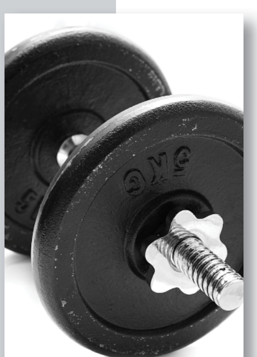
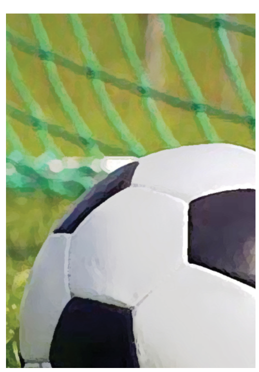
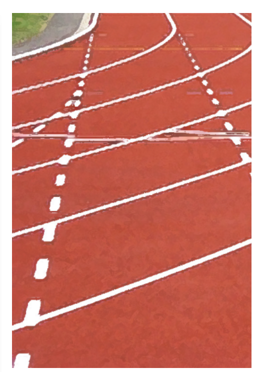
FRA2019-0628
ATTACHMENT 3

FOOTHILLS ATHLETICS CENTRE AND FIELDHOUSE

Prepared for The City of Calgary Recreation







Issue Date: February 15, 2019

In collaboration with SportsPLAN Studio

Prepared for
The City of Calgary

FRA2019-0628 Program Overview and Update ATT 3
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Figure 1.1: Foothills Athletic Park Aerial View

1.0 EXECUTIVE SUMMARY

Calgary Recreation has requested a concept design report to update site and cost information for the proposed fieldhouse, including a new indoor track and field facility, planned as part of the Master Plan for Foothills Athletic Park in Calgary, Alberta. The genesis of this athletics and recreation venue was the desire for a high-quality indoor competition track and field venue, suitable to host events sanctioned by the International Association of Athletics Federations (IAAF, the governing body for track and field events). It is to accommodate up to 10,000 spectators for national and international meets. To ensure full utilization of this highly specialized venue for a specific group of athletes and other participants, additional recreation components which serve the broader community were included. Previous studies had clearly indicated a significant community demand for indoor field space (thus the term "fieldhouse") and gymnasiums.

The conceptual design includes a 400-meter track, fitness and weight training areas and 1,800 permanent seats, with capacity for 8,200 temporary spectator seats. Because the need for 10,000 seats would occur relatively infrequently for track and field events, the space for the temporary seating structure will accommodate a series of eight gymnasium courts. Within the 400-meter track itself, an artificial turf of FIFA regulation size is proposed to provide the "fieldhouse" function. The identified demand for these added recreation components became the larger justification for the Foothills facility, while the construction of an indoor track and field facility capable of hosting national and international competitions would provide an exceptional venue found nowhere else in Canada.

Importantly, the proposed venue at Foothills is much more than the typical "fieldhouse" serving soccer and other field sport participants. Such a facility would, more appropriately, be identified as the Foothills Athletics Centre and Fieldhouse and therefore, this project will be referred to as the Foothills Athletics Centre and Fieldhouse through the remainder of this report. This facility is planned as part of the high-quality competition facilities to be built as part of the redevelopment of the Foothills Athletic Park, including a 50-meter pool and natatorium, and twin ice arenas, each with spectator capacity.

This report summarizes the work performed to update and refine the Foothills Athletics Centre and Fieldhouse Concept Plan, identifying opportunities and documentation in support of the completion of a standalone Fieldhouse at Foothills as the first phase of the Athletic Parks Concept Plan.

Included in this report are:

- A project background of the Foothills Athletics Centre and Fieldhouse;
- A description of the Fieldhouse programme components and location at Foothills;
- A costing summary and potential timelines for design and construction of the Fieldhouse facility.

A high-level project schedule was produced as part of this report, indicating major activities and milestones through design and construction of the project. This schedule indicated an approximate 4.5 year duration from project start through engagement, design, construction and facility start up to complete the Fieldhouse, with consideration for acceleration techniques to decrease the overall duration.

Figure 1.2: Soccer Field

2.0 INTRODUCTION

The intent of the Athletic Park Concept Plan was to create a comprehensive overall plan for improvements and additions to Foothills Athletic Park that can be completed in phases as priorities and funding availability dictate. This report focuses on the Foothills Fieldhouse as the first phase of the realization of the Foothills Athletic Park Concept Plan.

Foothills Athletic Park hosts many sport, recreation activities, and organizations in Calgary - including Calgary's Track and Field community. However due to seasonal weather conditions, their period of use is short, and year-round practice is difficult to accommodate in the existing facilities and the city at large. As part of the Concept Plan, the development of a large Fieldhouse with a 400-meter indoor track with a regulation size soccer pitch infield was investigated and determined as plausible for the Foothills site, given its ability to serve both the Calgary Track community and more importantly other sports groups for year-round practice, play, and competitions in the infield.

The Fieldhouse programme addresses the principles and needs identified in previous reports. The Concept Plan for Foothills and Glenmore Athletic Parks -Stage I report (June 30, 2010) set guiding principles, namely:

1. Adaptable Design
    - Develop adaptable spaces to address various sport and future opportunities.
    - Serve the needs of numerous sport activities at one location.
2. Community Wellness
    - Benefit the health, well-being and social development of the community (including children and youth)
    - Enrich the urban design of the community.
3. Accessibility
    - Maximize utilization of spaces.
    - Consider the number of users.
4. Sustainability
    - Ensure economic sustainability of facilities.
    - Plan for the life cycle and maintenance of facilities.
5. Activity Coverage

- Support all performance levels of play and tournaments.
- Contribute to the excellence of sport organizations and the City.

Additionally, through extensive workshops, policy review and stakeholder consultation, the Concept Plan identified five key findings:

1. An un-met need to accommodate both current and anticipated sport demand, recreational users and their varied requirements;
2. The need for competition capable sport and recreation facilities;
3. The intense demand for indoor practice and play space;
4. The opportunity to provide a unique, complimentary inventory of facilities at both athletic parks accessible to all Calgarians regardless of level of ability or interest; and,
5. The opportunity to create dynamic civic spaces with a distinct sense of place specific to, and identifiable with the athletic park.

The primary facility deficits and needs that were identified in the concept report and are addressed with the proposed Fieldhouse include:

- Demand for year-round indoor practice, training and play space for sport and recreation;
- Need for competition capable sport and recreation facilities, including facilities to host provincial, national and international competition with associated seating and staging capacity;
- Need to accommodate both current and anticipated sport demand, recreational users and their varied requirements.

Project Context

The Foothills Athletic Park is a premier facility operated by the City of Calgary Recreation. The Foothills Athletic Park is currently the center of Calgary's Track and Field community. However due to seasonal weather conditions, their period of use is short, and year-round practice is difficult to accommodate in the existing facilities and the city at large. As part of the Concept Plan, the development of a large fieldhouse with a 400-meter indoor track with a regulation size soccer pitch in-field was investigated and determined as plausible for the Foothills site, given its ability to serve both the Calgary Track community and other sports groups for year-round practice, play, and competitions.

3.0 PROJECT DESCRIPTION

The concept design report, including a class 4 cost estimate, will assess the viability of locating the facilities at the north-east corner of the site adjacent to Crowchild Trail and 24th Avenue NW and advance the concept design of the facility such that an accurate class 4 estimate of probable costs to be completed. The estimate of probable costs contained in appendix C complies with the City of Calgary Estimation, Contingency & Schedule Standard v2.5 with an expected accuracy of -30% to +50%.

The documents provided as the basis for the cost estimate include:

- Conceptual floor diagrams and sections for the proposed Athletics Centre and Fieldhouse
- Facility programme of space requirements
- Facility building system summaries
- Alberta Building Code report
- IAAF Facility Manual
- LEED v4 proposed Scorecard

The proposed Athletics Centre and Fieldhouse is intended to be a legacy building for the City of Calgary, fitting into the recreation master plan by providing spaces for year round practice, play and competition. As such, it will be used daily for practice, community sporting events, as well as large scale competitions; requiring that it be constructed with durable, as well as beautiful, materials and finishes. Further, it must meet the sustainability goals of the City of Calgary, and provide effective means of managing operational and maintenance costs, mandating use of efficient building systems.

The detailed scope of work of this report was to provide an alternate Foothills Athletic Park concept plan and to provide a level 4 cost analysis to complete a standalone fieldhouse as first phase of the Foothills Athletic Park concept plan. The plan proposes a best use siting option to locate the Fieldhouse, including potential structured parking.

As a marquee site for Calgary Recreation, the Foothills Athletic Park derives importance from its complex urban context as much as from its role in recreation and sport. Accordingly, the recommendations outlined in this report take into account a composite policy framework structured by several key documents that influence both sport and urban design. These include:

- The Municipal Development Plan (2017)
- Transit Oriented Development (T.O.D.) Policy Guidelines (2005)
- Imagine Calgary Plan: For Long Range Urban Sustainability (2006)
- Triple Bottom Line Policy Framework (2011)
- Team Spirit: Advancing Amateur Sport for All Calgarians. A 10 Year Strategic Plan for Sport Facility Development and Enhancement (2008)
- Plan It Calgary (2011)
- Recreation Master Plan (2010)
- Recreation Amenities Gap Analysis (2010)
- Recreation Facility Development and Enhancement Study 'FDES' (2016)

Please refer to Appendix 'A' in the 2010 concept plan report for a summary of identified policies in support of the Concept Plan.

Also, key components of long term athletic development as illustrated in Canadian Sports Center's Canadian Sport for Life. By supporting the Canadian Sport Policy goals of – "Enhanced Participation, Enhanced Excellence, Enhanced Capacity, and Enhanced Interaction"- The Concept Plan fosters and encourages physical literacy while providing the opportunity for Calgarians to be physically active for life.

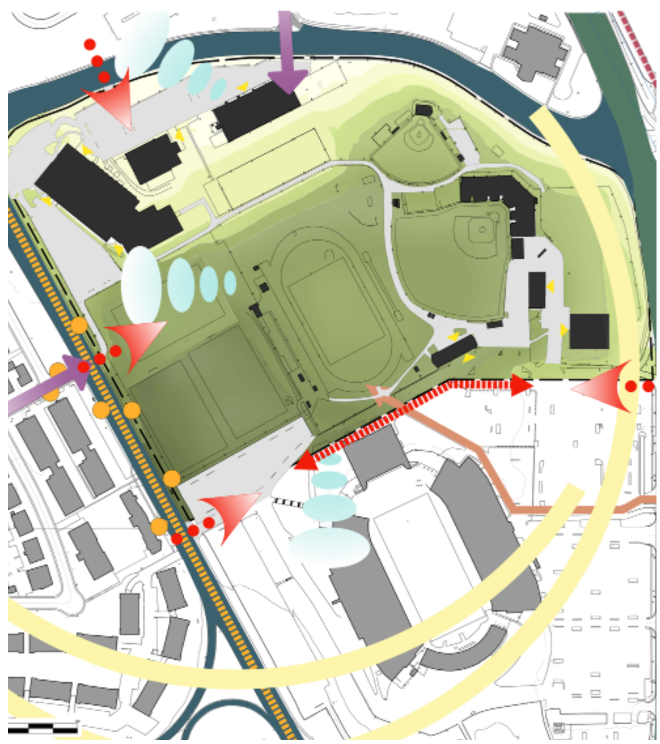


Figure 3.0: Environmental Factors Influencing Design

3.1 PROJECT SITE DESCRIPTION

Foothills Athletic Park is located at 2424 University Drive NW, which is directly west of Crowchild Trail and south of 24th Avenue NW. The total site area is approximately 20.5 hectares – or 50.7 acres. Facilities included in the park are the Father David Bauer and Norma Bush Memorial Arenas, built in 1963 and 1974, respectively (retrofitted in 1985, 1987 and 1996); Foothills Aquatic Centre, constructed in 1964 (retrofitted in 1989 and 1991), Foothills Baseball Stadium opened in 1966 (retrofitted in 1987); Little League Baseball Stadium, built in 1975 (retrofitted in 1984 and 1992) and the Athletic Park, including a 400 meter track and infield, completed in 1975. The Fieldhouse Building opened in 1977 and bleachers were added in 1986.

Please refer to existing inventory reports (EFIs) under separate cover for more background information on the existing facilities/amenities.

In addition to the arenas and aquatics centre, the existing features included in the Foothills Athletic Park that are owned,

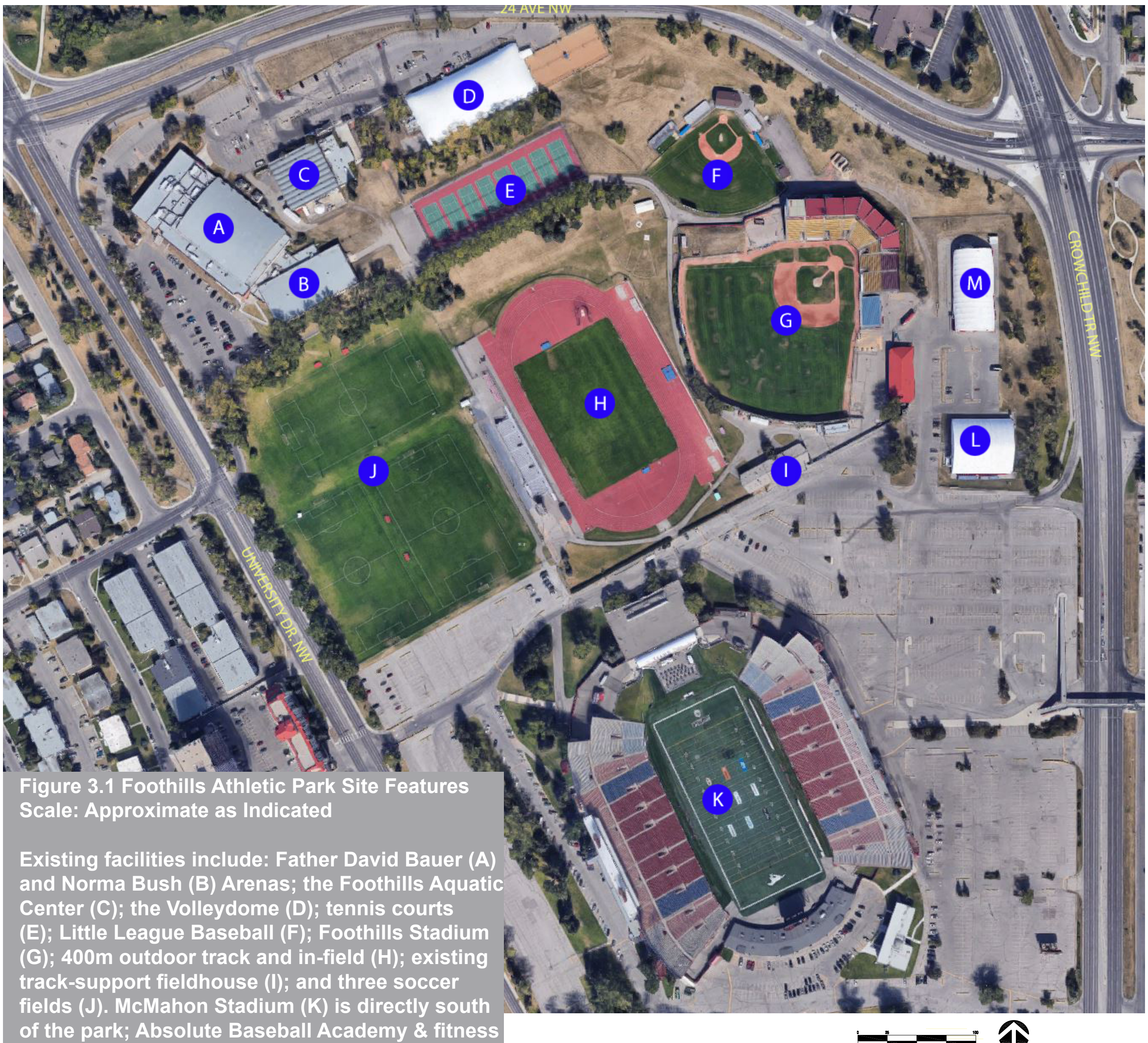


Figure 3.1 Foothills Athletic Park Site Features
Scale: Approximate as Indicated

Existing facilities include: Father David Bauer (A) and Norma Bush (B) Arenas; the Foothills Aquatic Center (C); the Volleydome (D); tennis courts (E); Little League Baseball (F); Foothills Stadium (G); 400m outdoor track and in-field (H); existing track-support fieldhouse (I); and three soccer fields (J). McMahon Stadium (K) is directly south of the park; Absolute Baseball Academy & fitness Centre (L); Viper's Dome (M)

operated and maintained by Calgary Recreation and include:

- Four regulation soccer fields including two with lights, one of which is located within the track infield.
- Field concession and washrooms
- Little League baseball diamond with a 200’ outfield fence
- Eight outdoor public tennis courts with one practice backboard
- 400-meter outdoor running track with in-field
- Field event facilities, including shot-put, long jump pits, javelin, pole vault and discus / hammer throw

A. Figure 3.2 Foothills Track and Grandstand
The existing spectator amenities for track and field.

B. Figure 3.3 Little League Baseball Diamond
The Little League diamond is tucked into the slope on the northeast corner of the site.

C: Figure 3.4 View West Across Foothills Athletic Park
View from Crowchild Trail NW across the park to the Little League diamond, running track and soccer fields.

D. Figure 3.5 View of the Volleydome
View of the existing air-supported structure.

E. Figure 3.6 Foothills Soccer Fields
View looking south.

F: Figure 3.7 Foothills Aquatic Center Entrance
The building is original to its construction in 1964.

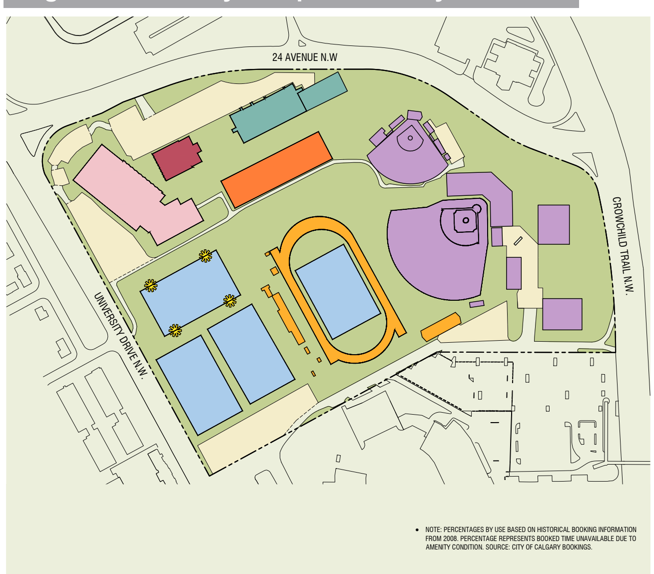
3.1.1 PROPOSED PARK PROGRAMME

The components to be included in Foothills Athletic Park after redevelopment were indicated in previous reports. The same approach has been continued in the scope of this project with a change in focus to the facilities of the Athletics Centre and Fieldhouse as a separate scope of work to be completed as a first phase of the redevelopment of the Foothills Athletic Park. The amenities to be provided after the redevelopment of the athletic park are illustrated by figure 3.8.

The focus of the programme proposed by this report is the Athletics Centre and Fieldhouse itself. The demand for indoor space - specifically for field sports - continues to be the most critical need reported by Calgary Recreation users. This report proposes to address this need with the construction of an Athletics Centre and Fieldhouse that includes a full size indoor soccer field within a 400 meter, 8-lane running track with jumping and throwing areas. Permanent seating for 1800 spectators is proposed. Space is included for as many as 10,000 total seats for provincial, national or international events, but that same space would be utilized for basketball/volleyball/badminton courts during non-event periods. Divider curtains could provide adaptable separations of space to accommodate multiple sport and training activities, including potential batting cages, baseball training, tennis, golf hitting cages and other uses to maximize the multi-sport capabilities of the facility. Future engagement with stakeholders will be required to determine the functions that the building will be designed to support.

This focused programme of development will begin to address the needs identified in previous reports and will allow for many of the existing site functions to continue operations. Many challenges and constraints influenced the exploration of the site layout and location of the Foothills Athletics Centre and Fieldhouse and are further detailed in section 3.3 of this report.

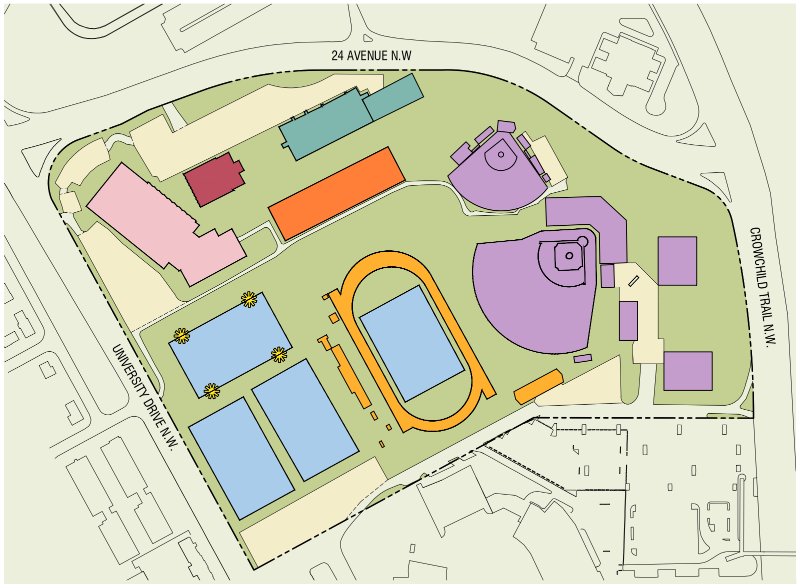
Figure 3.8 Amenity Comparison - Key Plan



Existing Facilities

Proposed Facilities

Figure 3.9 Amenity Comparison Table



- NOTE: PERCENTAGES BY USE BASED ON HISTORICAL BOOKING INFORMATION FROM 2008. PERCENTAGE REPRESENTS BOOKED TIME UNAVAILABLE DUE TO AMENITY CONDITION. SOURCE: CITY OF CALGARY BOOKINGS.

AMENITY COMPARISON

EXISTING FACILITIES			PROPOSED FACILITIES	
N / A		COMMUNITY COMPONENTS	**ON-SITE COMMUNITY/GATHERING COMPONENTS & FACILITIES** • CAFE / RESTAURANT • PEDESTRIAN ACCESS THROUGH SITE/PEDESTRIAN PLAZA	• CIVIC & COMMUNITY SPACES & PLAYGROUND
DEDICATED ON-SITE PARKING • 420 STALLS TOTAL ON SITE (INCLUDES 200 STALLS SHARED w/ PRIVATE LEASEHOLDER)		PARKING	**DEDICATED ON-SITE PARKING** • ±887 STALLS TOTAL ON SITE	
2 ICE ARENAS • NHL RINK (NORMA BUSH) w/ SEATING FOR 60 SPECTATORS • OLYMPIC RINK (DAVID BAUER) w/ SEATING FOR 1790 SPECTATORS	• CHANGE ROOMS, CONCESSION, OFFICE & ADMINISTRATION SPACE • TENANT AREA LEASED TO PRIVATE BUSINESS	ARENAS	**2 ICE ARENAS - FUTURE DEVELOPMENT** • NHL RINK w/ SEATING FOR 200 SPECTATORS • OLYMPIC RINK w/ SEATING FOR 2000 SPECTATORS	• CHANGE ROOMS, CONCESSION, OFFICE & ADMINISTRATION SPACE • 4 - LANE SPRINT TRACK
3 POOL BASINS (FOOTHILLS POOL) • 6-LANE PRACTICE POOL • DIVE TANK	• WADING POOL • CHANGE FACILITIES • 1 CLASSROOM	AQUATICS	**3 POOL BASINS - FUTURE DEVELOPMENT** • ONE 10-LANE COMPETITION w/ SEATING FOR 1000 SPECTATORS • ONE TEACH POOL	• DIVE TANK (DEPTH TBD) • CHANGE FACILITIES
1 BASEBALL STADIUM & FIELD • 400' OUTFIELD FENCE, SPECTATOR GRANDSTAND, CONCESSION, BATTING CAGES & 2 INDOOR PRACTICE BUBBLES	**1 LITTLE LEAGUE FIELD** • 200' OUTFIELD FENCE, SPECTATOR BLEACHERS, CLUBHOUSE & BATTING CAGES	BALL FIELDS	**AMENITY RELOCATED OFF-SITE**	
FITNESS SPACE (NO PUBLIC ACCESS) • WEIGHT ROOM IN EXISTING FIELD HOUSE CONTROLLED BY PRIVATE LEASEHOLDER		FITNESS	**FITNESS SPACE** • WEIGHT TRAINING (PUBLIC ACCESS) • MULTI-PURPOSE ROOMS (PUBLIC ACCESS)	• ADMINISTRATION & T.I. SPACES (SPORTS MEDICINE, ETC.) • GROUP EXERCISE ROOMS • CLIMBING WALL
9 VOLLEYBALLCOURTS • 5 INDOOR COURTS & OUTDOOR SAND COURTS • ALL COURTS PRIVATELY OPERATED BY VOLLEYDOME		GYMNASIA	**8 BASKETBALL COURTS** • CONVERT TO 12 VOLLEYBALL COURTS OR 16 BADMINTON COURTS • AVAILABLE TO PUBLIC	
4 SOCCER FIELDS • ONE FIELD w/ LIGHTS AND P.A. SYSTEM • ONE ON TRACK IN-FIELD		RECTANGULAR FIELDS & SUPPORT	**4 RECTANGULAR FIELDS** • TWO FIELDS w/ LIGHTS AND P.A. SYSTEM • ONE INDOOR FIELD w/IN INDOOR TRACK	• 1 OUTDOOR FIELD w/IN OUTDOOR TRACK
8 TENNIS COURTS • ALL OUTDOOR COURTS • 2 BACKBOARD PRACTICE COURTS		COURTS	**AMENITY RELOCATED OFF-SITE**	
1 - 400m OUTDOOR TRACK • SEATING FOR 1000 SPECTATORS, DEDICATED JUMPING & THROWING AREAS		TRACK AND FIELD	**1 - 400m INDOOR TRACK** • CONCESSIONS, CHANGE ROOMS, WASHROOMS, EQUIPMENT STORAGE & AREA FOR SEATING (SEATING EXPANDABLE TO 7500)	**1 - 400m OUTDOOR TRACK** • EQUIPMENT STORAGE & AREA FOR SEATING

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3.1.2 DEMOLITION OF EXISTING FEATURES

The location of the Fieldhouse on the east side of the site was selected to allow for the planned Fieldhouse as well as the future planned phases of a new natatorium and twin ice arenas to be built without impacting the operation of the existing Ice arenas and Foothills Aquatic Centre as well as the existing 400 metre outdoor running track.

For the construction of the proposed Athletics Centre and Fieldhouse, the existing site features that would require demolition include the Foothills Stadium (G), Little League field (F), existing track support fieldhouse (I), Absolute Baseball Academy and Fitness Centre (L), Viper's Dome (M), and the other features in the indicated area in Figure 3.9 below.

Only site features that were located in the area of the proposed footprint of the Athletics Centre and Fieldhouse were indicated for demolition and included in the cost estimate for this scope of work. All disturbed areas including those for subsequent phases will be graded and seeded. For a detailed account of the demolition costs included in the estimate of probable construction costs refer to Appendix C.

Although the buildings that fall within or partially within the area of land that will be given over to Calgary Transportation for implementation of the result of the study on Crowchild Trail were included in the cost of demolition, the trees and landscaping features on this land were not included.

The inventory of parking stalls that would be demolished during construction were included in the number of stalls to be provided during the fieldhouse development in order to meet the demand created by the existing site uses and the new demand created by the proposed fieldhouse uses.

Figure 3.10 Foothills Athletic Park Demolition Area
Scale: Approximate as Indicated

Existing facilities to be demolished include: Little League Baseball (F); Foothills Stadium (G); existing track-support fieldhouse (I); Absolute Baseball Academy & fitness Centre (L); Viper's Dome (M)

3.1.3 SITE SERVICING

The proposed location for the fieldhouse includes the necessary demolition and recycling of the baseball stadiums and a few associated support and amenity buildings. These buildings and amenities are currently serviced to various degrees by underground buried services. The construction of the field-house as proposed will require the demolition or abandonment of underground services in the area prior to the construction of the proposed Athletics Centre and Fieldhouse.

Figure 3.11 illustrates the extent of the servicing changes that are required to support the proposed fieldhouse.

The Electrical service also requires upgrading. The service for the fieldhouse would be sized for the future phases of the project including the arena and aquatics portions. The maximum size pad-mounted transformer service that would be available is rated to 2000A at 600V which would not be adequate for the base or future needs of the proposed facility. The capacity of the existing electrical infrastructure will be evaluated by the electrical service provider at the time of the service request and any upgrades required at that time will be determined by their project team. As the electrical service provider in the area, any substation work would be completed by Enmax Power Corporation on pre-existing Enmax owned land in order to accommodate all existing and future expected loads into the capacity of the surrounding infrastructure.

The intent of the electrical service design would be to demolish the existing feeds to the existing buildings and reuse the existing overhead lines and tap off them to provide the fieldhouse with power. The overhead lines run east/west across the site feeding all of the existing buildings and sites along the way. Upon the service request to Enmax for the fieldhouse site, Enmax would review the capacity of their system based on the demand and service size the fieldhouse site requires. If the existing infrastructure can handle the new demand of the facility, the Enmax charges would be at the lower end of the cost estimate since it is a simple tie in to the system. If Enmax determines they have insufficient capacity on the system they would need to upgrade the underground feeder from substa-tion #20 that is located on the SW corner of Crowchild Trail and Kensington Road. This scenario is the higher end of the costing scale. It it likely that some significant upgrade will be required as the largest pad-mounted transformer that could be added to the existing system would not be adequate for the expected demand created by the proposed Athletics Centre and Fieldhouse.

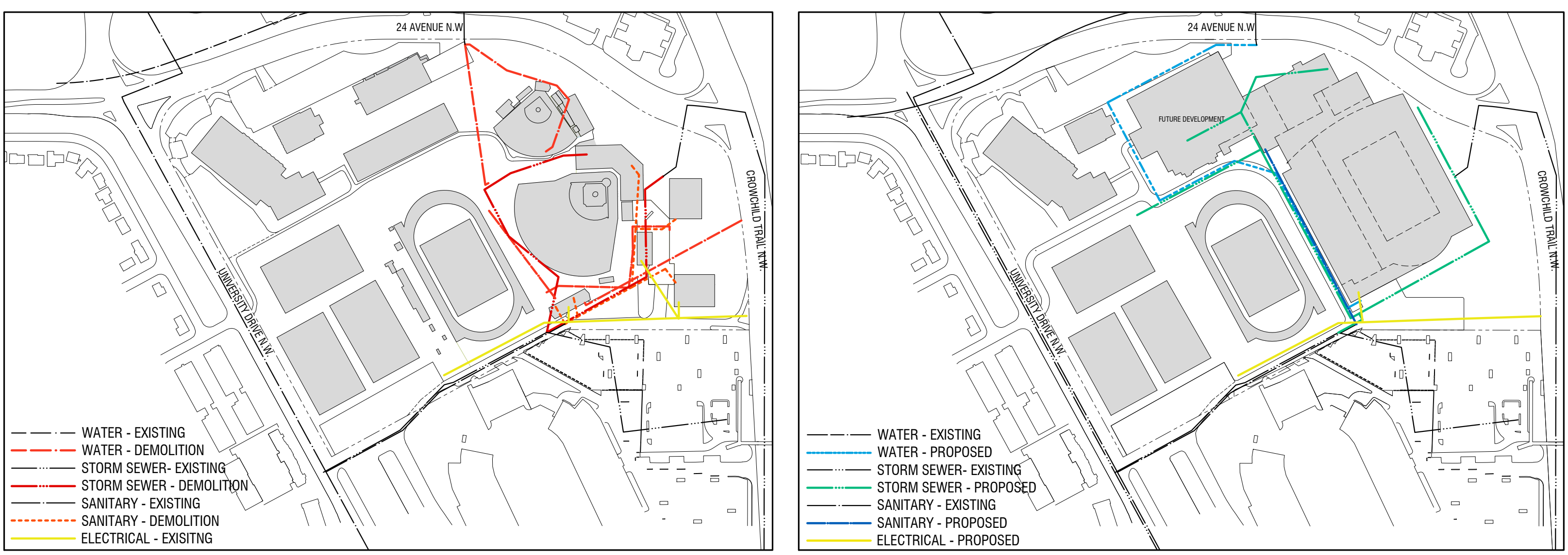


Figure 3.11 Servicing Diagram

3.2 PROGRAMMING

The schematic of internal programming for the Fieldhouse (Figure 3.12) illustrates potential efficiency in both area and operational planning of the programmatic elements. This configuration allows for both multi-sport use space capacity as well as concurrent indoor practice, year-round, for multiple users. The gymnasia, as an example, provides space for 8200 temporary spectator seating capacity for specific track events in addition to meeting the need for indoor court space. The rectangular infield can also be utilized for Track and Field events or other activities such as baseball training or tennis. Practice in the gymnasia could be concurrent with practice in the track as well as multiple user groups in the demised infield.

TRACK AND FIELDHOUSE

- One (1) rectangular field as will fit inside the track;
- One (1) 400-meter, 8-lane indoor track;
- Jumping and throwing areas;
- Eight (8) basketball courts convertible into twelve (12) volleyball courts or 16 badminton courts;
- Administrative operational support facilities;
- Multiple activities, including batting cages, baseball training, tennis and golf hitting cages;
- Capacity for 10,000 -1,800 permanent and 8,200 temporary - spectator seats in the space of the gymnasium courts;
- Storage rooms, washrooms and requisite support spaces;
- Outdoor track storage to replace demolished facility.
- Recreation/Support Facilities
- Fitness and weight training facilities;
- Multi-purpose rooms;
- Administration and operational support, cafe, tenant improvement spaces;
- Change rooms and associated amenities;
- Outdoor playground (site availability is in question); and
- Parking stalls, structured and surface.

The track and field competition and practice space will be designed according to the facility standards of the International Association of Athletics Federations. Designing the competition track and Athletics Centre to the standards

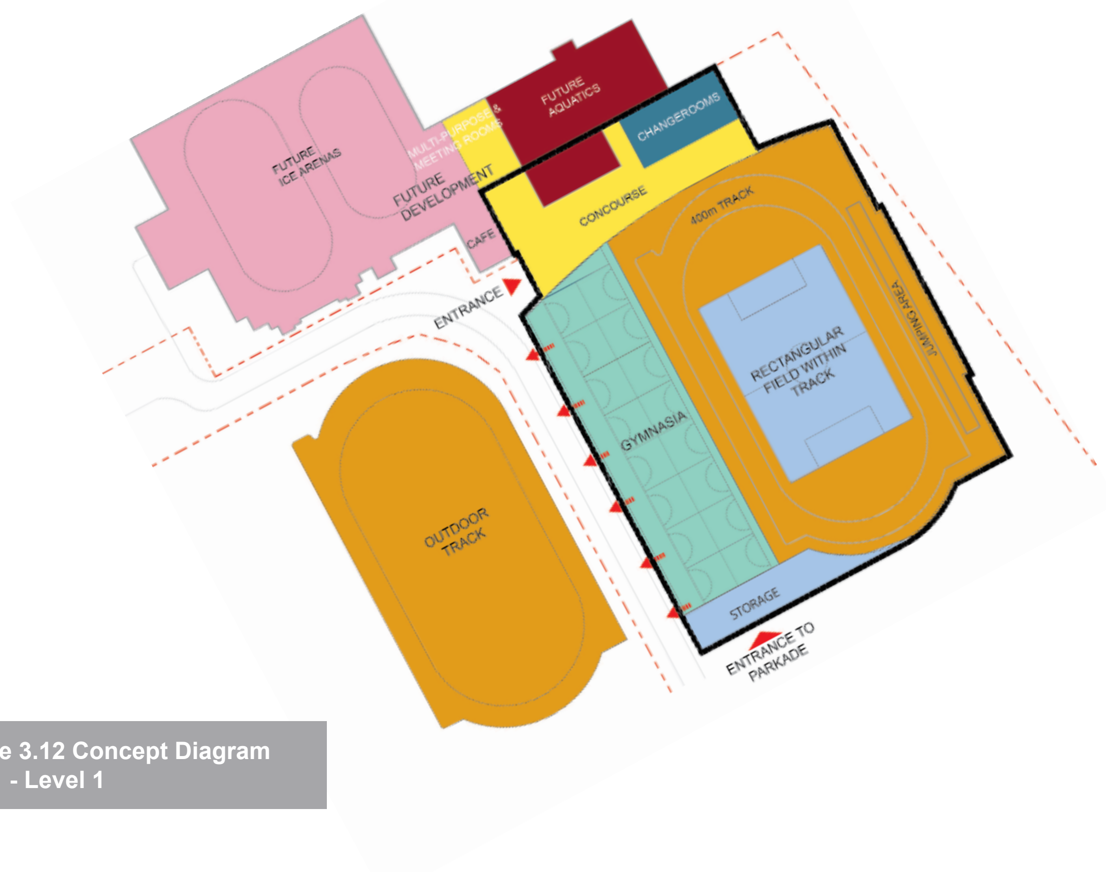


Figure 3.12 Concept Diagram Plan - Level 1

that are found in the documents provided by the IAAF will allow the building to be designated as a Class 1 or Class 2 competition space for Athletics competitions. This designation should attract training groups and national and international competitions to use the space for track and field competitions. These standards define the size and radius of the track, the competition surface, the lighting and building services required for a training and competition space of this calibre.

The fitness facility space will be used to provide training support, strength and conditioning areas, group exercise rooms, sports medicine centre, change rooms and leasable space for the competitors and public. In conjunction with the track and indoor field spaces this facility will provide a uniquely integrated training and performance facility for athletes. This function will be available to athletics competitors and other sports athletes as determined by future engagement with Calgary Sports and Recreation stakeholders and will be the focus of training and development programs and community users. Change rooms for all activities will be provided and the location of the change rooms is selected to gain building efficiencies by planning for training, recreational, and future aquatic participants to share consolidated facilities if possible. In addition, fieldhouse participants may share support facilities such as public washrooms, concessions, equipment storage and site management space within the fieldhouse.

Multi-purpose rooms and designated meeting rooms will further support the use of the building by many varied sports and community programs and ensure that the capacity of the facility is available to a wide range of concurrent users. Support for the existing outdoor track will also be provided in the design of the fieldhouse.

Refer to Appendix F. for a more detailed summary of space requirements included in the fieldhouse conceptual design.

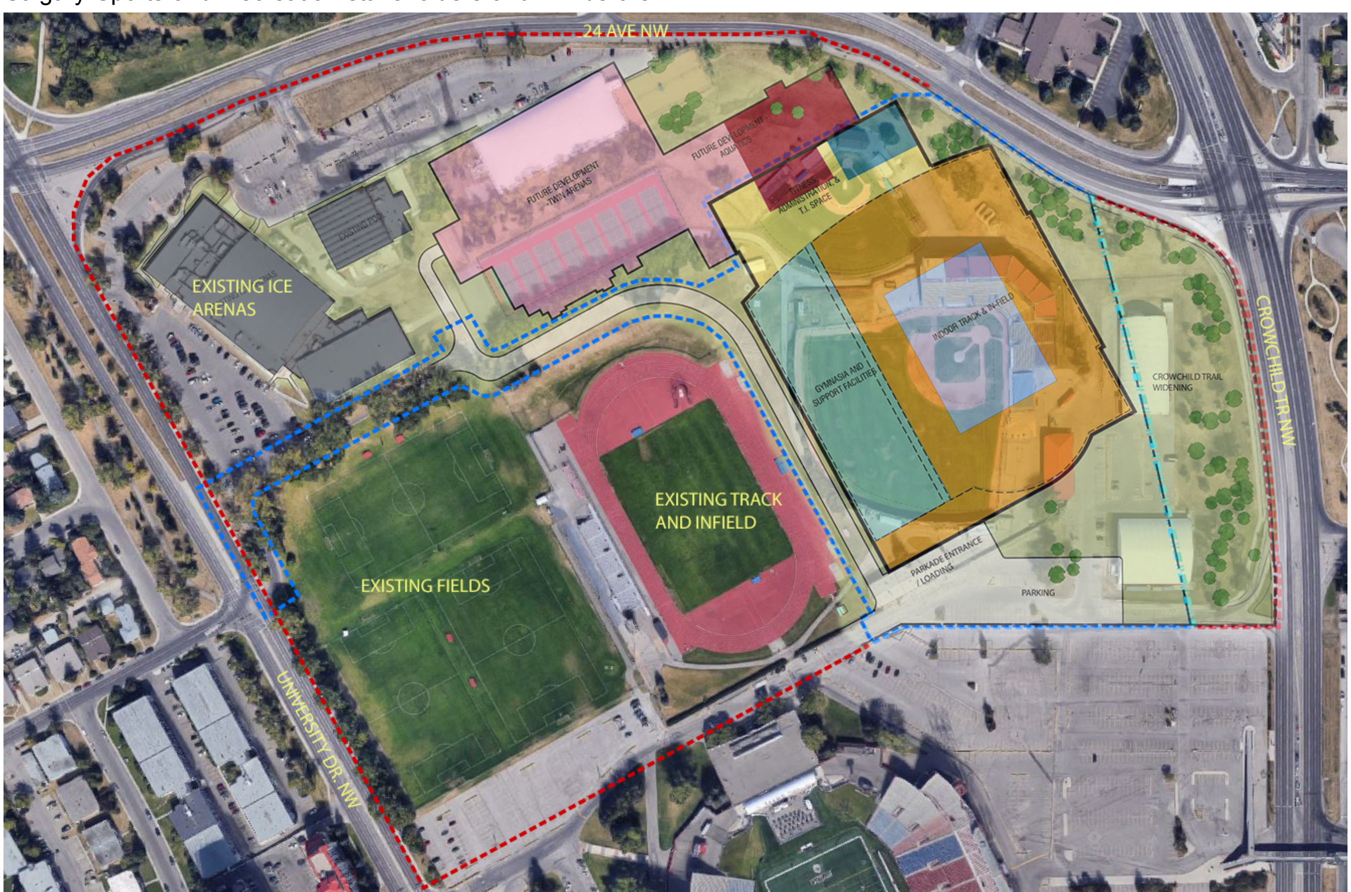


Figure 3.13 Concept Plan Overlaid on Existing Site Features

3.3 LAYOUT EXPLORATION

3.3.1 SITE PLAN

The proposed Athletics Centre and Fieldhouse requires a significant amount of site area, which is limited due to a number of factors: the facility cannot impact the land agreement made for the planned improvement to the Crowchild/24th Street intersection; the desired retention of the existing outdoor track and the existing two arenas and aquatics centre; the need to accommodate future facilities (twin arenas and natatorium) and additional parking; and the sizable elevation change at the edges of the site.

The conceptual design, for the purposes of this costing and site-fit exercise, was located to remain outside of the easement required for the Crowchild improvements and to allow the existing outdoor track to remain. It is also located vertically such that a reasonable balance of cut and fill could be achieved to minimize the need for moving earth on or off of the site. In addition, because additional parking is required, a parking deck is included at the level of the McMahon Stadium parking lot with the gymnasium portion of the Fieldhouse above.

