage System

- .1 The existing storm drainage is currently captured through a gutter system and is daylighted to the ground with no direct storm connection. At the time of this report, the strategy for the existing building is to remain.
- .2 For the new addition, a storm drainage system on the building can collect all roof drains and overflow drains and deck storm drainage. The number and arrangement of roof drains will be designed to suit the building configuration and will be in accordance with the B.C. Plumbing Code with a minimum of 2 drains for every major roof surface. Internal rainwater leaders will be collected within the building but will most likely discharge directly out to the exterior of the building. For this reason, it may be worth considering having similar strategies as the existing building to avoid multiple penetrations.

5.4 Footing Drainage System

- .1 At the time of this report, it is unknown if there is any footing drainage around the existing building or the pool
- .2 It is anticipated that new footing drainage around the pool will be provided for this project to protect sub grade footings and structural slabs, along with the pools and basement mechanical rooms.
- .3 Submersible sump pumps may be required. However, the strategy to this will require further investigation based on discharge point. As there is no active storm connection, this may require further investigation.

5.5 Sanitary Waste and Vent Systems

- .1 All plumbing fixtures will have drains connected to the sanitary waste and vent system. Plumbing vents will be collected and terminated above the roof level (one vent per building segment/washroom group). Sanitary waste system will discharge to the building sewer below grade which is connected to an existing septic system.

5.6 Plumbing Fixtures

Please see attached in Appendix A for proposed plumbing fixtures..

- .1 All public water closets are currently flush tank and to remain as is. A new flush tank, ADA approved toilet to be installed in the universal change room.
- .2 Lavatories to remain as is. A new ADA approved LAV and faucet to be installed in the universal change room.
- .3 Barrier-free fixtures, including drinking fountains, will be provided where required.
- .4 Showers to remain as is. New ADA compliant shower to be installed in universal change room.
- .5 A drinking fountain/bottle filler will be provided. Number of fountains to be determined by architect.
- .6 Non-freeze hose bibbs will be installed in areas subject to freezing. Existing ones to remain as is.
- .7 New floor drains will be provided in the new mechanical rooms. Replacement floor drains may be required in the existing building.
- .8 Dependent on chemicals, emergency eyewash and shower will need to be provided in the chemical storage area.

6. FIRE PROTECTION SYSTEMS

At the time of the report, it has been discussed that a fire protection service is not required.

- .1 Fire extinguisher cabinets complete with a 4.5-Kg fire extinguisher will be provided in accordance with NFPA 10 and reviewed and approved by the authority having jurisdiction.

7. HEATING, VENTILATION AND COOLING SYSTEMS

7.1 Building Conditioning:

The base design proposed for this facility is for pool heating and domestic hot water only. There have been no allowances made for any heating/cooling throughout the building.

7.2 Electric Domestic Hot Water Tanks

Given the condition of the domestic hot water tanks on site, it is proposed to keep these units in their current location.

7.3 Heating, Ventilation, and Air Conditioning Systems in Various Spaces

1. Ventilation:

Ventilation in the change rooms will be provided with the existing fans in the space. A new exhaust fan for the universal change room for 125 CFM to be added.

2. Air Conditioning

At the time of the report, it has been determined that air conditioning will not be required for this facility. Specialty Systems

3. Pool Chemical Storage Room

Dedicated exhaust systems will be provided for the chemical room. Dependent on the selection of the chemicals, there may be a requirement to have two separate exhaust fans to ensure that the two air streams do not mix. These fans will be sized for 15 ACH from the chemical room and will lead directly to the outdoors. It is recommended and potentially required by code (based on chemical types and gas appliances) to separate the chemical room from the main pool mechanical room.

8. CONTROL SYSTEMS

All major mechanical systems can be equipped with Direct Digital Control (DDC) systems. This will include all equipment located in pool mechanical rooms as well as HVAC systems.