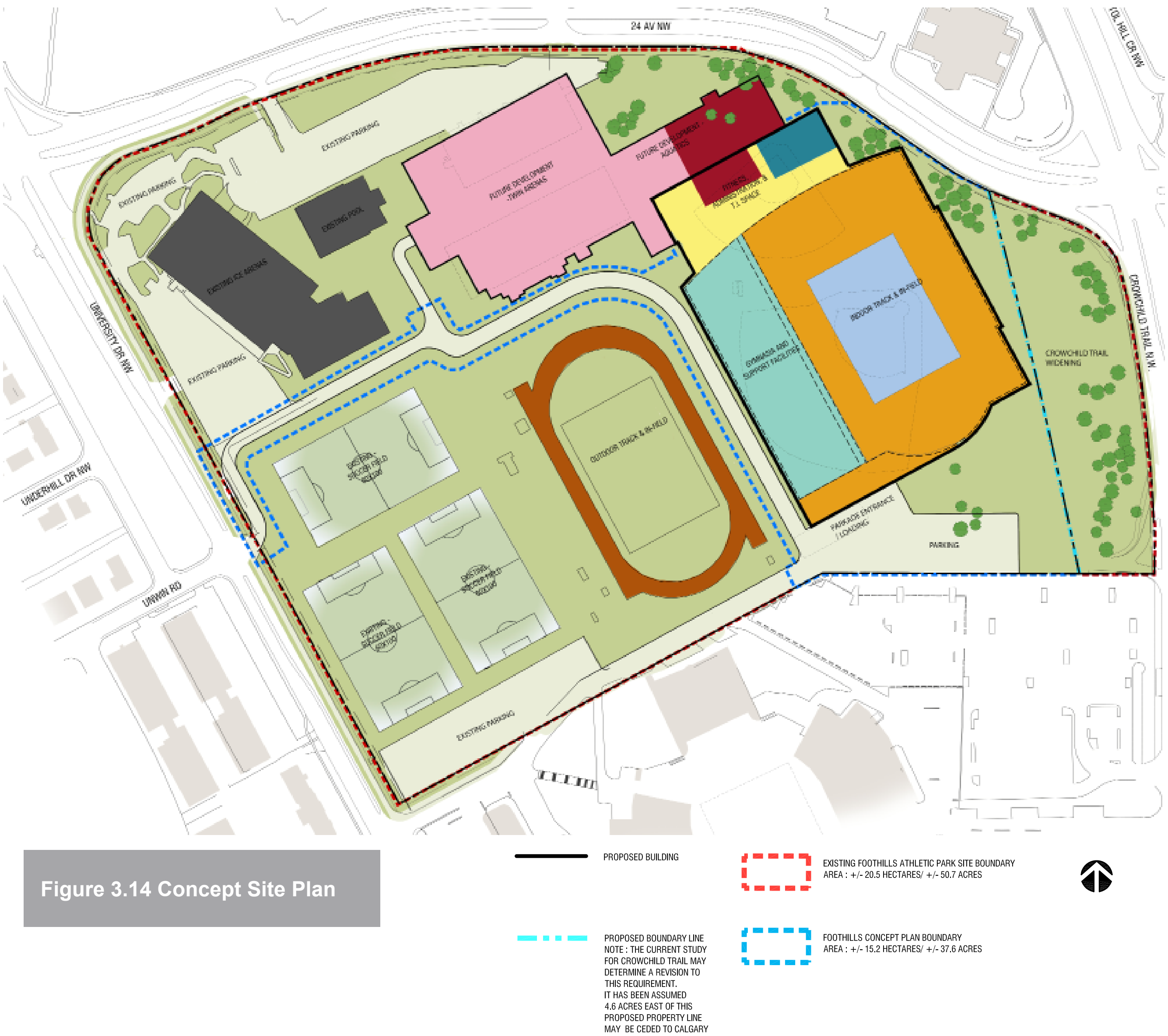


Figure 3.14 Concept Site Plan

The revised location of the Fieldhouse, as included in this current report and referenced in Figure 3.12, is centered on the east edge of the property adjacent to the existing track and outside of the area reserved for the road right-of-way for Crowchild Trail.

The rationale of the revised Fieldhouse location considers several factors which can be grouped around cost, phasing, project flexibility and site configuration.

Decision factors in relation to cost include:

- Relatively flat grades of existing ball fields
- Reduced costs for execution due to availability of adjacent staging areas for construction southeast of proposed site.
- Potential energy & operational efficiencies (when combined with future amenities either directly or as a 'campus').

Decision factors in relation to phasing include:

- Allowance for physical integration with future development
- Operational synergy/efficiency with future amenities;

Decision factors in relation to project flexibility include:

- Flexibility for Crowchild Trail widening;
- Clear servicing access at the south-east corner of the athletic park;
- Simplicity of primary access/entry by existing access road through the centre of Foothills athletic park;

Decision factors in relation to site configuration include:

- Visual prominence from Crowchild Trail and 24th Street
- Continued operation of selected site features.

The primary entrance road will be upgraded from the existing access pathway connecting from the site entrance on University Drive NW to the building entrance, then turning to the west to exit at the west edge of the park site beside McMahon Stadium West Parking. The road is located to provide adequate bus access to the proposed Athletic Center and Fieldhouse, as well as future access to the planned natatorium and ice arenas. Access is provided to the parkade and loading and waste and recycling areas via the McMahon parking lot access road.

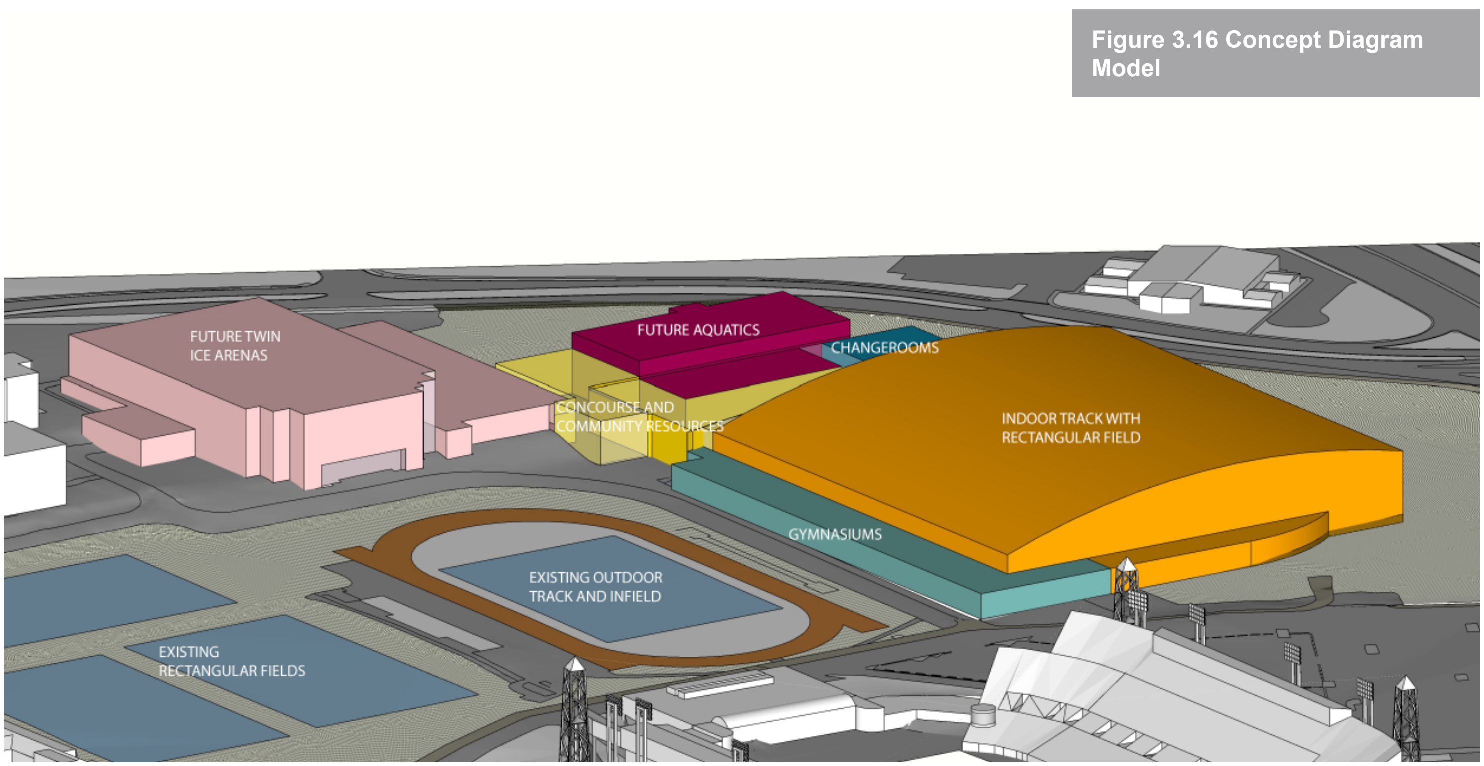
Figure 3.15 Concept Site Section

The proposed Athletics Centre and Fieldhouse was configured to allow easy views into all activity areas from a central concourse connecting the entrance and all activity areas. Further, it is located for easy extension to future planned pool and ice facilities. Change rooms and other facilities to be shared with the future natatorium are included and could easily be expanded to ensure adequate support for the future additions.

Access from the parking beneath the building leads directly to the central concourse, providing the same experience of viewing the multiple activity areas, consistent with the main entry sequence. In addition, the entrance to the future natatorium will be from the same central concourse. The concourse is planned to be adequate to direct the crowds of the large spectator events anticipated for track and field as well.

Temporary support facilities are adjacent to the gymnasium, where the temporary seating will be located.

Figure 3.16 Concept Diagram Model



3.4 PROJECT PLANNING, SCHEDULE AND PHASING

3.4.1 Phasing

While not included in the scope or the budget of this concept design, a basic test fit has been done for the future development of the ice arenas and natatorium as part of a whole and unified facility when developing the location and conceptual design of the proposed Fieldhouse. Building efficiencies such as shared loading and waste and recycling functions as well as change rooms that service the Fieldhouse and the natatorium will be planned and designed into the Fieldhouse. Some temporary facilities for these functions will be required until the rest of the phases of the whole facility is complete. Loading and parkade access are temporarily provided in phase 1 at the south-east of the building. The loading spaces associated with the future ice arenas would be sized for the whole facility.

The construction of the Fieldhouse in the proposed location requires relocation of facilities of some existing site stakeholders to other facilities within the City. Facilities proposed to be demolished in the first phase include the Absolute Baseball Academy, Viper's Dome, and baseball fields. The proposed plan will require the stakeholders to relocate these facilities.

The proposed and future phasing of the construction on the site is intended to maintain the most existing site functions.

Phase 1

1. Deconstruct and recycle absolute baseball academy dome;
2. Deconstruct and recycle viper's dome;
3. Deconstruct and recycle little league field #7;
4. Deconstruct and recycle foothills baseball arena;
5. Deconstruct and recycle the existing track support fieldhouse;
6. Construct fieldhouse, athletic components and gymnasia.
7. Upgrade existing access road;
8. Reconfigure parking.

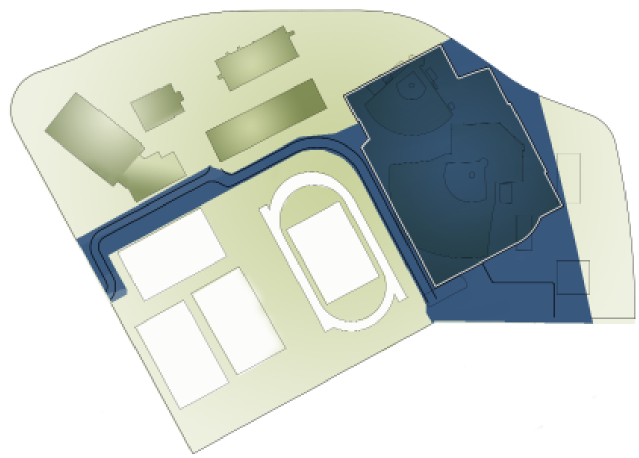
Phase 2

1. Deconstruct and recycle Volleydome;
2. Deconstruct and recycle existing tennis courts;
3. Construct aquatics and ice arena components;

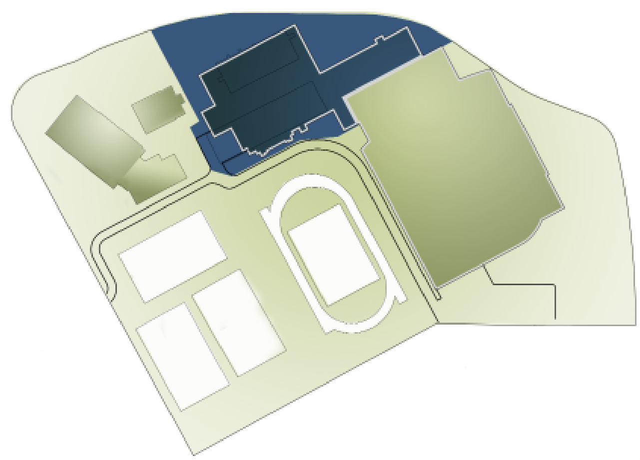
Phase 3

1. Decommission, deconstruct, recycle Norma Bush ice arena
2. Decommission, deconstruct, recycle David Bauer ice arena
3. Decommission, deconstruct, recycle Foothills Pool
4. Construct additional fields, courts, or parking facilities to be determined.

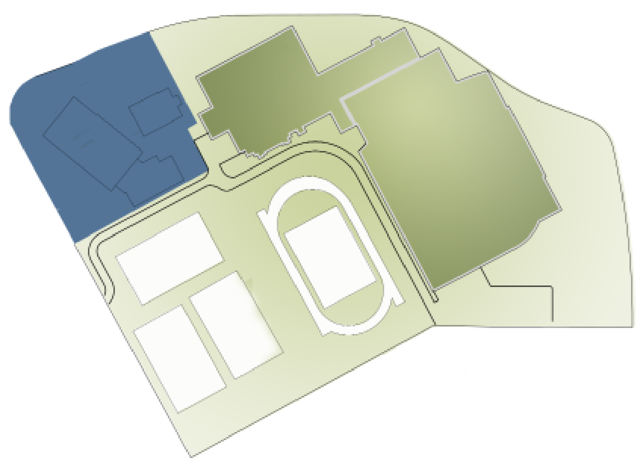
Figure 3.17 - Phasing Diagrams



Phase 1 - Proposed



Phase 2 - Future Construction



Phase 3 - Future Decommission

The List of amenities planned after all proposed and future phases includes:

Playground
Community Recreation Space
Cafe / restaurant
Improved L.R.T. access
Foothills Pool
Aquatics amenity with 3 pool basins (including a dive tank)
1 Olympic size ice surface
1 NHL size ice surface
Gymnasia - convertible court space
Basketball courts, volleyball courts, badminton courts, or large practice spaces
Sports medicine, physiotherapy Services.
2 Rectangular fields (illuminated, artificial turf with p.a. system)
1 Rectangular field (indoor track infield with p.a. system)
400m indoor track with dedicated throwing areas
400m outdoor track with dedicated throwing areas
Fitness Centre, weight training, cardiovascular training
Multi-purpose and meeting rooms

The future development of the Olympic and NHL Ice arenas and aquatics amenity are intended to replace the existing Norma Bush and David Bauer Ice arenas and Foothills Pool. There will be a undefined period of time before the decommissioning of the older facilities when the older facility and newer facility would be operating in tandem. There is also an unexplored potential for including additional fields and courts in place of these older facilities. Engagement and future planning studies will be needed to determine what additional features should replace these older facilities within Foothills Athletic Park.

3.4.2 Schedule

The proposed schedule outlined in section 4.0 begins with an engagement period to meet with stakeholders and prepare plans for the relocation of programs and facilities that will be impacted by the first phase of construction. The design period and permitting period will allow time for the relocation of impacted facilities and expiry of the existing leases.

3.4.3 Parking

A Traffic Impact Assessment report was prepared for the Concept Plan for Foothills and Glenmore Athletic Parks - Stage II Report (March 27, 2012). It indicated that +/- 780 parking stalls would be required for full build out of the Foothills Athletic Park concept plan. This whole campus approach will allow the provision of adequate parking by sharing the parking inventory between the various functions on site. Calculating the bylaw required parking independently for each element of the Park may result in a larger portion of the site dedicated to parking stalls than would be used.

When assessing the future parking needs of the Foothills Athletic Park the calculations in the TIA was based on this whole campus approach with an observed demand and projected increase in demand due to the additional uses proposed on the site. The observed demand number was derived from three surveys of parking use conducted by Bunt and Associates. In each of these cases usage of the baseball fields was noted as a part of the generation of parking demand. Noting that the baseball fields were in use during these surveys and no figures were reported for the percentage of parking demand generated by just the baseball fields, we cannot reliably accept the accuracy of the observed demand

Element	Design Factors	Rate	Stalls Req.
Outdoor Track	Existing Facility Maintained	68 *(table 5.9)	68
Indoor Track	Indoor Track Added	68 *(table 5.9)	68
Ice Arenas	Comparable Facilities to Replaced	35 / arena *(table 5.6)	70
Pool	Increases in Size and Function	5 / 100 sqm *(table 5.8)	119
Multipurpose rooms	Included in Fieldhouse	1.5 / 100 sqm *(table 5.8)	17
TI Future Sports Medicine	+ 676 sm	6 / 100 sqm *(table 5.8)	41
Weight Training & Sports Performance	+1488 sqm	5 / 100 sqm *(table 5.8)	80
Soccer fields	+1 field	45 / field *(table 5.7)	180
Tennis courts	removed		0
Indoor gymnasia	8 indoor courts	22 / court *(table 5.7)	176
*Tables found in Appendix J.			**819**

Figure 3.18 - Parking Stalls Required by Site-Use Element

after redevelopment if the baseball fields are removed from the site as proposed by this report. Similarly, the projected demand number which would be based on the added uses must also change to reflect the uses now proposed in this report.

Using the rates and tables provided in the TIA by Bunt to estimate the future demand of parking generated by those amenities that will be located in the Athletic Park after redevelopment, and by calculating demand for each element, finds the anticipated peak demand for parking will be 819 stalls. The rates and design factors used to make this determination are included in figure 3.15. As noted in previous reports, the bylaw requested parking supply appears excessive due to the proximity of the site to the public transit system. This rationale of parking supply would form the basis of design for the provision of parking infrastructure throughout the Foothills Athletic Park and by extension in this proposed conceptual design instead of the calculations found in the bylaw review located in appendix K. The cost of including the number of parking stalls that would be required by some interpretations of the bylaw parking requirements in an underground parkade are included in the cost report in appendix C.

On-site parking would be provided for weekly activities and daily use. It would be available in proximity to each of the major components within the park and will be located distributed throughout the site. A combination of surface parking and underground structured parking is contemplated for the Foothills site to meet the expected day-to-day parking needs for all of the facilities. The existing parking supply for these daily activities is 734 stalls. In order to ensure that the Athletic Park reaches the required parking supply and to replace the parking supply that will be eliminated during construction, a parkade with 250 stalls is planned under the gymnasium. The completion of this parkade will bring the parking supply on site to 859 stalls, which should be more than sufficient to handle daily use demand. Event parking requirements are recommended to be accommodated through a standing traffic demand management plan (combined with facility bookings) for frequently occurring events and through the specific event permit protocols existing within City administration for atypical events (ie: national/provincial championships).

When the future development of the ice arenas is designed additional provision of underground parking stalls may be considered within the footprint of those buildings if parking needs develop to be greater than that predicted by the transportation studies that have been completed previously.

3.4.4 Sustainability

The project will strive to be an example of the purposes identified by Calgary's Sustainable Building Policy and attain at minimum a Gold rating in the LEED v4 Building design and construction rating system. Credits identified for achievement in this system will focus on the long term sustainability and community integration that will make this a successful legacy building.

As demonstrated by the Proposed LEED scorecard - included in appendix H - a conservative selection of targeted points allows for the building to achieve LEED Gold rating. Targeted points for the LEED scorecard focused on building systems and materials that will improve building efficiency, durability and comfort in ways that will have a direct impact on the maintenance and operational costs of a large facility. The location chosen for the fieldhouse within Foothills Athletic Park is notable for the sustainability goals that it embraces as it makes available to the project at minimum 10 points within the LEED rating system due to the nearby public transit and diverse urban density of the surrounding community. The proposed LEED Scorecard is included as Appendix 'H'.

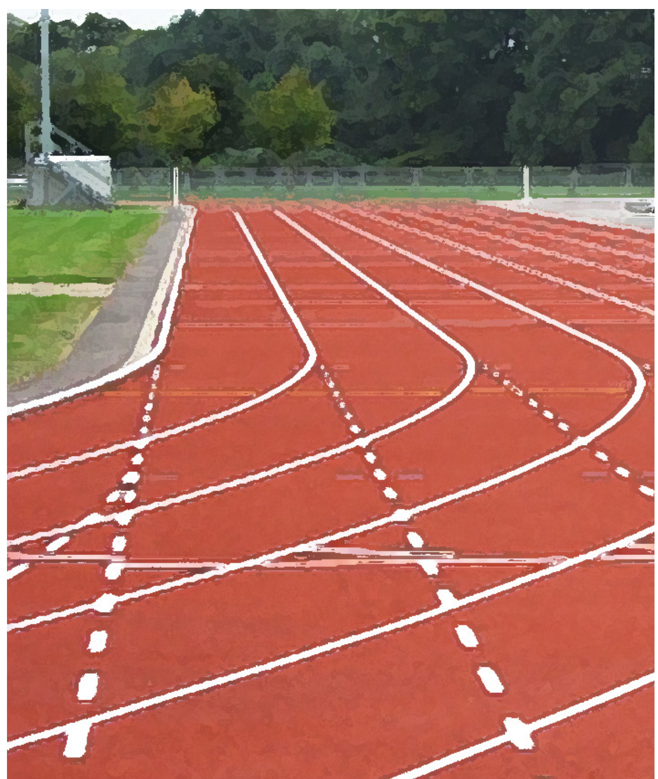


Figure 3.19: 8 Lane Running Track

3.5 Project Systems and Construction

Following an investigation of spectator venues in Canada and the United States, it became apparent that there are very few comparable facilities in which a 400m track is located inside an indoor IAAF competition venue. It is reasonably common to combine a 200m track and fieldhouse competition space with public access recreational use and training facilities. This arrangement does not provide the opportunity to use the centre of the track as a soccer pitch. Therefore a 400m track with interior soccer pitch is proposed for this facility. This will position the facility as a uniquely valuable practice and competition space.

The requirements of professional sport spectator venues are specific and are the primary drivers of design and operational decisions, with other uses becoming secondary. The running track and central soccer pitch will determine many attributes of the Fieldhouse facility.

3.5.1 Technical and Functional Implications

The Foothills Athletics Centre and Fieldhouse will be a shared use of a single facility for FIFA-sanctioned soccer and a 400-meter, 8 -lane IAAF certifiable track requires overlaid fields of play. Additionally, the configuration of spectator seating around a 400M track compromises sight-line distances for soccer. Another consideration in assessing multiple use facilities is concurrent use of the playfield and track components, deemed an important consideration for maximizing use of the approved Foothills Fieldhouse concept. Concurrent use requires protective safety measures for each component, including divider curtains and safety nets, generally stored overhead. the proposed design of the facility will manage and coordinate the technical and functional implication of each of the proposed uses to maximize the user and spectator experience of the Foothills Athletic Centre and Fieldhouse.

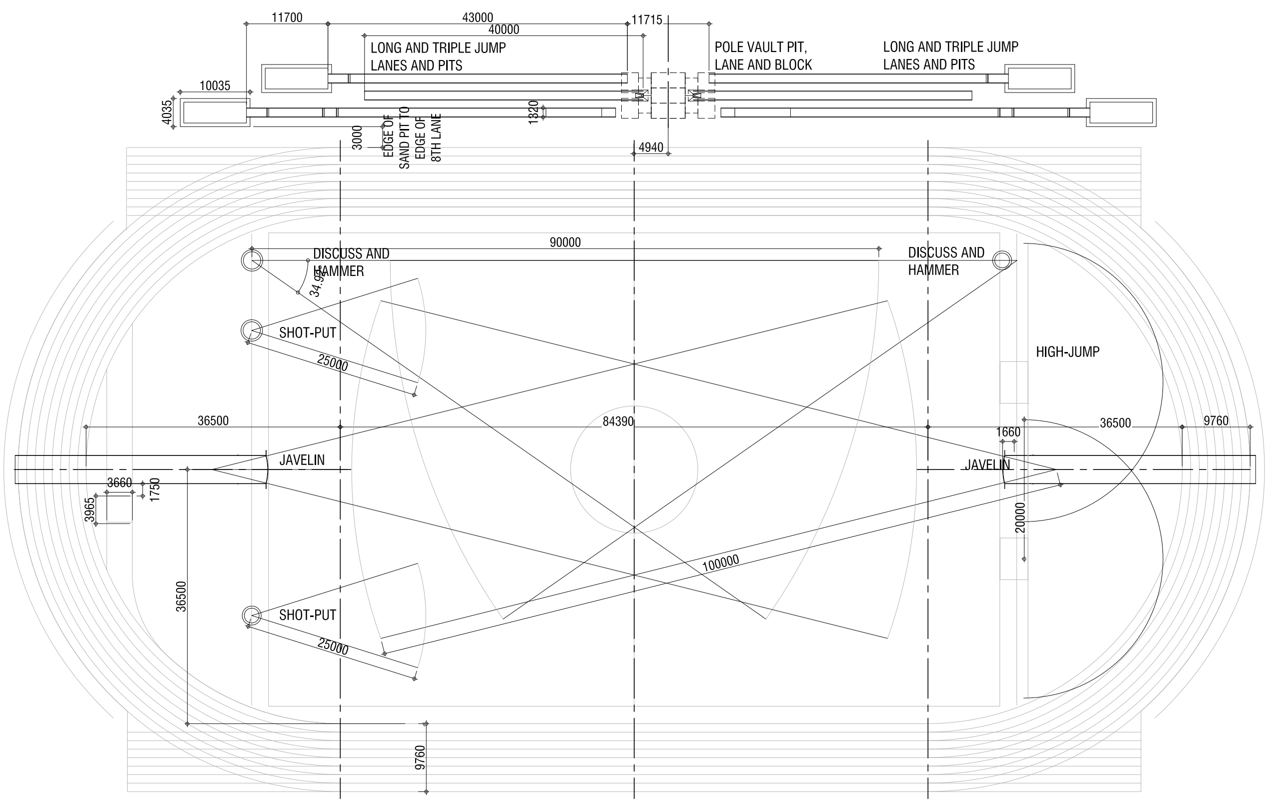


Figure 3.20 IAAF Jumping and Throwing Areas with Standard 400m Track

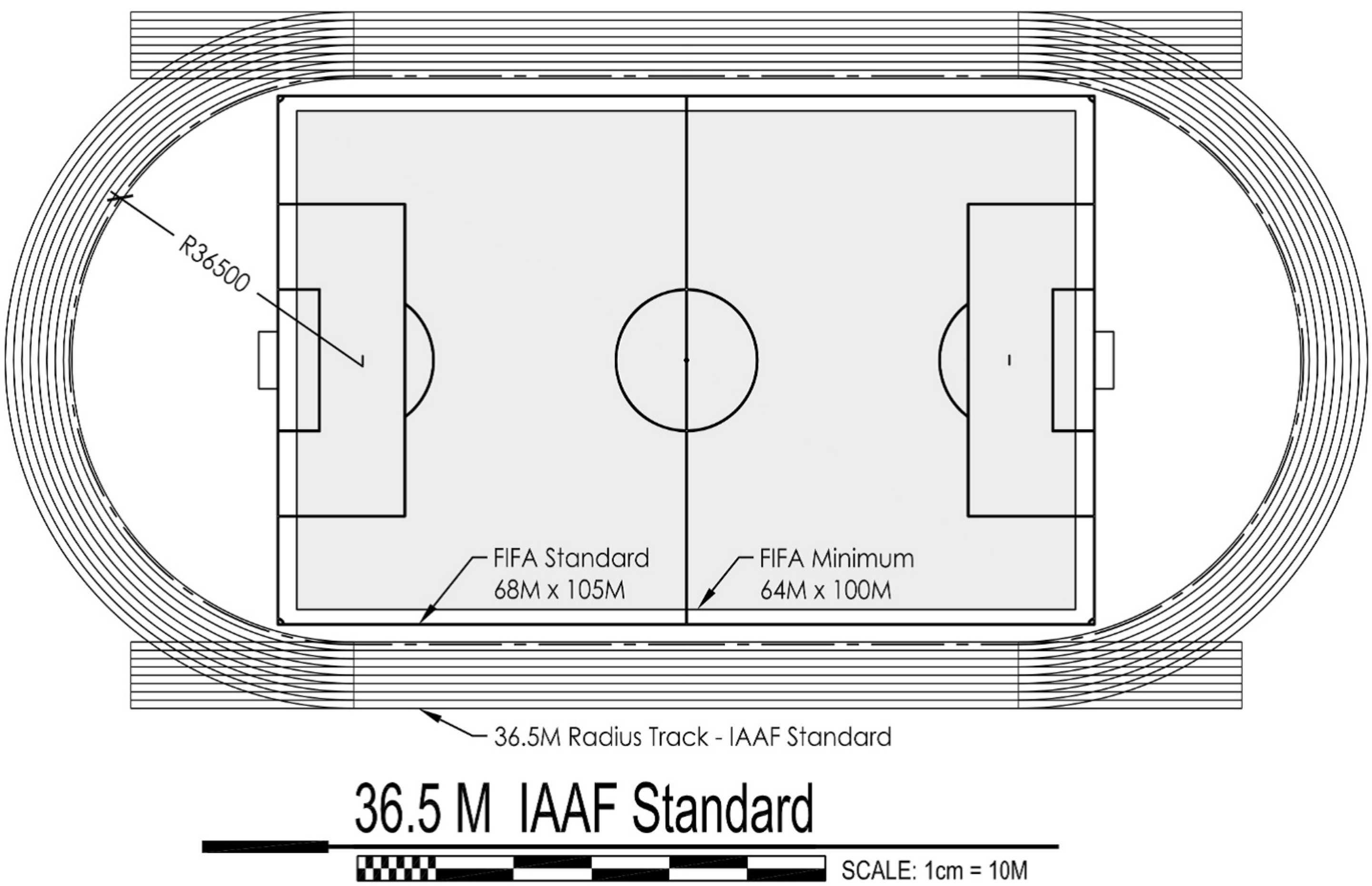
3.5.2 IAAF Standard Track

As the fieldhouse is proposed to be built according to the standards for a Class 1 International Association of Athletics Federations (IAAF) certifiable competition facility space. The layout of the track and athletics areas is a focus of the design of the building. The preferred competition 400-meter track configuration has single-radius turn arcs with radii ranging from 35M to 38M in dimension. The preferred standard of the IAAF is 36.5M. The 8 lane track will be laid-out with the jumping and throwing areas as described in the IAAF Facility Standard Manual (current edition 2008). Figure 3.3 below illustrates the preferred 36.5 radius turn arcs and their relationships to a FIFA regulation sized soccer field with the Standard and minimum recommended dimensions. The turn arcs are proposed to be flat graded as banked corners are only recommended for smaller 200m indoor tracks. 200m indoor tracks also do not meet the standards to be certified as class 1 or 2 competition spaces by the IAAF.

3.5.3 Soccer

The minimum size FIFA soccer pitch (64M x 100M) could be accommodated within the standard or maximum radius tracks, with minimally acceptable sideline bench areas. The preferred FIFA soccer pitch (68M x 105M) could be accommodated within the infield of the maximum radius track but would require additional area to accommodate team benches. Protective covering for the track during use of the central soccer field is recommended in either case. Goals would be removable and located in nearby storage rooms during use of the track facility for competitions though field markings could remain in place.

Figure 3.21 IAAF Standard 400m Track with Soccer Infield



3.5.4 Spectator Seating/Sightlines

Excellent sight-lines are of paramount importance in modern sports stadiums. The closer to the venue sideline for the spectators, the shorter the sight distance and the more intimate the spectator experience of the event. The track around the centre field pushes the spectators for any event on the field farther away from the action. Figure 3.18 illustrates the viewing relationship between the spaces for potential competition activities, as well as the fixed grandstand for viewing those activities. Future development of the design for the building will need to consider the relationship between the spectator viewing areas, including both the permanent and temporary seating, and the competition spaces to ensure that the sightlines are optimized for spectator events. Solutions for beginning the seating closer to the sideline of the field within the track should be weighed with the expense and operational concerns of temporary seating over the running track.

As noted in Appendix C there is a potential to relocate some columns used to support the roof structure away from between the permanent and temporary seating locations which would greatly improve the sightlines from the temporary seating area. With the intermediate columns there are many areas in the temporary seating that will have their view of the event partially blocked by the structural elements of the building.

3.5.5 Multi-Sport Concurrent Use

To maximize the multi-sport use of the facility, and therefore the overall utilization of the building, concurrent uses should be planned and the facility provided with the equipment to maintain proper safety and visual separation of participants from other activities. Concurrent recreational use of the various components: track, field, training areas, courts, gymnasia, and spectator areas; requires divider curtains around the track and between portions of the field and gymnasia when used concurrently. The divider curtains and cages that facilitate this concurrent use are typically stored overhead near the ceiling or within the roof structure.

Professional Field sports events generally require higher ceilings and clear space overhead. A fieldhouse accommodating track and recreational soccer can function reasonably with 20 meters overhead clearance. Various sports will require different overhead clearance and supported activities should be confirmed during future design development to ensure that the proper overhead clearance is maintained or operational considerations are put in place to accommodate greater overhead clearance if required.

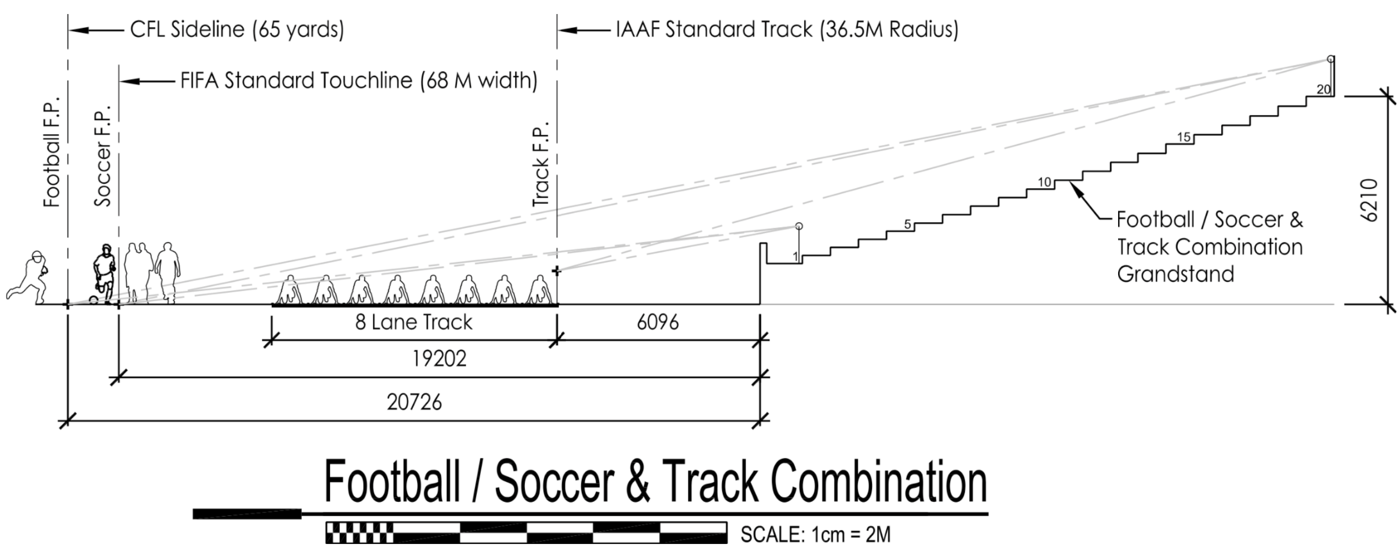


Figure 3.22 Sight-line Diagram for Combined Spectator Facility

3.5.6 CASE STUDIES

STEPHEN M ROSS COMPETITION AND PERFORMANCE CENTER

UNIVERSITY OF MICHIGAN

Completed: 2017

Professional use:

No professional teams

Regular users:

Student Athletes,
University of Michigan

Other users:

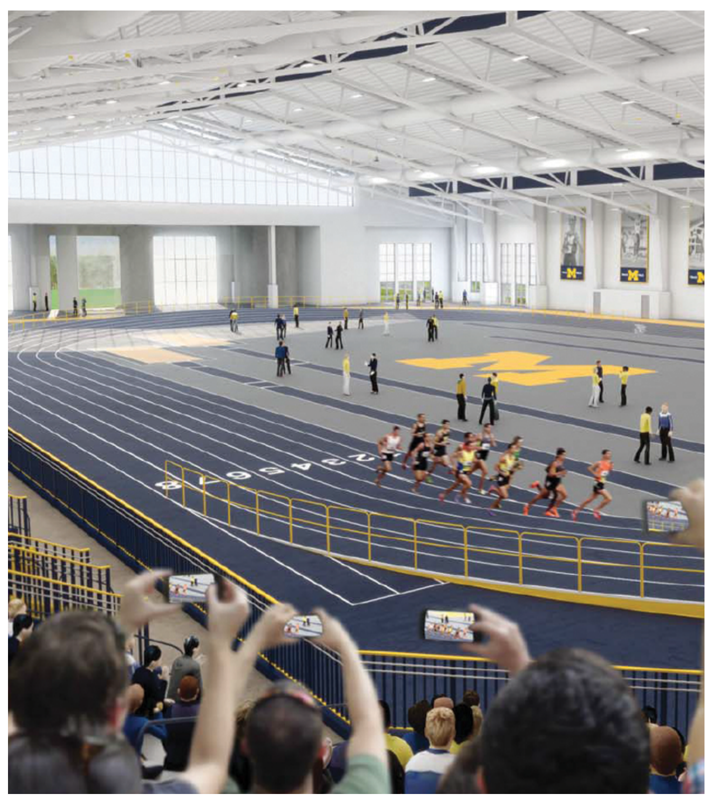
Community events, recreation space for university students, faculty and community members.

Spectator capacity: 2000

Built as a part of a larger athletic campus at the University of Michigan, the Stephen M. Ross Competition and Performance Centre houses a 200m Indoor track with spectator seating. The centre space of the running track is used for jumping and throwing competition and training only with no central field. This arrangement reduces the range of supported activities at the facility and the banked corners of the smaller track further restricts other possible uses of the large open track space. The facility also includes a sports medicine and performance testing and training function area that is available to student athletes and public users.

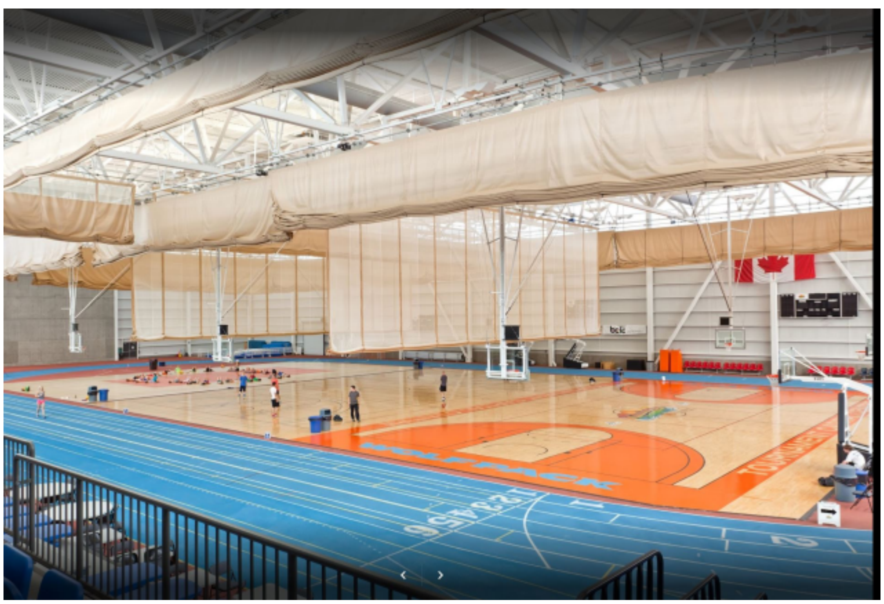
As with the Foothills Athletics Centre and Fieldhouse the competition spaces are paired with a sports performance and training facility built directly adjacent to support intensive training and development programs for athletes. Student athletes as well as community members use the facility for both practice and recreation.

The Foothills Athletic Centre and Fieldhouse will contain a 400m flat surface running track to maximize the multi-sport and community use of the competition space, and pair that competition space with a performance focused training facility to support similar training and development programs for athletes in Calgary. Providing access to a dedicated indoor space for competition running will allow more effective year-round training for developing competitive athletes and amateurs.



KAMLOOPS TOURNAMENT CAPITAL CENTRE

KAMLOOPS, BC



Completed: 2007

Professional use:

No professional teams

Regular users:

TRU basketball and volleyball,
Kamloops Track and Field Club

Other users:

Community events,
recreation space for
university students, faculty
and community members.

Spectator capacity: 2,200

Within the Kamloops Tournament Capital Centre a 200m Track surrounds 2 FIBA Basketball courts. To allow for multiple simultaneous uses in both training and competition the space is equipped with multiple dividing curtains.

The City of Kamloops uses this versatile and flexible facility to draw national and international competitions to be hosted in the city as well as host many community events.

When considering the proposed Athletics Centre and Fieldhouse to be built in Calgary, a facility that is focused on attracting national and international competitions, as a IAAF Class 1 certified facility would, will allow for increased sports tourism revenue. Additionally the year round availability of practice space and performance training facilities will increase the competitive edge of local athletes.

With both indoor and outdoor running tracks as well as a variety of fields and courts arranged indoors this facility is the host to many community sport and engagement programs and offers multiple concurrent uses. This maximizes the contribution that the facility makes to its community. The Foothills Athletic Venue and Fieldhouse should strive to host many concurrent uses by development programs, community resources, athletics programs and clubs, and related commercial uses and become a true hub of sport and recreation to the citizens of Calgary. The proposed facility as represented by this report would be a unique facility within Canada, providing an indoor 400m running track and support functions will position it to become a indispensable resource and focus of sport development and athletics competition.

COMMONWEALTH FIELDHOUSE & COMMUNITY RECREATION CENTRE

EDMONTON, AB

Completed: 2012

Professional use:

Edmonton Eskimos - Team Support

Regular users:

Community events, Community Recreation, Commonwealth Stadium organizers

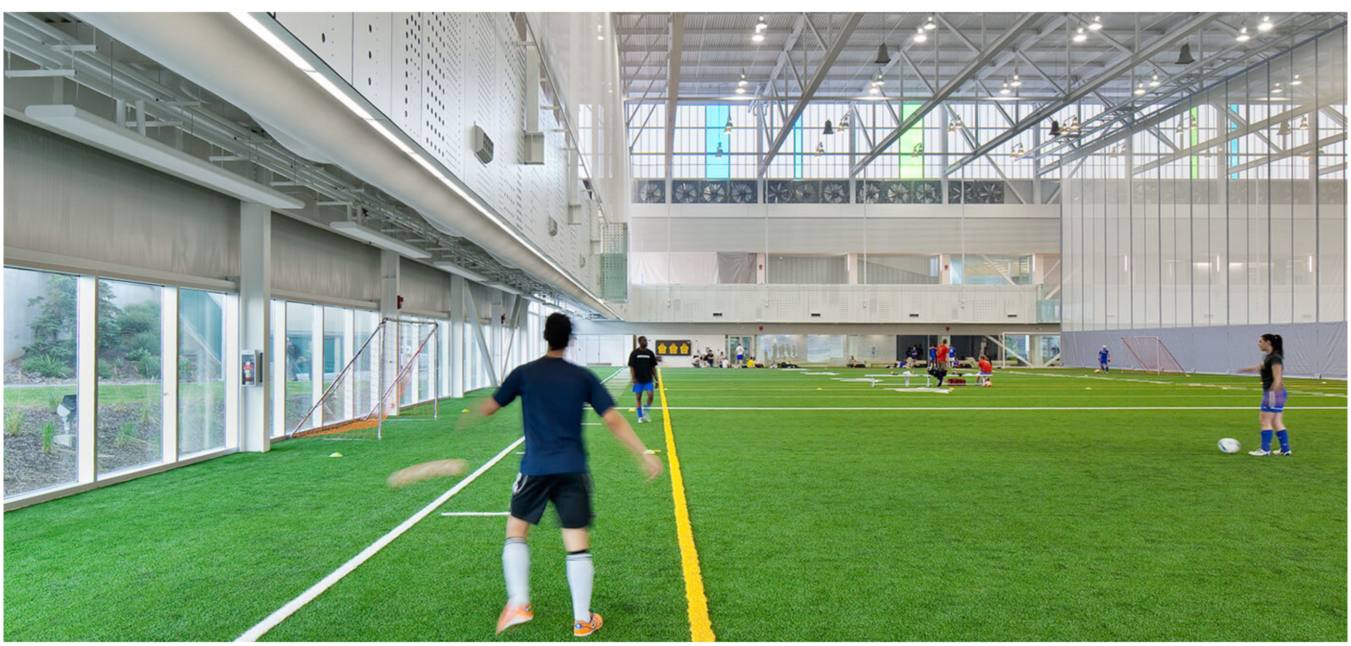
Spectator capacity: N/A

The Commonwealth Community Recreation Rentre consists of three main elements, the fieldhouse, aquatic centre and gymnasium. These spaces support use by the community, the nearby stadium ownership and the local professional football team. The running track and fieldhouse are designed as practice and play spaces not focused on high level competition.

This new facility represents the newest completed indoor field and practice space within the City of Edmonton, guaranteeing access to quality practice space all year-round. This amenity is used by the community as well as many sports clubs and activity programs to increase the performance of the competitors that access these facilities.

Users have concurrent access to the running track, pool, soccer fields, Batting cages, fitness centre, basketball volleyball and badminton courts, multi-purpose rooms and studios. Dividing and protective curtains separate the fields and courts to further allow for concurrent uses.

The Commonwealth Community Recreation Centre is a model for concurrent use to maximize the utilization of the building. The Foothills Athletics Centre and Fieldhouse should strive to achieve high levels of utilization by focusing on competition space for athletics and field sports that will be used by many sports and recreation users of all competition levels.



1ST CHOICE SAVINGS CENTRE

LETHBRIDGE, AB

Completed: 2007

Professional use:

University of Lethbridge Sports programs

Regular users:

Community events, Community Recreation, University student recreation

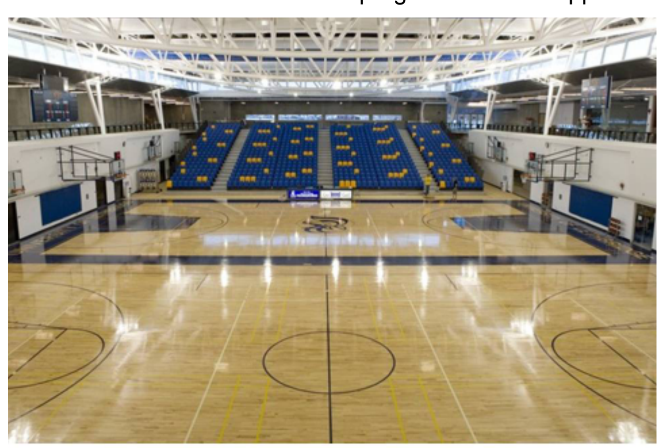
Spectator capacity: 2000

The facilities provided at the 1st Choice Savings Centre include:

- 3 multi-sport gymnasiums
- Fitness and training centre
- Four-lane 200 metre indoor running track
- Multi-purpose room and studios
- Kinesiology and Physical Education research facilities

As a part of the University of Lethbridge this new facility provides practice and recreation spaces for the students and sports development programs of the University. It supports research and development in sports performance and athlete training. The running track in the facility is not designed to any competition standard but provides year round opportunity for running training. Dividers and a variety of surface finishes support multi-sport concurrent use.

The Foothills Athletics Centre and Fieldhouse athletics performance and training facilities should be designed to allow for all levels of sports development support. Kinesiology research, professional training support, student athlete sport development, sports club resourcing, and open community access can all be facilitated by the performance and training facilities proposed for the project. This wide range of training and improvement users in many varied sports and recreation activities maximizes the overall utilization of the project. Future design effort and engagement with stakeholders in Calgary will determine what activities and programs can be supported.



3.5.7 ARCHITECTURAL SYSTEMS DESCRIPTION

The proposed fieldhouse is intended to be a legacy building for the City of Calgary, fitting into the recreation master plan by providing spaces for year round practice, play and competition. As a legacy building that will be used for daily practice, community sporting events and large scale competitions it is imperative for the facility to be constructed with durable materials and finishes. To meet the sustainability goals of the project and in order to control the operating costs and maintenance costs of the project the building will be comprised of efficient building systems within a durable envelope.

The main entrance of the facility is comprised of a multi-storey public concourse that will provide common access to multiple activity areas such as performance training and fitness testing areas, gymnasiums and a large competition arena containing a 400m oval running track and the field facilities. The public concourse will also be the connection point for future phase programs such as a twin ice arena and a natatorium.

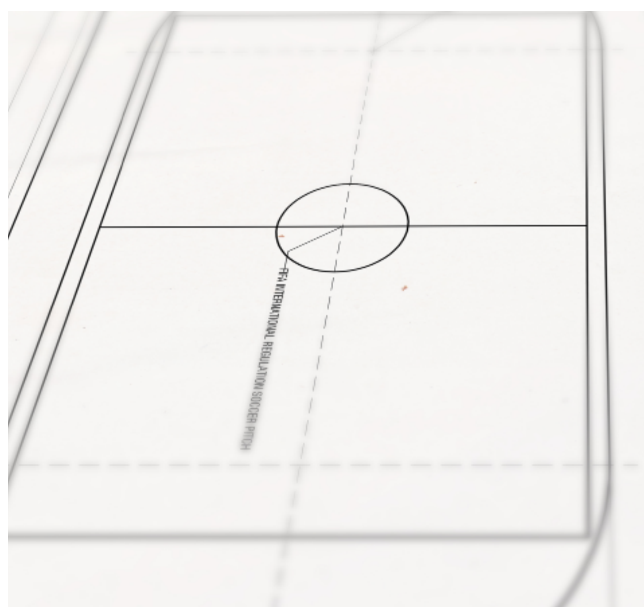
The track and field competition and practice space will be designed according to the Facility standards of the International Association of Athletics Federations. Designing the competition and practice track to the standards that are found in the documents provide by the IAAF will allow the building to be designated as a Class 1 or Class 2 competition space. This designation should attract training groups and national and international competitions to use the space. These standards define the size and radius of the track, the competition surface, the lighting and building services required for a training and competition space of this calibre.

The fitness facility space will be used to provide training support, strength and conditioning areas, group exercise rooms, sports medicine centre, change rooms and leasable space for the competitors and public.

In conjunction with the track and indoor field spaces this facility will provide a uniquely integrated training and performance facility that will be the focus of training and development programs and community uses alike. Change rooms for all activities will be provided and the location of the change rooms is selected to gain building efficiencies by planning for training, recreational, and aquatic participants to share consolidated facilities if possible. In addition, fieldhouse participants may share support facilities such as public washrooms, concessions, equipment storage and site management space within the fieldhouse.

The building envelope enclosure will be a high performance design to support a year-round athletic facility. The facility will have a long-span structural steel system supporting a metal standing seam roof over the competition space. The lower level flat roofs over the sport performance and training functions will be comprised of an SBS roof system. The exterior walls will be constructed as a pressure equalized rain screen that will ensure a long-lasting exterior finish with high thermal performance. The exterior cladding system is selected for durability, costs and aesthetics. A combination of composite metal panel, phenolic resin panels, masonry and glass is proposed to create an iconic piece of sports infrastructure that will be enjoyed by the people of Calgary for many years.

The envelope will be designed to maximize opportunities for natural daylight and views into the spaces while eliminating potential glare from the sun. High performance aluminum curtain wall with fixed triple-glazed sealed units will be employed where vision glazing can facilitate achievement of site views and the sun glare will be controlled using an exterior sun shading system. The public spaces and competition surface of the building will be subject to high volumes of traffic over many years of year-round use and will be selected for their performance, durability and sustainability characteristics.



3.5.8 STRUCTURAL SYSTEMS DESCRIPTION

The scope of this project is to allow for the construction of a new single facility containing a fieldhouse, 8 gymnasiums, and a single storey 250 stall parkade. To allow for the construction of the new facility an earth retaining structure is required along the north corner of the site (intersection of 24th Avenue and Crowchild Trail). The Conceptual Design Report provided (in Appendix B) summarizes the primary structural systems for the structures noted above, with the primary purpose of estimating each of their construction values at a schematic design level. Below summarizes the primary structural systems for each project component.

Track and Gymnasiums - Superstructure

The event level structure of the fieldhouse, the track and gymnasiums, will be comprised of a 300mm thick cast-in-place (CIP) reinforced concrete suspended slab, supported by reinforced CIP concrete columns. There are multiple structural roof framing concepts that can be explored. For this conceptual estimate exercise we have assessed several of those concepts and chosen a system to describe as the baseline, as it represents an efficient approach to meet the conceptual architectural design and it is a relatively straightforward system for which to develop an estimated budget. The roof structure will be comprised of four 12m deep primary long-span steel trusses, clear spanning the width of both the fieldhouse and the gymnasiums. The long-span steel trusses support secondary 4m deep trusses, steel beams, and roof deck. The clear span roof structure (spanning both the fieldhouse and gymnasiums) is the recommended baseline roof structural system. However an alternate framing system, of introducing an intermediate column line between the fieldhouse and the gymnasiums to reduce the roof span and costs, is provided for evaluation.

Parkade – Superstructure

The 250 stall parkade is conceptually located beneath the gymnasiums. The ground floor level of the parkade will consist of a 125mm cast-in-place reinforced concrete slab on grade.

Facility – Substructure

The facility is located in an area of Calgary known for soft soils. Based on geotechnical information obtained for projects in the surrounding area, the facility (fieldhouse and parkade) superstructures are anticipated to be supported on pile caps and drilled cast-in-place concrete piles ranging in depth from 8m to 20m, founded in the native sand/silt/clay soil.

Earth Retaining Structure

Due to the elevation difference (adjacent hill) and close proximity of the proposed facility to the adjacent roadways along 24th Avenue & Crowchild Trail, it is anticipated a separate soil retaining structure will be required along the northwest and northeast sides of the facility. As there is limited clearance between the proposed facility and the adjacent roads we recommend earth retaining walls (steel or concrete). This concept would allow for excavation and re-grading of the site with minimal disruption to the adjacent roadways.

This recommendation assumes expansion to Crowchild Trail will not affect the site grading and proposed retaining wall structure. Final and future proposed site grading along 24th Avenue and Crowchild Trail should be confirmed with The City of Calgary to better understand its impact to the conceptual design of this facility.

The structural schematic design report should be considered in conjunction with the drawings provided herein. In addition the report outlines further items that should be given consideration when developing a schematic estimated budget.
The complete structural conceptual design report prepared by RJC Engineering is included as part of Appendix B.

3.5.9 MECHANICAL SYSTEMS DESCRIPTION

The proposed mechanical systems for the Foothills Fieldhouse have been selected to:

- Provide a safe and comfortable indoor environment for all athletes and visitors.
- Provide exceptional indoor air quality for an enhanced user experience.
- Provide systems designed for longevity that are accommodating to maintenance and renewal.
- Be cost effective in design and energy efficient in operation.
- Utilize a pragmatic design philosophy with well tested and robust system and equipment choices.

The primary focus of any building mechanical system is to provide thermal comfort and acceptable indoor air quality, the two of which are critical elements that contribute to a facility occupant's well-being. Indoor environmental conditions such as mechanical system aesthetics, sound levels and energy efficiency all contribute to the promotion of well-being.

The complete mechanical schematic design report prepared by Remedy Engineering is included as part of Appendix 'B'.

3.5.10 ELECTRICAL SYSTEMS DESCRIPTION

The design for the new fieldhouse centre in Foothills Athletic Park will be completed in accordance with the various local standards, codes and guidelines for a LEED® project. In addition the IAAF standards will be referenced to ensure baseline compliance for the facility. In some cases the base design will not meet the IAAF standard but the facility will have the ability to enhance the existing system to meet the standard. The electrical design for the building includes but is not limited to: power distribution and branch circuitry, lighting design and control, and auxiliary systems design. Lighting throughout the building will be designed to provide a warm and inviting atmosphere while accenting and enhancing architectural features. The building is not considered to be a post disaster facility however consideration will be given to provisions to allow the building to operate in the event of a major event. The primary light sources are expected to be LED. In addition, day lighting and occupancy control will be used to reduce unnecessary energy consumption.

The distribution throughout the facility will be designed primarily with 600V to reduce line losses and decrease conductor sizes. It is proposed a diesel emergency generator be installed to service life safety loads along with any owner specified loads. The security system will be designed with a high amount of owner input, however, it is anticipated it will be comprised of intrusion detection, card access system, and CCTV in accordance to City of Calgary standards. Communication rooms will be located strategically throughout the building in order to limit wire distance to the end devices. A fibre backbone will be provided as a distribution medium for the building IT infrastructure. Select areas will have sound systems designed to suit the user's needs and requirements.

The complete electrical schematic design report prepared by SMP Engineering is included as part of Appendix 'B'.

3.5.11 LANDSCAPE SYSTEMS DESCRIPTION

Site landscaping forms a critical component of the character and quality of athletic parks. Locating the proposed Foothills Fieldhouse within an established site, the project presents opportunities to creatively integrate within and adapt to existing topography and vegetation to offer a contextually appropriate and functional landscape. As a fundamental principle, incorporation of low-water use, chinook hardy, native and adaptive landscaping is essential to provide a responsible, low-maintenance site.

The complete landscape narrative systems description prepared by SMM Landscape Architects is included as part of Appendix 'B'.

3.5.12 CIVIL ENGINEERING SYSTEMS DESCRIPTION

Currently, the area being developed is serviced from University Drive for the Water, Storm and Sanitary mains. We are expecting that this will be maintained for the planned development. On-site pipe networks will be modified to suit the building layout and provide future expansion as the entire parcel is developed. There are some services that currently flow through the site that will be accounted for by rerouting or by simply avoiding these locations during construction. Stormwater runoff will be detained on-site in an underground oversized pipe network as required by the City of Calgary.

The complete civil schematic design report prepared by Watt Consulting Group is included as part of Appendix 'B'.

4.0 PROJECT SCHEDULE

The potential timeline for the design & construction of the Foothills Athletic Park concept plan is shown in Figure 4.1 below. It suggests the following high level summary schedule indications:

- The Fieldhouse would take +/- 4.5 years from project detailed design start to full occupancy and use.
- Sequential construction of the remaining amenities indicate that the completion of the Foothills Athletic Park concept plan could take a further +/- 3 years.

Strategies to reduce the duration of construction for the Fieldhouse by up to +/- 1 year may include other construction procurement techniques that may accelerate construction timelines including sequential tendering and design build.

The schedule below assumes a linear sequence of consulting design, construction and regulatory approvals as well as funding approvals. Reductions to the timeline may be possible if some of these activities are permitted to occur simultaneously. The simultaneous approach carries risks associated with unforeseen delays and project changes and may require rework.

The schedule and cost estimate assume that construction management will be the project procurement method selected. Allocated lengths of time in the schedule are based on the typical permit circulation timing and expected design development and documentation duration for a building of similar complexity. Early in design development the schedule should be confirmed against the more defined project scope.

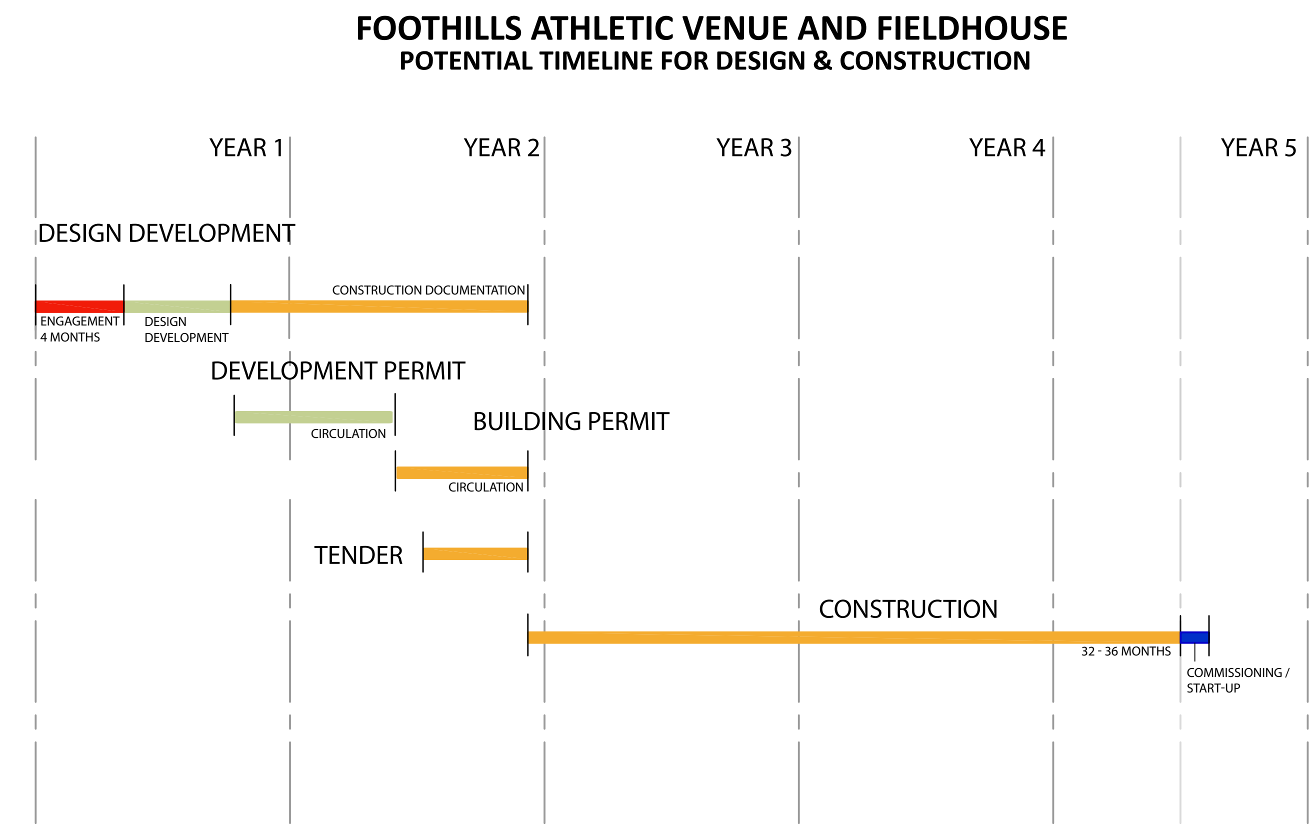


Figure 4.1

Potential Timeline for Design & Construction for the Foothills Athletics Centre and Fieldhouse

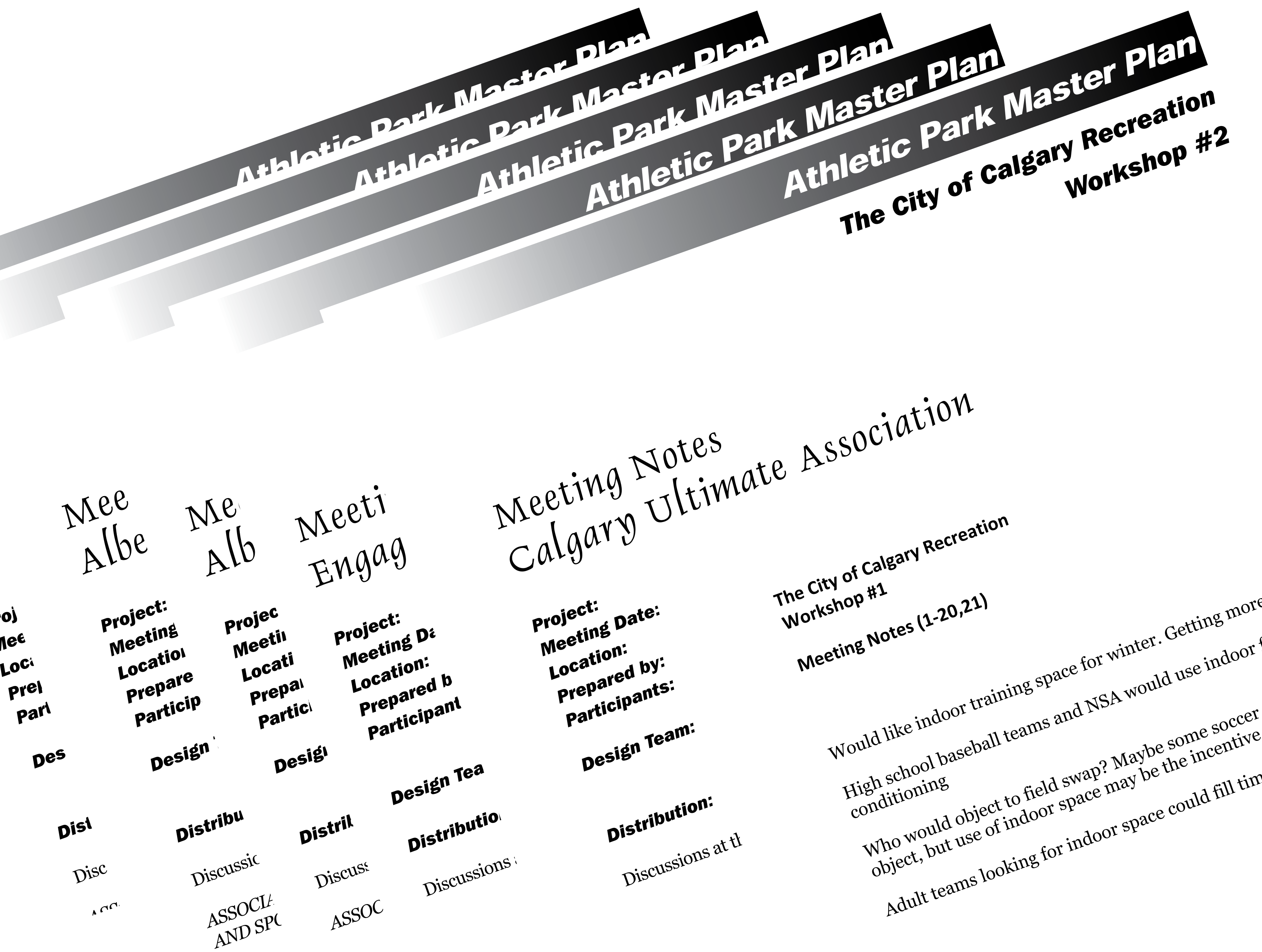
6.0 STATEMENT ON STAKEHOLDER ENGAGEMENT AND IDENTIFICATION

Previous Engagement

Extensive preliminary stakeholder engagement was completed previously with Sport and Recreation Group input, adjacent communities and stakeholders information sessions and open houses, and analysis of the needs and provision of sport facilities throughout the City of Calgary. The lessons learned in these engagement sessions have been incorporated into the facility programme and design concept. The conceptual design of the Foothills Athletic Centre and Fieldhouse has not deviated significantly since the initial report produced in 2010.

Expected Engagement

When the project progresses into design all stakeholders will be engaged once again to validate and expand on their needs and wants for consideration during the design process. This effort will be managed by city representatives with support by the future consultant team. It is anticipated that this process will be substantial and a 4 month placeholder is accounted for in the project schedule.



7.0 APPENDICES

APPENDIX A:
SITE AND BUILDING PLAN DIAGRAMS

1 EXISTING SITE PLAN

S2 architecture

EXISTING SITE PLAN

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE

CITY OF CALGARY RECREATION

218050

A1.0

Appendix A

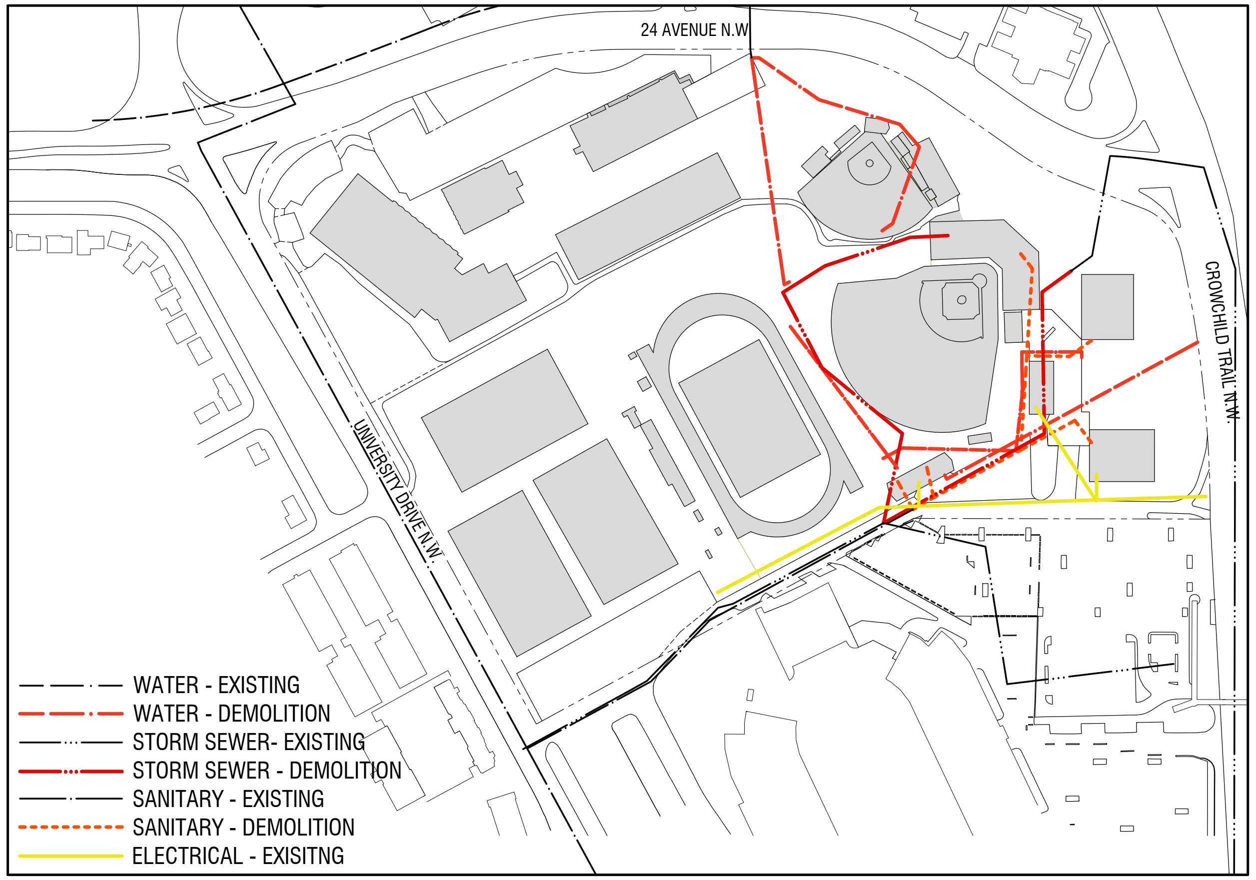
1 EXISTING SITE PLAN

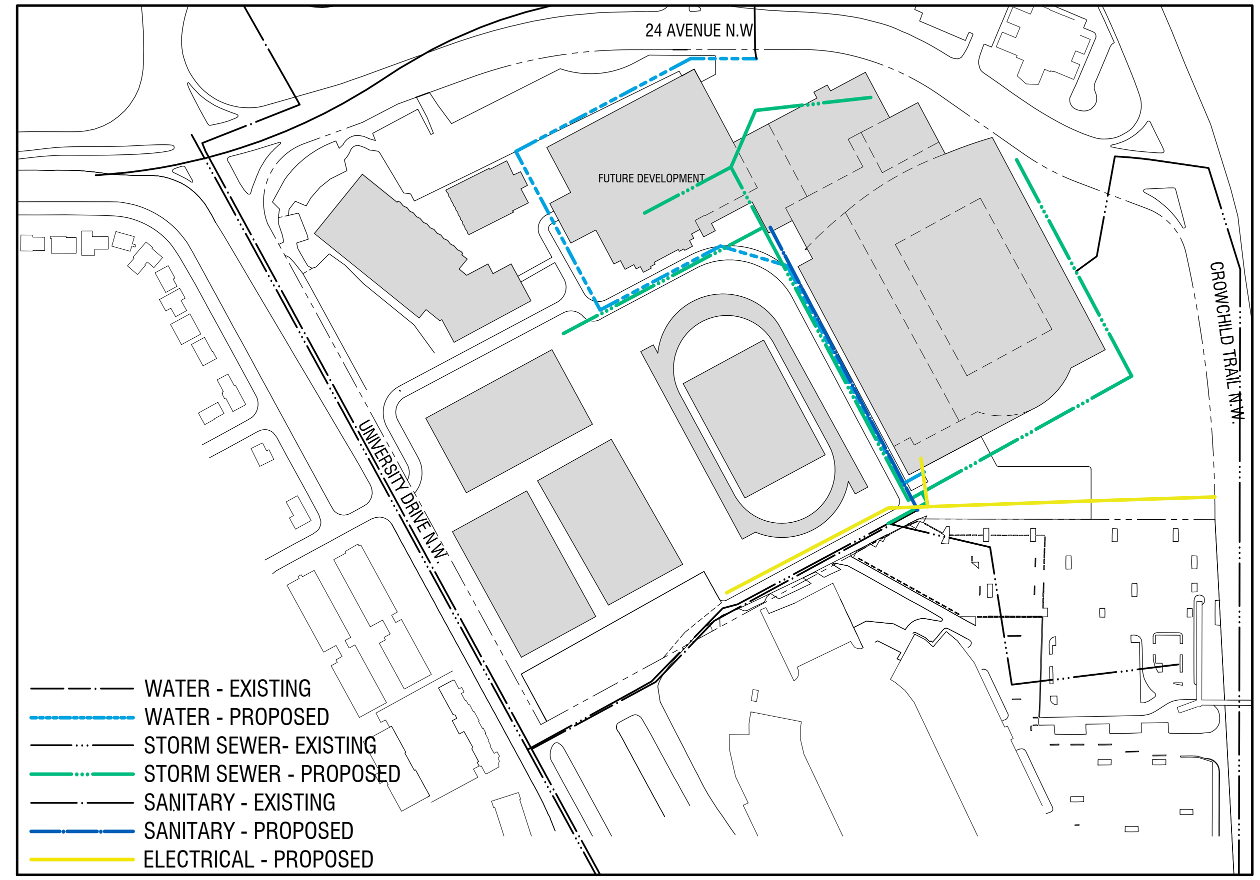
S2 architecture

MIRRORED FIELDHOUSE SITE PLAN

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
CITY OF CALGARY RECREATION
218050

A1.1





SERVICING DIAGRAM

2018-07-08

FOOTHILLS FIELDHOUSE

CITY OF CALGARY RECREATION

218050

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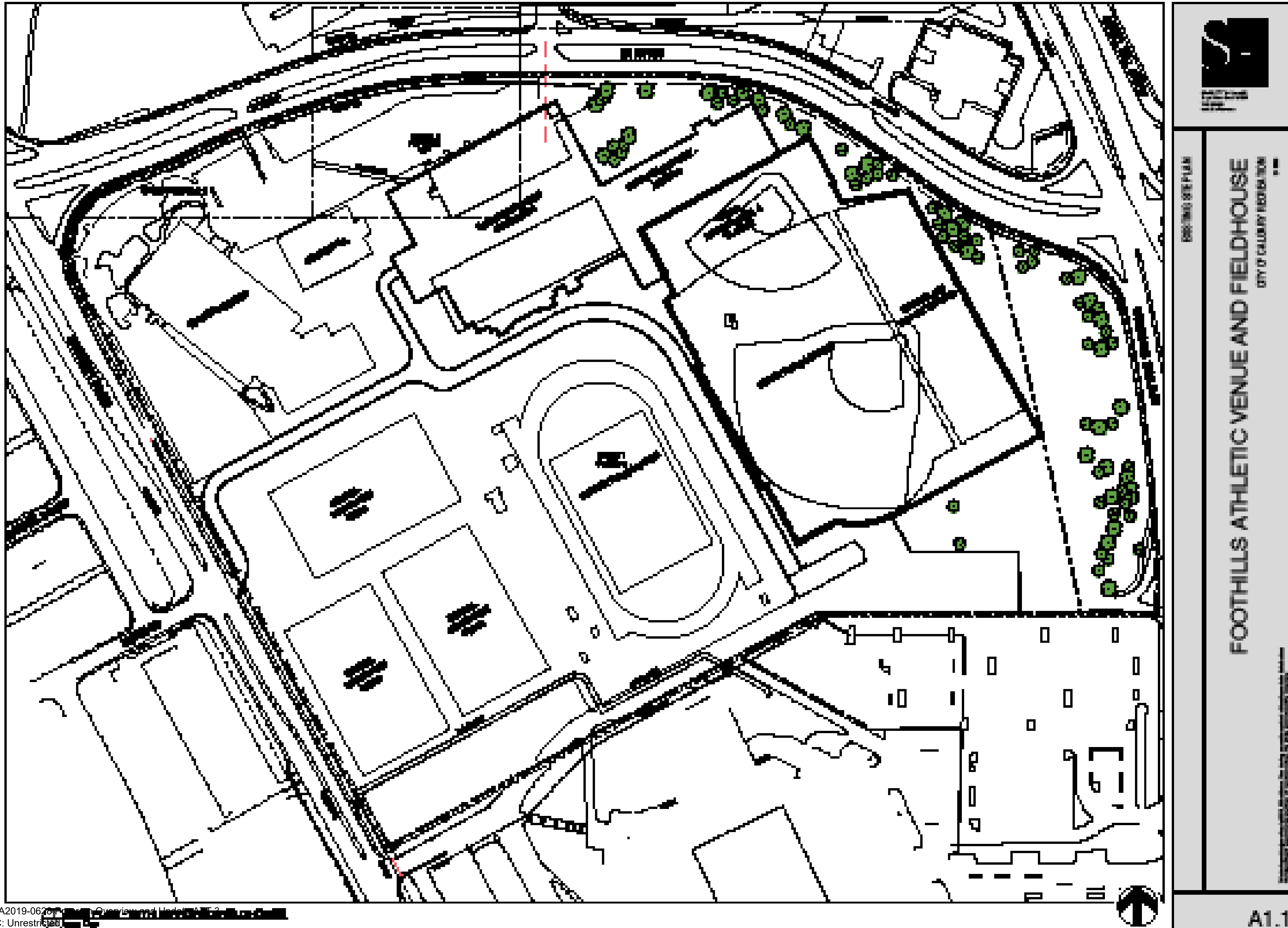

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
A1.1

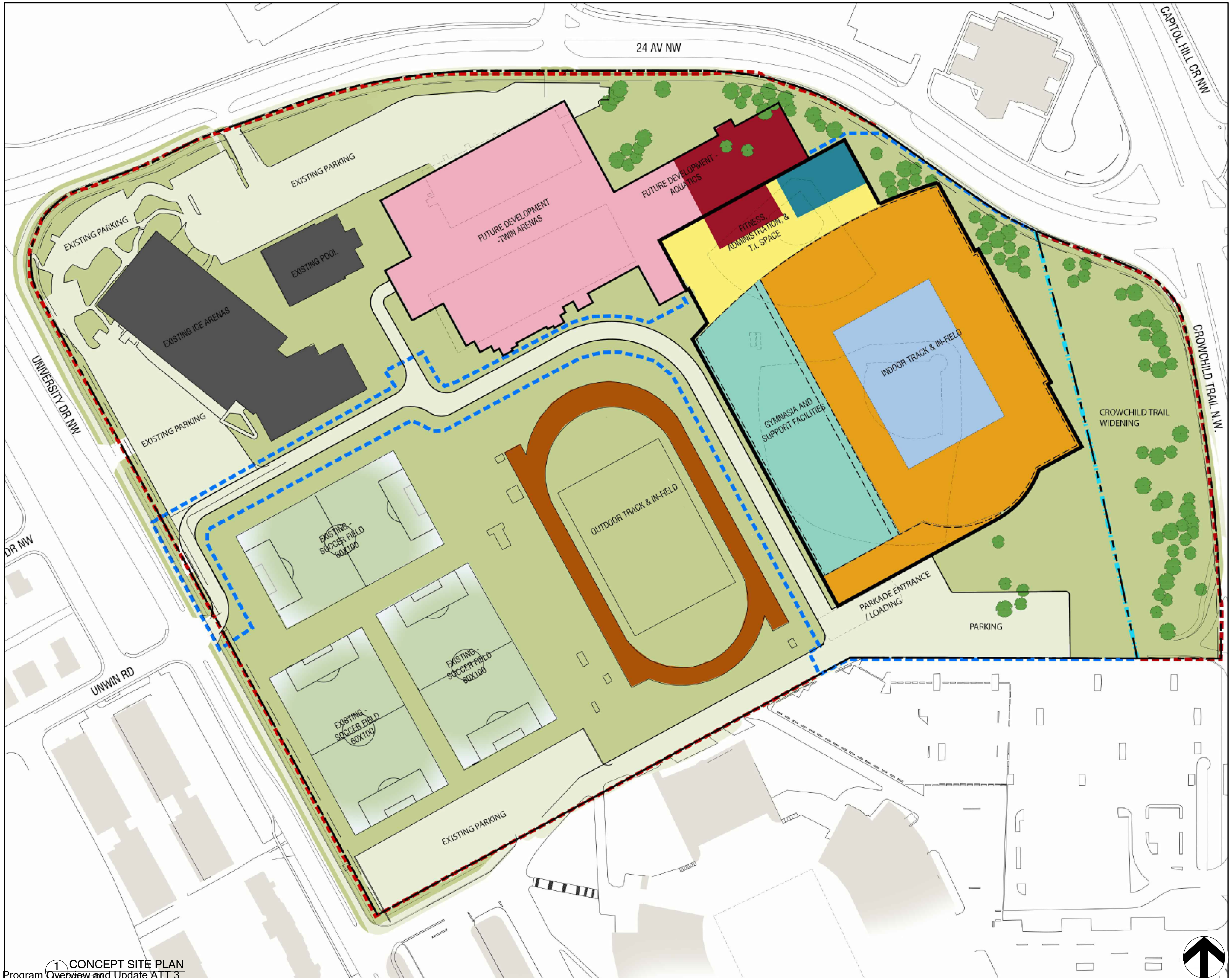
S2 architecture

DEMOLITION SITE PLAN

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
CITY OF CALGARY RECREATION
218050

A2.0

1 DEMOLITION SITE PLAN

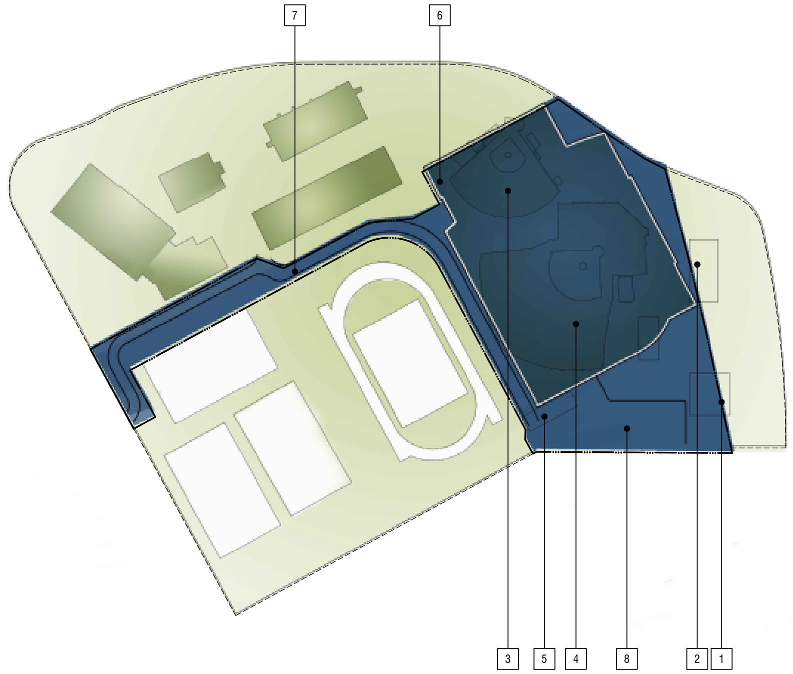


S2 architecture

CONCEPT SITE PLAN

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
CITY OF CALGARY RECREATION
218050

A3.0



Available Amenities

PLAYGROUND
COMMUNITY SPACE

FOOTHILLS POOL
3 POOL BASINS

FATHER DAVID BAUER ARENA
1 OLYMPIC SIZE ICE SURFACE

TWIN ARENA
1 OLYMPIC SIZE ICE SURFACE
1 NHL SIZE ICE SURFACE

GYMNASIA - CONVERTIBLE COURT SPACE
BASKETBALL COURTS, VOLLEYBALL COURTS, BADMINTON COURTS, OR LARGE PRACTICE SPACES

T.I. SPACE
SPORTS MEDICINE, PHYSIOTHERAPY, ETC.

2 RECTANGULAR FIELDS
2 RECTANGULAR FIELDS (ILLUMINATED, ARTIFICIAL TURF WITH P.A. SYSTEM)
1 RECTANGULAR FIELD (INDOOR TRACK INFIELD WITH P.A. SYSTEM)

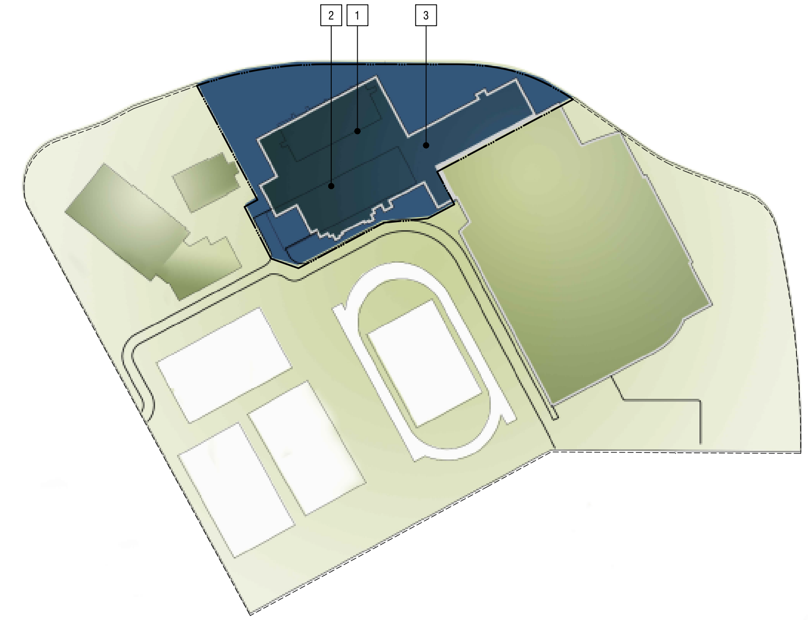
400m INDOOR TRACK WITH DEDICATED THROWING AREAS

400m OUTDOOR TRACK WITH DEDICATED THROWING AREAS

1 A4.0 Phase One

SCALE: 1:3000mm

1. DECONSTRUCT AND RECYCLE ABSOLUTE BASEBALL ACADEMY DOME;
2. DECONSTRUCT AND RECYCLE VIPER'S DOME;
3. DECONSTRUCT AND RECYCLE LITTLE LEAGUE FIELD #7;
4. DECONSTRUCT AND RECYCLE FOOTHILLS BASEBALL ARENA;
5. DECONSTRUCT AND RECYCLE FIELDHOUSE AT ANY TIME;
6. CONSTRUCT FIELD HOUSE, PORTION OF T.I. COMPONENTS, AND GYMNASIA.
7. UPGRADE EXISTING ACCESS ROAD;
8. RECONFIGURE PARKING.



Available Amenities

PLAYGROUND
COMMUNITY SPACE
CAFE / RESTAURANT
IMPROVED L.R.T. ACCESS

FOOTHILLS POOL (3 POOL BASINS)
AQUATICS AMENITY WITH 3 POOL BASINS (INCLUDING A DIVE TANK)

2 TWIN ARENAS
2 OLYMPIC SIZE ICE SURFACES
2 NHL SIZE ICE SURFACES

GYMNASIA - CONVERTIBLE COURT SPACE
BASKETBALL COURTS, VOLLEYBALL COURTS, BADMINTON COURTS, OR LARGE PRACTICE SPACES

T.I. SPACE
SPORTS MEDICINE, PHYSIOTHERAPY, ETC.

2 RECTANGULAR FIELDS (ILLUMINATED, ARTIFICIAL TURF WITH P.A. SYSTEM)
1 RECTANGULAR FIELD (INDOOR TRACK INFIELD WITH P.A. SYSTEM)

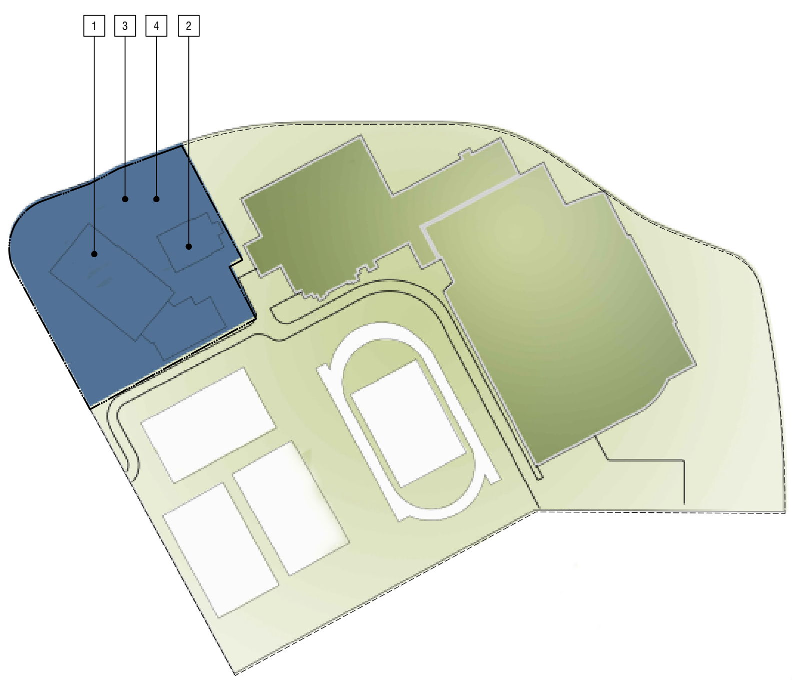
400m INDOOR TRACK WITH DEDICATED THROWING AREAS
400m OUTDOOR TRACK WITH DEDICATED THROWING AREAS

FITNESS SPACE
WEIGHT TRAINING, CARDIOVASCULAR TRAINING, MULTI-PURPOSE ROOMS

2 A4.0 Phase Two

SCALE: 1:3000mm

1. DECONSTRUCT AND RECYCLE VOLLEYDOME;
2. DECONSTRUCT AND RECYCLE EXISTING TENNIS COURTS;
3. CONSTRUCT AQUATICS AND ICE ARENA COMPONENTS;



Available Amenities

PLAYGROUND
COMMUNITY SPACE
CAFE / RESTAURANT
IMPROVED L.R.T. ACCESS

FOOTHILLS POOL (3 POOL BASINS)
AQUATICS AMENITY WITH 3 POOL BASINS (INCLUDING A DIVE TANK)

2 TWIN ARENAS
2 OLYMPIC SIZE ICE SURFACES
2 NHL SIZE ICE SURFACES

GYMNASIA - CONVERTIBLE COURT SPACE
BASKETBALL COURTS, VOLLEYBALL COURTS, BADMINTON COURTS, OR LARGE PRACTICE SPACES

T.I. SPACE
SPORTS MEDICINE, PHYSIOTHERAPY, ETC.