The entire building can be controlled by BACnet compatible components. BACnet is an ASHRAE protocol that allows standardised data communication for complete automation and control of building systems,

such as heating, ventilating, air- conditioning control, lighting control, access control and fire detection systems. All systems and equipment will be compatible with and operate with BACnet over IP protocols.

END OF REPORT

APPENDIX B – FIELD REVIEW

MFR-001

February 14, 2024

Site Visit: January 25, 2024

| | |
|------------------------|--------------------------------------------|
| Owner: | CCRD – Bella Coola |
| Prime Consultant: | Carscadden Stokes McDonald Architects Inc. |
| Prime Contractor: | TBD |
| Mechanical Contractor: | TBD |
| Pool Contractor: | TBD |

This field report is for the purpose of determining general conformance to the contract plans and specifications. It does not relieve the contractor of the responsibility of completing the work as indicated in the contract documents. This report shall not be interpreted as an authorization to change the contract scope, value or extend the contract duration. Unless noted otherwise all field photos included in this report were taken by person who issued the report and on the date of the site visit.

Updates to previous items are identified in bold.

| Item: | Description: | Action By |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1.1 | AME visited site on January 25 th , 2024 to review the existing site | Info |
| 1.2 | It was noted that the pool heater is a new unit and the new flue was observed going through the roof of the existing pool mechanical room. As part of the DD report, there are discussed options of potentially keeping this unit or replacing all together. (Photos 1 through 4) | Info |
| 1.3 | The pool chemicals utilized on site are the Pentair Rainbow chlorine chemical puck feeder with direct injection into the pool return line located in the main mechanical room. No chemical injection pumps or controller was seen on site. Attached chemical room housed various chemicals where operators manually mix chemicals to feed directly into the pool or through the sump located next to the space. The chemical room is not mechanically ventilated or heated (Photos 5 through 7) | Info |
| 1.4 | The existing sand filter and the face piping shows considerable rust on the outside. The backwash pipe extends through the pool mechanical room, out through the chemical room and into a gravel pit outside. (Photos 8 through 11) | Info |
| 1.4 | Pool piping was spread low across the pool mechanical room. There were two pitot type flow meters installed on the pool return and supply. There is an active single pool pump and what appears to be an old decommissioned one in the mech room. It is recommended that all equipment related to the pool filtration system (with the potential exception of the pool heater) be removed and discarded. (Photos 12 to 16) | Info |

| Item: | Description: | Action By |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1.5 | A boiler switch along with a the filtration pump start/stop buttons were observed by the door. For the new mechanical room, an emergency boiler/pool heater stop button will be required as per code. (Photo 17) | Info |
| 1.6 | There is a new propane tank sitting adjacent the pool enclosure which feeds the pool heater room. The tag on the tank indicates that it is a 1000 gallon tank. During the visit, the city had expressed that propane can sometimes be hard to come by during operations. AME recommends that the size of the tank be verified with the new pool heater and gas consumption. (Photos 18 & 19) | Info |
| 1.7 | The incoming water line into the building is located near the front entrance of the building. The incoming line is 3/4" and there was no water meter visible on site. The main shut off valve for this is located inside of the old change room and will most likely need to be relocated based on the updated pool configuration. (Photos 20 and 21) | Info |
| 1.8 | At the time of visit, the ground was and pool was covered in snow. However, it appears that the pool utilizes a skimmer system (4 in total) with some eyeball diffusers located throughout the pool. The main drain was completely covered. It was mentioned that the hydrostatic relief valve located in the pool does not work properly and that there is a concern the pressures around the pool basin an cause it to lift out. The pool was kept half full with antifreeze in the inlets (Photos 22 through to 24) | Info |
| 1.9 | The kitchen sink shown in the existing staff room of the building is showing signs of major rusting. This sink could potentially also be used to test pool water which could explain the rusting. Any sink that is going to see pool water should be either porcelain or 316SS to avoid corrosion (Photo 25) | Info |
| 1.10 | There was one domestic hot water tank located in each gendered change room. Both tanks appear to be in good working condition and would recommend keeping if there are no major issues (Photos 26 -28) | Info |
| 1.11 | The current winterization strategy for the main change room involves either blowing out fixtures where possible (i.e showers, sinks, lavs) and using anti-freeze in toilets | Info |
| 1.12 | The current proposal is to remove all existing fixtures and replace with new. A fixture package has been included as part of the DD report for review. Given the incoming water line, it is recommended that toilets remain the flush tank with manual flush to help conserve water. The existing pipework may need modification and upgrades based on the finishes prescribed for this space by the architect. There were several locations where the pipework was fully exposed with no insulation. (Photo 29) | Info |