2 RECTANGULAR FIELDS (ILLUMINATED, ARTIFICIAL TURF WITH P.A. SYSTEM)
1 RECTANGULAR FIELD (INDOOR TRACK INFIELD WITH P.A. SYSTEM)

400m INDOOR TRACK WITH DEDICATED THROWING AREAS
400m OUTDOOR TRACK WITH DEDICATED THROWING AREAS

FITNESS SPACE
WEIGHT TRAINING, CARDIOVASCULAR TRAINING, MULTI-PURPOSE ROOMS

3 A4.0 Phase Three

SCALE: 1:3000mm

1. DECONSTRUCT AND RECYCLE FATHER DAVID BAUER ARENA AND NORMA BUSH ARENA;
2. DECONSTRUCT AND RECYCLE FOOTHILLS POOL;
3. COMPLETE CONSTRUCTION OF ADDITIONAL COURTS AND FACILITIES TO BE DETERMINED;
4. RECONFIGURE ACCESS AND PARKING.

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PHASING DIAGRAMS

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
CITY OF CALGARY RECREATION
218050

A4.0

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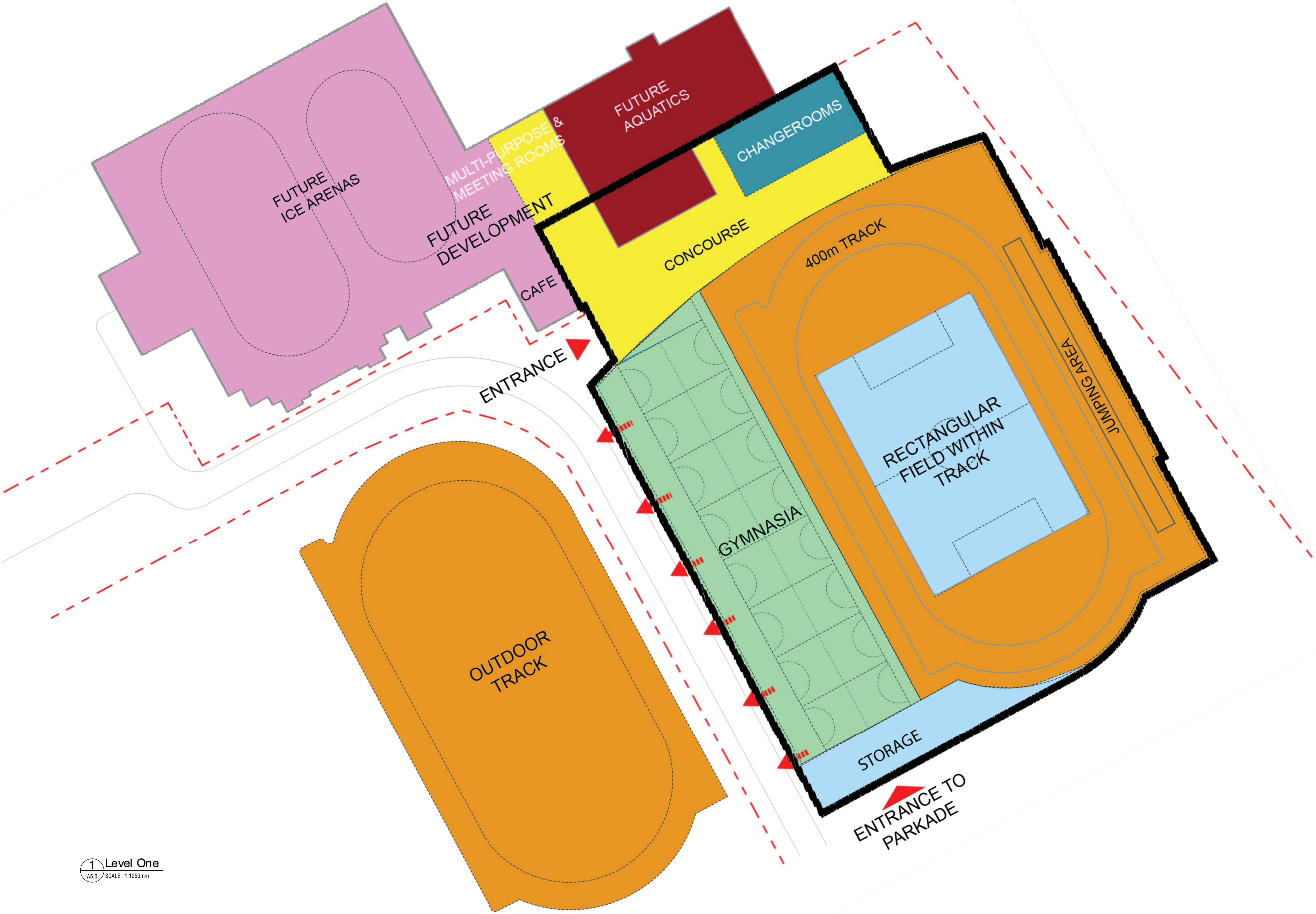


architecture

CONCEPT PLAN DIAGRAM - LEVEL 1

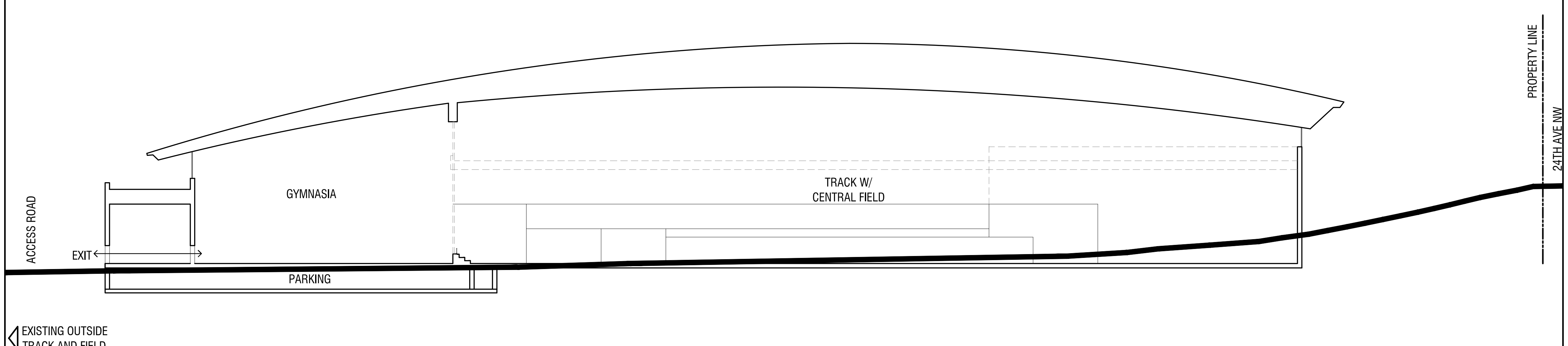
FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE

CITY OF CALGARY RECREATION

218050

A5.0

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
CITY OF CALGARY RECREATION
218050
CONCEPT PLAN DIAGRAM- LEVEL 1
A5.1



1 A5.2 CONCEPT BUILDING SECTION
SCALE: 1:300

S2 architecture

CONCEPT BUILDING SECTION

FOOTHILLS ATHLETIC VENUE AND FIELDHOUSE
CITY OF CALGARY RECREATION
218050

A5.2

APPENDIX B:
SYSTEMS DESCRIPTIONS REPORTS

Foothills Athletic Park - Fieldhouse

Calgary, AB

Conceptual Design Report – Primary Structure – DRAFT Rev5

August 08, 2018

RJC No. CAL.121139.0001

PREPARED FOR
S2 Architecture
Suite 900, 110 – 12th Avenue SW
Calgary, AB T2R 0G7

PREPARED BY
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RJC
Suite 500, 1816 Crowchild Trail NW
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TABLE OF CONTENTS

1.0 INTRODUCTION

Read Jones Christoffersen Ltd. (RJC) has been engaged to provide conceptual design of the primary structure of a new fieldhouse located at the Foothills Athletic Park, with the primary purpose of estimating construction values at a conceptual design level (class 4).

2.0 DESCRIPTION OF PROJECT WORK

The Foothills Athletic Park Fieldhouse project includes the following components:

a) A 26,050 m^2 single storey steel structure, with a main event level covering a fieldhouse and eight (8) gymnasiums. The fieldhouse will contain 2,500 permanent spectator seats with an allowance for an additional 7,500 temporary spectator seats.

b) A 250 stall, single storey below grade parkade, located beneath the event level (gymnasium area only).

c) An earth retaining structure along the north corner of the site (intersection of 24th Avenue and Crowchild Trail).

To provide conceptual design for the fieldhouse, we reviewed the comments and recommendations from the geotechnical report prepared by Golder Associates, dated February 16, 2007 (File: 06-1321-080). The Golder geotechnical report investigated and commented on sub-surface water flow and does not recommend, nor give guidance on, a building foundation system. To progress the conceptual design for the fieldhouse, we also reviewed comments and recommendations from geotechnical information of projects completed in the surrounding area. Note, additional geotechnical investigation is required to confirm assumptions made in this document.

3.0 STRUCTURAL CONSIDERATIONS

The sections below summarize the conceptual primary structural systems proposed for the new fieldhouse project, with the primary purpose of estimating construction values at a conceptual design level (class 4). The structural conceptual design narrative should be read in conjunction with the three conceptual structural drawings (S1.0, S2.0, and S3.0) listed in Appendix B.

3.1 Foundations

For the final project there are multiple structural foundation systems that can be explored to support the fieldhouse roof and event level/parkade. For this conceptual estimate exercise we have assessed several of those concepts and selected the system described below as the baseline.

The facility is located in an area of Calgary known for deep soft soils. Based on geotechnical information obtained for projects in the surrounding area, the fieldhouse and parkade superstructures are anticipated to be supported on pile caps and drilled cast-in-place concrete piles, founded in the native sand/silt/clay soil. It should be assumed temporary pile casings will be required to advance the piles through the overlying sandy layers, where encountered. The foundation system supporting a typical parkade column and fitness centre column will be comprised of 1200mm x 1200mm x 1000mm deep pile-caps and one (1) 910mm diameter continuous flight auger (CFA) concrete pile, approximately 8m long. The foundation system supporting a typical fieldhouse roof column will be comprised of 6600mm x 6600mm x 1800mm deep pile-caps and eight (8) 910mm diameter CFA concrete piles, approximately 20m long.

3.2 Parkade Foundation Wall

Historically, the story height for a single story below-grade parkade has ranged between 3200mm and 3800mm. Assuming a parkade storey height of 3800mm, the structural system around the perimeter of the parkade would be comprised of a 250mm cast-in-place reinforced concrete foundation wall supported on a continuous 600mm x 800mm deep grade beam, which in turn is supported on 910mm diameter CFA concrete piles (approximately 8m long) spaced at 4500mm on centre. The concrete foundation wall would span between the parkade and event levels.

3.3 Parkade Level

The 250 stall parkade is conceptually located beneath the gymnasium event level. We recommend the parkade floor structure be comprised of a 125mm reinforced concrete slab-on-grade (SOG) supported on a 200 mm layer of well compacted gravel, uniformly compacted to a minimum of 98 percent of SPMDD.

Some relative movement between the parkade slab-on-grade and adjacent walls or foundations, as well as minimal differential movements throughout the parkade should be anticipated. However, we would expect the movements will be within tolerance for parking use.

3.4 Event Level

The fieldhouse event level will be comprised of three program spaces; an athletic/soccer event area, eight (8) gymnasiums, and fitness centre & change rooms. The gymnasium area will support temporary bleacher seating to allow for up to 7,500 spectators. The design of the temporary bleacher seating has not yet been determined; therefore, for the purpose of a conceptual design we have assumed typical retractable bleachers with a service self-weight of 0.75 kPa (15 psf).

Delay slab strips are required for all three program spaces noted above. Assume 1000mm wide delay strips in both slab directions, 3 delay strips in the north/south direction and 3 delay strips in the east/west direction.

The following describes the recommended conceptual event level structural systems for the three program spaces noted above.

Athletic/Soccer Event Level Structure

The fieldhouse athletic (track and field) and soccer event area shall be compliant with the International Association of Athletics Federation (IAAF) indoor facility standards. The performance standards of the athletics surface require very tight tolerances for overall surface gradients. IAAF requires no high points or depressions exceeding 6mm beneath a 4000mm straightedge, or exceeding 3mm beneath a 1000mm straightedge, at any position and in any direction along the athletic surface. To achieve these stringent IAAF slab performance requirements, we recommend the fieldhouse athletic event level structure be comprised of a 150mm cast-in-place concrete slab on grade supported on a minimum 450mm engineered fill (gravel). The concrete slab on grade will be depressed to allow for a 15mm concrete levelling topping to achieve the IAAF requirements.

The structural system around the perimeter of the athletic/soccer area would be comprised of a continuous 400mm x 1200mm deep perimeter grade beam, which in turn is supported on 910mm diameter CFA concrete piles (8m long) spaced at 4500mm on centre.

Note, the fieldhouse athletic/soccer event level slab will require localized slab depressions for specific track and field events. These include: long jump sand pit, triple jump sand pit, steeplechase water pit, javelin throw facility, discus and hammer throw facility, pole vault facility, and high jump facility.

Gymnasium Event Level Structure

The event level structure supporting the gymnasiums (sport flooring assembly) and temporary bleacher seating requires a high level of slab performance with minimal slab movement. We recommend the event level structure supporting the gymnasium area be comprised of a 300mm cast-in-place concrete slab, with 3000mm x 3000mm x 500mm deep drop panels at each interior column. The suspended slab would be supported on 300mm x 900mm concrete columns at an assumed spacing of 9000mm on centre. Each concrete column would be supported on below-grade pile caps and piles.

To control differential movement of the slab due to site excavation, a 300mm structural slab on grade will be required between the gymnasiums and athletic/soccer area. The 300mm structural slab on grade will span approximately 6500mm and will be supported on a continuous 600mm x 800mm deep grade beam, which in turn is supported on 910mm diameter CFA concrete piles (approximately 8m long) spaced at 4500mm on centre.

Note, the gymnasium event level slab will be depressed to accommodate the gymnasium sport floor assembly.

Fitness Centre and Change Rooms Event Level Structure

The conceptual design locates the fitness centre and change rooms near current grade, with no parking below. The event level slab would be comprised of a 150mm cast-in-place concrete slab supported on grade. Because this area of Calgary is known for soft soils, it is recommended the 150mm event level concrete slab be supported on 450mm of engineered fill (gravel).

The change room shower area is assumed to be depressed 75mm to 125mm to accommodate a tiled floor assembly.

The structural system around the perimeter of the fitness centre and change rooms would be comprised of a continuous 400mm x 1200mm deep perimeter grade beam, which in turn is supported on 910mm diameter CFA concrete piles (8m long) spaced at 4500mm on centre.

3.5 Lower Roof Area

The lower roof area is situated above the change/storage rooms (court, track, and soccer) as well as the mechanical penthouse. This section conceptually describes a structural system for each of the two areas.

Low Roof Structure – Above Fitness Centre, Change Rooms, and Storage Rooms

We recommend the structure above the fitness centre, change rooms, and storage rooms (and roof above the mechanical penthouse noted below) be comprised of 38mm thick steel deck, supported by 650mm deep open web steel joists (OWSJ) spaced at approximately 1800mm on centre. In turn, the

OWSJ are supported on W460 and W610 edge and interior beams, respectively; each spanning approximately 9000mm between W250 columns, supported on below-grade pile caps and piles.

Based on the system described above, a structural steel allowance of 40 kg/m^2 is estimated for the low roof structure. This allowance is inclusive of the perimeter steel columns and steel braced frames, but does not include the roof deck.

Low Roof Structure – Mechanical Penthouse

We recommend the structure supporting the roof-top mechanical penthouse be comprised of 38mm thick composite steel deck with 152mm concrete topping (190 mm total), supported by W530 beams spaced at approximately 1500mm on centre. In turn, the W530 beams are supported on W690 and W760 edge and interior beams, respectively; each spanning approximately 9000mm between W310 columns, supported on below-grade pile caps and piles. The roof structure above the mechanical penthouse is similar to the low roof structure described above for change/storage rooms.

Based on the system described above, a structural steel allowance of 95 kg/m^2 is estimated for the low roof mechanical penthouse structure. This allowance is inclusive of the perimeter steel columns and steel braced frames, but does not include the roof deck. An allowance should be made for topping and housekeeping pads within the mechanical room.

3.6 Fieldhouse Roof

For the final project there are multiple structural concepts that can be explored to support the fieldhouse roof. For this conceptual estimate (class 4) exercise we have assessed several of those concepts and selected the system described below as the baseline. It represents an efficient approach to meet the conceptual architectural design and it is a relatively straightforward system for which to develop an estimated budget. In-keeping with the concept of a legacy project, the concept described below is adaptable and can be varied depending upon final architectural considerations. Potential alternative systems, worthy of consideration in subsequent project phases are described at the end of this section.

The fieldhouse roof may be supported by long-span structural steel trusses. The conceptual baseline design consists of four primary trusses spanning in the north-south direction over the gymnasiums and the athletics/soccer field. This configuration creates a column free space that allows for unobstructed sightlines for the 7,500 temporary seating that will be used for select track and field events. The primary trusses are spaced at approximately 36 meters on centre. The top chord of the primary trusses will follow the unique architectural profile of the roof, consistent with the goal of making the fieldhouse a legacy project for Calgary. The bottom chord will also be sloped and shaped to reflect the architectural profile of the roof, while maintaining the minimum clearance requirements over the field. The overall depth of the primary trusses has been determined to provide a structurally efficient system that also respects and responds to the architectural design of the fieldhouse roof. The depth of the primary trusses varies based on the roof profile, with an approximate maximum depth of 12 meters at mid-span. To further optimize overall roof steel tonnage, grade 450 MPa (GR65) structural steel can be utilized for the truss chords and heavier truss diagonals and verticals.

Secondary girder trusses will span between the primary trusses and are spaced to align with the panel points of the primary truss. The secondary trusses are approximately 4 meters deep to allow for shop fabrication and shipping to the project site. W460 in-fill roof beams will span north-south at approximately 4.5 meters on center to align with the panel points of the secondary girder trusses.

The in-fill beams will have mid-span bridging to brace the beam bottom flange against wind-uplift. 76mm deep acoustic steel roof deck will span between the W460 infill beams to support the roofing membrane and finishes.

At select, discrete locations, diagonal bridging will be provided from the secondary trusses down to the bottom chord of the primary trusses for overall stability and bracing of the primary truss bottom chord. Additional in-plane diagonal framing will be provided at the top chord of the roof for stability and to deliver lateral forces to the braced frames that are distributed on all four sides of the facility.

Additional secondary framing may be required to support any required catwalks, or additional rigging support locations.

Based on the long-span system described above, the following structural steel allowances shown in Table 1 are estimated for the fieldhouse roof. These allowances are inclusive of the perimeter steel columns and steel braced frames described in Section 3.8.

Estimated Structural Quantities – Fieldhouse Roof			
Element	Structural Member	Quantity Estimate	Comments
(4) Primary Long-Span Trusses	Wide-Flange Shapes	50 kg/m^2	- Average over entire roof area - Assumes Grade 450 steel
Secondary Trusses and Bridging/Bracing	Wide-Flange and Double Angle Shapes	35 kg/m^2	- Average over entire roof area
In-Fill Roof Beams	Wide-Flange Shapes	18 kg/m^2	- Average over entire roof area
In-Plane Horizontal Truss Diaphragm Framing	Wide-Flange Shapes	7 kg/m^2	- Average over entire roof area
Perimeter Columns, Braced Frames and Secondary Wind Girts to Support Enclosure	Wide-Flange Columns and Beams HSS Wind Girts	60 kg/m^2	- Average over entire roof area
Long Span Roof – Steel Deck	Steel Roof Deck	76 mm	- Acoustic deck
Total Fieldhouse Primary Steel Framing		170 kg/m^2	- Average over entire roof area

Table 1: Estimated Structural Quantities – Fieldhouse Roof

Notes:

1. *All quantity estimates are inclusive of element specific connection factors*
2. *The cost estimate should include an additional allowance for miscellaneous steel for catwalks, A/V support framing, graphic/signage support framing, videoboard support framing, additional rigging framing, and other secondary steel framing.*

As previously noted, there are several alternate structural concepts to the baseline structural scheme described above that may be worthy of further study and assessment in subsequent project phases. In addition, the final architectural design may lead to a desire to explore alternate structural solutions to the field house roof. Specifically, consideration should be given to a two-way truss system and also a cable-stayed roof system. The two-way truss system may pose a potential benefit through a possible reduction in truss depth, however, additional shoring and field fabrication is required and a discussion with a steel erector is required to determine potential cost benefits. The cable-stayed roof system would introduce masts that would extend well above the roof surface, with cables splayed from the mast to support the primary roof framing, similar to a bridge structure. Comparable to the two-way system described above, there would be a reduction in the depth and weight of the structure below the roof surface while the masts and cables have potential to create a unique architectural expression, enhancing the goal of creating a legacy project. The cable-stayed system would have cost premiums associated with the masts, cables, and the construction methods required for that type of system that may offset the savings of the reduced roof steel tonnage. In addition, the cable-stayed roof system may not be consistent with the final architectural design and there are unique environmental challenges associated with this option.

ALTERNATE FRAMING OPTION – INTERMEDIATE COLUMNS

The clear span roof structure (spanning both the athletic/soccer event area and the gymnasiums) is the recommended baseline roof structural system. However, an alternate framing system would introduce intermediate columns between the athletic/soccer event area and the gymnasiums. The intermediate columns would align with the four primary long-span trusses, reducing their span and depth. The estimated total fieldhouse primary steel framing tonnage for this alternate would reduce from 170 kg/m^2 to 140 kg/m^2. The addition of the intermediate columns would have a negligible impact to the foundation cost.

3.7 Fieldhouse Roof – Temporary Erection Costs

The cost model for the field house roof should capture the cost premiums associated with the means and methods and temporary erection costs associated with this type of long-span steel construction, through higher unit costs for the structural steel tonnage associated with the roof. Based on our experience, we expect the four primary trusses would be fabricated on site, in halves, and then lifted into place. The truss' mid-span would be supported by temporary shoring towers with splices between the two halves made in the air. We expect a minimum of two shoring towers total. After the first two primary trusses are erected with adequate in-fill framing to tie-into the braced frames, the trusses could be de-shored and the shoring tower could be re-used to erect the remaining two primary trusses. Alternately, there could be schedule benefits to utilizing four shoring towers to erect the entire roof system at once.

3.8 Lateral and Gravity Load Resisting System – Fieldhouse Only

The fieldhouse roof will be supported by wide flange columns distributed around the perimeter at 9 meter spacing on the north and south sides and 12.5 meter spacing on the east and west sides of the fieldhouse, to align with the spacing and modules of the long-span roof truss system described above. In addition to supporting the roof, the perimeter columns will support the building enclosure system, including wind forces against each face of the building. To provide adequate strength and stiffness, W760 to W1000 column shapes are anticipated. HSS wind girts at regular spacing up the height of the perimeter walls will span between the columns and provide back-up support and connection points for the building enclosure system.

Lateral forces due to wind or seismic events will be resisted by in-plane roof bracing and braced frames distributed around the perimeter of the fieldhouse. Two braced frames per side are envisioned. The braced frame system will engage select perimeter W760 columns, along with wide flange or HSS beams and diagonals to provide overall stability to the fieldhouse.

At the event level, the lateral forces from the field house braced frames will be transferred directly to piles or through the grade level concrete slab to be resisted by the parkade concrete structure below.

3.9 Site Slope Stability

Due to the elevation difference and close proximity of the proposed fieldhouse structure to the adjacent transportation right-of-way along 24th Avenue & Crowchild Trail, it is anticipated a separate soil retaining structure will be required along the northwest and northeast sides of the facility. We recommend re-grading the slope of the northwest embankment to minimize the size and extent of the soil retaining structure. As there is limited clearance between the proposed facility and the adjacent roads, we recommend either a cantilevered secant concrete pile or cantilevered steel sheet pile soil retaining system. This would allow for excavation and re-grading of the site with minimal disruption to the adjacent roadways. Final heights of the soil restraining system will vary depending on the height of retained soil, but it is anticipated the soil retaining system would project on average 4m above the event level and 8m below the event level for approximately 205 linear meters of the facility. As discussed in Section 5.0, the soil retention system must form part of the north-slope water control system.

Please note the above recommendations assume expansion to Crowchild Trail will not affect the site grading and proposed retaining wall structure. Final and future proposed site grading along 24th Avenue and Crowchild Trail should be confirmed with The City of Calgary to better understand its impact to the conceptual design of this facility.

4.0 NON STRUCTURAL CONSIDERATIONS

This conceptual design report is intended to describe the structural systems and summarize the primary structural design criteria for the purposes of estimating construction values at a conceptual design level (class 4). The structural conceptual design report should be considered in conjunction with the architectural report. In addition, the following items should be given consideration when developing a conceptual estimated budget.

Allowances must be made for secondary structure, special structures and atypical elements consistent with this building type. Examples of such elements are as follows.

i. Secondary framing for the support of cladding, louvers, screens and glazing
ii. Secondary framing for mechanical equipment and at electrical rooms
iii. Secondary framing for floor and roof openings as well as sleeves for floor penetrations
iv. Skylights, catwalks and other miscellaneous structural steel indicated on the architectural drawings
v. Parapets and roof projections
vi. Support for hanging partitions and miscellaneous fieldhouse equipment
vii. Housekeeping pads, ramps, and curbs
viii. Stairs, stair landings, and framing for elevators between floors
ix. Exterior structures such as retaining walls, planters, walkways, curbing and the like
x. Window washing and fall arrest requirements
xi. Roof snow restraining systems

5.0 GROUND WATER CONTROL

As identified in Golder Associates geotechnical report, there is significant ground water discharge from the north end of the site (along 24th Avenue and Crowchild Trail). The ground water table is located approximately 700mm below existing grade, and is expected to rise to the surface with increase discharge from the north-slope during spring run-off. We recommend intercepting the water discharge at the toe of the north-slope (north face of the new facility) with the purpose of routing the water around the facility, minimizing water flow beneath it.

The water interception system will be integrated with the soil retaining structure described above.

6.0 ASSUMPTIONS

The following assumptions have been made with respect to the conceptual design report:

i. Construction loads will not exceed the design loads noted in this document. Shoring will be provided during construction to ensure typical floor areas and non-typical areas will be adequately shored. Temporary support will be provided for structural work adjacent to existing structures.

ii. Except where specifically noted otherwise, construction tolerances are as described in CSA A23.1/A23.2 for concrete construction and as per CSA S16 for steel construction.

7.0 RISK ASSESSMENT

The following is a list of items in the design process or inherent in this particular project which may create risk to the Owner and should be reviewed in more detail to mitigate this risk. This list will be refined as the design progresses.

i. Design continues to evolve in parallel with the design by other consultants and through an evolution of the program requirements. We recommend a Design Contingency be carried to reflect the conceptual nature of the available information.

ii. Based on our experience, we recommend a Construction Contingency be carried to cover the effect of unforeseen site conditions and unexpected construction process items, such as varying foundation conditions, construction sequencing, the need for temporary bracing or shoring, etc.

iii. We also recommend an Escalation Contingency be carried to cover the effects of the escalation in construction costs from the time the cost estimate is prepared to the estimated start of construction.

Yours truly,

READ JONES CHRISTOFFERSEN LTD.

8 August 2018

Mark Ritchie PEng, BSc, MSc
Associate
APEGA PERMIT TO PRACTICE NUMBER P0152

REVIEWED BY

Rein Matiisen PEng, BSc, MSc
Principal

APPENDIX A – SUMMARY OF DESIGN CRITERIA

Unless otherwise noted, the design criteria for this project are summarized as follows:

A.1 DESIGN CODES AND STANDARDS

- Alberta Building Code (ABC), 2014 or National Building Code of Canada (NBC), 2010
- CSA S16 – "Design of Steel Structures"
- CSA A23.3 – "Design of Concrete Structures"
- CSA A23.1/A23.2 "Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete"
- CSA S304.1– "Design of Masonry Structures"
- CSA O86 – "Engineering Design in Wood"

A.2 DESIGN LOADS – GENERAL

Design loads adhere to code requirements and are based on the intended building uses, building finishes and proposed building equipment. The importance factor for load types is based on the importance category. It is assumed the building is classified as NBC Importance category "Normal" based on its use. The resulting Importance Factors are summarized in Table 2.

	Importance Factor	
Load Type	Ultimate Limit States (ULS)	Serviceability Limit States (SLS)
Snow & Rain	1	0.9
Wind	1	0.75
Earthquake	1	N/A

Table 2: Building Importance Factor

A.2.1 DESIGN SUPERIMPOSED DEAD LOADS

Design superimposed dead loads (excludes structural self-weight) are based on the assumed roof and floor assemblies noted in the architectural conceptual report. The following specified superimposed dead loads were assumed:

Fieldhouse Roof .... 0.60 kPa

Low Roof .... 2.75 kPa

Event Level .... 1.50 kPa

Typical Parking Level .... 0.50 kPa

Mechanical Rooms .... 3.60 kPa

A.2.2 DESIGN LIVE LOADS

Specified uniform live loads used for design are below. Live load reduction factors are utilized to the extent as outlined by the code.

Fieldhouse roof live load .... 1.00 kPa

Fieldhouse roof snow load .... 1.20 kPa

Low roof live load .... 1.00 kPa

Low roof uniform snow load (excluding drifting) .... 1.00 kPa

Event level .... 7.20 kPa

Parking .... 2.40 kPa

Mechanical Rooms .... 7.20 kPa

Specified concentrated fieldhouse roof load (applied to structural steel members) .... 12.00 kN

Specified concentrated low roof load (applied to structural steel members) .... 9.00 kN

Specified concentrated event level load .... 22.00 kN

A.2.3 DESIGN WIND LOADS

Design wind loads are calculated as per the Alberta Building Code (ABC), using a 1 in 50 year return wind reference velocity pressure using the climatic data for the city in which the building will be located. For this project in the City of Calgary q (1/50) = 0.48 kPa.

A.2.4 DESIGN SEISMIC LOADS

Seismic design loads are calculated as per ABC based on a 2% probability of exceedance in 50 years using design data for the city in which the building will be located. For this project in the City of Calgary: Sa (0.2) = 0.150, Sa (0.5) = 0.084, Sa (1.0) = 0.041, Sa (2.0) = 0.023 and PGA = 0.088.

The seismic force resisting system (SFRS) will be conventional construction, steel braced frames (assembly occupancies). R_d = 1.5 and R_o = 1.3 as per ABC.

A.3 DEFLECTION CRITERIA

The structure shall be designed to minimize the effects of deflections including the effects of long-term creep in concrete. The limitations are as per CSA S16, Design of Steel Structures, for steel structures and CSA A23.3, Design of Concrete Structures, Concrete Structures.

Deflection Criteria Summary (Live Load)

Typical fieldhouse roof .... TBD

Typical low roof Span/240

Maximum Wind Storey Drift Height/400

Seismic Storey Drift Height/40

APPENDIX C – STRUCTURAL MATERIALS

Unless otherwise noted, structural materials shall meet the following specifications and requirements:

C.1 STRUCTURAL STEEL AND CONCRETE REINFORCEMENT

W Sections: .... Grade 350W CAN/CSA-G40.20/G40.21 or

Grade 50 (345MPa) ASTM A992/A992M

W Sections Field House Roof: .... Grade 65 (450MPa) ASTM A913

WWF Sections: .... Grade 350W CAN/CSA-G40.20/G40.21

Channels, Angles & Plates: .... Grade 350W CAN/CSA-G40.20/G40.21

HSS Sections: .... ASTM A500 Class C

Steel Reinforcement for Concrete .... CSA G30 Series (F_y = 400MPa)

C.2 REINFORCED CONCRETE STRENGTHS

Reinforced concrete shall meet the requirements of CSA A23.1/A23.2-14 "Concrete Materials and Methods of Concrete Construction/Methods of Testing for Concrete" and shall generally adhere to the following requirements shown in Table 3.

Element	Concrete Strength (MPa) (f'c @ 28d)	Exposure Class
Parkade Slab on Grade	35	C2
Event Level Slab on Grade	35	N
Event Level Structural Slab on Grade	35	N
Event Level Slab	35	N
Foundation Walls	35	N/F1
Parkade Columns Supporting Fieldhouse	55	C1
Columns Supporting Event Level	35	C1
Pile Caps Supporting Fieldhouse Columns	45	C1
Pile Caps Supporting Event Level Columns	35	C1
Piles Supporting Parkade Columns	35	N
Concrete Topping on Metal Deck	25	N
Secant Soil Restraining Pile	35	F1

Table 3: Reinforced Concrete Strengths

Foothills Fieldhouse

City of Calgary Recreation

Mechanical Schematic Design Report

Remedy Project No.: 18-107

August - 2018

Prepared For:

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1 Introduction

This report outlines the proposed mechanical schematic design for the Foothills Fieldhouse. The mechanical systems have been selected to:

- Provide a safe and comfortable indoor environment for all athletes and visitors
- Provide exceptional indoor air quality for an enhanced user experience.
- Provide systems designed for longevity that are accommodating to maintenance and renewal
- Be cost effective in design and energy efficient in operation
- Utilize a pragmatic design philosophy with well tested and robust system and equipment choices

The primary focus of any building mechanical system is to provide thermal comfort and acceptable indoor air quality, the two of which are critical elements that contribute to a facility occupant's well-being. Indoor environmental conditions such as air temperature, humidity levels, presence of drafts, and other design considerations such as mechanical system aesthetics, sound levels and energy efficiency all contribute to the promotion of well-being.

2 Design Criteria

2.1 External Design Criteria

External design conditions are as per the Alberta Building Code and ASHRAE recommendations as described below. Individual systems and components may be designed to slightly different criteria as discussed in the respective sections.

- Outside design dry-bulb temperature, Heating: -34°C is the design heating temperature, per Alberta Building Code
- Standard cooling design condition, Cooling: 28°C DB/19°C WB per Alberta Building Code

2.2 Internal Design Criteria

Internal comfort conditions are designed to comply with ASHRAE Standard 55-2010 for regularly occupied spaces.

Design Criteria:

SPACE TYPE	COOLING DESIGN TEMP. (°C)	HEATING DESIGN TEMP. (°C)	DESIGN RH (%)
Fieldhouse	N/A	18	Uncontrolled
Gymnasium	18	18	Uncontrolled

Change rooms	24	24	Uncontrolled
Lobby, Educational and Administrative Spaces, MPR’s	24	22	Uncontrolled
Meeting Rooms	24	22	Uncontrolled
Elevator Machine Rooms	29	–	N/A
IT/Telecom Rooms	18-24	–	N/A

Notes:

.1 The indoor design temperature is the temperature at which the systems are sized. The system and space set point temperatures may be operated at different temperatures from above.

.2 Spaces will not be actively humidified or dehumidified.

Special Exhaust Systems

All washrooms and food service areas will be served by dedicated exhaust systems. The change room wet areas will be fully exhausted with no recirculation.

3 Code and Code-Reference Standards

3.1 Applicable Codes and Standards

The mechanical design shall comply with the most current version of the following codes and industry standards:

- Alberta Building Code 2014
- National Energy Code Building (NECB 2011), Canada
- Plumbing Code of Canada 2015
- Alberta Fire Code 2006
- CAN/CSA B149.1 Natural Gas Installation Codes
- National Fire Protection Association (NFPA) Standards
- Canadian Standards Association (CSA)
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- ASHRAE 55-2010 Thermal Environmental Conditions for Human Occupancy
- ASHRAE 62.1-2001 Ventilation for Acceptable Indoor Air Quality
- ASHRAE 90.1-2010 Energy Standard for Buildings

3.2 Life Safety Systems

No optional life safety systems are required. Smoke control systems are not required, and no stairwells or elevators will be pressurized or vented.

4 Site Services

The plumbing utility design responsibility terminates 1m from the edge of the building. Our mechanical design will coordinate the natural gas, water, sanitary sewer and storm sewer utilities with the civil consultant beyond that point.

4.1 Natural Gas

A natural gas connection will be required to supply heating boilers, domestic water heaters, kitchen equipment, and laundry equipment.

Gas meter and pressure reducing valve will be located outside the building. The gas pressure will be reduced at the point of entry and will be piped through the building at 35kPa (5psi) pressure and reduced where connected to the gas fired appliances.

4.2 Water

A single 200mm water service connection will be made to the City of Calgary main and will serve for domestic use and for the firefighting service.

4.3 Sanitary Sewer

A single 150mm connection will be made to the sanitary sewer from the building. This will serve all domestic discharges

4.4 Storm Sewer

A storm sewer connection will be required to discharge the flow from the building roof as well as the surrounding areas of hardscape, which forms part of the civil engineers work.

The design rainfall intensity for Calgary is 23 mm based on 15 minutes of rainfall duration as per the Alberta Building Code. Rainwater leaders will be connected inside the building before exiting the building

5 Plumbing

5.1 Domestic Water

Piping for all domestic water systems will be copper. Hot, cold, recirculated and tempered water piping will be insulated.

Velocities in the pipes will be limited to 2.0 m/s to help limit water hammer and cavitation in the system.

.1 Domestic Cold Water

The incoming domestic water main will be fitted with an approved backflow preventer, this will safeguard the City of Calgary from any contamination from within the building.

.2 Domestic Hot Water

Hot water will be provided at lavatories, sinks, showers and other fixtures as required.

Primary heat for domestic hot water will be supplied from 2 condensing tank type commercial water heaters sized at 60% capacity each. Water heaters will be used along with 2-120 gallon storage tanks to ensure there is adequate hot water to meet the peak hour requirement. The water will be stored at 60°C (140°F) and distributed around the building at the same temperature.

The domestic hot water systems will be arranged with a recirculating/return system to minimize heat loss within the system and ensure quick delivery of hot water to all fixtures.

5.2 Sanitary Waste and Vent

A complete and fully vented gravity soil and waste system will be provided to drain all plumbing fixtures and equipment rooms throughout the buildings. The system will connect to the 150 mm sanitary sewer. The system will be designed to maintain a minimum 1:50 slope. Vent and soil stacks will be provided as required. The vent lines will be located through the building roof. Adequate vent piping will be provided to equalize pressure fluctuations within the system stacks and branches within acceptable limits.

Area drains within the parkade will be piped thru oil and grit separators. Trench drains will be installed in loading docks and at parkade ramp entrances.

5.3 Rainwater

Rainwater will pass by gravity from the roof drains to the storm sewer via internal building rain water leaders. Buried storm lines within the building will tie into a storm main at the building exit.

5.4 Natural Gas

Natural gas will be piped to the heating boilers, water heaters, parkade gas fired make-up air units, and laundry equipment. The piping will run at 35kPa (5 psi) within the building and will be reduced locally to supply the gas fired appliances.

5.5 Plumbing Fixtures

The plumbing fixtures will be selected to minimize the amount of water usage in accordance with the City of Calgary's sustainability requirements to maintain the project's sustainability goals. In addition to water savings, features will include infrared touchless activation which can enhance occupant experience.

- Lavatory faucets shall have 1.9 litres per minute aerators
- Showers will have 5.7 litres per minute aerators
- Water closets shall utilize 4.8 litres per flush
- Urinals shall be ultra-low flow type, using 0.5 litres per flush

The final selection of the fixtures will be made in conjunction with the Architect and the Owner.

6 Fire Protection

6.1 Automatic Sprinkler System

The building will be sprinklered throughout. Upright heads will be used in exposed areas while pendant heads will be used where there are suspended ceilings. Wire guards for exposed heads will be supplied in areas that require protection such as the fieldhouse, gymnasiums and storage rooms and the fieldhouse.

In areas subject to freezing, such as the parkade entrances and loading docks, a dry pipe sprinkler system will be provided.

Sprinkler zones will be designed to the following NFPA13 hazard:

- Fieldhouse & Gymnasium – ordinary hazard
- Mechanical Rooms, Storage Rooms, parkade – ordinary hazard
- Admin/Meeting Rooms/Office – light hazard
- Strength training/sports medicine – light hazard

A stand pipe system will be installed throughout in accordance with NFPA 14. Hose stations will be located in accordance with code requirements.

A pre-assembled preaction fire protection valve package enclosed within a free standing cabinet will be utilized in the main electrical and main communication rooms.

6.2 Extinguishers

Handheld extinguishers in wall mounted cabinets will be provided throughout in compliance with NFPA 10 and local authorities.

7 Heating

The primary heating system will make use of radiant slab within the fieldhouse and hot water radiation or radiant panel elsewhere. Most areas will use radiant panel which is a quiet, efficient and aesthetically pleasing system. Hot water systems are energy efficient and are also a common choice for the southern Alberta climate.

The heating plant will consist of 3 fully modulating condensing boilers with a 15:1 turndown and an anticipated seasonal efficiency of approximately 93% which will provide exceptional heating performance. The heating load will be cascaded from a high temperature water loop to a lower temperature glycol loop in order to maximize temperature differential which in turn will maximize boiler efficiency. The heating plant will be sized to accommodate skin load and ventilation load. The boilers will be sized for peak heating requirements.

The boilers will be piped in variable primary arrangement with variable speed pumps on the primary loop. Exact boiler plant capacity will be adjusted once a detailed load calculation is developed.

Two pumps will circulate heating water to terminal heating equipment throughout the building. The pumps will be controlled by variable frequency speed controllers to maintain constant pressure in the heating distribution main piping. The pumps will operate in duty/standby configuration with the standby pump operating only if the duty pump fails. In slab heating will heat the fieldhouse and continuous hot water radiant panel or radiation along all outside walls will heat the remainder of the building perimeter. Cabinet unit heaters will heat the entrances. The suspended unit heaters will heat the parkade, mechanical rooms and loading docks. The two-way modulating valves will control heating water flow to all terminal heating units.

Vertical in-line pumps will circulate the heat transfer fluid through a primary loop and a glycol loop. The glycol loop will feed heating coils on the ventilation units and the primary loop will feed the perimeter radiation, unit heaters, entrance heaters, radiant slab, etc. Standby pumps will be provided on each loop. Pumps will be complete with integral variable frequency speed drives

8 Ventilation

Adequate ventilation is one of the most critical elements contributing the health and wellness of a building occupant. Ventilation is required to maintain a high level of indoor air quality by removing contaminants, odors and dust and to replenish a space with oxygen and outdoor air. In the southern Alberta climate this process can be energy intensive with the requirements for heating outdoor air during the winter months. Our proposed ventilation systems are designed to maintain exceptional levels of indoor air quality by utilizing energy saving technologies such as demand controlled ventilation, exhaust air heat recovery, and free cooling.

8.1 System Descriptions:

.1 Gymnasium System

A significant component of indoor environmental quality is indoor air quality. ASHRAE 62 outlines ventilation requirements to maintain healthy spaces. Providing ventilation based strictly on peak occupancy using the ventilation rate procedure will result in over ventilating during low use periods. The positive impact of over ventilation will be outweighed by the cost associated with the energy required to condition the ventilation air.

The gymnasium is a variable occupancy space. CO_2 sensors mounted within the gym return air will be utilized to measure and control the per person ventilation rate and reduce the energy consumption during low use periods. The space will be provided with an individual constant volume ventilation unit but the fans will be housed with VFD's to ramp down the air volumes during periods of low use.

The gym air handling unit will have the following components:

- Supply and exhaust fans c/w VFD's for capacity control
- Energy recovery wheel
- Heating and cooling coils c/w 50% glycol
- MERV 13 filters
- Energy recovery wheel bypass for free cooling mode

.2 Fieldhouse:

Large sports halls, by their nature are large spaces and they contain large volumes and associated large surface areas (walls, roofs, floors, etc.). This 'size' when subject to external conditions creates large heat loads within the hall.

In addition to the above, internal loads and especially occupancy (including associated outside air requirements) add more heat load. Fieldhouses are typically multi use facilities thus occupancy can very significantly from 50 to 2,000 occupants, or on rare occasions even as many as 10,000 occupants.

For the purposes of this report, it is assumed that close control of internal temperatures is not required during summer months, cooling is not proposed for the large fieldhouse volume. The ventilation system is proposed as follows:

- Winter & Shoulder Season:

  Variable air volume bell shaped centrifugal destratification fans (fans have zero exposed fan blades, minimizing damage from activities) mounted on the high ceilings are used for the fieldhouse playing floor. In heating mode, the destratification fans automatically modulate speeds – controlled by variable speed drives – to maintain a zero temperature differential from the ceiling space to the playing floor, thus utilizing the stratified heat in the high ceiling space to heat the floor space.

Fresh air will be provided to the playing surface and spectator area through the use of 2 indoor variable volume energy recovery air handling units mounted within the fieldhouse structure. Like the gymnasium, the fieldhouse is a variable occupancy space. CO_2 sensors mounted within the fieldhouse return air will be utilized to measure and control the per person ventilation rate and reduce the energy consumption during low use periods.

The fieldhouse air handling units will have the following components:

- Supply and exhaust fans c/w VFD's for capacity control
- Energy recovery wheel
- Heating coil c/w 50% glycol
- MERV 13 filtration

- Summer:

Summer cooling will be provided by a set of 4 fan arrays made up of 60,000 CFM each with variable speed controlled fans that can collectively draw as much as 240,000 CFM of outdoor air into the fieldhouse to help temper the space during warm summer temperatures.

4 low level intake louvres complete with filters and insulated low leakage dampers will be interlocked with the exhaust fan arrays to provide summer ventilation.

.3 Parkade:

Two 40,000CFM indoor direct fired make up air units sized for 0.75 CFM/ft² with modulating gas burners and discharge air temperature control will provide the parkade ventilation. They will be interlocked with 2 - 40,000CFM exhaust fans to provide parkade ventilation. Gas detection sensors (CO and NOX) located throughout the parking garage will enable the system based on gas levels.

.4 Change Rooms

Change rooms consist of approximately 1/3 wet area (showers, washrooms) and 2/3 change room. Wet areas will be exhausted at a rate of 2 CFM/ft2 in accordance with ASHRAE 62. An equal amount of outside air will be fed into the change room dry area and exhausted thru the wet areas.

The ventilation systems serving the change rooms will be with 100% outside air and 100% exhaust energy recovery units. The outside air from the units will be fed into the outside air plenums of the other air handling units

.5 Lobby/Admin/MPR's

Variable air volume (VAV) air handling systems will serve these spaces. A mixed air air handling unit will feed a medium pressure duct system. VAV boxes will vary the air volume to maintain the space at setpoint. The low pressure ductwork downstream of the VAV box will feed overhead ceiling diffusers and grilles. The unit will be an indoor unit and will be housed with supply and return fans, glycol heating coil, chilled water cooling coil and mixed air section sized for 100% free cooling.

.6 Strength Training

The strength training is a variable occupancy space. CO_2 sensors mounted within the strength training return air will be utilized to measure and control the per person ventilation rate and reduce the energy consumption during low use periods. The space will be provided with an individual constant volume ventilation unit but the fans will be housed with VFD's to ramp down the air volumes during periods of low use.

The strength training air handling unit will have the following components:

- Supply and exhaust fans c/w VFD's for capacity control
- Energy recovery wheel
- Heating and cooling coils c/w 50% glycol
- MERV 13 filters
- Energy recovery wheel bypass for free cooling mode

.7 Miscellaneous

.1 Servery

The servery will function with commercial kitchen exhaust hoods and will be provided with NFPA 96 approved fan and exhausted directly outside. A direct fired make-up air unit will be interlocked to the kitchen hood exhaust fan.

.2 Telecomm Rooms and Server Rooms

Telecomm rooms and server rooms will be provided with transfer fans for cooling. Fans will be sized to maintain a room condition of no more than 29°C based on an adjacent space temperature of 24°C. Fans will be located above the adjacent space ceiling, connecting to an exhaust grille in the sidewall of the telecom or elevator machine room and exhausting into the adjacent ceiling plenum. Transfer air will be provided via a door grille.

.3 Main Communication Room

The main communication room will be serviced with a split air conditioning unit sized to meet the space loads. Room will be maintained between 18-21°C

8.2 Additional Requirements

.1 Redundancy and Flexibility

The hot water heating system is provided with some redundancy to ensure that heat is provided to the building in the event of equipment failure. Three (3) boilers each size at 40% capacity, are proposed. If one boiler fails, the building will still have 80% of full capacity, which is sufficient to meet the full design day building heating and ventilation load. Two hot water circulation pumps are provided, each sized at 100% of system flow (1 duty and 1 standby). Additionally, the reheat coils in the air handling units are sized as if the heat wheels were not operational, so if the heat wheel motor fails the system will still have sufficient capacity to maintain temperature in the building.

.2 Future Sizing

The boiler plant and domestic hot water plant will be designed with the ability to add additional capacity for the future aquatic and arena expansion.

9 Cooling

The central cooling plant will consist of a single outdoor air cooled liquid chiller and associated chilled water pumps. The chiller will have 2 rotary screw compressors with independent refrigeration circuits for capacity control and for redundancy. The unit will use R-134a refrigerant. The chilled water system will have 2 variable speed pumps, 1 duty and 1 standby, for distribution to cooling coils on air handling units throughout the building. A control valve will modulate to maintain minimum flow thru the chiller.

10 Controls

A complete Direct Digital Control (DDC) Energy Management Control System (EMCS) will be installed to control to monitor all building systems. Controlled and monitored systems include.

- All HVAC systems and components
- Central plant systems and components
- Plumbing systems and components

The EMCS will be of a standard architecture consisting of terminal controllers, remote control panels, and operator interface workstations.

Space temperature control will be provided through terminal controllers, electronic room temperature sensors, and electronic reheat control valves.

Standalone remote control panels will operate and monitor major mechanical equipment.

Building operators will interface with the EMCS through personal computer based operator workstations using graphical software. The interface from the wellness center to the existing campus will utilize the proposed fiber optic cable communication network expansion.

All field devices including valve and damper actuators, room temperature controllers, and HVAC system and equipment control and monitoring devices will be electronic. The EMCS will not be utilized for lighting control, it will be controlled form a standalone system.

11 Sustainable Initiatives

The mechanical design of this building will address many features that contribute to lowering building energy consumption, enhancing occupant comfort and increasing the sustainability of the building. The following is a listing of mechanical features that contribute to sustainable design.

- All cooling equipment will utilize CFC and HCFC free refrigerants.
- Plumbing fixtures will be low water consumption type.
- The heat recovery ventilation units will provide full heat recovery on all washroom, shower & general exhaust.
- Heating plant will utilize fully modulating high efficiency condensing boilers to maximize plant efficiency striving for a seasonal boiler efficiency of 93%.
- The heating, chilled water and glycol pumps will utilize VFD's to control flow/pressure and reduce pump energy.
- All air handling systems will utilize VFD's to control air volumes and reduce fan energy.
- The fieldhouse and gymnasium spaces (variable occupancy spaces) will utilize demand controlled ventilation using CO_2 sensors to regulate the quantity of outside air being delivered.
- The energy management control system will optimize start/stop, occupancy, boiler & chiller plant efficiency, etc. to maximize the HVAC system efficiency.

12 Mechanical Outline Specifications

12.1 Fire Suppression

- Provide wet-pipe sprinkler system, and standpipes in locations described.
- Provide a packaged preaction valve cabinet and schedule 40 galvanized pipe will be utilized in all main electrical & switch gear rooms.
  Provide a dry pipe system in loading dock areas and parkade entrances and exits.

12.2 Plumbing Insulation

- Provide pre-formed rigid mineral fiber insulation for all domestic cold and hot water piping as well as storm drainage piping and vent piping.
- Conductivity of 0.039 W/m-K at 24°C.
- Provide ASJ jacket with PVC fitting covers. Provide PVC jacket on all exposed piping.
- Insulate all fittings, joints and valves.
- Domestic Cold and Hot water piping: 25mm insulation for up and including 75mm pipe; 40 mm for 100 mm pipe and larger.
- Storm lines shall be insulated within the first 3 meters downstream of roof drains in non-gymasium/fitness areas and shall be insulated for their entire length in gymnasium/fitness areas.
- Plumbing vent lines shall be insulated for 3 meters from the roof penetration.

12.3 Domestic Water Piping and Valves

- Provide inline close-coupled pumps for small circulating pumps. Pumps shall be cast iron with cast bronze impeller.
- Provide copper tubing, type L, hard drawn on all domestic hot and cold, tempered water and grey water. Provide Type K, hard drawn, on all domestic hot water and tempered water recirculation.
- Provide ball type isolation valves at all heat exchangers, pumps, and fixtures. Valves for throttling, bypass or manual flow control shall be calibrated ball, or globe valves.
- Provide preinsulated 120 us gal package storage tanks for domestic hot water.
- Perform pressure testing with water on all domestic water piping.

12.4 Sanitary Sewer Piping – Above Grade

- PVC XFR Pipe and Fittings: Solvent Weld Joints.

- Cast Iron Pipe and Fittings: Hubless with neoprene gaskets and stainless steel clamp-and- shield assemblies.
- Copper Tubing with Cast Bronze or Wrought Copper Fittings: 50/50 solder joints.

12.5 Sanitary Sewer Piping: Buried

- ABS Pipe and Fittings: Solvent weld joints. PVC Pipe and Fittings: Solvent weld joints.

12.6 Storm Water Piping – Above Grade

- PVC XFR Pipe and Fittings: Solvent weld joints.
- Cast Iron Pipe and Fittings: Hubless with neoprene gaskets and stainless steel clamp-and- shield assemblies.

12.7 Storm Water Piping: Buried

- ABS Pipe and Fittings: Solvent weld joints. PVC Pipe and Fittings: Solvent weld joints.

12.8 Plumbing Equipment

- Provide indirect gas-fired condensing water heaters for production of domestic water.

12.9 Plumbing Pumps

- Domestic hot water recirculation pumps to be bronze body, stainless steel volute, and flange connection, suitable for use with domestic water.

12.10 HVAC Insulation

- Provide mineral fiber blanket insulation for round and rectangular ductwork. Conductivity of 0.039 W/m-K at 24°C.
  - Supply ductwork on systems with air conditioning: 50 mm, with vapor retarder.
  - Return ductwork: no insulation required.
  - Exhaust ductwork: insulation with 50 mm insulation for 5 m from building exterior
- Provide flexible closed cell elastomeric duct liner on ductwork where acoustic duct liner is required. Conductivity of 0.039 W/m-K at 24°C.
  - 25 mm thickness for acoustic applications.
- Provide semi-rigid glass fiber insulation for equipment. Conductivity of 0.039 W/m-K at 24°C.
  - Provide 1” stainless steel hexagonal wire mesh stitched on one face of insulation.

- Provide vapor retarder.
- Provide canvas jacket for all equipment.
- 50 mm for heat exchangers, breeching, etc.

- Provide pre-formed rigid mineral fiber insulation for piping. Conductivity of 0.039 W/m-K at 24°C.
    - Provide PVC fitting covers. Provide PVC jacket on all exposed piping.
    - Insulate all fittings, joints and valves.
    - Hot water piping: 25 mm insulation for up to and including 75 mm pipe; 40 mm for 100 mm pipe and larger.

12.11 Natural Gas Piping

- Provide Schedule 40 black steel piping and malleable iron fittings. Provide shutoff valves as two-piece, full-port bronze ball valves with a pressure rating of 862 kPa. Meter and pressure reducing valve shall be in accordance with utility requirements.

12.12 HVAC Piping and Pumps

- Provide vertical in-line centrifugal pumps for all large hot water and chilled water pumps. Provide inline close-coupled pumps for smaller circulating pumps. Pumps shall be cast iron with cast bronze impeller.
- Provide Schedule 40 black steel pipe for piping 65 mm and larger with welded joints. Grooved coupling (i.e., Victaulic) is not acceptable for heating and chilled water piping.
- Provide copper tubing, type L, hard drawn for piping 50 mm and smaller, with soldered joints.
- Provide calibrated balancing valves at all AHU coils.
- Provide isolation valves at all coil connections, heat exchangers, chillers and boilers. Isolation valves shall be ball valves for pipe sizes up to and including 50 mm, and gate valves for pipe size 65 mm and above. Valves for throttling, bypass or manual flow control shall be calibrated ball, or globe valves.
- Provide pressure and temperature (P/T) gauges and temperature sensors on all AHU coil connections and heat exchanger connections. Provide P/T taps at all coil connections. Provide thermometer and temperature sensor on boiler connections. Provide air vents at all piping system high points and drain valves (ball valves) at low points including at all coil connections. Provide strainers on all coil connections.
- Provide ASME stamped expansion tanks and air separators. Perform pressure testing with water on all hydronic piping.

12.19 Air Filtration

- Provide MERV 13 filtration on the supply side of all air handling units. Provide MERV 8 filters in ERVs on each side of the heat exchangers.

12.20 Central Heating Equipment

- Boiler basis of design is the AERCO Benchmark water boiler designed for condensing application, full modulation, and stainless steel heat exchanger.
- Provide direct venting for boilers; flue shall be double wall AL29-4C Class IV stainless steel. Inlet shall be galvanized steel pipe with fully sealed joints.
- Provide condensate neutralization tank for each boiler.

12.21 Central Cooling Equipment

- Provide air cooled, dual screw compressor chiller with independent refrigerant circuits. Refrigerant shall be R-134a (no CFC or HCFC refrigerants).
- Variable volume ration compressors
- Chiller shall be nominal 250 tonnes. Daikin McQuay or equal.

12.22 Heat Exchangers for HVAC

- Provide single pass ASME stamped plate type heat exchangers constructed with removable head to allow plates to be added or removed. Frame plates and pressure plates shall be carbon steel. Plate pack shall use positive plate alignment system to ensure proper plate to gasket seals.

12.23 Central HVAC Equipment

- Air handling units and heat or energy recovery ventilators shall be custom units:
  - 50 mm insulated double-wall galvanized steel construction, with structural steel base, foam core panels.
  - Provide galvanized steel double wall access doors with double glazed laminated glass window to each AHU section.
  - Fans shall be direct drive air foil or plenum fans.
  - Glycol heating and chilled water coils shall be copper tubes with aluminum fins.

12.24 Terminal Heating Equipment

- Radiant ceiling panels shall consist of a rigid aluminum panel faced with copper tubes mechanically fastened to the panel using a hardening heat transfer paste.
- Force flow hydronic unit heaters shall be provided in all entry vestibules, with 7.5 kW of heating output for a single door vestibule and 15 kW of heat output for double door vestibule.

12.25 Instrumentation and Control for HVAC

- Provide EMCS as described in narrative above.
- Instrumentation and Control Devices:
  - Provide Platinum RTD sensors for duct, space, and fluid temperature sensing.
  - Provide solid state carbon monoxide sensor in loading dock.
  - Provide relative humidity sensors in AHU supply and return.
  - Provide CO2 sensor in rooms indicated to have demand-control ventilation in the design criteria tables earlier in this narrative.
  - Provide ULC and CSA certified actuators compatible with damper or valve provided.
  - Provide insertion magnetic flow meter for hot water and chilled water flow sensing.
  - Provide shielded room static pressure probe and static outdoor air probe for sensing building pressurization.
  - Provide fan inlet mounted air flow measuring stations on AHU fans. Provide thermal dispersion type air flow measuring station for outside air intakes.
  - Provide magnahelic differential pressure sensors on AHU filters.
  - Control valves: AHU coil control valves shall be globe type. Terminal unit control valves shall be Pressure Independent Characterized Control Valve type.

Foothills Fieldhouse

Electrical Schematic Design Report

SMP Project No: 18-01-0294

~~May 30, 2018~~June 25, 2018

Submitted By:

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EXECUTIVE SUMMARY

The design for the new fieldhouse centre in Foothills Athletic Park will be completed in accordance with the various local standards, codes and guidelines for a LEED® project. In addition the IAAF standards will be referenced to ensure baseline compliance for the facility. In some cases the base design will not meet the IAAF standard but the facility will have the ability to enhance the existing system to meet the standard. The electrical design for the building includes but is not limited to: power distribution and branch circuitry, lighting design and control, and auxiliary systems design. Lighting throughout the building will be designed to provide a warm and inviting atmosphere while accenting and enhancing architectural features. The building is not considered to be a post disaster facility however consideration will be given to provisions to allow the building to operate in the event of a major event. The primary light sources are expected to be LED. In addition, day lighting and occupancy control will be used to reduce unnecessary energy consumption.

The distribution throughout the facility will be designed primarily with 600V to reduce line losses and decrease conductor sizes. It is proposed a diesel emergency generator be installed to service life safety loads along with any owner specified loads. The security system will be designed with a high amount of owner input, however, it is anticipated it will be comprised of intrusion detection, card access system, and CCTV in accordance to City of Calgary standards. Communication rooms will be located strategically throughout the building in order to limit wire distance to the end devices. A fibre backbone will be provided as a distribution medium for the building IT infrastructure. Select areas will have sound systems designed to suit the user's needs and requirements.

1 ELECTRICAL STANDARDS AND GUIDELINES

1.1 Electrical Design

.1 Electrical design will comply with the following standards and guidelines:

- Canadian Electrical Code, Part 1
- "Fire Protection Engineering Standards of the Fire Commissioner of Canada for Fire Alarm System Requirements"
- National Building Code of Canada
- Canadian Standards Association
- Illuminating Engineering Society of North America
- LEED® Canada V4

2 INTRODUCTION

Electrical systems for complexes of this nature tend to be categorized into two major classifications; Power & Distribution Systems and Auxiliary Systems.

Power & Distribution systems generally comprise the following:

- Utility Service
- Distribution Panelboards
- Branch Panelboards
- Motor Control Centres
- Transformers
- Convenience Power
- Lighting Systems
- Emergency Power Systems
- Special Power Systems for ancillary equipment

Auxiliary Systems usually comprise the communication systems within the complex, they include:

- Telephone/Data Systems
- Paging, Intercom, and Sound Systems
- Security Systems
- Fire Alarm Systems
- Broadcast Centre and Equipment
- Scoreboards

This report provides an overview of the Electrical systems for this complex, identifying key issues to foster discussion on user requirements and preliminary cost analysis. A general specification is included for basic materials and methods.

3 GENERAL – POWER & DISTRIBUTION SYSTEMS

It is proposed that a new 13.2KV primary metered utility feed be brought to site from Enmax which will be sized for the capacity of all phases of the facility along with some additional capacity to feed potential other future development loads. The primary metered switch gear will be supplied and installed by the contractor while the primary conductors and additional utility upgrades as required will be completed by Enmax. The existing feeders to the site substation may be revised from overhead to underground as a part of the future planned Crowchild Trail widening project and would not be expected to affect this project. An allowance should be carried to bury the overhead distribution running east/west along the site.

Division 26 will be responsible for the installation of all conduit, trenching, transformers, switch gear, ct's/pt,s to meet current primary metering requirements and coordination with Enmax to allow for the complete installation of the new 15KV distribution system.

The new 600 volt distribution system will be designed with two new transformers and double ended distribution equipment to allow for redundancy for the complete project under the phase 1 scope of work.

The distribution should allow for a large generator tie in for high profile events where certain loads are critical to the success of the event. The generator would sit outside and would tie into a camlock system through an automatic transfer switch.

Transformer "A" will be 3750KVA, 13,200/347/600 volt, three phase, 4 wire to provide service to the "A" side new 4000 amp, 3 phase, 4 wire, 600 volt distribution equipment to be located in the main electrical room. It is anticipated that a 1200 Amp CDP and sub-service will be required for the mechanical central plant, 1000 amps for the fieldhouse/track and 400 amp service for the administrative area of the building.

Transformer "B" will be 3750KVA, 13,200/347/600 volt, three phase, 4 wire to provide service to the "B" side of the new 4000amps, 3 phase, 4 wire, 600 volt distribution equipment located in the main electrical room. It is anticipated that a 1200 amp service will be installed for the future 3000 seat arena, 1000 amp service for the future aquatics phase, 400 amp for common areas.

The "A and "B" distribution systems will be interconnected with a 4000 amp tie breaker and bussing to allow for either transformer and distribution sized to carry to phase 1 load if required

Spare ducts and load break cells will be installed to allow for future feeders to be incorporated for the future phase of the project.

Division 26 to carry all costs for primary metering changes, high voltage cable installation and terminations which will be done by Enmax. Division 26 will carry all cost for 600 volt distribution installation and equipment. The main distribution panel will be located in the main electrical/mechanical rooms in phase 1 of the facility.

All distribution will be provided at 347/600 volts, 3 phase, 4 wire to reduce line loss, installation costs and improve performance to larger power loads. All distribution will be sized to allow future growth and be complete with a PTY filter to reduce transient noises and protect against power surges.

All mechanical and some of the lighting loads will be powered from the 347/600 volt, 3 phase, 4 wire system. This type of system is recommended to its capacity to reduce installation costs for feeders and conduits while improving performance of the electrical equipment because of less voltage drop.

A dry type step down transformer will provide 120/208 volt, 3 phase, 4 wire power onto its own central distribution panel. From this, distribution panel boards will be powered to provide power to lighting, communications, receptacles and fractional kilowatt motor loads.

All panelboards will be sized and located in areas to allow for proposed power demands and future circuitry. Panelboards used to provide service to computer equipment will be complete with PTY filters to protect against power surges and transient noises.

Motor Control Centres (MCC) and Variable Speed Drives (VFD) will be located in mechanical rooms. The MCC will incorporate low voltage and single phase sensing to protect motors during power line disturbances. MCC will also contain motor starter equipment to facilitate control of motors by the building management system. VFD will be supplied by Division 23 and wire/installed by Division 26.

4 GENERAL – LIGHTING

4.1 Inside Lighting

Interior lighting will be designed to provide a warm and inviting atmosphere, with the lighting designed to reflect the needs of the area they have been installed in.

Generally, most lighting will be provided with an LED light source.

The fixtures selected will be based on several key factors to include for vandalism, performance and architectural appearance to improve life cycle, reduce maintenance and improve energy performance.

The fixtures in the fieldhouse are anticipated to be professional grade sports field lighting by Musco or Ephesus. The design intent would be to provide the vertical and horizontal illuminance levels at 1000lux with the ability to switch or dim to varying light levels depending on the event. International event requirements would influence the standard to which the lighting is designed to. These fixtures would be installed around the perimeter of the field surface to reduce glare and provide the appropriate vertical light. The fixtures would be mounted to a pipe grid type of system that has the ability to be raised/lowered for serviceability. A catwalk type of system in not expected for this facility. Additional power and pipe grid will be provided to allow for expandability to the system for special events as required.

Daylighting control will be used in areas where ambient light contribution exists. Consideration will be given to also look at IP based lighting control system complete with ballast and software lighting control over internet.

Careful consideration will be given to limit the number of fixture types to help in the long term maintenance and operation of the facility.

Lighting in administrative rooms, office areas, where reduced glare on screen and visual comfort is important, will be done generally with indirect/direct linear fixtures unless ceiling height is restricted and then recessed fixtures will be installed.

Lighting in corridors with high ceilings will be done with LED luminaries. In areas where paintings or murals will be located, lighting will be designed to enhance their appearance.

In the gathering space and proposed presentation area, lighting will be designed to allow for multi-levels and provisions for special control.

Lighting in mechanical rooms, service tunnels, Janitors Rooms, Electrical Rooms, Storage Rooms, and Nonpublic Areas will be done generally with strip LED lights c/w diffuse lenses.

Expected lighting levels for the various areas of the building are listed below. Light levels and uniformity ratios will be consistent with IES and IAAF recommendations unless a specific program requirement dictates otherwise. The glare rating shall not exceed 50 for any competition area. If light levels are required for specific events over and above what is described below it is assumed that additional lighting will be installed on a temporary basis.

Description	**Average lighting level**
Public spaces	200 lux (20 fc)
Gymnasium	500-1000ux (50-

	100 fc)
Running track/Fieldhouse	1000 lux (100fc)
Parking lot and pedestrian walkways	20 lux (2 fc)
Underground Parkade	100lux (10fc)

4.2 Outside Lighting

The exterior lighting will be designed to create a secure environment and to enhance the facilities night appearance with the lowest energy consumption and maintenance methods available.

Roadway lighting will be required for all site access locations using LED pole mounted area lighting. Pedestrian routes for staff and users will be provided with minimum 3500mm poles complete with LED luminaries. Parking lot lighting will be done with pole mounted LED luminaries located on 900mm concrete bases. All lighting will be designed to meet the City of Calgary DP requirements.

Principal entrances to the building will utilize LED sources. Additional landscape and façade lighting will be considered.

Exterior lighting will be installed at all doorways and selected locations around the exterior perimeter of the building.

All exterior luminaries will be chosen to provide maximum protection against vandalism and be controlled via photo-cell and the building management system as will all lighting will be dark sky compliant and designed to meet LEED® requirements.

It is not anticipated any regional pathway systems will be illuminated at this time. Since the pathways are not expected to be altered as a result of this project there would not be an allowance to add light to these pathways.

5 GENERAL – AUXILIARY SYSTEMS

Auxiliary systems are an adjunct to the efficient operation of any facility, and such as, should be relatively flexible to accommodate any changes that administrative functions dictate.

5.1 Telephone and Inter-facility Communication Systems

Telus will enter the building under-ground from a service manhole or pedestal to the complex main communications demarcation room. The service will be sized by Telus to accommodate a future growth of approximately 40%, in terms of communication requirements. The growth is anticipated due to increased use of global area network capabilities. It is anticipated that a fibre optic link will be available for users in the area. Additional conduits will be installed to accommodate future and additional low voltage service providers.

5.2 Data and Voice Cabling

.1 From the main communications room both multi-strand copper wire and fibre optic cable will be installed to individual data/communications rooms. All cabling installed will be Cat. 6 to E1A/T1A568A standards, the standards presently in place for communications requirements.

.2 These rooms will house the normal passive component requirements, such as racks and patch panels.

.3 Provisions for horizontal wiring will be provided to each area from the communication rooms to meet the various user requirements. All infrastructure cabling will be installed in conduit or ventilated cable trays judiciously located for accessibility.

.4 Conduit or cable tray systems will be run in the fieldhouse to allow for additional cameras as required for the events.

5.3 Electronic Message Boards

.1 Provisions will be made to allow for electronic message boards at all entrances and selected locations throughout the facility.

5.4 Public Address

.1 A public address system will be installed throughout the facility. Consideration will be given to integrating this into the fire alarm system through fire alarm speakers. Alternatively the sound systems in each space may be utilized for paging with mics at reception areas.

6 GENERAL – LIFE SAFETY SYSTEMS

6.1 Fire Alarm System

From a capital cost, and user perspective, it would be prudent to install a microprocessor based addressable system for the overall facility. The system will comprise a main fire alarm control panel, with remote annunciators at each entry. Individual transponder panels will be installed at each facility with peer to peer communication to allow either independently or integral functionally for maximum user flexibility.

This system will be installed with an EVAC system that will allow for building wide paging but with automatic override control in the event that the fire alarm system has been activated.

A two stage fully addressable fire alarm system will be installed in conjunction with the sprinkler system. This type of system allows for easy identification of each device or equipment activated, self-monitoring for ground fault and wiring supervision and reduced installation costs in conduit and wiring.

The system will have installation of system detectors in any un-sprinklered areas, pull station at all exit doors and floor areas, connection to monitor sprinkler system, emergency power, magnetic door releases and provision to provide a signal to a monitoring company or fire alarm department.

6.2 Exit Signs

Exit luminaries will be minimum maintenance, long life; low energy use LED type and is connected onto emergency power.

6.3 Emergency Power and Lighting

Emergency power for this facility will be done using a diesel powered emergency generator, automatic transfer switch and dedicated distribution panels and wiring. It is proposed that this equipment will be located inside the building and the generator will be complete with fuel storage located in the base of the generator package. The proposed emergency generator distribution system will be complete with two code required transfer switches to service life safety and non-life safety loads separately. The estimated size of the generator is 900 KW, at 347/600 volt.

An emergency distribution system will be installed and interconnected onto the utility system to allow for capacity to meet code and other selected loads to be energized in the event of a utility power failure.

Emergency lighting, exit signs, UPS, selected mechanical and other designated loads will connected onto the emergency distribution system.

In conjunction, standalone emergency battery packs and remote heads will be installed in all electrical rooms and selected areas to provide for instant on lighting until the emergency system is activated.

It is expected this facility will be equipped with emergency smoke exhaust system which would be powered through the emergency power distribution.

6.4 Broadcast Centre

Provisions will be made to include for a broadcast centre in the fieldhouse area to allow for TV broadcast, training and teaching videos to be controlled, edited and accessed on site.

Installation of conduit, base system cabling and cable tray will be included in the base building construction.

It is anticipated that provisions will be made for 10 camera locations, 4 high definition cameras and control editing equipment in a standalone room. As well, provisions will be made for power to broadcast trucks and intercommunication between camera and other selected locations to assist in TV production and training.

It is anticipated that a smart board will be located in fieldhouse surrounding area to assist in teaching and control of camera's used for teaching.

Provisions will be made for TV in press box and other meeting/multi-use areas and for replay on scoreboard in the fieldhouse.

6.5 Security Systems

The operator will be installing a security system to monitor all corridors, computer rooms, office areas and other designated locations. The systems will have all conductors installed in conduit and will include for motion detectors, control panels, annunciator, keypads, card access, CCTV, intrusion switches at doors and dialers.

The security system will allow for monitoring of fire alarms, HVAC system and door access at user request.

6.6 Sound Systems

The sound system in the fieldhouse will be a distributed system using speakers located onto the light truss system for various user requirements. The system will be designed to include for wireless microphones and control from the event level for teaching and from event control room when major events take place. A centralized server based system will be considered for multimedia content. The sound system will be zoned with individual control within each physically separate space. Multipurpose rooms will have their own zone, inputs and controls.

7 COMMISSIONING

Commissioning will include MCC, security/door access, intra-facility communication system, lighting control, identification and balancing of panels, CDP, etc.

8 ENERGY EFFICIENT SAVINGS

Cost savings can be attained with several options while paying a minimal premium on original installations. We would recommend the use of LED fixtures where possible throughout the facility in conjunction with motion detectors in all washrooms, storage rooms and all other areas where the space is periodically used.

Lighting control will be done with local on/off switches, IP addressable controls, photo light sensors, dual technology motion sensors in selected areas, and integration with the base building and local building management systems.

The team will also investigate the possibility of a combined heat and power unit to supplement the current building infrastructure. The CHP will be an asset for the overall energy model and will also reduce the amount of energy purchased from the grid.

Photovoltaic systems have not been considered as a part of this costing exercise.

9 INDIVIDUAL USER GROUP GUIDELINES

9.1 Common Areas

Power for the Common Areas will include public space, parking lot receptacles, rough-in for other designated areas, signage and exterior lighting.

A 347/600 volt distribution center for the Common Areas will be used to provide power to the Central Chiller system, strategically located panels and transformers for 120/208 volt convenience power. The system will be sized to accommodate future growth and provide convenience power throughout.

Lighting systems within the Common Areas will be provided through the use of fixtures and sources in conjunction with the intended ambience at each of the facilities within the complex.

Emergency lighting and exit signage will be connected onto the emergency distribution system.

Exterior lighting will be provided using post-top fixtures that have been carefully selected to blend with residential environment surrounding the facility.

Lighting in public washrooms and spaces will be LED vandal-proof fixtures. Lighting control will be done with low voltage and dimmer switches.

The issue of energy efficiency will be addressed by using proven technology, such as energy efficient lighting, judicious load control, photo-light sensors, power factor control and interface, with the Building Management Systems.

Provisions will be made for security, pay phones, commercial retail units, signage, laundry and towel services, and displays.

The addressable fire alarm system will be installed to meet code and user requirements with LCD read out and non-active coloured graphic located at the emergency vehicles designated entrance.

Provisions will be made to provide services to the main building information desk for data/phone, security monitoring etc. All lounge areas will be designed to allow for TV's, phones, and other audio visual equipment as requested by the owner.

9.2 Food Service

A 120/208 volt distribution panel will be installed to provide power for power and lighting. This panel will be fed from the main distribution panel and be designed to be metered separately.

Provisions will be included to allow for required exit signs, emergency lighting and fire alarm to allow for base building occupancy.

A dedicated conduit complete with pull wire and backboard will be installed to allow for tenant to connect to the main Telus demarcation room for the connection as needed.

Additional 400A 120/208V services will be brought to building owned commercial kitchen spaces.

9.3 Fieldhouse

A 347/600 volt distribution panel will be installed to provide power for HVAC and general lighting. This individual panel will be fed from the main distribution panel; with convenience 120/208 volt power provided using a 600-120/208 volt transformer and 120/208 volt panels.

All panels used for computer and other selected electronic loads will be complete with dedicated neutrals with each circuit, and sized to allow for future growth. Large event power camlock disconnects will be provided around the fieldhouse to allow for specific event power. It is anticipated 2-200A 208V 3phase power locations will be provided along with 2-50A 208V single phase power locations.

The fieldhouse will have high end sound systems complete with wireless microphones for special events and to assist in training and teaching. The fieldhouse sound system will be designed to allow for spectators and special event needs. It will also have the ability to augment for events as required.

The electrical system will be designed and adaptable to allow for future technology and growth. These provisions will include both power and communications where practical.

A cable and/or conduit system will be installed in a network fashion, and are to be of sufficient size to allow for easy addition and relocation. Conduit/cable tray will be installed at the roof level back to a designated control point/data rack for future additional lighting, theatrical type lighting, or sound systems.

9.4 Parkade

The parkade lighting will be provide with LED sources along the edges of the drive aisles. The target would be approximately 50lux with a uniformity no greater than 5:1.

Allowances will be made for Calgary Parking Authority if required to monitor parking in the parkade.

A CCTV surveillance system will be installed to monitor the facility during unstaffed hours.

Emergency lighting will be provided by connecting base building LED fixtures onto the emergency power distribution system.

9.5 Gymnasium, Community Offices, Kitchen, Fitness Studios and Multi-Function Rooms

A 347/600 volts, 3 phase, 4 wire, distribution panel will be installed to provide for these areas, fed from the main distribution panel.

Major mechanical loads will be fed from the 347/600 volt distribution panel.

Convenience 120/208 volt power will be provided using in judiciously located 600-120/208 volt transformers, through 120/208 volt panels.

LED sources will provide illumination for the administration of mechanical rooms. The offices and meeting rooms will be illuminated using direct/indirect fixtures, to levels of approximately 500 lux.

Emergency lighting will be provided using LED fixtures connected onto the emergency power distribution.

A panic alarm system with push buttons, audible and visual alarms will be provided in the gym, annunciated at the main control desk.

Boardrooms will be illuminated using LED fixtures with dimming of light for functional versatility. LED wall sconces or recessed LED down lights will be used for functions requiring low levels of light.

Emergency lighting will be provided by connecting base building LED fixtures onto the emergency power distribution system.

9.6 Running Track and Multi-Purpose Rooms

A 347/600 volts, 3 phase, 4 wire, distribution panel will be installed to provide for these areas, fed from the main distribution panel.

Major mechanical loads will be fed from the 347/600 volt distribution panel.

Convenience 120/208 volt power will be provided using in judiciously located 600-120/208 volt transformers, through 120/208 volt panels. As well, separate panels will be provided for the locker rooms and exercise areas.

The exercise track, and gymnasiums will be illuminated using LED high bay sports lighting fixtures. LED sources will provide illumination for the administration of mechanical rooms. The offices and meeting rooms will be illuminated using direct/indirect LED fixtures, to levels of approximately 500lux.

Emergency lighting will be provided using base building lighting fixtures connected onto the emergency power distribution system similar to the rest of the facility.

The multi purposes room will be illuminated using LED fixtures with dimming of light for functional versatility. LED wall sconces or recessed LED down lights will be used for functions requiring low levels or light.

A panic alarm system with push buttons, audible and visual alarms will be provided in the exercise rooms, enunciated at the main control desk.

10 OUTLINE SPECIFICATIONS

10.1 General Provisions

.1 Work Included:

.1 Applicable systems include:

.1 Incoming power, telephone and cable TV services and utility co-ordination.
.2 Complete electrical distribution system including main switchboard and sub-distribution with provision for metering, feeders, distribution with provision for metering, feeders, distribution panel, branch circuit panels, branch circuits, etc.
.3 Telephone distribution raceway system, outlet boxes and termination panels.
.4 Cable television distribution raceway system.
.5 Complete fire alarm system.

.6 Complete emergency and exit lighting system.
.7 Complete grounding and ground fault system where required,
.8 Power and telephone to elevator motors and controllers.
.9 Exterior site lighting and building security lighting.
.10 Interior lighting.
.11 Interior light control, exterior lighting control.
.12 Connection of all mechanical, plumbing and owner furnished equipment.
.13 Security system raceways.
.14 Computer/data system raceway system.
.15 Switches, receptacles and special outlets as noted herein.
.16 Testing of all systems, equipment and conductors.
.17 Co-ordination with all other trades.

.2 Work or items not Proposed by Division 26, or Included in Other Work:

.1 The owner will pay for electrical primary and secondary costs charged by the utility company telephone.
.2 Primary utility cable to be furnished and installed by the utility company.
.3 Secondary cable to be furnished by electrical contractor. Connections at transformer by utility, at secondary switchgear by electrical.
.4 Package starters for elevators.
.5 Installation of data, telephone, security, sound equipment, unless noted otherwise.
.6 HVAC temperature control wiring.
.7 Sprinkler flow switches and valve tamper monitors.
.8 Package starter units for air compressors, fire pump and water pumps.
.9 Irrigation controllers and low voltage wiring for control valves.
.10 Electric door hardware.
.11 Telephone system, wiring and switchboards.

.3 Reference Standards and Codes:

.1 Canadian Electrical Code (2015).
.2 Current Alberta Building Code.
.3 Current National Fire Protection Act.
.4 Inspection Program Requirements: (CSA 7299.4).
.5 ULC – S524 – M1987 (Standard for Installation of Fire Alarm Systems).
.6 Current Dominion Fire Code.
.7 Local Requirements from:

.1 Electrical Inspection Branch
.2 Alberta Standards

.3 City of Calgary Planning Department
.4 Telus Communications Inc.
.5 City Electric System

.8 EEMAC (Electrical and Electronic Manufacturer's Assoc. Council).
.9 LEED Canada V4

10.2 Basic Materials and Methods

.1 Raceways:

.1 Schedule 40 PVC for underground services, feeders, branch circuits and underground signal runs.
.2 EMT for exposed feeders and branch circuit conduits and for communication conduits.
.3 Rigid steel for exposed conduits where exposed to weather and/or subject to physical damage.
.4 Flexible conduit will be used for motor connections. (max 450mm), transformer connection (max 450mm), recessed lighting fixtures (max 1800mm). Liquid tight for all connections in mechanical rooms, where water lines is present.

.2 Wiring and Cable:

.1 Insulated copper 600V, solid #10 AWG and smaller, stranded for #8 and larger. Aluminum conductors will be used for feeders #1 and larger.
.2 Minimum #12 AWG, except runs over 33m to be #10 AWG.
.3 Junction Boxes:

.1 Sheet metal for interior use.
.2 Cast for exterior use.
.3 Concrete for exterior use.

.3 Wiring Devices:

.1 Receptacles – 15A, 125V, duplex, grounding type, convenience outlets, specification grade
.2 Switches – 15A, 120V, quiet type, specification grade

.4 Panelboards:

.1 Bolt on moulded case circuit breakers.
.2 Aluminum bus.
.3 10,000A IC minimum rating for 120/208V panels.

.5 Distribution Switchboards:

.1 Bolt on circuit breakers and fused switches.

.2 Aluminum bus bars.
.3 EEMAC 1 enclosure.
.4 Components braced for and rated for available short circuit current.

.6 Dry Type Transformers:

.1 600 – 208V/120 3-phase, 4 wire, delta-wye.
.2 Dry type, class H insulation.
.3 Secondary wye connection grounded.

10.3 100mm concrete housekeeping pad under transformer. General Guidelines and Standards

1. Main Service	Characteristics	15 kV, incoming service from utility to two main pad-mount utility supplied transformers. The transformers will reduce voltage to 347/600V for distribution throughout the complex from a double ended 4000amp switchboard c/w utility metering
	Interrupting Rating	42,000 amps
	Power Factor Correction	Individual at designed loads
	Ground Fault Protection	Over 1,000 amps feeders
	T.V.S.S.	At selected locations
2. Load Expansion Capacity	40%	
	Space for future	4 @ 400 amps in each
	Sub-feeders	347/600V sub distribution board
3. Metering	Utility plus customer digital	
4. Main Service Conductors Distribution System		Copper aluminum will be considered
5. Main Distribution Risers Bus Switches Breakers		Copper Aluminum will be considered

6. Building Dry Type Transformer		K-13
7. Kiosk Dry Type Transformer	Standard	
8. Lighting Panels	Bolt in circuit breaker, 347/600 and 120/208 volt	
9. Power Panel	120/208V bolt in circuit breaker	
10. T.V.S.S.	Future space in power panels only.	
11. Panel Feeders Under 100 amp		Copper
12. Panel Feeders Over 100 amp		Aluminum
13. Major Mechanical Feeders		Copper
14. Chiller Feeders		Copper
15. Fire Rated Feeders		Pyrotenax
16. Separate Neutrals for Computer Circuits		Yes
17. Tenant Metering	Future	
18. Exterior Lighting	Security	Yes
	Decorative / Flood Lighting	Yes
	Control	Photocell & Time Clock BMS
	Voltage	347 volt
19. Parking Lot Lighting	General	LED
	Levels	1 – 3 f.c.
	Control	BMS/LV
	Voltage	347 volt
20. Service Spaces Lighting	General	Fluorescent / LED
	Levels	IES
	Control	Switch
	Voltage	120 volt
21. Public Lobbies Lighting	General	Fluorescent / LED

	Levels	10 – 40 f.c.
	Control	BMS/LV
	Voltage	120 volts
22. Service Rooms Lighting Control		Local Switches
23. Parking Lot Lighting Control		Low Voltage/BMS
24. User Group Lighting Control		Low Voltage and/or line switches
25. Exterior Lighting Control		Low Voltage/BMS/Photo Sensor
26. IP addressable System		Dimming
		Local Control
		Cleaning Switch
		Sweep/Off Function
		Typical Floor
27. Service Entry Data/Telephones		Underground
		Copper
		Fibre
28. Demarkation Rooms Data/Telephones		Yes (1)
29. Tenant Equipment Data/Telephones		On Tenant Premises
30. User Group Distribution Data/Telephones		Conduit or Cable Tray in ceiling space
31. Addressable Fire Alarm System		Yes
32. Interface with BMS Fire Alarm System		Yes
33. Telephone Interface Fire Alarm System		Yes
34. Speaker/ Strobes Fire Alarm System		Yes

35. Expandable Capacity Fire Alarm System		25%
36. Smoke Control Fire Alarm System		Yes

WATT Consulting Group
Since 1983

Foothills Fieldhouse
City of Calgary Recreation

Civil Schematic Design Report

May 31, 2018

#310, 3016 – 5th Avenue NE
Calgary, AB T2A 6K4
Phone: 403.273.9001
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wattconsultinggroup.com

WATT Consulting Group
Since 1983

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WATT Consulting Group Since 1983

1.0 SITE SERVICING DESIGN

The proposed site servicing design has been prepared using the current City of Calgary design standards for sanitary, water and stormwater systems. The following sections outline the design process that is being used for water service, sanitary service and stormwater service and management.

2.0 SITE GRADING

The site grading concept for this site is to maintain existing grades surrounding the site as much as possible. The grades on the north and east side of the site will be designed to direct stormwater drainage to the proposed storm system in the area surrounding the new facilities. There will be low points within the landscaped areas with catch basins that will be used to capture all of the drainage from the landscaped areas and provide trap low storage on surface. The grading to the south of the building will tie to the existing grades of the McMahon Stadium parking lot. Grades on the west side of the building will transition from the existing track and field grades to the parking lot and access to the underground parking of the proposed Fieldhouse. The proposed Fieldhouse location is currently situated over the baseball stadium which is in a naturally depressed location.

3.0 STORM DRAINAGE

There is an existing 750mm concrete pipe that drains into the City infrastructure along University Drive to the west of the site that currently collects and releases storm flow from the site with some contribution from offsite. A 525mm concrete pipe enters the site on the northeast corner that crosses 24 Avenue and originates beyond Crowchild Trail. A 375mm concrete pipe also enters the site on the south west corner of the development that currently conveys storm water from the parking immediately east of McMahon Stadium offsite. These flows will need to be maintained within the infrastructure planned for our site.

Due to the construction of the new facilities, existing surface conditions will be affected and the site will experience additional runoff that will need to be managed. At minimum, it will be restricted to a release rate that would be equal to the pre-development rates for the area and the City may impose some additional restrictions based on the current trend to improve upon the minimum.