| Item: | Description: | Action By |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1.13 | Whilst on site, there were some concerns expressed regarding drainage issues in the change rooms. It was expressed that if this building is going to be maintained as is, modification to the location of the drains would be difficult | Info |
| 1.14 | The exhaust of the change rooms appear to be done through a ceiling mount Broan exhaust fan. Given some of the rusting issues observed on site, it is recommended that these fans be replaced with a higher exhaust rate to help with moist air extraction out of the space (Photo 30) | Info |
| 1.15 | The domestic cold water distribution is currently fed off of the main that is routed through the old change room. The distribution from this location will need to be altered based on updated pool design changes | Info |

Yours very truly,

The AME Consulting Group Ltd.



Emi Nakamura

Associate - Vancouver, BC

Attachment(s): Issued in Conjunction with the 90% DD Report

Photos

Photo 9: Sand Filter Pressure Gauge

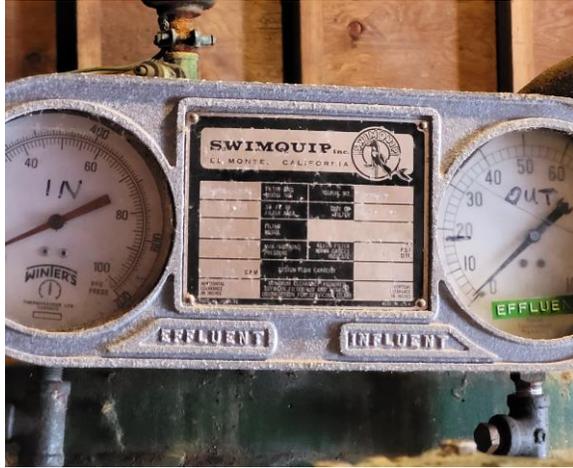


Photo 10: Sand Filter Name Plate



Photo 11: Alternate angle of sand filter and face piping



Photo 12: Pool piping and pitot-type flow meters



Photos

Photo 13: Flow meters



Photo 14: Pool Pump tag



Photo 15: Pump with strainer basket



Photo 16: Decommissioned Pump



Photos

Photo 17: Circulation Start/Stop and Boiler Switch



Photo 18: Propane Tank Tag



Photo 19: Propane tank adjacent pool enclosure



Photo 20: Incoming Water Main



Photo 21: Water main Shut Off



Photo 22: Skimmers



Photo 23: Anti-freeze in pool skimmer



Photo 24: Unconfirmed eyeball fitting



Photo 25: Kitchen Sink in Staff Room



Photo 26: Boys Change Room Domestic Hot water Tank



Photo 27: Girls Change Room Domest Hot Water Tank



Photo 28: Girls Change Room Domestic Hot Water Tank Name Plate



Photo 29: Insulated and Uninsulated Pipework in Girl's Changeroom

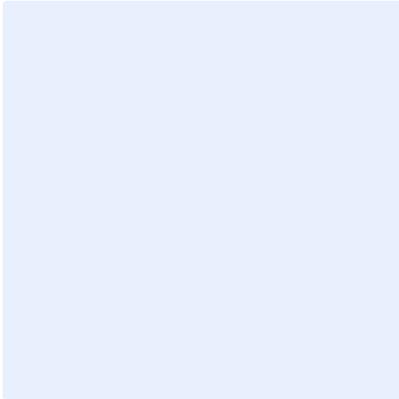


Photo 30: Exhaust Fan in Change Room