Stormwater runoff from this site will be captured by catch basins and roof drains. The runoff from the roof drains will be directed through the building. Storm connections will be provided on the west and east sides of the Fieldhouse to convey this runoff into the storm infrastructure. Stormwater will be controlled and detained onsite at designed low points in traplows and underground storage reservoirs, and then released through an inlet control device (ICD). Based on the current design no roof storage will be available and underground storage is anticipated. Runoff discharge will be released at a controlled rate through a series of ICDs on the pipe network. Water quality will be addressed by the installation of an Oil/Grit Separator (OGS) manhole prior to the storm flow leaving the site.

The controlled release rate and proposed OGS manhole will conform to the Current Edition of the City of Calgary Stormwater Standards and Specifications and Stormwater Design Manual. The 750mm pipe based on historical use of the site, is assumed to have sufficient pipe capacity to handle the runoff flows that will be allowed from this site.

Based on previous experience with the City of Calgary, we have assumed the allowable release rate from the site will be 20 L/s/ha. Given the allowable release rate and the site area of 5.7 ha, the approximate stormwater storage requirements for this site will be about 2,700 m^3. An easy way to store this volume would be to utilize box culvert beside the building to provide a linear storage reservoir in close proximity to the source of the runoff.

Our understanding is the proposed development will be staged. As the site is developed, additional storm water storage will be required for each component until the ultimate build out is achieved. Additional storm water storage will be brought online in the areas being developed as required.

4.0 SANITARY SEWER

An existing 200mm concrete sanitary main is available from University Drive on the west side of the property. This connection will likely be maintained to service this site. An existing service to Red and White Club will need to be maintained with the development.

The sanitary service will be extended through the site to collect the effluent from all currently planned and future structures. The pipe capacity will be evaluated for the ultimate buildout of the site and its varied potential uses.

A sanitary sewer study will likely be triggered by the development based on the increased sanitary flow from the site. It is assumed that the results of this study will not indicate that additional offsite sanitary upgrades are required.

5.0 WATER

An existing 200mm PVC water main exists on site to service an existing hydrant that can be repurposed to provide water to the facilities. A second service will be required to loop the water system and a potentially source for this is available utilizing a second 150mm PVC hydrant service available from 24th Avenue.

An existing 1200 concrete feeder main is located running across the site. Confirmation of its exact location will be useful to ensure that we are not encroaching and that it will not disrupt the design in the future.

6.0 SHALLOW UTILITIES

Electrical (Enmax) and communication (Telus & Shaw) main lines will be located and sized based on each of the utility loads which are being determined by others. Once the size required for these utilities is confirmed, alignments will be selected so that no conflicts with any utilities on site will occur.

7.0 CONCLUSION

Based on the existing information available at this time there does not appear to be any significant servicing issues for this site.

Should you have any questions or comments with regards to this report please contact the undersigned.

Sincerely,
Watt Consulting Group

PROFESSIONAL ENGINEER ALBERTA
JAMES F. CHAPMAN
May 31, 2018

PERMIT TO PRACTICE
WATT CONSULTING GROUP LTD.
Signature
Date May 31, 2018
PERMIT NUMBER: P 3818
The Association of Professional Engineers and Geoscientists of Alberta

James Chapman, P.Eng, CPESC, PMP.
Project Manager

Moh'd Al-Heneiti, P.Eng.
Manager, Engineering

[SMM]

FOOTHILLS FIELDHOUSE SYSTEMS SUMMARY
LANDSCAPE I August 09, 2018

NARRATIVE SYSTEMS DESCRIPTION

Site landscaping forms a critical component of the character and quality of athletic parks. Locating the proposed Foothills Fieldhouse within an established site, the project presents opportunities to creatively integrate within and adapt to existing topography and vegetation to offer a contextually appropriate and functional landscape. Incorporation of low-water use, chinook hardy, native and adaptive landscaping is essential to provide a responsible, low-maintenance site and to ensure the long-term vitality of the site for generations to come.

As a fundamental principle, the landscape must be diverse and elegantly enhance the current conditions while providing for and stimulating future growth in the area. The landscape must carefully and thoughtfully accommodate future development while providing a vibrant and complete public realm experience through the interim stages. The conscientious and strategic design of project edges and transitional spaces will be critical in achieving a project that is holistic through all stages of the sports and recreation district.

The following guidelines are to be observed for site landscape development:

1.0 Hardscape and Plaza Areas

- Staging of pedestrian circulation and vehicular access routes within the athletic park is a critical component to the success of the site. This includes the clear delineation of drop-off areas, pedestrian crossings, circulatory pathways and main entry plaza spaces.
- A sense of pageantry is to be expressed in the approaches to the Fieldhouse by users and visitors. Incorporation of contemporary light standards, poles and furnishings, formalized gateway plantings, and use of decorative surface treatments are to be used to enhance the expression and sense of place for the athletic grounds.
- Of particular importance to hardscape amenity and circulation areas is the adherence to accessible guidelines. All pathways, ramps and stair locations are to follow the City's Access Design Standards to ensure accessibility for all users and visitors of the facility. As a rule, all sidewalks are to be a minimum of 2.0m in width and differ in surface material from vehicular areas on site.

2.0 Trees and Shrubs

- Utilize native and adaptive locally grown trees and shrubs to ensure hardiness to Zone 3. Drought tolerance and chinook hardiness are essential for plant material survival.
    - Native tree species should include Trembling Aspen, White Spruce, Balsam Poplar, Round Leaf Hawthorne and Lodgepole Pine. Adaptive tree species should include Colorado Blue Spruce, Siberian Larch, Brandon Elm, and Green Ash.

- Native shrub species should include Silverberry, Red Osier Dogwood, Snowberry, Wild Rose, Gooseberry, Silver Buffaloberry and Native Saskatoon. Adaptive shrub species should include Siberian Dogwood, Preston Lilac, Mugo Pine, Prince of Wales Juniper, Sea Buckthorn and Ural False Spirea.

- Plant material should be selected and placed according to their natural sunlight and water requirements. Plants that naturally occur in wet environments such as Aspen should be planted in lower areas whereas White Spruce should be planted in elevated well-drained areas to ensure survival.

- Tree selection and placement should be undertaken to provide solar heating / shading, view buffering and wind mitigation. Deciduous trees such as Aspen, Elm and Oak should be planted on the south side of buildings and adjacent to seating areas to provide shade in the summer and maximize sun penetration in the winter. Coniferous trees such as White and Colorado Blue Spruce should be used along the northern edges of the project and field areas to mitigate and buffer northwest winds to enhance the sport experience through the creation of sheltered microclimates.

- Healthy site trees should be protected and retained while those at the end of their lifecycle should be removed. Trees such as Northwest Poplar that are nearing the end of their lifecycle (40 years) should be removed as they are highly susceptible to wind damage presenting a safety concern as they can lose large branches and potentially fall over under strong winds.

2.0 Turf and Groundcover

- Drought tolerant, low-mow, low-grow grasses for non-athletic field areas should be incorporated to minimize irrigation and maintenance requirements while providing a tidy aesthetic value. A grass mix that includes low-growing drought tolerant species such as Sheeps Fescue, Hard Fescue, Chewings Fescue and Creeping Red Fescue should be utilized in the non-field areas.

- Ensure proper maintenance and weed management practices throughout the establishment period of turf and groundcovers to ensure long term viability. A three year maintenance program from the time of seeding is required to ensure that the drought tolerant seed mix establishes. Brillion drill seeding should be used rather than hydro seeding. Seeding should be undertaken in the spring to aid in establishment.

3.0 Water and Irrigation

- Rainwater management strategies should be implemented to direct rainwater run-off from building roof areas and hard surface areas for natural irrigation of plant material. Swales and curb openings in parking areas should be considered to direct rainwater to landscape areas.

- Stormwater collection should be incorporated on site through elements such as bioswales which can be 2 to 4m wide and wet meadows and/or rain gardens which can be up to and in excess of 1 acre if space allows. Retention and rainwater use on site reduces the impact on municipal storm systems while providing outdoor amenity space and natural irrigation for the landscape.

- Automatic irrigation systems should be minimized outside of the athletic field areas. However, when required, irrigation systems should be limited to low-flow drip irrigation systems which provide for the efficient use of water by minimizing losses through evaporation and reduced volume.
- 75mm to 100mm shredded bark mulch should be placed in all tree and shrub beds to retain rainwater for plant use and reduce the need for irrigation.
- Rainwater harvesting cistern(s) to collect and supply water to the irrigation system should be incorporated in any new facility planned for the site. Rainwater harvesting cisterns are typically concrete, fibreglass or metal and can be accommodated within an underground parkade or basement level of a building.

DP BYLAW CALCULATIONS FOR FULL CONCEPT BOUNDARY:

Zoning as per Landuse Bylaw 1p2007: **Special Purpose – Recreation (S-R) District**
Site Area (full concept boundary): +/- 85,600m^2
Proposed Building Gross Main Floor Area: +/- 51,191m^2

Existing Trees within **Phase 1 Boundary** Including Proposed Roadway (per survey information): **133**
Approximate Quantity of Anticipated Tree Removals for **Phase 1** Construction: **56 (pending further review and final concept layout)**

Approximate Hardscape Area (includes walkways, staircases + ramps, entry plazas, and roadways):
~14, 400 m^2 (40% of landscape)

Approximate Softscape Area (includes plaza planting islands, boulevards, and NW slope integration with building):
~20,000 m^2 (60% of landscape)

NORTH SETBACK (SIDE) – 811.00m^2
Total Trees Required (low water irrigation)
(Based on 1 tree for every 50m2 setback area) 16

Total Shrubs Required (low water irrigation)
(Based on 2 shrubs for every 50m2 setback area) 32

SOUTH SETBACK (SIDE) – 499.75m^2
Total Trees Required (low water irrigation; shared lane w/ adjacent McMahon Stadium parcel)
(Based on 1 tree for every 60m2 setback area) 08

Total Shrubs Required
(Based on 2 shrubs for every 60m2 setback area) 16

EAST SETBACK (REAR) – 731.75m^2
Total Trees Required (low water irrigation)
(Based on 1 tree for every 50m2 setback area) 15

Total Shrubs Required (low water irrigation)
(Based on 2 shrubs for every 50m2 setback area) 30

WEST SETBACK (FRONT) – 224.40m^2
Total Trees Required (low water irrigation)
(Based on 1 tree for every 50m2 setback area) 5
(Note: Seven (7) existing mature boulevard trees located within setback to be protected in place)

Total Shrubs Required (low water irrigation)
(Based on 2 shrubs for every 50m2 setback area) 10

APPENDIX D: SITE PHOTOS

View of the front entrance of Foothills Pool

View of the Foothills Stadium from south parking lot

View of the entrance to Father David Bauer Arena


View of the Little league baseball field from central access road

View of the Little league baseball field and Foothills Baseball Stadium from central access road

View southeast from outside Baseball field

View of the parking lot and entrance of Norma Bush arena

FRA2019-0628 Program Overview and Update ATT 3
ISC: Unrestricted

View of the lighted soccer fields from central access road

View of the existing 8-lane outdoor running track

View of the existing 8-lane outdoor running track and spectator area

View of the Volleydome and parking

View of Baseball fields from adjacent hill


Example of condition of the existing fields - Foothills Athletic Park


Example of condition of the existing fields - Foothills Athletic Park

APPENDIX E: SOILS REPORT

Golder Associates Ltd.

1000, 940 6th Avenue S.W.
Calgary, Alberta, Canada T2P 3T1
Telephone (403) 299-5600
Fax (403) 299-5606

February 16, 2007 06-1321-080

Graham Edmunds Cartier Architects
1110 – 1st Street SW
Calgary, Alberta T2R 0V1

Attention: Mr. Dave Edmunds

**RE: FINAL REPORT
GEOTECHNICAL SERVICES AT
FOOTHILLS AND GLENMORE ATHLETIC TRACKS**

Dear Mr. Edmunds,

Golder Associates Ltd. (Golder) has carried out geotechnical engineering services at the Foothills Athletic Park on December 19, 2006 and January 24, 2007 and at Glenmore Athletic Park on December 20, 2006 in order to provide geotechnical recommendations for the proposed running track upgrading programs at the two parks. This report summarizes the observations made during the geotechnical investigations and provides engineering recommendations.

1.0 BACKGROUND

It is understood that the existing surfacing of the running tracks at both parks has delaminated locally from the underlying base material, and subsurface and surface drainage issues were suspected to be the reason.

The drilling investigation program explained in the following section was planned to investigate the water issues and the subsurface conditions below the running tracks and the surrounding areas.

2.0 GEOTECHNICAL INVESTIGATION

A field investigation carried out on December 19 and 20, 2006 included the drilling and sampling of four boreholes: two on the running track of the Foothills Athletic Park and two at the Glenmore Athletic Park (one on the track and one off the track). In Foothills Athletic Park, some of the planned boreholes could not be drilled on the first day since underground utilities known to exist on the north side of the track could not be located. Therefore, a second investigation was carried out at the Foothills Athletic Park on January 24, 2007, where four boreholes were drilled off the track on the north side of the park.

The observations made during the drilling investigations are summarized below:

2.1 Foothills Athletic Park

2.1.1 Drilling Program on December 19, 2006

At this site, two holes were drilled on the running track at the approximate locations shown on Figure 1 to depths of 1.2 m (BH01) and 0.8 m (BH02) below the ground surface. The rubber surface material at the borehole locations was adhered to the underlying pavement; thus it was decided to core through the surfacing material, instead of removing a patch of the surfacing material prior to commencing the coring. At locations of BH01 and BH02, the track was cored through the asphaltic concrete pavement underlying the rubber surface and then split spoon sampling was carried out to determine the conditions of the underlying soil. In BH03, only coring through the pavement was carried out, since underground utilities around that area were suspected and could not be confirmed.

In boreholes 1 and 2, underneath the 12 mm thick surfacing material, 140 to 152 mm thick asphaltic concrete layer underlain by 38 to 50 mm thick rubberized asphalt layer, followed by 76 mm asphaltic concrete layer was encountered (Photo 1 in Appendix I). The rubberized asphalt layer was softer than the asphaltic concrete layers. In BH03, underneath the surfacing material a 177 mm thick asphaltic concrete layer underlain by gravel fill was encountered (Photo 2). In this hole, a rubberized asphalt layer was not encountered. In BH02, at 760 mm depth from the ground surface, refusal to sampling was encountered due to the underlying gravel. Water used in the coring process flowed into the gravel layer affecting the natural water content of this zone. Nonetheless, the gravel layer did not appear to be saturated at the time of the investigation. At the end of sampling, boreholes 1 and 2 were backfilled with ready-mix concrete to 25 mm from the top asphaltic concrete surface. Details of the 3 boreholes are given in Table 1.

Table 1
Summary of Borehole Records – Foothills Athletic Park (Boreholes on the Track)

Borehole Number	Depth (mm)	Description
BH01	0 - 12	Surfacing material (12 mm thick)
	12 - 152	Asphaltic concrete layer (140 mm thick)
	152 - 202	Rubberized asphalt layer (50 mm thick)
	202 - 278	Asphaltic concrete layer (76 mm thick)
	278 - 989	Grayish brown sand and gravel, trace clay (Fill) (711 mm thick)
	989 - 1039	Moist, brownish gray clay, trace silt (50 mm thick)
	1039 - 1191	Moist, gray fine sand, trace silt, trace clay
	1191	End of hole (achieved required depth)
BH02	0 - 12	Surfacing material (12 mm thick)
	12 - 164	Asphaltic concrete layer (152 mm thick)
	164 - 202	Rubberized asphalt layer (38 mm thick)
	202 - 278	Asphaltic concrete layer (76 mm thick)
	278 - 760	Grayish brown sand and gravel, trace clay (Fill)
	760	End of hole (Refusal to sample)
BH03	0 - 12	Surfacing material (12 mm thick)
	12 - 188	Asphaltic concrete layer (177 mm thick)
	188	End of core hole

2.1.2 Drilling Program on January 24, 2007

Four boreholes were drilled north of the track at the approximate locations shown on Figure 1. The north side of the park is bounded by a slope, which is about 6 m high. The distance to the toe of the slope from the edge of the track varies from approximately 3 m to 15 m. To investigate the subsurface conditions, two holes were drilled at the toe of the slope and two were drilled on the slope.

Water issues were anticipated around the toe of the slope; thus BH 4 and BH 5 were drilled at the selected locations. Since the underground utilities known to exist in this area could not be located, the initial 1.5 m was vacuum excavated (Photo 4 in Appendix II). The initial plan was to auger drill these holes to 5 m depth after clearing the holes for utilities. However, during the vacuum excavation, in both boreholes, a poorly graded gravel fill encased in filter fabric was encountered below the top soil. The ground water was flowing into the holes quickly and caving was observed (Photo 5 in Appendix II). The ground water and caving gravel was unfavorable for auger drilling; thus vacuum excavation was continued up to 1.8 m depth in BH04 and 2.5 m depth in BH05. Piezometers were installed in each hole with piezometer tips at the bottom of the holes. The holes were backfilled with sand and bentonite and a lock cap was set flush mounted to the ground surface.

In both holes, filter fabric was encountered just below the top soil (i.e. about 0.3 m depth) and at about 1 m depth from the ground level. It appeared that the gravel fill continued below the lower filter fabric; however good quality samples could not be obtained. The water levels in the standpipe piezometers were recorded about 3 hours after drilling; the water levels were 0.75 m below ground level in BH04 and 0.63 m below ground level in BH05.

It is apparent that both boreholes BH04 and BH05 encountered a subsurface drain. No pipe was evident within the drain, and the horizontal dimensions of the drain are not known.

Boreholes 6 and 7 are located 4.5 m to 7 m up the slope; they were auger drilled to 4.6 m with a solid stem auger and standpipe piezometers were installed in both holes. The holes were backfilled with sand and bentonite and a lock cap was set flush mounted to the ground surface. In both holes, below the top soil a moist to wet sand layer was encountered. Below the sand layer, a clay layer with sand lenses was encountered. The water levels in BH06 and BH07, approximately 3 hours after drilling, were 1.45 m and 1.20 m below ground level, respectively. The records of these two boreholes are attached at the end of the report as Appendix I and Table 2 provides a summary of the borehole records.

Table 2
Summary of Borehole Records – Foothills Athletic Park

Borehole Number	Depth (m)	Description
BH04	0 - 0.3	Top soil
	0.3 - 1.0	Gravel with little sand, trace silt (Fill). A heavy non-woven geotextile was encountered at 0.3 m, separating the topsoil from the gravel fill. The fill is not drain rock.
	1.0 - 1.8	Gravel with little sand, trace silt (Fill). A heavy non woven geotextile was encountered at 1 m, separating the gravel fill from very similar material underlying the fabric. The soil below the geotextile may include sand and silt zones with depth
BH05	0 - 0.3	Top soil
	0.3 - 1.0	Gravel with little sand, trace silt (Fill). A heavy non-woven geotextile was encountered at 0.3 m, separating the topsoil from the gravel fill. The fill is not drain rock.
	1.0 - 2.5	Gravel with little sand, trace silt (Fill). A heavy non woven geotextile was encountered at 1 m, separating the gravel fill from very similar material underlying the fabric. The soil below the geotextile may include sand and silt zones with depth
BH06	0 - 0.3	Top soil
	0.3 - 2.4	Moist to wet brown sand
	2.4 - 4.6	Clay with wet sand lenses
BH07	0 - 0.3	Top soil
	0.3 - 1.8	Moist to wet brown sand
	1.8 – 4.6	Clay with wet sand lenses

2.2 Glenmore Athletic Park

In this site, two bore holes were drilled, one off the running track (BH01) and one on the running track (BH02) at the approximate locations shown on Figure 2. BH01 was drilled to a depth of 6.1 m with sampling at every 1.5 m. A stand-pipe piezometer (25 mm plastic pipe) was installed in the borehole with the piezometer tip at the base of the hole to monitor the groundwater level. The hole was backfilled with sand and drill cuttings and sealed at the top with bentonite.

At the location of BH02, a 350 x 350 mm piece of rubber surfacing was cut and removed prior to augering (Photo 1 in Appendix III). Approximately 50% of the area between the rubber surfacing and the underlying asphaltic concrete was delaminated (Photo 2); however no free water or ice was observed between the layers at this location. Then, BH02 was augered and sampled to 1.16 m depth. At the end of sampling, the hole was backfilled with ready-mix concrete to the top of the asphaltic concrete layer. Details of the borehole records are given in Table 3.

Table 3
Summary of Borehole Records – Glenmore Athletic Park

Borehole Number	Depth (mm)	Description
BH01	0 - 300	Top soil (300 mm thick)
	300 - 1500	Compact moist, grayish brown sandy silt, trace clay, trace gravel (1200 mm thick)
	1500 - 2700	Moist silty clay (1200 mm thick)
	2700 - 6100	Moist greenish yellow Mudstone bedrock
	6100	End of hole (Achieved depth)
BH02	0 - 12	Surfacing material (12 mm thick)
	12 - 88	Asphaltic concrete layer (76 mm thick)
	76 - 676	Moist, light brown gravel and sand, trace clay (Fill) (600 mm)
	676 - 714	Moist, dark brownish black silty clay (38 mm thick)
	714 - 1160	Compact moist, gray sand, trace silt with brown silty clay pockets
	1160	End of hole (Achieved depth)

3.0 SUMMARY OF THE OBSERVATIONS

Summary of observations made at the two sites during the geotechnical investigation are listed below separately.

Foothills Athletic Park

Pavement Structure

The following observations and comments regarding the pavement structure for the track at Foothills Athletic Park are provided:

- The test holes encountered a minimum of 150 mm asphaltic concrete pavement overlying at least 0.5 m of clean, well graded granular material.
- Older asphaltic concrete also exists at some locations though apparently, the older pavement was not continuous over the track surface when the newest asphaltic concrete pavement was placed.
- As a pavement structure, the A.C. pavement and underlying granular zone appear to be structurally sufficient for use as a track. There does not appear to be a need to remove and replace the pavement (asphaltic concrete plus underlying gravel) for structural purposes.
- While not encountered during the investigation, it is likely that the asphaltic concrete pavement is cracked due to annual temperature variations and it is probable that water moves through the cracks. Even if the asphaltic concrete pavement was completely uncracked, water would likely move through the pavement as a vapour particularly if the surface is warm and the granular zone below the track is saturated (a situation that may exist in the spring and early summer).

Drainage

The following comments and observations regarding subsurface drainage conditions of the north end of the Foothills Athletic Park are provided:

- Significant ground water discharge from the slope that forms the north end of the Foothills Park has been encountered by this investigation.
- An existing ground water drain was encountered at the toe of the slope. The horizontal dimensions of the drain and its discharge point have not been confirmed.
- The drain does not appear to be functioning properly. This may be due to the relatively low hydraulic capacity of the drainage media that was used and/or due to plugging further downstream in the drain.
- The current ground water level at the toe of the slope is approximately 0.6 to 0.7 m below the surface. It is expected that this level will rise to the surface with increased discharge from the slope during spring break-up and early summer.
- If the ground water level rises to the surface near the toe of the slope, it is likely that the gravel zone below the asphaltic concrete running track pavement will become saturated in the spring with saturation levels near the underside of the A.C. pavement.

Glenmore Athletic Park

Pavement structure

- The track structure at the Glenmore Athletic Park also appears to be structurally sufficient for use as a running track. There does not appear to be a need to remove and replace the pavement (asphaltic concrete plus underlying gravel) for structural purposes.

Drainage

- No water level was recorded in the standpipe installed in BH01.
- Neither ground water nor frozen soil was encountered in BH01 and BH02 during the drilling investigation. The information from the investigation indicates that in-flow of ground water is not a significant issue at the Glenmore Athletic Park.

4.0 RECOMMENDATIONS

Based on the observations made during the geotechnical investigations and our experience in this area, the following recommendations are provided:

- The performance of the track surfacing may be adversely affected by the prevalence of available water from seepage (and possibly surface drainage) at the north end of the Foothills track. The water issues can likely be minimised with an effective drainage system along the toe of the slope. Figure 3 shows a cross-section schematic of a recommended subsurface drain. The actual invert elevation of the drain will be determined by the available storm drainage facilities in this area of the park. It is important that the elevation of the base of the drain be constructed at an elevation as low as practical, since seepage will be able (to some extent) to pass under the drain. In the unlikely event that the suggested 2 m depth proves to be insufficient in the future a second (similar) drain could be placed along the northern edge of the track. In addition to the subsurface drain, all surface grades around the track should be examined and regraded if necessary to ensure positive drainage away from the track surface.

- At the Glenmore Athletic Park, no geotechnical issues that can be connected to the delaminations in the surfacing material of the running track have been identified. At the time, BH02 in Glenmore Athletic Park was dry at the end of drilling. Water may also be affecting the track surface, but the source of the water does not appear to be seepage. From a geotechnical perspective there does not appear to be any remedial action needed.
- More data about the ground water levels at both sites can be obtained by recording the piezometer readings regularly during the spring-summer seasons.

5.0 CLOSURE

We trust that the information presented meets your requirements. If you have any questions, please contact the undersigned at your convenience.

Yours truly,

GOLDER ASSOCIATES LTD.
APEGGA Permit to Practice #05122

FEB 16/07

Anupama Amaratunga, M.Sc
Geotechnical Engineering Group

Doug Pelly, P.Eng.
Principal, Senior Geotechnical Engineer

AA/RP/DP/wk

Attachments:
Figure 1 – Foothills Athletic Park borehole location plan
Figure 2 – Glenmore Athletic Park borehole location plan
Figure 3 – Schematic design detail for the drainage line
Appendix I – Borehole Records from Foothills Athletic Park
Appendix II – Foothills Athletic Park site photos
Appendix III – Glenmore Athletic Park site photos

Distribution:
2 copy Graham Edmunds Cartier Architects
3 copy Golder Associates Ltd.

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client’s expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder’s report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder’s report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder’s report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

FIGURES

FIGURE 1 - FOOTHILLS ATHLETIC PARK BOREHOLE LOCATION PLAN
FIGURE 2 - GLENMORE ATHLETIC PARK BOREHOLE LOCATION PLAN
FIGURE 3 - SCHEMATIC DESIGN DETAIL FOR THE DRAINAGE LINE

NOT TO SCALE - SCHEMATIC ONLY

BH01 - Located at the centre of fifth lane from center
BH02 - Located on the fourth lane from the center
BH03 - Located on the third lane from the centre
BH04 - Located at the toe of the slope
BH05 - Located at the toe of the slope
BH06 - Located on the slope
BH07 - Located on the slope

PROJECT
GEC ARCHITECTS
FOOTHILLS ATHLETIC PARK
CALGARY, ALBERTA

TITLE
FOOTHILLS ATHLETIC PARK BOREHOLE LOCATION PLAN

Golder Associates
Calgary, Alberta

PROJECT 06-1321-080.1000			FILE No.	Location Plan
DESIGN	AA	02/02/07	SCALE AS SHOWN	REV. 0
CADD	RFM	05/02/07	FIGURE: 1	
CHECK	AA	06/02/07		
REVIEW	DP	06/02/07		

L:\2006\1330-Engin\1321\06-1321-080\1000\Figure 1 Location Plan.dwg Feb 16, 2007 - 1:42pm

NOT TO SCALE - SCHEMATIC ONLY

BH01 - Located on the grass side, 4 m from the inner edge of the track
BH02 - Located on lane 1 from the inner side

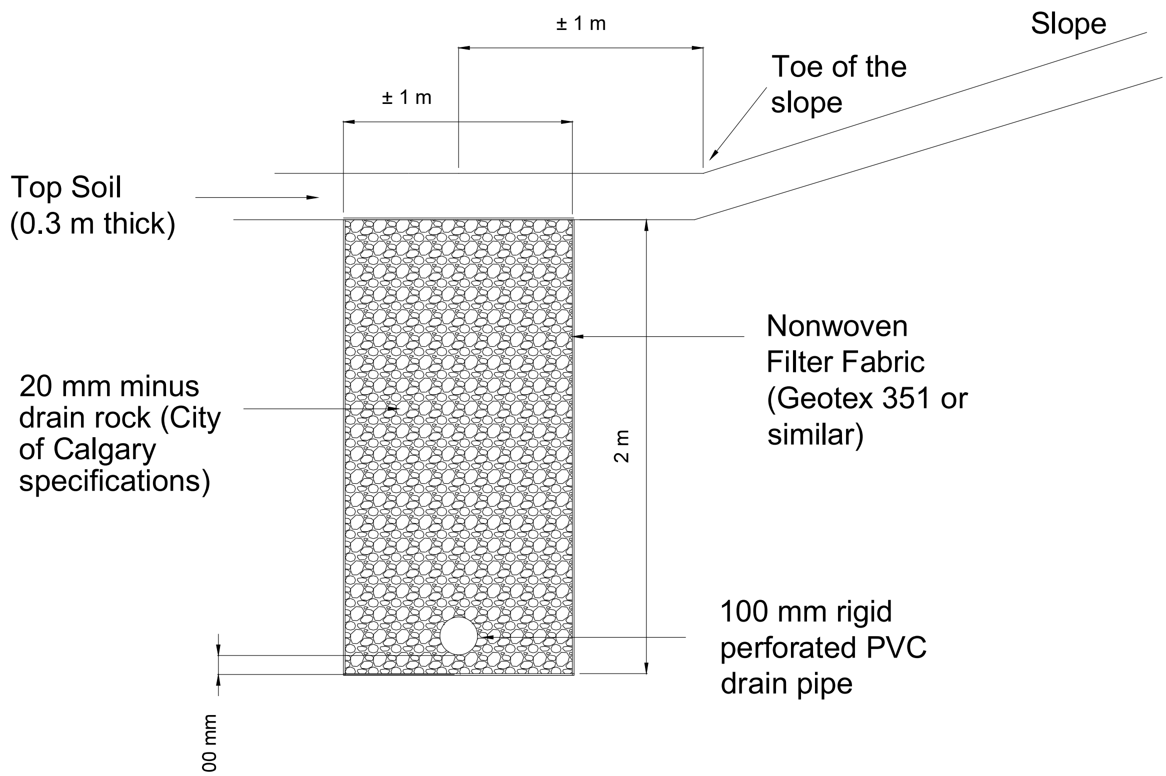
PROJECT
GEC ARCHITECTS
GLENMORE ATHLETIC PARK
CALGARY, ALBERTA

TITLE
GLENMORE ATHLETIC PARK BOREHOLE LOCATION PLAN

Golder Associates
Calgary, Alberta

PROJECT 06–1321–080.1000			FILE No.	Location Plan
DESIGN	AA	02/02/07	SCALE AS SHOWN	REV. 0
CADD	RFM	05/02/07	FIGURE: 2	
CHECK	AA	06/02/07		
REVIEW	DP	06/02/07		

L:\2006\1330–Engin\1321\06–1321–080\1000\Figure 2 Glenmore Location Plan.dwg Feb 16, 2007 – 1:44pm



L:\2006\1330-Engin\1321\06-1321-080\1000\Figure 3 Drainage Line.dwg Feb 16, 2007 - 1:45pm

NOTE

INVERT OF DRAIN PIPE SHOULD BE SET AT LOWEST ELEVATION THAT WILL DRAIN BY GRAVITY TO AVAILABLE STORM DRAINAGE.

NOT TO SCALE - SCHEMATIC ONLY

PROJECT

GEC ARCHITECTS
GLENMORE ATHLETIC PARK
CALGARY, ALBERTA

TITLE

SCHEMATIC DESIGN DETAIL FOR THE DRAINAGE LINE

Golder Associates
Calgary, Alberta

PROJECT 06-1321-080.1000			FILE No. Drainage Line	
DESIGN	AA	02/02/07	SCALE AS SHOWN	REV. 0
CADD	SWD	06/02/07	FIGURE: 3	
CHECK	AA	06/02/07		
REVIEW	DP	06/02/07		

APPENDIX I

BOREHOLE RECORDS FROM FOOTHILLS ATHLETIC PARK

Appendix I

Borehole Records from Foothills Athletic Park

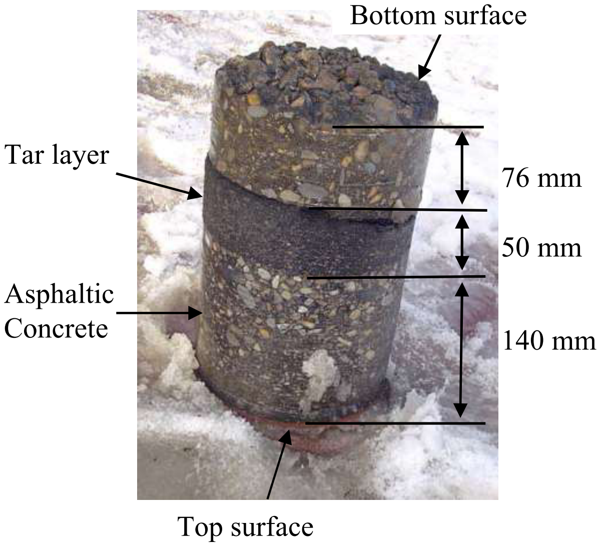


Photo 1: Core sample - BH01

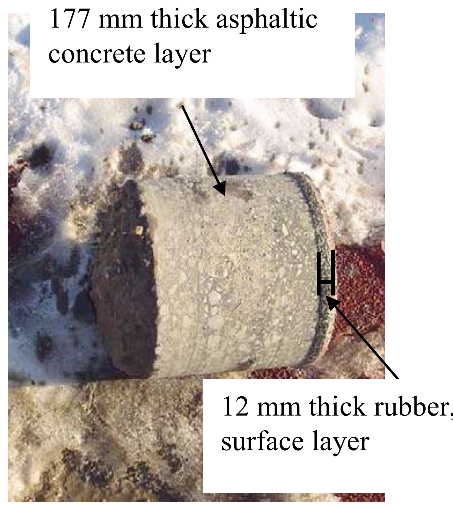


Photo 2: Core sample –BH03

Photo 3: Sand and gravel fill from 600 to 760 mm depth in BH02

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APPENDIX II

FOOTHILLS ATHLETIC PARK SITE PHOTOS

Appendix II

Foothills Athletic Park Site Photos

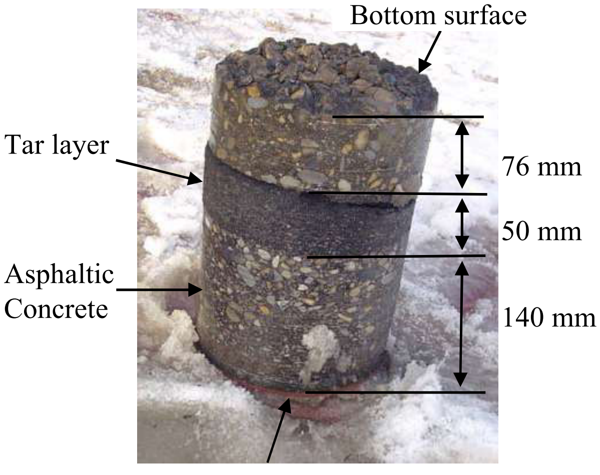

Photo 1: Core sample - BH01

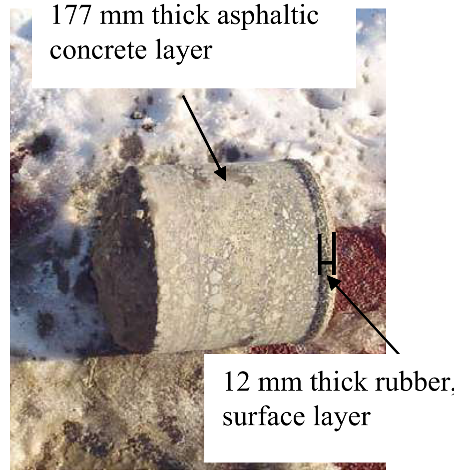

Photo 2: Core sample –BH03

Photo 3: Sand and gravel fill from 600 to 760 mm depth in BH02

Golder Associates

Appendix II

Foothills Athletic Park Site Photos

Photo 4: Hydro Vacuuming through the gravel layer (BH05)

Photo 5: BH04 after vacuum excavation

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APPENDIX III

GLENMORE ATHLETIC PARK SITE PHOTOS

Glenmore Athletic Park Site Photos

Photo 1: Ripping the surface material at BH02 before augering

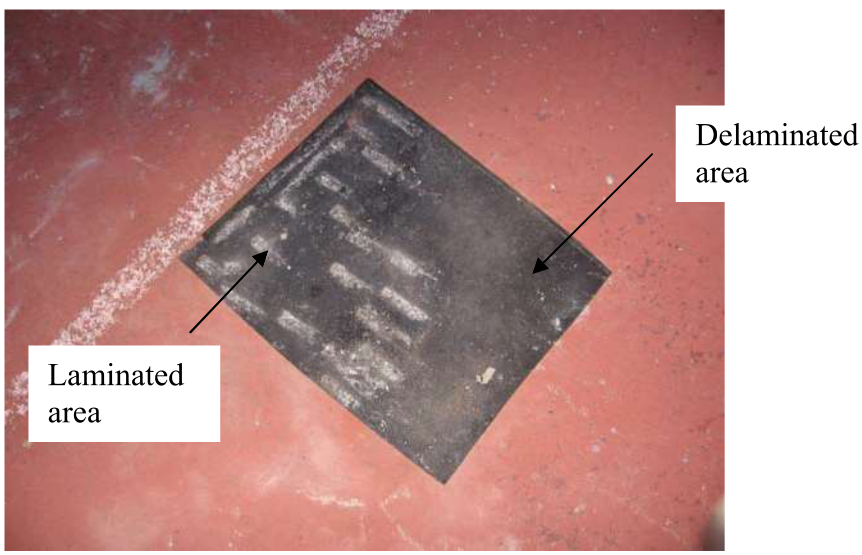


Photo 2: Asphaltic concrete surface after removing the rubber surface

APPENDIX F: SPACE PROGRAMME

Athletic Park Master Plan
The City of Calgary Recreation
Draft Summary of Space Requirements
Foothills Athletic Park

30 June, 2010, revised
4 October, 2016

			PROGRAM NEED	Square Feet	Square Meters	REMARKS
			Field House			
A.	**Field House**					
	A.	1	Field House 630' x 400' (192M x 122M):	252,000	23,411	
	A.	2	400-Meter, 9-lane Track, 10-lane straightaway, Infield Soccer Field			
	A.	3	Long/Triple Jump			
	A.	4	Pole Vault runway			
	A.	5	High Jump area			
	A.	6	Batting Cages (4); Nets/Curtains			
		Spectator Facilities (Based on 500 permanent, 2,000 portable telescoping bleacher seats, expansion to 10,000)				
	A.	7	Spectator Grandstand (10 rows portable telescoping bleachers)	0	0	7,500 seats installed in Basketball/Volleyball Courts space
	A.	8	Concessions Stand(s) (4 points-of-sale)	250	23	
	A.	9	Women's Washrooms (22 wc, 11 lavs)	1,320	123	Consider additional use as outdoor washrooms
	A.	10	Men's Washrooms (6 wc, 6 urinal, 6 lav)	700	65	Consider additional use as outdoor washrooms
	A.	11	Family Washrooms (two at 100 SF)	200	19	Consider additional use as outdoor washrooms
	A.	12	Custodial Closet	50	5	Include in women's fixture count
	A.	13	Ticketing/Fan Care	180	17	
		Courts				
	A.	12	Basketball / Volleyball / Badminton (456' x 114') (7 courts)	52,000	4,831	138 M x 35 M
			Subtotal Group A Field House	**306,700**	**28,492**	
			Circulation, mechanical, chases, wall thickness	**33,737**	**3,134**	**90% efficiency**
			Grand Total Gross Area Requirements	**340,437**	**31,627**	

FRA2019-0628 Program Overview and Update ATT 3
ISC: Unrestricted

Athletic Park Master Plan
The City of Calgary Recreation
Draft Summary of Space Requirements
Foothills Athletic Park

30 June, 2010, revised
4 October, 2016

			PROGRAM NEED	Square Feet	Square Meters	REMARKS
			Fitness Component			
A.	**Lobby**					
	A.	1	Manager Office	120	11	
	A.	2	Security Manager Office	120	11	
	A.	3	Entrance/Lobbies/Circulation	1,500	139	
	A.	4	Women's Washrooms (5 wc, 3 lavs)	300	28	
	A.	5	Men's Washrooms (2 wc, 3 urinals, 3 lavs)	280	26	
	A.	6	Family Washrooms (Two at 100 sf)	200	19	
	A.	7	Vending Machine and Payphone Alcove	160	15	
	A.	8	First Aid	150	14	
	A.	9	Equipment Check-In Preparation	250	23	
	A.	10	Equipment Distribution	180	17	All distribution may not be centralized
	A.	11	Equipment Room Receiving	140	13	
	A.	12	Equipment Manager Office	140	13	
			Subtotal - Group A Lobby	**3,540**	**167**	
B.	**Change Rooms**					
	B.	1	Women's General Change Room (100 Full, 100 Half-height lockers)	1,800	167	Serve Future Natatorium, Field House and Fitness Component
	B.	2	Women's General Shower/Washroom (8 showers, 4 wc, 4 lavs)	600	56	
	B.	3	Men's General Change Room (100 Full, 100 Half-height lockers)	1,800	167	Serve Future Natatorium, Field House and Fitness Component
	B.	4	Men's General Shower/Washroom (8 showers, 2 wc, 2 urinals, 4 lavs)	600	56	
	B.	5	Unisex Special Needs Change Room (100 lockers)	1,500	139	(100 @ 15" x 18" x 60")
	B.	6	Unisex Special Needs Shower/Washroom (3 showers, 3 wc, 3 lavs)	900	84	
			Subtotal - Group B Change Rooms	**7,200**	**669**	
C. Meeting/Classrooms/Multi-Purpose Rooms						
	C.	1	Multi-Purpose Room	800	74	Capacity 30
	C.	2	Meeting Room/Classroom	800	74	Capacity 30
	C.	3	Meeting Room/Classroom	1,200	111	Capacity 45
	C.	4	Storage	300	28	Shared by meeting rooms
			Subtotal - Group C Meeting Rooms	**3,100**	**288**	
D. Group Exercise Rooms						
	D.	1	Group Exercise Room 1	2,400	223	Capacity 36
	D.	2	Group Exercise Room 2	2,000	186	Capacity 30
	D.	4	Storage	200	19	Shared by Group Exercise
			Subtotal - Group D Group Exercise Rooms	**4,600**	**427**	
E.	**Fitness and Conditioning**					
	E.	1	Fitness and Conditioning Room	6,000	557	Includes Stretching/Selectorized/Cardio Equipment
	E.	2	Supervisor's Desk/Check-in Counter	120	11	
	E.	3	Fitness Supervisor's Office	150	14	
	E.	6	Nutritional Supplement Station/Preparation/Distribution	100	9	
	E.	7	Maintenance and Storage	200	19	
	E.	8	Meeting/Counseling Room/Classroom	180	17	Smaller room suitable if near larger classroom
			Subtotal - Group E Fitness and Conditioning	**6,750**	**627**	

Athletic Park Master Plan
The City of Calgary Recreation
Draft Summary of Space Requirements
Foothills Athletic Park

30 June, 2010, revised 4 October, 2016

		PROGRAM NEED	Square Feet	Square Meters	REMARKS
F.		**Strength Training**			
F.	1	Strength Training Room	8,500	790	Includes Stretching/Plyometrics/Free Weights/Circuit Trng.
F.	2	Supervisor's Desk/Check-in Counter	120	11	
F.	3	Strength Coach's Office	150	14	
F.	4	Assistant's Office	120	11	
F.	7	Maintenance and Storage	200	19	
F.	8	Meeting/Counseling Room/Classroom	180	17	Smaller room suitable if near larger classroom
		Subtotal - Group F Strength Training	**9,270**	**861**	
G.		**TI / Future Sports Medicine**			
G.	1	Treatment Area (2 tables)	200	19	
G.	2	Taping Area (2 stations)	100	9	Stations along wall allow greater efficiency
G.	3	Rehabilitation Area	250	23	
G.	4	Hydrotherapy	250	23	2 whirlpools, 1 large ice machines
G.	5	Examination Room	140	13	
G.	7	Unisex Washroom/Changing Room	60	6	
G.	8	Physical Therapist	180	17	
G.	9	Assistant Office	120	11	
G.	13	Student Intern Workroom (8 lockers, 2 study carrels)	150	14	
G.	14	Storage	500	46	
G.	15	Additional to accommodate current space occupied by tenant	5,325	495	LifeMark currently occupies 7,275 sf in Bauer
		Subtotal - Group G Sports Medicine	**7,275**	**676**	
H.		**Building Services**			
H.	1	Materials Storage/Workroom	250	23	
H.	2-4	Electrical Panel Rooms (Assume 4 @ 50 SF)	200	19	
H.	5	Switchgear	0	0	
H.	6	Steam Reduction / Hot water pumps	1,000	93	
H.	7-11	HVAC Fan Rooms (Assume 6 @ 400 SF)	2,400	223	
H.	12	Fiber Distribution	70	7	
H.	13-16	Telephone/Data Equipment Rooms (Assume 4 @ 60-80 SF)	320	30	
H.	17	Elevator (2)	360	33	
H.	18	Elevator Machine Room	160	15	
H.	19-22	Custodial Closets (4 @ 50 SF)	200	19	
		Subtotal - Group H Building Services	**4,960**	**461**	
		Subtotal Net Assignable Area	**46,695**	**4,338**	
		Circulation, Structure, Mechanical Chases	**31,236**	**2,902**	**65% efficiency**
		Total Gross Area - Community/Training Building	**77,931**	**7,240**	

APPENDIX G:
FUTURE CONSIDERATIONS /RISKS

Future Considerations

NEXT PHASES / FUTURE DEVELOPMENT

The conceptual design of the fieldhouse takes as part of its basis and assumptions that the future development proposed in the natatorium and ice arenas will be built as part of a unified sports facility. Adjustments to the conceptual layout were made in order to provide for the future linkage to these other programmes. Although the Fieldhouse will be a self-sufficient building there are functions that will be housed in temporary location awaiting the permanent location to built as future development.

This report focused on the further development of phase 1 as the fieldhouse only as it has been identified as the most immediate need. Further study of the impact made to the Foothills master plan layout as presented in the previous reports should be completed. A brief discussion of phasing was included in this report but a more in depth examination of the future development of the entire Foothills Athletic Park, including potential replacement of the existing ice arenas and pool with courts and fields that were previously identified as part of the master plan.

REPLACEMENT OF EXISTING POOL AND ICE ARENAS

The scope of this report was the completion of the fieldhouse and the required access and parking to support that programme. The report acknowledges the future development of the pool and ice arenas that will form a part of a completed whole community sports and performance facility. The conceptual design of these facilities assumes that they will be completed as replacements for the existing Norma Bush and Father David Bauer ice arenas and the Foothills Pool.

These existing facilities are identified in the most recent Facility Inventory Report as minimally suitable or In need of replacement. After the completion of the proposed future development of a replacement for these facilities there will be site area that could be used for various elements proposed on the Foothills Athletic Park Master Plan that are not currently reflected in the site facilities as shown in this report.

BASEBALL FACILITIES

Although there are many baseball fields within the City of Calgary. There is no other Baseball stadium with a spectator capacity and amenities provision like that of Foothills Stadium. Although there is not currently a professional team in Calgary that claims the facility as home, since the closing of the Calgary Vipers, several university and smaller league teams currently use the facility in their programs. Engagement efforts by the design team acknowledge these stakeholders and ensure that baseball fields are available to provide these programs and groups with the facilities required to continue these sport programs.

Risks

SOIL CONDITIONS

The geotechnical investigation completed in 2007 and contained in Appendix E of this report does not provide data or analysis of the bearing capacity or a recommendation of the likely foundation for the large building proposed as the Foothills Fieldhouse. The focus of the completed report was the subsurface groundwater conditions that were suspected as the cause for the premature delamination of the track surface. Therefore the structural engineers that have provided input to the conceptual design of the facility have assumed the bearing capacity of the soil in the current proposed location.

The actual condition of the soil may require changes to the foundation of the building that was assumed in the estimate of cost analysis.

TRAFFIC IMPACT ASSESEMENT / PARKING

Completed in 2011 the traffic Impact assessment (TIA) report assumes the continuation of the baseball programs on the site including the Calgary Vipers professional baseball team. The site layout as presented in this report contains no baseball activities. Because the TIA report used the methodology of verifying the existing parking demand count and proposing additional parking supply as required only for the new or increased features in the Master plan the recommended parking supply of 778 parking stalls would no longer be representative of the actual demand on site. This report uses the rates and values provided in the TIA to establish a new recommended parking inventory that will reflect the demand generated by the uses that will be found on site. An update to the TIA should be undertaken to verify the parking supply prior to the development permit application process for the Fieldhouse to fully support the parking relaxation that would be requested from the land-use bylaw application.

POTENTIAL LAND CEDED FOR THE ROAD WIDENING OF CROWCHILD TRAIL

When the study being undertaken on Crowchild Trail and its intersections is completed there is an expectation that land may be ceded to Transportation to allow the road to be expanded. The location of the new property line is assumed from documents that were provided during the conceptual design phase. The exact location of this line is unconfirmed. The proposed location of the fieldhouse is close to this assumed line in order to avoid impacting the fields and existing track to the west. More or less land are may be ceded. This may require adjustment to the proposed layout of the Foothills Athletic park.

GROUNDWATER CONDITIONS

As the building is located next to and cutting into the hill on the north and east of the site it is anticipated that there will be groundwater infiltration on this border. The geotechnical report also indicates groundwater concerns that will need to be accounted for in the detailed design of the proposed facility.

MARKET ADJUSTMENT

Included in the estimate of probable costs is an amount intended to anticipate the increase of steel and metal material costs imported from the United States due to potential levies being discussed. Effects from levies and unforeseen supply difficulties may have a significant effect on the cost of the structural building materials required for this facility.

APPENDIX H:
PRELIMINARY LEED SCORECARD

2018-06-08 - Foothills Fieldhouse Preliminary LEED Scorecard

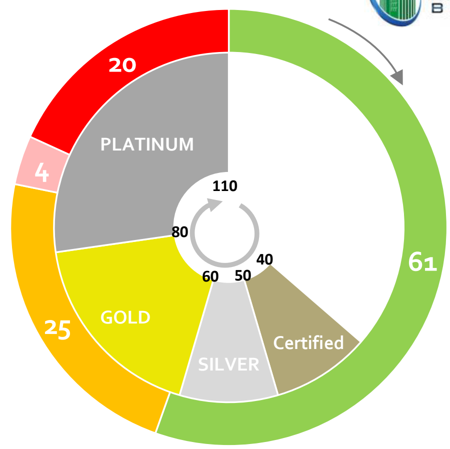
LEED v4 BD+C NC Scorecard

Foothills Fieldhouse

Point Summary: GOLD

Objective: TBD

USGBC Project #: TBD



Targeted	Analysis	Pending	No		Integrative Process
1				IPc1	Integrative Process

10	2	1	3		Location and Transport
				~~LTcND~~	~~LEED Neighbourhood~~
1				LTc1	Sensitive Land Protection
			2	~~LTc2~~	~~High Priority Site~~
4		1		LTc3	Density and Diverse Uses
3	2			LTc4	Access to Quality Transit
1				LTc5	Bicycle Facilities
			1	~~LTc6~~	~~Reduced Parking Area~~
1				LTc7	Green Vehicles

3	3	1	3		Sustainable Sites
Prerequisite				SSp1	Construction Pollution
		1		SSc1	Site Assessment
			2	~~SSc2~~	~~Protect/Restore Habitat~~
			1	~~SSc3~~	~~Open Space~~
	3			SSc4	Rainwater Management
2				SSc5	Heat Island Reduction
1				SSc6	Light Pollution Reduction

7	2	0	2		Water Efficiency
Prerequisite				WEp1	Outdoor Water Use
Prerequisite				WEp2	Indoor Water Use
Prerequisite				WEp3	Building Water Metering
2				WEc1	Outdoor Water Use
4	2			WEc2	Indoor Water Use
			2	~~WEc3~~	~~Cooling Tower Water Use~~
1				WEc4	Water Metering

19	9	0	5		Energy and Atmosphere
Prerequisite				EAp1	Fundamental Cx
Prerequisite				EAp2	Min. Energy Performance
Prerequisite				EAp3	Building Energy Metering
Prerequisite				EAp4	Refrigerant Management
6				EAc1	Enhanced Cx
11	2		5	EAc2	Energy Performance
1				EAc3	Energy Metering
	2			EAc4	Demand Response
	3			EAc5	Renewable Energy
1				EAc6	Refrigerant Management
	2			EAc7	Power/Carbon Offsets

5	3	2	3		Materials and Resources
Prerequisite				MRp1	Storage of Recyclables
Prerequisite				MRp2	Const. Waste Mgmt. Plan
	3		2	MRc1	Bldg. Life-Cycle Impact
1		1		MRc2	Enviro. Declarations
1			1	MRc3	Raw Material Sourcing
1		1		MRc4	Material Ingredients
2				MRc5	Const. Waste Mgmt.

7	5	0	4		Indoor Env. Quality
Prerequisite				EQp1	Min. O/A Ventilation
Prerequisite				EQp2	Tobacco Smoke Control
2				EQc1	Air Quality Strategies
	1		2	EQc2	Low-Emitting Materials
1				EQc3	Air Quality Mgmt. Plan
2				EQc4	Air Quality Assessment
	1			EQc5	Thermal Comfort
2				EQc6	Interior Lighting
	2		1	EQc7	Daylighting
	1			EQc8	Quality Views
			1	EQc9	Acoustic Performance

5	1	0	0		Innovation
1				INc1	Green Building Ed.
1				INc2	Low-Mercury Lighting
1				INc3	Ergonomics
1				INc4	Low-NOx Equipment
	1			INc5	0
1				INc6	LEED AP

4	0	0	0		Regional Priority
1				RPc1	LTc4 (achieve 3 pts.)
1				RPc2	LTc5 (achieve 3 pts.)
1				RPc3	WEc1 (achieve 4 pts.)
1				RPc4	EAc2 (achieve 10 pts.)

Mission Green Buildings is the trading name of Mission Green Limited

APPENDIX I:
OUTLINE SPECIFICATIONS

3.2.3 Architectural Preliminary Outline Specification

This Preliminary Architectural Outline Specification is based on the CSC/CSI UniFormat for Building Construction. Proposed assemblies and systems are presented in this manner to assist the Owner in evaluating the building envelope, interior finishes and outdoor spaces in the submission.

NUMBER AND ELEMENT	DESCRIPTION	MASTER FORMAT
EXTERIOR WALL ASSEMBLIES (BUILDING ENVELOPE)		
General Requirements	Window to wall ratio = 30%	
Glazed Aluminum Windows and Curtain Walls	High performance glazed aluminum curtain wall system, thermal transmittance U-value 1.8 W/m^2 • °C, consisting of internally reinforced back section with fixed triple glazed sealed glass units with Low-E coating, full length pressure plate system along mullions internal weep drainage in accordance with Rain Screen Principle; 19 mm and 64 mm deep snap-on covers at mullions and perimeter frame members, keyed-in glass-reinforced nylon thermal break, neoprene sponge interior and EPDM rubber exterior glazed (dry/dry glazing), clear anodized and baked-on charcoal painted aluminum finishes, spandrel glass, and insulated back pans at floor assemblies. Provide continuity of building enclosure vapour and air barrier using glass and glazing materials Reference product: Kawneer 7525 Series Note: Typical insulated spandrels constructed as "Shadow Boxes," with sealed glass units forming the exterior rainscreen, providing partially obscured view of the insulation facing within the assembly. Sealed Insulated Glass: Double Pane Insulating Glass Units: meet or exceed requirements of CAN/CGSB 12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using minimum 6 mm glass thickness for individual panes. Use two stage seal method of manufacture, as follows: Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar. Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal. **Use at low level of field house, include sun screens / shades.**	07 21 13 07 21 16 07 62 00 08 11 16 08 81 00 08 44 13 08 80 50 09 21 16
Aluminum Composite Panel System	Aluminum Composite panel comprised of two (2) 0.51 mm (0.020") thickness, pre-finished aluminum sheets; alloy 3105-H14; bonded to extruded thermoplastic core for a total panel thickness of 4 mm (5/32"), and having reinforced and riveted corners in a non-progressive exterior wall system forming an integrated rain screen assembly vented horizontally and vertically, with system of girts, vertical drainage channels, insulation and air/vapour retarder, flashings and trims using prefinished materials and concealed fasteners. Total panel system to have an insulating value of RSI=3.52(R-20). Acceptable materials: Alcan Composites Inc., Alucobond	07 21 13 07 42 43 07 21 16 07 62 00

	Panels; Alcoa Cladding Systems, Reynobond Panels; Mitsubishi Chemical America Inc., Alpolic Panels. Colour / finish: To match Reynobond Colorweld 300 Frisco White, and Reynobond Colorweld 300XL Silver Metallic.	
Solid Phenolic Panel System	This Section includes requirements for supply and installation of solid phenolic interior and exterior soffit panel application. CAN/ULC S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies CAN/ULC S134-92 (R1998), Standard Method of Fire Test of Exterior Wall Assemblies Solid Phenolic Wall Panels: Flat panel comprised of thermosetting resins homogeneously reinforced with cellulose fibres, manufactured under high pressure and temperature and as follows: Mounting Configuration: Prepare panels for non-exposed fastener installation. Panel Thickness: minimum 8 mm Panel Core: Fire Resistant Black Core meeting requirements of CAN/ULC S102. Basis-of-Design Materials: Trespa North America, Meteon FR Aluminum Sub-Framing Materials: Aluminum extrusions, mill finish meeting requirements for ASTM B221M alloy 6063-T6 in shapes and sizes selected by fabricator as required to suit design loading and wall configuration. Hanger Wire: 4.0 mm dia. minimum, commercial quality maximum 1200 mm on centre and where additional support is required. Aluminum Trim and Accessory Materials: Aluminum sheet or plate, anodized finish meeting requirements for ASTM B209M alloy 6063-T6 in configurations and sizes selected by fabricator as required to suit details. Panel Fasteners: Non-corrosive fasteners as recommend by panel manufacturer, and as follows: Attach panel sub-framing system to primary structural supports using manufacturer's recommended concealed fasteners. Attach trims and joint profiles using manufacturer's recommended concealed fasteners for typical joinery. Attach panels to sub-framing using manufacturer's standard non-exposed fasteners. Flashings: Prefinished flashings, colour to match panel colours as specified in Section 07 62 00. Accessories: Manufacturer's recommended materials required for complete installation.	07 42 33
Translucent Wall Panel System	Translucent fibreglass faces: manufactured from glass fibre reinforced thermoset resins by insulated translucent panel system fabricator specially for architectural use. Flammability: The (interior) face sheet flamespread rating no greater than 25 and smoke developed no greater than 225 when tested in accordance with CAN4-S-102-M. Burn extent by ASTM D-635 no greater than 25mm. Faces will not deform, deflect or drip when subjected to fire or flame; or delaminate when exposed to 1500C for 25 minutes. Weatherability: The full thickness of the exterior face shall not change colour more than 3.0 Hunter or CIE Units DELTA E by ASTM D-2244 after five (5) years outdoor south Florida weathering at 5 degrees facing south, determined by the average of a least three (3) white samples with and without a protective film or coating to ensure maximum, long term colour stability. Exterior face: permanent glass veil erosion barrier embedded	08 94 11

	integrally to provide maximum long term resistance to reinforcing fiber exposure. Sacrificial plastic surface films, coatings or veils are not acceptable. Appearance: Exterior face smooth 1.78 mm thick and white colour. Interior face sheets: 1.14 mm thick and white in colour. Faces will not vary more than +/- 10% in thickness and be uniform in colour. Strength: The exterior face sheet uniform in strength and repel and impact equal to 89kg/M without fracture or tear when impacted by a 87 mm diameter, 2.89kg free falling ball and be resistant to penetration by pencil point. Grid Core The thermally broken I-beam core: 6063-T5 aluminum alloy with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam not less than 10 mm. Machine I-beam grid to tolerances of not greater than +/- 0.05 mm. Thermal break minimum of 25 mm. Panels to withstand 1200ºF fire for a minimum of one (1) hour without collapse of exterior framing. Thermally broken panels have a minimum condensation Resistance Factor of 80 by AAMA 1503.1 measured on the grid line. Basis-of-Design: Kalwall 10% of exterior wall, high level of field house	
Unit Masonry	Standard and light weight concrete Masonry Units to CAN/CSA A165.1 and classification: H/15/B/M (standard), special shapes as required. Ground terrazzo or burnished block on exterior feature areas	04 22 00
Underslab Sheet Vapour / Radon Membrane Radon Mitigation Rough-in System	Sheet Vapour and Radon Retarder (Underslab): Polyethylene sheet in accordance with ASTM E1745, Class A, including manufacturer recommended seam tape, pipe boots and vapour proof mastic. Thickness: 10 mil, minimum Vapour Permeance: 0.01 perm or less: ASTM E96 Tensile Strength: Class A Stego Wrap 10 mil or WR Meadows Perminator 10 mil. Rough in for radon mitigation system in accordance with EPA 625R..	31 21 13
Modified Bituminous Sheet Waterproofing	Waterproofing System capable of resisting moisture/water head and preventing moisture migration to interior. Compatibility between components of waterproofing system is essential. Self-Adhesive Waterproofing System Materials: Primer: water based primer as recommended by membrane manufacturer and for temperatures above 4 degrees C. Primer: to CGSB 37-GP-9Ma, elastomeric bitumen, solvent primer with adhesive enhancing resins to enhance adhesion of self-adhesive membranes at temperatures above -10 C as recommended by membrane manufacturer. Waterproofing Membrane: SBS modified bitumen self-adhering sheet membrane with cross-laminated polyethylene film, covered by pull-off release sheets and as follows: Minimum total thickness: 1.5 mm Tensile strength (membrane): 4.07 MPa to ASTM D412 Tensile strength (film): 40.71 MPa to ASTM D412 Ultimate elongation: 455% to ASTM D412 Flexibility at cold temperature: minimum -30C Water vapour permeability: <0.019 perms to ASTM E96 Puncture Resistance: 2.98 kN to ASTM E154 Waterproofing Mastic: single component sealing compound to	07 13 52

	seal exterior, vertical and horizontal terminations as recommended by manufacturer.	
Board Insulation	Design and Performance Requirements Foundation Wall Insulation: Type 4 extruded polystyrene (XPS) to CAN/ULC S701 and as follows: Thermal Resistance: RSI 0.87/25 mm minimum. Edges: ship-lapped. Compressive Strength: minimum 170 kPa at 10% deformation in accordance with ASTM D1621. Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842. Load Bearing Insulation: Type 4 Polystyrene, high density extruded type in accordance with CAN/ULC S701, Thermal Resistance: RSI 0.87/25 mm minimum. Compressive Strength: minimum 690 kPa at 5% deformation in accordance with ASTM D1621. Water Absorption: maximum 1% (% by volume) in conformance with ASTM D2842. Cavity Wall Insulation: Type 3 extruded polystyrene (XPS) to CAN/ULC S701 and as follows: Thermal Resistance: RSI 0.87/25 mm minimum. Compressive Strength: minimum 170 kPa at 10% deformation in accordance with ASTM D1621. Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842. Semi-Rigid Insulation: Type 3 mineral wool blanket insulation to ASTM C553. Dimension: 610 mm wide x 1219 mm long. Density: 32 kg/m3 to ASTM C612. Thermal Resistance: RSI 0.71 m2K/W to ASTM C518. Adhesive (for polystyrene): trowel consistency, synthetic rubber based insulation adhesive compatible with polystyrene insulation to CGSB 71 GP 24; suitable for application in temperature down to - Thermal Spacers: low-conductivity, fibreglass thermal spacers.	07 21 13
Fibrous Insulation	Design and Performance Requirements Fibrous Mineral Wool Insulation: Type 1 un-faced, preformed mineral slag fibrous insulation in accordance with CAN/ULC S702 and as follows: Thermal Resistance: nominal RSI of 0.67/25 mm. Combustion Characteristics: non-combustible in accordance with CAN/ULC S114. Flamespread: less than 5 in accordance with CAN/ULC S102. Density: 32 kg/m3.	07 21 16
Foam-in-Place Insulation	Design and Performance Requirements Insulation: Closed cell, two pound density, one component rigid urethane foam. Thermal Barrier: spray applied fire retardant overcoat meeting applicable requirements of the Alberta Building Code for thermal barrier of foamed plastic. Installers: Use companies that are members and licensed having trained and certified installers in accordance with CAN/ULC S705.2 requirements. Manufacturer: Obtain air and vapour seal materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section. Install foam in place insulation around all protrusions through the exterior building envelope to achieve and maintain continuity of air/vapour seal.	07 21 19
Modified Bituminous Air and	Design and Performance Requirements	07 25 13

Vapour Barrier	Self-Adhesive Air and Vapour Barrier System Materials: Primer: SBS synthetic rubbers, adhesive resins and solvents used to prime porous substrates to enhance adhesion of self-adhesive membranes at temperatures above -10 C Air/Vapour Barrier Membrane (winter application): to CAN/CGSB 37.56 or ASTM D1970; SBS modified bitumen, self-adhering sheet membrane with polyethylene facer, for application temperatures between - Air/Vapour Barrier Membrane (summer application): to CAN/CGSB 37.56 or ASTM D1970; SBS modified bitumen, self-adhering sheet membrane with polyethylene facer, for application temperature above 5 C Waterproofing Mastic: solvent-based mastic containing SBS modified bitumen, fibres and mineral fillers, used to seal around penetrations and extrusions. Quality Assurance Applicator: company specializing in performing work of this section with minimum 3 years documented experience with installation of air/vapour barrier systems. Completed installation must be approved by the material manufacturer. Applicator: company: Currently licensed by National Air Barrier Association certifying organization. Must maintain their license throughout the duration of the project. Single-Source Responsibility: obtain primary air and vapour materials from a single manufacturer regularly engaged in the manufacturing and supply of the specified products and meeting or exceeding the material properties and performance characteristics of the materials and manufacturers named in this Section. Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.	
EXTERIOR ROOF ASSEMBLIES (BUILDING ENVELOPE)		
Modified Bituminous Membrane Roofing (flat roofs)	Design and Performance Requirements Performance Criteria: Follow ARCA Manual and Alberta Infrastructure Technical Design Requirements. Roofing System: to CSA A123.21 for wind uplift resistance. Provide system to achieve 10 year ARCA warranty Deck Covering: Glass Mat Faced Roof Boards: to ASTM C1177/C1177M for manufacturing and ASTM D3272 for mould resistance, standard, mould resistant. Vapour Retarder: Premanufactured Self Adhesive Air/Vapour Barrier: 0.8 mm thick self-adhesive vapour barrier membrane composed of SBS modified bitumen with thermoplastic polymers and high density polyethylene film and primer. Insulation: Flat Insulation and Sloped Insulation: Closed-cell polyisocyanurate foam core laminated to heavy non asphaltic glass fibre reinforced facers; minimum 25 mm thickness of largest panels practical, having square edges, minimum LTTR RSI 1.04/25 mm; conforming to ULC S704, Type 3, Class 2, to a tolerance not exceeding 3 mm from nominal size in any dimension. Composite Cover Board: Asphaltic-support board and factory applied base sheet: SBS modified base sheet membrane and polyester	07 52 00

	reinforcement, factory applied to a semi-rigid asphaltic board.. The membrane side lap is 60% self-adhesive and 40% covered with a poly film that is heat sealed in conformance with: CGSB 37.56-M Membrane base sheet flashing (stripping): 2.5 mm thick roofing membrane with non woven polyester reinforcement and glass grid and elastomeric bitumen and primer. Top face covered with thermofusible plastic film, underside self adhesive and protected by silicone release paper in accordance with CGSB 37 GP 56M type 2, class C, grade 1. Roofing cap sheet membrane for field surfaces and flashings and parapets: Roofing membrane composed of SBS modified bitumen with a composite reinforcement and elastomeric bitumen. The surface is protected with coloured granules. The underface is covered with a release film in conformance with: ASTM D6162 (Exposed) Conventional Membrane Roofing (CMR) Installation/Application Insulation: fully adhered, adhesive application: Installation of Composite Cover Board and Factory Laminated Base Sheet: in accordance with the CSA A123.21 Wind Uplift Roof System Analysis Report. Cap sheet application – torched to ARCA Requirements. Cap Sheet Flashings Application: to ARCA Requirements Roof penetrations: to ARCA Details Quality Assurance Installer qualifications: company or person specializing in application of modified bituminous roofing systems with 5 years documented experience approved by manufacturer. .Roofing and sheet metal work shall be performed in conformance with roofing manufacturer's written recommendations using materials in accordance with CAN/ULC S107 to obtain Class A fire resistance rating and FM 1-60 Classification. .Conform to Roofing Application Standards Manual as published by ARCA. Work shall be executed by an applicator approved by the ARCA as a member in good standing at time of application. Provide ten (10) year Certificate of Assurance issued through ARCA.	
Standing Seam Metal Roofing (curved field house roof)	Design and Performance Requirements Thermal Movements and Wind Loads: The metal wall and associated flashing systems shall be so designed and constructed as to provide for such expansion and contraction of component materials as will be caused by an ambient temperature range of -40°C to +60°C without causing harmful buckling, failure of joint seals, undue stress on fasteners or other detrimental effects. The system shall provide clear internal paths of drainage in order to drain any trapped moisture to the exterior, discharging moisture in a manner avoiding staining of architectural finishes, collecting in puddles, formation of unsafe icicles and dripping onto pedestrians. Materials Zinc coated steel sheet: to ASTM A653/A653M, commercial quality (CS), with Z275 galvanized coating and as follows: Base Metal Thickness: 0.91 mm. Finish: prefinished Silicone Modified Polyester coating. Prefinished steel with factory applied silicone modified polyester.	07 41 13

	Class: F1S. Specular gloss: 30 units +/ 5 to ASTM D523. Coating thickness: not less than 25 micrometres. Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows: Outdoor exposure period 1000 hours. Humidity resistance exposure period 1000 hours. Basis-of-Design: BEMO Underlay: dry sheathing to CAN/CGSB 51.32 Ventilation and Drainage Mat: sandwich structure, open core with nonwoven filter or membrane. Waterproofing Membrane: provide membrane to protect roof. Sealant: Asbestos free sealant, compatible with systems materials, recommended by system manufacturer and as indicated in Section 07 92 00. Rubber asphalt sealing compound: to CAN/CGSB 37.29. Snow Guards: continuous type, fabricated of non-corrosive prefinished metal as directed by Consultant. Installed without penetrating metal roofing system, and complete with predrilled holes, clamps, or hooks for anchoring. Quality Assurance Installer Qualifications: Engage experienced installer with a minimum of 5 years experience who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance. Installer to be a member of the Alberta Roofing Contractors Association. Obtain each type of metal roofing system through one source from a single manufacturer. Install metal roofing in accordance with manufacturers written instructions to meet ARCA minimum requirements.	
Sheet Metal Flashing And Trim	Design and Performance Requirements Zinc coated galvanized steel sheet (pre-finished): Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating. Class: F1S-Finsihed one side. Thickness: minimum 0.45 mm base metal thickness. Factory Finish: silicone modified polyester Formed aluminum flashings: Tension levelled, aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 3003 H14 and as follows: Thickness: minimum 1.00 mm. Quality Assurance Installer: Engage an experienced installer having a minimum of three years' experience who has completed projects similar in material, design, and extent to that indicated for this Project and with a record of successful in service performance. Construct and install roof metal flashings in accordance with ARCA Manual details and in accordance with the ARCA Manual.	07 62 00
EXTERIOR DOOR ASSEMBLIES (BUILDING ENVELOPE)		
Steel Doors And Frames	Design and Performance Requirements Perform work in accordance with CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, except as otherwise specified herein. Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of 35 degrees C to 35 degrees C. Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span. Steel fire rated doors and frames: Label and list fire rated doors and frames by an organization accredited by the Standards Council of Canada in conformance with CAN4-	08 11 13

	S104 and CAN4 S105 for ratings specified. Fire labels must be factory applied by the manufacturer. Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 for ratings specified or indicated. Materials: Doors and Frames: Metallic coated steel sheets in accordance with ASTM A924/M924; coated to meet requirements of ASTM A653/A653M. Commercial Steel (CS), Type B, ZF120 galvannealed; stretcher levelled standard of flatness where used for face sheets. Honeycomb Door Core (Interior): Structural small cell, 25 mm maximum, kraft paper honeycomb as follows: Weight: 36.3 kg/ream minimum. Density: 16.5 kg/m3 minimum. Sanded to required thickness. Polystyrene Door Core (Exterior): Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness. Welded Frames: Exterior frames: 1.98 mm minimum welded, thermally broken type construction. 50 mm face standard frame profile, throat and frame width to suit wall construction. Interior frames: 1.6 mm minimum for single doors; 1.98 mm for frames with opening width in excess of 1220 mm; welded type construction. 50mm face standard frame profile, throat and frame width to suit wall construction. Welding in accordance with CSA W59. Steel Doors: Fabricate doors with longitudinal edges locked seamed and spot welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Exterior Doors: Form face sheets from 1.6 mm sheet steel with polystyrene core laminated under pressure to face sheets. Interior Doors: Form face sheets from 1.6 mm sheet steel with honeycomb core laminated under pressure to face sheets. Prepare surfaces for field painting to ASTM D6386 and ASTM D7396. Field paint steel doors and frames in accordance with Section 09 91 00 Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.	
Aluminum Doors And Frames	Design and Performance Requirements Design Criteria. Design frames and doors in exterior walls to: .1 Accommodate expansion and contraction within service temperature range of 35 to +35 degrees C. .2 Limit deflection of mullions to maximum 1/175th of clear span when tested to ASTM E330 under wind load of 1.2 kpa. Submit certificate of tests performed. .3 Air Infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E283 at a pressure differential of 6.24 psf (300 Pa) for single doors and 1.567 psf (75 PA) for pairs of doors. A single 915 mm x 2134 mm entrance door and frame shall not exceed 0.50 cfm per square foot. A pair of 1830 mm x 2134 mm entrance doors and frame shall not exceed 1.0 cfm per square foot. Materials: Aluminum extrusions: Aluminum Association alloy AA6063 T5, T6 or T54 anodizing quality.	08 11 16

	Sheet aluminum: Alloy 1100, F temper, 1.5 mm or 3 mm minimum thickness exposed sheet finished to match frames. Steel reinforcement: to CAN/CSA G40.20/G40.21, grade 300 W, shop painted with zinc chromate primer, thickness as required to support imposed loads and in no case less than 4.8 mm thick. Fasteners: to ASTM A167, stainless steel, type 304 or cadmium plated steel, finished to match adjacent material and selected to prevent galvanic action with fastened materials of suitable size to sustain imposed loads. Isolation coating: bituminous paint, acid and alkali resistant asphaltic paint in accordance with MPI Architectural Painting Specification Manual approved product listing. Glazing materials: refer to Section 08 80 50. Glass Gaskets: As specified under Section 08 80 50. Sealant: Including primer, joint filler, as specified in Section 07 92 00. Aluminum Frames: Exterior Aluminum Frame: thermally broken to profiles indicated and as required to performance requirements, but not less than 3 mm thick unless otherwise shown, suitable alloy and proper temper for extruding and adequate structural characteristics; and suitable for finishing as specified. Aluminum Swing Doors: Aluminum doors fabricated of rigid extruded rectangular aluminum tube cut and welded together and with internal reinforcing at corners. Hardware: provide door hardware and keying to meet AHS standards. Finishes: Clear Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA M12C22A41, clear anodized matching Kawneer #14.	
Sliding Entrance Aluminum Doors	Sliding, automatic entrance door system manufactured from extruded aluminum rectangular tube and channel framing having fixed, sealed glass units, and frames having internal weep drainage to "Rain Screen" principle, and insulated exterior aluminum doors and having the following features: Design automatic entrance doors as emergency exits, as required means of egress from the building, and to comply with the Building Code Design automatic entrances to comply with applicable requirements of CAN/CGSB 69.26 Single glazed 6 mm tempered glass for interior doors and 25 mm wide double glazed 6 mm tempered glass for exterior doors; tinted to match glass in aluminum curtain wall. Coordinate entrances with Aluminum Curtain Wall System Acceptable Manufacturers: Nabco Entrances Inc. Overhead Door Corporation, Horton Automatics; Stanley Access Technologies; C.J. Rush Industries	08 32 13
Overhead Coiling Grilles	Overhead Coiling Shutter Door: 2 hour Fire rated and labelled, steel units; electric operation: spring counterbalanced; interlocking slat shutter doors. Fire rated door to be ULC labelled and shall have time delay system release mechanism activated by second stage building fire alarm.	08 33 23

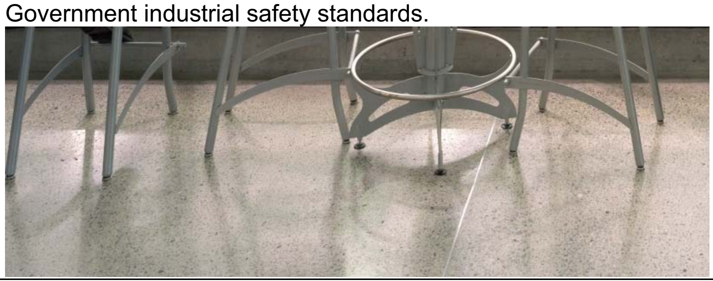
high speed garage doors (parkade)	Curtain: Two layers styrene butadiene rubber (SBR) each 3.2 mm thick, 70 durometer, sandwiched with 1 ply 50 kg polyester cord centre. Material provides normal resiliency and flexibility at temperatures ranging from -40° C to +85° C. Molded curtain locks, mechanically attached to the vertical edges of curtain material. Continuous glued SBR windlock or molded-in place Teflon windlock designs are not acceptable. Colour: black. Guides: One piece extruded aluminum to form a slot of sufficient depth to allow to move freely in guides at all times. Provide aluminum to thickness at pressure of up to 0.96 kPa. Steel guides (bolted or spring loaded) are not acceptable. Side frame: steel angle for installation directly onto steel door framing. Bottom Rail: Bottom bar to extend the full width of the curtain to maintain the bottom edge of the curtain parallel to the door threshold. Provide knock away section to reduce risk of damage during impact. Knock-away bottom bar to be reset without the need to open side frames. Single angle design is not acceptable. Roll-up Door System: Barrel to carry load with deflection of not more than 2.5 mm/m and evenly balance by 100,000 cycle oil tempered, helical outboard torsion springs. Drive barrel shafts are constructed of 38 mm cold rolled steel shafts. Idler barrel of 102 mm outside diameter round HSS tubing with minimum wall thickness of 3.4 mm and supported by 32 mm cold rolled steel shaft at each end. Idler shall be guide mounted. End brackets: 6 mm hot rolled steel plate c/w sealed heavy duty, self-aligning bearings with cast iron housings to support drive barrel. Bearings load rated at 2540 kg dynamic and 1524 kg static. Welded truss to brace end plates at top and bottom with channel and 50 mm x 6 mm flatbar diagonal bracing. Reversing Edge. Basis-of-Design: TNR Industrial Door, Model "HDP-LH" springless design	08 33 39
Sectional Overhead Insulated Doors	Electrically operated, heavy-duty, fully weather stripped and counter balanced sectional overhead doors with vision panels rated for 50,000 operational cycles consisting of the following: Door Construction: Construct door sections including face sheets and frames from zinc coated (galvanized), cold rolled, commercial steel (CS) sheet, in accordance with ASTM A 653/A 653M, Z275 (G90) coating designation, and as follows: Exterior Face Sheets: 0.912 mm (0.0359") core metal thickness; custom coloured; having manufacturer's standard flat panel profile. Interior Face Sheets: 0.455 mm (0.0179") core metal thickness; colour white; having manufacturer's standard flat panel profile. Fabricate door sections with continuous thermal break construction, separating faces of door. Enclose open sections with channel end stiles formed from 1.519 mm (0.0598") core metal thickness, galvanized steel sheet and weld end stiles to door section in place. Provide clear vision panels as indicated. Units to manufacturer's standard acrylic or tempered units. Thermal Insulation: Polyurethane foam core, foamed-in-place,	08 36 13

	having LTTR of RSI 1.04/25 mm (R6.0/1") in accordance with ULC S770, and as follows: Maximum Flame Spread Index: 75 in accordance with ULC S114. Maximum Smoke Developed Index: 450 in accordance with ULC S114. Completely fill inner core of door panels and pressure bond to face sheets to prevent delamination under wind load Enclose insulation completely within steel door panels. Tracks: Construct steel track system, sized for door size and weight, from zinc coated (galvanized), cold rolled, commercial steel (CS) sheet, in accordance with ASTM A653/A653M, Z180 (G60) coating designation, and as follows: Lift Type: Standard Lift. Track Size: 76 mm (3"); with 380 mm (15") radius, and having all required brackets, bracing, and reinforcement for rigid support of ball bearing roller guides. Weld to track supports. Electrical Operator: Jackshaft Type: V-belt primary-drive reduction, chain-drive intermediate reduction, roller-chain final drive connected to counterbalance shaft, and floor-level quick release for manual operation and as follows: Motor: Medium Duty ¾ HP, 115 Volt Single Phase; with manual reset current sensing overload protection, high starting torque, continuous duty motor; separate from reduction mechanism; factory pre-wired motor controls, starter; rated for door size and usage classification. Electrical Enclosure: Hinged enclosure cover, lockable in closed and open position having a NEMA 1 enclosure rating. Control Accessories: Button Control Station: 3 push button station. Obstruction Detection Device: Equip each motorized door with external automatic safety sensor capable of protecting full width of door opening; activation of sensor immediately stops and reverses downward door travel; self monitoring electrically actuated located within weather stripping mounted to bottom bar; contact with sensor immediately stops and reverses downward door travel, connect to control circuit using manufacturer's standard take up reel or self coiling cable. Acceptable Materials: Atlas Roll-Lite Overhead Doors; Creative Door Services Ltd.; Overhead Door Company; Richards-Wilcox Canada Inc.; or Steel-Craft Door Products Ltd.	
All Glass Entrances	Support components transferring stresses to glazing, and glazing to glazing or glazing to support contact: Structural loads Thermal movements Movements of supporting structure including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads Dimensional tolerances of building frame and other adjacent construction Deflection of Within Glazing Plane: Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 4100 mm, and to 1/240 of clear span plus 6 mm or spans greater than 4100 mm or an amount that restricts edge deflection of individual glazing lites to 19 mm, whichever is less. Deflection Parallel to Glazing Plane: Limited to amount	08 42 26

	not exceeding an amount that reduces glazing bite to less than 75% of design dimension and that reduces edge clearance between framing members and glazing or other fixed components to less than 3 mm. Materials: Tempered Glass: In accordance with CAN/CGSB 12.1 and as follows: Thickness: minimum 13 mm Type: 2 Tempered Class: B Float Glass Category: II 540 J impact resistance. Aluminum: Materials recommended by manufacturer for type of use and finish indicated. Stainless Steel Cladding: In accordance with ASTM A666, Type 302 or 304 as standard with manufacturer Hardware: Heavy duty hardware units in sizes, quantities, and types recommended by manufacturer of all glass entrances systems; match fitting metal and finish for exposed parts.	
Exterior Louvres	Extruded aluminum sight proof louvres, mitred at corners, non-operational, having laminated insulated panels finished to match louvres. Colour: as selected by Consultant.	08 91 00
INTERIOR ASSEMBLIES		
RATED AND NON-RATED PARTITIONS		
Concrete Block walls	Concrete block: Normal weight aggregate concrete block conforming to CSA A165.1; H/15/D/O except as modified for fire resistant rating; 190 mm x 190 mm x 390 mm for solids or hollow units; running bond; non-load bearing. Special shapes for outside corners, purpose made shapes for lintels and bond beams. Burnished Face: exterior architectural feature areas. Acoustic Block: location, field house. All block to extend to underside of structure to maintain acoustic isolation.	04 81 00
Interior Gypsum Board Partitions	Provide full height construction to the underside of structural slab for all walls Acoustically controlled spaces, minimum STC 55. Ensure mechanical penetrations for ductwork contain sound elbows and isolator dampers. Provide a continuous airtight seal around piping, duct and conduit penetrating through walls. Gypsum board partitions only used in offices.	09 21 16 07 92 00
Common and Rated Gypsum Board Partitions	16 mm Type X gypsum board (single or double layer as indicated), meeting ULC design for rated partitions. 92 mm (or greater) steel partition framing to ASTM C754; Steel components to ASTM C645 with ASTM A653 Z180 hot-dipped galvanized zinc coating; Steel studs nominal 0.46 mm base metal thickness; except use 0.75 mm heavy weight framing to support fire rated door frames and walls over 5500 mm in height. Use slotted deflection track or double runner deflection track. Isolate base runner from concrete slab by using vinyl foam Isolation tape (compressible 6 mm) Norseal V-980. Acoustic Batt, 13 mm resilient channels spaced at 600 mm O/C. 16 mm type X Gypsum Board taped and sanded to AWCB Level 4, all surfaces finished with minimum 3 coats of paint including primer. Provide abuse resistant gypsum board conforming to ASTM D1037 test for indentation resistance and ASTM E 695 for impact resistance walls, locations as on Drawings. Use Resilient furring channels to locations indicated on Drawings. Provide an institutional grade of casing beads, reveals, corner beads and edge trims, fill type with Z275 zinc finish to ASTM	09 21 16 07 92 00 09 91 00

	A525. Use preformed reveals at doors, chair rails and baseboards. Use a minimum 3 coat tape and fill system at joints and screw heads, with an asbestos-free joint compound conforming to CSA A82.31. Final installation shall be smooth, level and plumb, free from waves and no visible joints.	
Shaft Wall Partitions	One layer of 16 mm gypsum board, taped and sanded to AWCB Level 4, all surfaces finished with minimum 3 coats of paint including primer. 101 mm light gauge proprietary C-H shaped shaft wall framing system spaced at 406 mm O/C, with 25 mm thick shaft wall liner panel.	07 92 00 09 22 16 09 91 00
Tile Partitions (for wet areas – washrooms and showers)	13 mm cementitious board as a substrate for ceramic tile finishes. 92 mm light gauge steel studs spaced at 400 mm o/c, walls will extend to underside of ceiling, complete with "Revoe" clips.	09 21 16 09 31 00
Resilient Wall Coverings	RFP panel (Fibreglass Reinforces Plastic) Panels: Resilient sheet vinyl wall covering. Homogeneous single layered vinyl to CSA A126.3M1984 Extruded semi-rigid PVC Sheet Thickness: 2.5mm Sheet size: 2500x1200 Location: warming Kitchen / Concessions / Kitchen Manufacturer: Altro Whiterock .Welded rod	06 82 00
Architecturally exposed concrete	cast-in-place for exposed smooth form finish.	03 33 00
Tile	Ceramic Tile (CT): to CAN/CGSB 75.1, Type 5, MR4 with epoxy grout system, colours to be selected from manufacturer's custom product for Wall surfaces where indicated.	09 31 00
Painting	Design and Performance Requirements Paint materials listed in the Master Painters Institute (MPI) Approved Products List (APL) are acceptable for use on this project. Only qualified products with E2 "Environmentally Friendly" ratings are acceptable for use on this project, Use E3 rated products where available.	09 91 00
Fireproofing and Firestopping	Joists, beams and columns supporting second floor to be fire protected. Includes for sprayed cementitious, non-fibrous fire rating materials at exposed steel structure where a fire-rating may be required. Includes for materials installed in cavities, around pipe penetrations and other openings in floors and between floors and curtain walls to prevent spread of fire and smoke. Intumescent paint to exposed column locations	07 81 23 07 81 00 07 84 00
INTERIOR FLOOR FINISHES		
Resilient Flooring	Design and Performance Requirements Sheet vinyl and coved base: to ASTM F1303, commercial. Rubber sheet flooring: composed of natural and synthetic rubbers, stabilizing agents and pigmentation conforming to ASTM F1860. Sealer and wax: type recommended by the manufacturer (following within LEED requirements) for material type and location. Sealer: maximum VOC limit 100 g/L to SCAQMD Rule 1113. Possible locations: kitchens, multipurpose, canteen, offices.	09 65 00
Epoxy Flooring	Provide primers, undercoats, and finish coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.	09 96 00

	Provide manufacturer's highest grade of the various high performance coatings specified; materials not displaying manufacturer's product identification are not acceptable. Flooring: Liquid applied, 2 component-2 coat, solvent free epoxy coating system specifically designed for mechanical equipment room floors, providing waterproof, elastomeric, traffic bearing coating system consisting of primer, membrane and wear course approximately 1 mm total DFT; colour selected by Consultant. Locations: showers, mechanical rooms	
Tiling	Design and Performance Requirements Tile work to conform to requirements of Terrazzo, Tile and Marble Association of Canada (TTMAC). Tile Materials: to CAN/CGSB 75.1. Patching and Levelling Compounds: Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable. Mortar Materials: Thin Set Interior Floor: two component liquid latex mixed with factory blended dry-set mortar. Both components must be compatible and supplied by the same manufacturer. Mortar for flooring system materials shall meet or exceed the requirements of ASTM C627 for Extra Heavy installation using Latex-Portland Cement Mortar and comply with ANSI A118.4 and ISO 13007 Classification C2ES2P2. Thin Set Interior Wall: Dry set mortar meeting or exceeding the requirements of ANSI A118.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of Portland cement, sand and additives requiring only potable water to be added for installation Epoxy Grout: Multi-component, factory prepared, 100 percent epoxy resin and hardener with sand or mineral filler material; comply with ANSI A118.3 and ISO 130007 Classification R2/RG/ Classification RD for industrial grade. Membranes: Waterproofing Membrane: Sheet membrane. Crack Isolation Membrane for large format tiles: Sheet membrane	09 30 13
Polished Concrete floor	Provide a polished and hardened concrete surface to concrete slabs, exposing aggregate for a terrazzo like finish; concrete should have the appearance of 50% big rock showing; smooth for floors and slip resistant for stairs as follows: Concrete Polishing and Grinding Heads: Sized for machinery required for project; hand held and walk behind machinery as required for project requirements: Metal bonded 16/18, 30/40, 80/100 ,180/200 and 300 grit diamond grinding head for initial finishing. Resin bonded 200 and 400 grit diamond polishing head for final finishing. Surface Treatment: Liquid surface applied, multi-component catalytic hydrosilicate solution engineered for penetration up to 150 mm (6”) on single application; and control of integral moisture and moisture migration in new or existing concrete or masonry structures and flatwork; containing no VOC’ s. resistant to chemicals; non-flammable; colour: clear. Stain Resistant Finish: Proprietary stain resistant finish as recommended by concrete polishing fabricator. Anti-Slip Finish: Waterborne anti-slip finish providing slip resistance reduction of installed materials to meet Canadian	09 66 13

	Government industrial safety standards. 	
Sealed Concrete Flooring	Liquid Sealer and Hardener: Water base, inorganic silicate, colourless transparent liquid penetrating hardener and sealer; bonding to ASTM D3359; hardening to ASTM C42 and C805. Acceptable material: “Ashford Formula” by Chemical Company Inc.; Sealhard Starseal PS (210) by Sika; Federal Formula by Valspar Corporation, Federal Flooring Division; Shur-Seal by Paul M. Wolff Co. Inc.; EPC-120 by Enhance International Inc.	03 35 00 03 36 00
Carpet tile	Carpet Tile – Team Rooms: carpet tile needle punched with polyproplyene fiber over a 4 mm rubber backing and water proof, stain proof and impervious to mildew and rot. Install Carpet tiles permanently using purpose-suited adhesive. Carpet tile size: 9.5 mm high x 500 mm x 500 mm; Colour: as selected from standard product colours. Accepted materials: BAP Choice Carpet Tiles by Becker Arena Products Inc	09 68 16
Carpet tile	Carpet tile: minimum 1153 g/m2 (34oz.) pile face weight, 5 mm pile height. minimum 1/10 pile gauge or 39.4 rows/10cm. Carpet shall have a minimum density of 13.0 kilotex/cm2. Stain Resistance when tested to AATCC 175-1993 shall be a minimum 8.0 Flammability shall be to CGSB 4-GP-129 and to ASTM E648 – Class 1. Carpet shall have passed a CCI/CRI Indoor Air Quality test and the test number shall be provided.	09 68 13
Safety Flooring	Resilient Safety Sheet Flooring (Warming Kitchen, Concessions, Kitchen): Slip resistant sheet vinyl: To ASTM F1303, type 2, grade 1, sheet vinyl flooring with moisture resistant backing class A. Static coefficient on slip resistance in excess of 0.6 when tested with ASTM D2047, AltroSan integrated bacteriostat. Thickness: 3.0 mm Sheet width: 2000 mm Acceptable Materials: Altro Flooring	09 65 00

Hardwood Flooring Gymnasium - type 1	The entire system must be anchored in place and not "free floating". The performance of the hardwood system, when evaluated against the current requirements of the DIN 18032 Part 2 requirements, must be demonstrated. All wood based components must be of solid wood or plywood construction. No pressboard, chipboard or like assemblies will be accepted within the proposed system assemblies. The system must be serviced by the warranty as contained in these specifications. Hardwood Maple Flooring: All products to be Northern hard maple, Second grade or better, unfinished 26 mm thick x 38 mm wide. tongue and groove edges and matched ends, graded and stamped to MFMA standards, latest edition. Wood Blocking: 89 mm x 89 mm x suitable thickness clear fir blocks or continuous clear fir blocking strips x 89 mm wide x suitable thickness, to allow for 5 mm deformation of the wood floor system before engaging. Blocking to be placed in areas where retractable bleachers are stored and in extended positions and under path of travel and the locations where the portable basketball standards are placed for games. Floor Finish: Oil modified urethane coatings, sealer and finish coats, to meet or exceed specified Manufacturer's requirements. Manufacturer or installer to submit details of proposed products including lists of successful installations where proposed products have been used successfully. meet or exceed the requirements of the MFMA. Vinyl Cove Base: Moulded vinyl vent cove base which has ventilation tubes built-in and 75 mm x 100 mm angle; colours from manufacturer's standard selection. Place around perimeter of gymnasium. Floor Painting: Floor painting to be provided under the terms and conditions of a Cash Allowance. Basis-of-Design: Connor Floor, Focus Acceptable Materials: Bio-Channel Classic by Robbins.	09 64 66
Hardwood Flooring Group exercise Studio - type 2	Basis-of-Design: Connor Floor, Type WAF-1: Alliance Type WAF2: NeoShok Black Type WAF-3: NeoShok Blue Acceptable manufacturers: Action Floor Systems; Aacer Sports Flooring; Robbins Sport Surfaces Vapor Barrier - 6-mil polyethylene. Resilient Pads: 19 mm thick, hemispherical, two stage, polyurethane Black 50D durometer (aerobic/dance) pads. Subfloor - two layers of 15/32" APA rated sheathing, Exposure Flooring 25/32" X 2-1/4" Third & Better Grade, Square Edge, Kiln Dried, Edge Grain, Northern Hard Maple Flooring, graded in accordance with MFMA standards, Fasteners Flooring Adhesive – Manufacturer's single component elastomeric polyurethane. Subfloor Adhesive - PL 400 construction adhesive or equal. Subfloor Fasteners – 1" coated staples or equivalent. Wall Base - 3" x 4", heavy duty, molded, vented cove base with pre-molded outside corners. Finish Materials – Manufacturer's recommended seal and finish products.	09 64 66

Resilient Athletic Flooring (RAF-1) Location: Olympic platforms in strength and conditioning area within fitness.	RAF-1 Basis of Design: Mondo Armor S.p.A.: Piazzale E. Stroppiana, 1, 12051 Alba, Fraz. Gallo - Italia Field Color 8 Inlaid Olympic Platforms, each with the Owner's custom logo 8 pairs of Inlaid Bumper Drop Zones Subject to compliance with all requirements of this section, and with colors approved by the Architect, products by other manufacturers, laminated over a resilient base mat to provide a total thickness of 18 mm may be acceptable. Description RAF-1 MondoArmor performance layer is prefabricated resilient virgin rubber athletic flooring, calendered and vulcanized, with a base of natural and synthetic rubbers, stabilizing agents and pigmentation, as manufactured by Mondo S.p.A or approved equal. MondoArmor shock absorption layer is prefabricated synthetic rubber honeycomb (elongated hexagon-shaped) designed and engineered for superior biomechanical properties and heavy impact resistance, calendered and vulcanized, with a particular closed cell structure, based on special isoprenic rubbers, mineral fillers, stabilizing agents and pigmentation, as manufactured by Mondo S.p.A. or approved equal. MondoArmor is phthalate-free, halogen-free, heavy metal-free, formaldehyde-free, isocyanate-free and BPA-free. Thickness: 0.709'' (18mm). Colors: Provided in standard, solid background colors with random colored flecks dispersed throughout material. Surface Texture: Sealskin. Triple durometer construction. The shore hardness of the performance layer will be greater than that of the remaining layers. Shore hardness of layers to be recommended by the Manufacturer and to respect limits specified. Format: Available in sheets that are 6'1" (1.86m) wide and 39'4" (12m) long [min. 19'8" (6m)/max. 55'9" (17m).	09 65 66

Resilient Athletic Flooring (RAF-2) Location: Fitness area, except where Olympic platforms and other heavy weights will be.	RAF-2 Basis of Design: Mondo SportImpact Subject to compliance with all requirements of this section, and with colors approved by the Architect, products by other manufacturers may be acceptable. Description RAF-2 Mondo Luxembourg S.A.: Z.I. Foetz - Rue de l'Industrie, L-3895 Foetz, Luxembourg. Sport Impact is prefabricated resilient rubber athletic flooring, calendered and vulcanized with a base of natural and synthetic rubbers, stabilizing agents and pigmentation, as manufactured by Mondo Luxembourg S.A. or approved equal. Sport Impact is phthalate-free, halogen-free, heavy metal-free, formaldehyde-free, isocyanatefree and BPA-free. Thickness: 0.315'' (8mm). Colors: Provided in standard, solid background colors with random colored flecks dispersed throughout material. Surface Texture: Sealskin. Manufactured in two layers which are vulcanized together. The shore hardness of the top layer will be greater than that of the bottom layer; shore hardness of layers to be recommended by the Manufacturer and the limits specified. Formats: Available in sheets that are 6'1" (1.86m) wide and 42'7" (13m) long [min. 19'8" (6m)/max. 55'9" (17m)]; available in tiles that are 36" x 36" (91.35cm x 91.35cm). Performance Performance of the Manufactured Product to conform to the following criteria: Performance Criterion Test Method Requirement Result Elongation at Break ASTM D412 - >105% Tensile Strength ASTM D412 - >670psi Static Coefficient of Friction ASTM D2047 ≥0.50 >0.80 Hardness (Shore A) ASTM D2240 - 80 ±5 (wear layer) 77 ±5 (backing) Abrasion Resistance (H18 wheel, 1000g, 1000 cycles) ASTM D3389 1.0mm Resistance to Chemicals ASTM F925 - Compliant Static Load Limit (tested at 250psi) ASTM F970 -	09 65 66
Elastic Polyurethane (RAF-3) Location: Track, D Areas, Jumping Runways.	Beynon Sports Surfaces, Inc. BSS-2000 Embedded Full-Pour Synthetic Track Surfacing with Hobart Finish System: (888)-240-3670, 410-771-9473 Materials Thickness: 13 mm with 18 mm at special, high-wear locations such as take-offs at runways and throwing locations. Elastomeric Polyurethanes Two component elastomeric polyurethane compounded from polyol and isocyanate components based on 100% MDI. The elastomeric polyurethane shall match the EPDM in color. EPDM Granulate .5 to 1.5 millimeter peroxide cured EPDM granulate. The EPDM granulate shall match the elastomeric polyurethane. Rubber Granulate Red butyl Rubber processed ground to a graded size .5 – 2.5 mm in size. A maximum of twenty percent by weight of the synthetic track system will be allowed in the force reduction layer. Line Striping Paint Single component, moisture cured, aliphatic polyurethane paint. Adhesive: Resilient athletic flooring adhesive to be two part polyurethane adhesive suitable for adherence of a sheet good to concrete substrate. Adhesive to be supplied or approved/recommended by flooring manufacturer. Patching compound: Patching compound and line marking paint to be supplied or approved/recommended by flooring manufacturer.	09 64 66

Resilient Bases (RB-1)	Integral cove base fabricated by extending vinyl sheet flooring up the wall using adhesive, welding rod, and accessories recommended and approved by the flooring manufacturer. Resilient base:, coved rubber 100 mm high having smooth, buffed exposed face and ribbed or grooved bonding surface, colours selected from full colour range of available products. Acceptable Materials: Johnsonite Tight-Lok	09 65 13
Synthetic Grass System (TURF)	Acceptable materials: Astroturf FieldTurf Shaw Sports Turf Turf Materials Synthetic Turf System: A complete synthetic turf system consisting of a combination of high micron monofilament polyethylene fibers and parallel slit film polyethylene fibers with texturized infill containment fibers for simulated grass. Basis of Design: AstroTurf® Rootzone 3D3 Blend. Pile height shall be nominal 2.0”. Fibers shall be tufted to a primary backing and a mechanically applied adhesive secondary backing. The tufted fiber shall not weigh less than 52 ounces per square yard. The tufted rows of fiber are to be spaced no more than 3/8” apart. ASTM tests proving the fiber meets these qualifications must be provided with the bid. The carpet’s primary backing shall be comprised of three layers (18 pic polypropylene, 13 pic polypropylene, reinforced by a non-woven PET cap fiber layer). This backing is to have a minimum weight of 8 oz per square yard. The carpet shall be coated with a secondary backing of polyurethane synthetic coating material with a minimum application rate of 20 ounces per square yard and then perforated for adequate drainage. The carpet shall be delivered in 15’ wide rolls. The rolls shall be of sufficient length to go from sideline to sideline. Head seams within the field-of-play shall not be acceptable. The pile surface shall provide good traction in all types of weather with the use of conventional sneaker type shoes, composition mold sole athletic shoes. The pile surface shall be suitable for both temporary and permanent line markings using acrylic paint recommended by the turf manufacturer. All adhesives used in bonding the seams shall be resistant to moisture, freeze/thaw, bacteria and fungus attacks, and resistant to ultraviolet radiation. The adhesive shall be made especially for the adhesion of synthetic turf seams. All panel seams shall be sewn. The entire turf system shall be protected with a factory-applied antimicrobial treatment. Supply field groomer and sweeper or single maintenance apparatus that performs basic maintenance functions. Perimeter edge details required for the system shall be as detailed and recommended by the turf provider, and as approved by the turf provider. TURF FABRIC SURFACE The pile surface shall resemble freshly mown natural grass in appearance, texture and color. The pile surface shall be nominally uniform in length. The pile fiber angle shall be 90 degrees ± 15 degrees, measured from the horizontal after installation of the infill material. The entire system shall be resistant to weather, insects, rot, mildew and fungus growth and will be non-allergic and non-toxic. The synthetic turf system shall have a nominal pile height of 2.0”.	32 18 23

	The entire system shall be constructed for porous standards as specified. Synthetic turf system shall be perforated at 4 – 6” on center. All markings shall be tufted in-place, inlaid or glued. To the degree possible, field markings shall be factory-prefabricated into the turf system prior to shipment to site. PRODUCT SPECIFICATIONS - TURF Face yarns shall be comprised of a blend of: Proven athletic-quality, outdoor-stabilized fibers: 10,000 denier non-texturized parallel slit film polyethylene fibers and; 12,000 denier high micron monofilament polyethylene fibers	
INTERIOR CEILING FINISHES		
Acoustical Panel Ceilings	Acoustic Panels conforming to ASTM E1264 and as follows: Noise Reduction Coefficient (NRC): minimum 0.55 Flame Spread: Class A Ceiling Attenuation Class (CAC): minimum 35 Light Reflectance (LR): minimum 0.83 Clean Panels conforming to ASTM E1264: Provide suspension system conforming to ASTM C635 and as follows: Maximum deflection: 1/360th of span to ASTM C635 deflection test. Basic materials for suspension system: commercial quality cold rolled steel	09 51 13
Exposed structure	Dryfall finish to all exposed structure (mechanical, structural and electrical). Colour: white.	09 91 00
Gypsum Board Ceiling Finishes	Acrylic or latex premium grade paint having low or no VOC’s, applied to a minimum of one coat primer with two coats of finish in accordance with MPI Manual. Additional coats shall be applied for darker colours and where coverage shows defects in paint finishes at distance of 1500 mm at 60° from wall surface. Locations: lobby, vestibule, lounge and public washrooms Use Moisture resistant gypsum board in all locations subject to moisture.	09 21 16
Acoustical Ceiling System	To CGSB 92.1. Achieve specified NRC when tested to ASTM C423. Achieve specified CAC when tested to ASTM C1414 Provide suspension system conforming to ASTM C635. Install ceiling systems in accordance with ASTM C636. Maximum deflection allowed 1/360th of span. Provide Class A fire rating when tested to ASTM E 1264 as required by the ABC in specific locations. Basis-of-Design: Armstrong; acceptable manufacturers include CertainTeed and CGC. Allow for variety of finishes, the following are listed as examples to indicate basic design intent: ACT-1: Armstrong Ultima Square Lay-in, 610 x 1220 ACT-2: Armstrong Calla with Colorations Colors, 610 x 610 ACT-3: Armstrong Ceramaguard; use in kitchens/warming kitchens / concessions, 610x1220 ACT-4: Armstrong Soundscapes acoustical clouds and walls; 1220x1220 and 1220x2440 ACT-5: Armstrong Calla round columns with trim, size varies ACT-6: Armstrong Metalworks, 610 x 610 ACT-7: Armstrong Infusions Canopy (running track), accent canopy, 1220 x 3000 ACT-8: Armstrong perforated Metalworks concealed with edge trim; 610 x 1220 WCT-1: Armstrong Woodworks	09 51 00

INTERIOR WINDOWS		
Glazed partitions	Fixed, non-thermally broken, low profile window framing having 35 mm face profile and depth to suit wall framing, snap-in glazing stops, dry sealed and having 6 mm thick clear tempered glass. Basis-of-Design: Kawneer Trifab 450	08 11 16 08 81 00
Pressed Steel Frames with Sprinklered Glass	Interior fire rated frames consisting of galvanized steel, 16 ga. metal core thickness, 150 mm nominal depth with 50 mm face width. Frames shall be fully welded and reinforced as required to suit window opening requirements. Acceptable materials: Greensteel Industries Ltd., Shanahan's Ltd. or S.W. Fleming Limited Fire rated, sprinklered glass to achieve fire rating as indicated; in accordance with Standata.	07 92 00 08 11 13 08 81 00
INTERIOR FOLDING ACOUSTIC WALL PANELS		
Folding Acoustic wall Panels	Panels shall be nominally 100mm thick, in manufacturer's standard widths up to 1220mm. Panel faces shall be made of appropriate acoustical substrate to meet the STC requirement. Panel faces shall be welded to the internal steel frame. Panel faces shall be formed to protect the panel edges Frames: constructed of steel and welded. No vertical face trim shall be allowed. Interlocking vertical seals between the panels shall consist of tongue and groove aluminum and vinyl reversible astragals creating a shock-absorbing, deep nesting, impact resistant acoustical interlock between panels. Horizontal top seals shall be continuous contact multi-fingered vinyl. Horizontal bottom seals shall automatically operate as the panels are positioned, providing 50 mm nominal operating clearance, and exert downward force when extended. Crank type shall not be acceptable. ADA-compliant pass door of the same thickness, construction and finish as the basic panels. Locate where shown on the plans. Weight of the panels shall be between 27 to 45 kg/sq.m (based on STC value selected) plus or minus 1 lb. based on options selected. Suspension system: Track shall be clear anodized tempered aluminum with soffit trim of clear anodized aluminum providing a transition to the ceiling. Track shall include support brackets and hanger rods, spaced to manufacturer's standards. Standard product finishes required. Acceptable Materials: Model 741 Series, as manufactured by Moderco Inc., Location: multipurpose rooms.	10 22 26
MISCELLANEOUS STEEL FABRICATIONS, INTERIOR STAIRS, LADDERS AND RAILINGS		
Architectural Stair	Architectural Grade steel stairs constructed in accordance with NAAMM – AMP 510-92 Metal Stairs Manual, open risers with concrete filled steel channel treads and boxed stringers. Treads shall have cast in abrasive nosings set above concrete surface ready for tread and landing finishes. Engineered by Structural. Railings: Glass, 16 mm tempered and laminated decorative rail system or solid phenolic panels for guard rails and balustrades, with stainless steel handrail.	03 30 00 05 51 00 05 73 13
Fire Exit Stair	Refer to structural.	05 51 00
Miscellaneous Steel Fabrications	Include for ancillary metal fabrications required for support of or forming a part of structural steel fabrications and steel deck	05 50 00

	installation, including but not limited to: Loose bearing and levelling plates. Miscellaneous steel framing and supports. Steel framing and supports for overhead doors. custom cable tray and supporting system Architectural metals include, but are not limited to, the following items: Custom cable tray and supporting system in interstitial spaces. Decorative metal wall panels. Metal for architectural woodwork. Stainless Steel Wall and Corner Guards, 1220 mm high Handrails not associated with stairs. Stair, hand and guardrails: pipe rail in fire exits, stainless steel in feature stair Steel stairs and handrails (exterior exits). Miscellaneous metal fabrications include, but are not limited to, the following items: Curtain wall supports. Loading dock frame. Overhead door frames. Embed plates. Stub wall reinforcing. Elevator sills, pit ladders, and miscellaneous elevator elements.	
Interior Ladders and Railings	Non-Architecturally Exposed Steel Stairs and Ladders: Includes catwalks, ladders and railings for the design of steel stairs and ladders where steel members have not been indicated, and will include for the following items: Steel Railings, as follows: Handrails and railings attached to stairs. Handrails attached to walls adjacent to stairs. Steel Ladders and Safety Cages Extruded Nosing and Steel Grating Treads Elevator pit ladders	05 51 00

INTERIOR SPECIALTIES		
Silvered Flat Glass Mirrors	Clear Glass Mirrors: ASTM C 1503, Mirror Quality. Nominal Thickness: Minimum 6 mm. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed. Available Manufacturers: Gunther Mirror Mastics. Palmer Products Corporation. Hardware Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.05 inch. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.062 inch. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following: Bottom Trim: Laurence, C. R. Co., Inc.; CRL Standard "J" Channel. Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar. Top Trim: Laurence, C. R. Co., Inc.; CRL Deep "J" Channel. Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Deep Nose "J" Moulding Lower Bar. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.	08 81 03

Toilet Partitions	Ceiling Mounted, graffiti resistant, solid phenolic toilet partitions shall meet the following requirements: Stiles, Doors, and Panels: NEMA LD-3, solid phenolic panels of laminated resin-impregnated kraft, color, and high pressure clear melamine matt facing fused under high pressure. Polished phenolic edges. Door Pilasters: Minimum 19 mm thick. Doors: Minimum 19 mm thick, full height. Side Panels: Minimum 16 mm thick, full height hardware: zinc die-cast, polished chrome finish Fasteners: zine-plated steel sheet metal screws, pilaster anchor kit. Door panels to have continuous hinge, 16 ga type 304 stainless, self closing. Sliding door latch.	10 21 12
Toilet and Bath Accessories	Flat Mirrors: Bobrick model B-1658 1836 Series Handicapped Tilted Mirrors: Bobrick model B-293 1836 HC Horizontal Grab Bar Short: Bobrick model B-5806x24 HC Horizontal Grab Bar Short: Bobrick model B-5806x24 HC Vertical Grab Bar: Bobrick model B-5806 x 18 Recessed Paper Towel Receptacle: Bobrick model B-43644 Sanitary Napkin Dispenser: Bobrick model B-2706 25 Sanitary Napkin Disposal: Bobrick model B-270 Electric Hand Dryer: Bobrick model B-700 115v HC Shower Seat: Seachrome model SSL-320225-HW Shower Change Cubicle Seat: Seachrome model SSB-180150-PWS Coat/Towel Hooks: Bobrick model B211: Shower Curtain Assemblies HC Showers: Bobrick B6047x72 rod attached with masonry anchors. Diameter to suit bracket; Bobrick 204-1 hooks. Quantity to suit curtain. Baby Change Table: Koala Kare model KB200-01SS: Mop Holder and Shelf: Bobrick model B-223 x 36	10 28 13
Phenolic Lockers	Panel material shall be constructed of phenolic treated kraft papers combined with Melamine-impregnated decorative surface papers, consolidated in a press at high temperatures. Phenolic panel materials shall have a fire test rating of ASTMA E-84 Class A Panel types: Doors shall be made of 0.3750 inch thickness solid phenolic material, radius edges and polished smooth on exposed edges. Doors shall be made of 0.500 inch thickness solid phenolic material (for single compartment lockers), radius edged and polished smooth Bottoms, tops and shelves shall be 0.3750 inch thickness solid phenolic material, radius edged and polished smooth. Interior back and sides panels shall be 0.1250 inch thickness solid phenolic material Exterior finish end panels and filler panels shall be 0.3750 inch thickness solid phenolic material, radius edges and polished smooth Finish filler panels shall be 0.3750 inch thickness solid phenolic material. Profiles Profiles shall be extruded aircraft grade aluminum Profile shall be 30mm diameter; wall and inner members 3 mm thick, panel slots 10 mm capture depth. Profile standard finish: gray, powder coated polyester-epoxy single coat with an integral gloss finish. Hardware Hinges	10 51 29

	Hinges shall be made of 3.5 mm thickness cast aluminum Frame wing shall be extruded aluminum continuous with length of the door openings and sealed with a plastic insert. Continuous hinge pin secured by top and bottom bolts Hinge fastened with through-bolts to door panels Strike Plates shall be: 3.5 mm thickness extruded aluminum, Integrated into the profile and continuous with length of the door opening. For Locker Room Z-lockers, provide hanging 3-pronged swivel hook to be polished aluminum, diameter 53mm x 53mm x 55mm, attached with 3 fasteners. Fasteners shall be stainless steel Bases Curb mounting: bases not furnished Lock Systems Provide Zephyr Model #3310 mechanical push button shared use locks. www.zephyrlock.com Provide ADA compliant lock Zephyr Model #2254 electronic RFID Numbering Plates Metal Inset Fonts as selected by Architect from available options. Locker Colors All panels shall have black cores. Interior panels: white. Door panels, finish end panels, filler panels: Patterns and colors shall be selected by Architect from range of available options. LOCKER SIZES AND CONFIGURATIONS Sizes and Configurations: Locker Room Lockers for curb mount: Two-tier Z-lockers: 15” w x 18” d x 72” h Book Bag Lockers mounted flush in framed openings: 15” w x 18” d x 12” h Wallet Size Security Lockers mounted flush in framed openings: 7.5” w x 6” d x 6 “ h Provide minimum required number of ADA compliant lockers at each location with security boxes and garment support hardware positioned as required by the 2010 ADA Standards for Accessible Design. BENCHES Integrated Benches. Bench shall be made of 0.5 inch thickness solid phenolic material supported by 0.5 inch solid phenolic brackets. Support brackets attached to profile hinge by 7 mm zinc plated bolt and acorn bolt Support brackets attached to every front profile. Bench is secured to support bracket with a zinc plated L-bracket. Provide minimum required number of ADA compliant benches at each location.	
Whiteboards	White fired vitreous porcelain 2 coat enamel on 28 gauge base metal with 13mm fibreboard core. Trim model # 202 with 201 chalk tray. Acceptable Materials: Shanahan’s Building Products, Telephone	10 11 00
Tack Boards	Jute patterned 15 oz. vinyl flame spread factor 5 applied to13mm cellulose fibre insulating board having a class 3 flame spread. Trim model # 202 Acceptable Materials: Shanahan’s Building Products	10 11 12

Boot Racks	Wall mounted powder coated steel boot rack. Available in 865mm and 1220mm standard widths. Acceptable Materials: Shanahan's Building Products	10 51 55
Acoustic Wall Panels	Fabric wrapped acoustic panels, thickness as indicated for required acoustics. Minimum 50 mm. Acceptable Materials: Acoustic-Trac Acoustic Panel System Fabri-Lok Wall System Fabr-Trak Systems Fabra-Wall Acoustic Systems	10 51 55
EQUIPMENT AND FURNISHINGS		
ATHLETIC EQUIPMENT		
Electrical Communications and Multipurpose Junction Boxes (Track Timing System)	Basis of Design: 3000 ComBox® Electrical/Communications and Multi-Purpose Junction Boxes and Accessories as manufactured and/or supplied by: Sportsfield Specialties, Inc. (888) 975-3343 www.sportsfieldspecialties.com Components: Box: 3/16" (0.1875") aluminum construction, welded frame with open bottom having the following attributes: 30"L x 18"W x 14"H 1/8" (0.125") aluminum adjustable main cover support ledge 3/16" (0.1875") aluminum removable divider panel 1" PVC drain stub for positive drainage connection Main cover and hand hole(s): 1/8" (0.125") aluminum construction with the following attributes: Lockable main cover and turn lockable hand hole(s) Wire feed cutouts between main cover and hand hole(s) Main cover and hand hole(s) style synthetic track material Included Accessories: Stainless steel leveling bolts Stainless steel assembly hardware	11 66 23
Take Off Boards	Basis of Design: Model TFLTP012SS International 12" Take-Off Board as manufactured by: Sportsfield Specialties Inc. 16-gauge stainless steel tray, with stainless steel insert containing double surface support. Overall Dimensions: 2.81 inches x 12.0 inches x 48.0 inches 19 mm white synthetic polyboards, 19 mm yellow synthetic polyboard foul strips. Lift Handles for removal of blanking lids. Stainless Steel Adjustment Bolts. Two pounds of 'Jolly King' Plasticene	11 66 23
Pole Vault Box Covers	Basis of Design: Model TFPV001CA-W vault box and accessories manufactured and/or supplied by Sportsfield Specialties, Inc. Cast Aluminum Set side wings for secure concrete encasement method Powder-coated white finish on cast aluminum vault box 8"W reverse bend at vault box entry area Cover fabricated of 1/8" thick aluminum with ½" recess to accept track material	11 66 23

Volleyball and Badminton Floor Anchors and Cover Plates	Basis for design includes products manufactured by Performance Sports Systems/Gared. Volleyball and badminton floor anchors and cover plates: To match Owner’s selected equipment, provide products manufactured by Senoh and distributed by Sports Imports (800) 556-3198 www.sportsimports.com	11 66 23
Portable Basketball Backstops	16 total Basis-of-Design: Porter	11 66 23
Basketball Backboards	Basketball Backboards: Model No. LXP4200 Steel Framed Rectangular Glass Backboard. Backboards shall be 42 inches high by 72 inches wide. Backboard shall be manufactured from 1/2” tempered glass set in heavy extruded steel framing and cushioned by shock absorbing vinyl. Official border and target area permanently fired into glass. Goal mounting structure shall be a heavy welded formed steel assembly, and directly attached to lower horizontal frame member to minimize stress on glass. Backboard shall have limited lifetime warranty against defects in material and workmanship, and when used with Performance Sports System’s Direct Goal Attachment feature shall be protected against shatter and breakage of glass. Board must meet NCAA, FIBA and NFSHSA specifications.	11 66 23
Basketball Backboard Padding	Basketball Backboard Padding: Model No. PMCE Bolt-On Cushion Edge backboard pad. Provide for each rectangular glass backboard, along bottom of backboard and up 15 inches on each side, meeting FIBA rules. Pads: 2-inch thick, molded from 9-pound density polyurethane foam with integral skin. Color: As selected by Architect from full range of available choices. Warranty: 5 years.	11 66 23
Basketball Goals	Basketball Goals: Model No. 4000+ MDG (Multi-Directional Goal). Goal shall have an official sized 18" ring of 5/8" diameter steel and shall be supported by a continuous welded wrap around brace. Inside of ring shall be positioned 6’’ from face of backboard by heavy, formed steel hinged-type housing with removable cover to conceal mounting bolts and shock absorption mechanism of goal and to protect against finger entrapment. Goal shall deflect according to the applied pressure from any position around the goal ring. Goal shall include an adjustable detent spring which gives the goal a positive lock in the play position, but is factory set to break-away at 180-200 lb force. Two springs shall return the goal to the play position following a breakaway action from the front or the sides. Goal shall have a tube style net connection. Goal shall meet FIBA specification on moveable rims, which states, "A moveable basket ring shall have rebound characteristics identical to those of a non-moveable ring." Goal shall be finished in durable, electrostatic powder coated official orange finish. Goal shall be furnished complete with white anti-whip nylon netting and mounting hardware.	11 66 23

Gym Divider Curtains	Model 4020 Fold Up: Electrically-operated, fold-up gymnasium divider including motor, cables, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation. Operation: Curtain moves by accordion fold-up action as bottom steel pipe is raised by hoist lines passing through grommets. Configuration: Rectangular shape with straight bottom and extending across room as indicated on Drawings. 12'-0" solid vinyl bottom with knotted black nylon netting above. Operating mechanism: Drive pipe winch powered with 1 HP, 110VAC, 60-cycle, single-phase, reversible capacitor, C-Face motor with thermal overload protection. Entire winch assembly to be UL listed and shall carry a five-year warranty. Provide with load holding worm gear reduction and integral limit switches to control curtain travel. Drive pipe shall rotate in pipe support assemblies spaced at approximately 8 to 12 feet. Attach to structural support with beam clamps, hanger brackets, and 1/2 inch diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor. Hoist lines: 1/8 inch diameter steel cable with 2,000 pounds minimum breaking strength attached to bottom batten and passing through curtain grommets at 18 inches to terminate at top drive pipe. Space lines at approximately 111 inches. Divider bottom: Hoist lines secured to 1-5/8 inches diameter steel pipe batten in 6 inches wide padded curtain pocket	11 66 23
Radius Perimeter Gym Divider Curtains	Model 4020R Fold Up: Electrically-operated, fold-up gymnasium divider including motor, cables, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation. Operation: Curtain moves by accordion fold-up action as bottom steel pipe is raised by hoist lines passing through grommets. Configuration: Segmented radius around inside of running track as indicated on Drawings. 1'-6" solid vinyl bottom with knotted black nylon netting above. Operating mechanism: Drive pipe winch powered with 1 HP, 110VAC, 60-cycle, single-phase, reversible capacitor, C-Face motor with thermal overload protection. Entire winch assembly to be UL listed and shall carry a five-year warranty. Provide with load holding worm gear reduction and integral limit switches to control curtain travel. Drive pipe shall rotate in pipe support assemblies spaced at approximately 8 to 12 feet. Attach to structural support with beam clamps, hanger brackets, and 1/2 inch diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor. Hoist lines: 1/8 inch diameter steel cable with 2,000 pounds minimum breaking strength attached to bottom batten and passing through curtain grommets at 18 inches to terminate at top drive pipe. Space lines at approximately 111 inches. Divider bottom: Hoist lines secured to 1-5/8 inches diameter steel pipe batten in 6 inches wide padded curtain pocket	11 66 23

Multi-Sport Cages	Model 4080 Multi Sport Cage: Electrically operated cage including motor, cables, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation. Size: 15’-0” high by 15’-0” wide by 70’-0” long. Operation: Cage moved up and down by cables wound onto overhead rotating drive pipe operated by electrical motor. For storage, cage is lowered, mesh gathered on top of frame, and frame raised to ceiling. Frame: Constructed of 1-5/8 inches diameter steel tubing with 0.109 inch wall thickness. Assemble frame with malleable iron galvanized fittings with case hardened set screws. Operating mechanism: Drive pipe power winch with 3/4 HP, 110VAC, 60 cycle, single-phase, reversible capacitor with thermal overload protection. Provide with load holding worm gear reducer and integral limit switches to control cage travel. Drive pipe shall rotate in pipe support assemblies. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2 inch diameter threaded rods. Attach at 10 feet centers. Hoist lines: 1/8 inch diameter steel galvanized cable with 2,000 pounds minimum breaking strength. Space lines at approximately 10 feet. Netting: #504 knotless black net ¾” mesh Perimeter of netting sections: Sewn with 3/8 inch polypropylene rope. Velcro at two corners for access to cage and for conversion for Golf hitting. Size netting to allow 12 inches of material to lay on floor in use position. Provide NEMA twist-lock plug kits for winch connections.	11 66 23

Throwing Cage with Motorized Winch	Basis of Design: MODEL 4075 Indoor Ceiling-Suspended Throwing Cage as manufactured by Performance Sports Systems. Weight throw door frames: Two vertical frame members hinged at the truss connection point to allow the system (frames and wing doors) to fold as a single unit. Frames shall be 4" square heavy wall tubing, extended to the floor in the down position, to support doors in the proper position for the event. Frames shall be laterally braced by means of a 2" x 3" rectangular sway brace. Offset design allows frames to rest on the floor and does not require folding diagonal braces. Frames shall be folded to the stored position by means of ¼" galvanized aircraft cable (breaking strength greater than 7,000 lb.) on each vertical frame routed to a single a 3/4 Hp. double drum electric winch. Rear cage frame shall be constructed of 1.9" O.D. heavy wall powder coated tubing. A cross spreader spans the perimeter of the cage to maintain the 5 m distance required by IAAF rule. Cross spreader is attached to the main frame with Tee fittings. The frame shall be raised to the overhead storage position by means of six 1/8" galvanized aircraft cables (breaking strength greater than 2,100 lb. per cable) routed through swivel pulleys to a central drive pipe with winding spools. The central drive pipe is powered by a ¾ Hp. Electric motor/gearbox assembly. The Rear cage frame can be lowered to approximately 3' off the ground for ease storage of the net to the cage frame. Net shall be constructed of #96 knotted black 1-3/4" net 4mm cord, 641# break strength. System requires a ¾ Hp. Motor gearbox assembly to operate the rear cage, and a ¾ Hp. Electric double drum hoist winch to operate the front hammer door frames. Wiring of all electrical components shall be in accordance with all local codes and the National Electric Code. All conduit, junction boxes, and wiring are to be supplied by the electrical contractor. Each motor includes a 6' power cord with a NEMA 20 twist lock 4 prong male plug and a key switch.	11 66 23

Gymnasium Control Systems for Divider Curtains, backboards etc	Model TSC2000XL – Touch Screen Group Controller utilizing a 7" color screen. Screen shall display equipment layout as directed by Owner. The screen will direct the operator through choices of single, double, or group operation. A "Group" will consist of (2) to (6) units operating simultaneously. Touch Screen will fit in a standard 12"x12"x6" deep metal box. Relay Panel (24"x24"x6") can be mounted in remote location within view of equipment. Operates on 110volts with screen communications at 24volts. System will operate equipment individually and has custom programming options for multiple equipment configurations, such as "game day" or 'practice" set up. The TSC2000 has unlimited expandability for operation of additional equipment. Password controlled system to prevent unauthorized operation with auto shut-off after thirty seconds of non-use. Self-diagnostic programming with voltage sensing shutdown feature in case of overload, LCD read-out of system alert and recommended maintenance, if required. Relay Panel to have back-up switches to operate equipment in the event of key pad or touch screen failure. Wiring: Install electric power and hook-up of electric controllers. Materials: Conduit, wire, and boxes for power and control of key switches, touch pad, and motors to be furnished and installed as specified in Division 16 (Division 26) electrical section. Hook-Ups: Complete and final hook-up of motors and electrical devises as specified in Division 26 electrical section.	11 66 23
Wall Wainscot and Door Padding	Basis of Design: BaseZone® protective padding and accessories as manufactured and/or supplied by Sportsfield Specialties, Inc. (888) 975-3343 www.sportsfieldspecialties.com 3" thick high impact polyurethane foam 5/8" square edge AdvanTech® water resistant sheathing panel 18 oz. per square yard EcoGuard® extruded vinyl Standard Z-clip attachment method Panels to be located 4" A.F.F. to 8'-0" A.F.F. Color: As selected by Architect from full range of available choices.	11 66 23

INDOOR SCOREBOARDS		
Basketball and Volleyball Scoreboard	13 required Basis of Design: Daktronics Basis of Design: Model BB-2107 single-sided basketball and volleyball scoreboard as manufactured by Daktronics. Unit scores home and guest, period, team fouls, player number, player foul, time outs left and indicates possession and bonus, Unit displays period time to 99:59 and during the last minute of the period, it displays time to 1/10 of a second. Dimensions: 6'-0" high, 10'-0" wide, 0'-6" deep Digits Clock and score digits: 13" high PERIOD, FOULS, PLAYER/FOUL, and time outs left digits: 10" high Clock, colon, PERIOD, PLAYER/FOUL, and T.O.L digits and bonus indicators: amber LEDs Score and FOULS digits and possession indicators: red LEDs Features Double bonus indicators Vinyl team logo/sponsor graphics Scoreboard striping Programmable Team Name Message Centers Hardware for installation on a manufactured operable backstop frame.	11 66 43
Indoor Message Centre (provides for track scoreboard)	The DVNMC single-sided message display offers text, graphics and animations in full color, with 19 standard matrix sizes and in five standard cabinet widths. Modules feature SMD (3-in-1) LED packages with 10mm pixel-to-pixel spacing to provide wider viewing angles and extremely close viewing distances. Control method shall be Fiber Optic. MESSAGE DISPLAY Cabinet Dimensions: 6'-0" (1.83 m) high, 10'-0" (3.05 m) wide, 0'-6" (152 mm) deep Matrix size: 160 x 288 Weight: 270 lb (122.5 kg) Power requirements: 1716 W Color as selected by Owner from full range of options All-aluminum construction Display face and perimeter: 0.063" (1.60 mm) thick Display back: 0.050" (1.27 mm) thick	11 66 43
Delay-of-Game Times (shotclocks)	8 @ courts (16 total – 2 at each end) Basis of Design is Daktronics Model #BB-2115-13 single-sided basketball shot timer. Displays game and event time including 1/10 second timing during the last minute, shot times up to a value of 99 seconds and counts down from any preset number between 0 and 99. Dimensions: 2'-4" high, 2'-5" wide, 0'-6" deep Digits AS AlInGaP LED digits Seven bar segments per digit Clock digits: 7" high All other digits: 13" high Clock digits: amber LEDs All other digits: red LEDs Accessories Model #BB-2135 LED Light Strips (for main court backboards) with synchronizers Visual horn indicator (end-of-period light) Hardware for installation on a center mast style folding backstop	11 66 43

Locker Room Timers (1 each locker room and official's room)	Basis of design is Daktronics TI-2031 wall mounted locker room clock. Displays game time or time of day. Displays time in synchronization with scoreboard clocks. Dimensions: 8" high, 1'-3" wide, 1.375" deep for Flush Mount Seven bar segments per digit LED digit technology: A diffusant over the LEDs blends the light achieving a uniform look with a 140 degree viewing angle. All digits: 4" high Red LEDs	11 66 43
Scoring Console for Scoreboard	Basis of Design is Daktronics All Sport® 5010 controller Capable of scoring basketball, and volleyball through the use of keyboard inserts Provide the following accessories: Carrying case for console 2.4 GHz spread spectrum radio control including transmitter and one receiver for each scoreboard. Battery pack	11 66 43
Media Player For Message Center	Provide DMP-83XX Digital Media Player. Resolution: 720p full motion Animation rates of up to 60 frames per second Video Output: DVI to Daktronics Video Processor Audio Output: 3-pin XLR balanced Ports: USB 2.0 @2, USB 3.0 @2 Specifications: 8 GB of DDR2 SDRAM (single-channel) 240 GB solid state drive 10/100/1000 Ethernet (RJ-45 LAN) @2	
Video Processor for Message Centre	Provide VIP-5X60 Video Processor. Video Input: DVI from Daktronics DMP-83XX Outputs: Daktronics ProLink® (fiber optic) @2 Color space conversion: Proprietary LED conversion Specifications 1.75" (44.5 mm) high, 8.75" (222 mm) wide, 12" (305 mm) deep Power: 15 watts 120/240 volts 50-60 Hz Half-width 1RU rack-mount case 10/100/1000 Ethernet (RJ-45 LAN) @1	

Control Software for Message Centre	Requires owner-supplied Windows® 7 based computer. The owner shall provide a PC on which to load bidder-provided control software. The display's control software shall provide simple, user-friendly features for creating, editing, scheduling, running and deleting messages. Display Software features: Direct control of an infinite number of displays located on a network Simultaneous display and edit capability Content playlists with loop, shuffle, random and next play functionality Thumbnail preview of content clips Onscreen display monitor Unlimited, color-coded buttons with adjustable sizes Multiple operator workspaces Support input devices such as a mouse, keyboard, touch screen, and dual monitor Icon and pull-down menu programming features Help screens Content Editor Software features: Display of TrueType fonts and other Windows® compatible character fonts Inline text editing Outlined, Drop shadowed, Bold, Italic, and Underlined text modes Ability to copy and paste text from most Windows applications Import common image and animation formats, including BMP, JPEG and AVI Content preview Content layering Real-time data (RTD) integration allows operators to create messages with information that automatically updates without user intervention. Such data may include scores, game time, player/team statistics, time-of-day, date or temperature. Profanity protection and Spell Check Multiple transition effects for entry, hold and exit	
BLEACHER SEATING		
Retractable Bleachers	Retractable bleacher seating with 6 ½” risers (custom). Capacity: 1900 Basis-of-Design: Hussey	11 74 13
Scaffold Seating	Capacity: 8300 Rental contract	11 74 19

CONVEYANCE SYSTEMS		
Elevators	Elevators shall conform to Canadian Safety Code for elevators, CSA B44 and its supplement CSA B44S1 Operation of all elevators shall comply with all requirements of Section 6 of the ABC, Current Edition. Elevators shall be AC variable voltage variable frequency (VVVF) electrical drive system. Elevators shall provide a minimum speed of 350 feet/minute and a minimum capacity of 2500 lbs rated load per car. Elevators shall have sliding or bi-parting doors with a ULC “B” label interlock to prevent car from pulling away from landing until the doors are locked in closed position. Provide stainless steel doors, door frames and interior exposed frames on all elevators. Painted finishes are not acceptable. Provide emergency communications from each elevator car and a telephone jack, complying with ADA requirements. Provide a fuzzy logic microprocessor-controlled and software-oriented controller, operating in real time continuously analyzing the cars changing positions. Optimize control to lower response time and provide flexibility to meet traffic patterns including peak demand periods within the building. Elevator systems shall be installed by experienced elevator personnel in accordance with ASME A17.1. Provide high grade, durable floor finish in elevators. Parkade: Service Elevator Field House: Passenger elevator, sized for stretcher	14 24 00
FURNISHINGS		
Finish Carpentry	Interior standing and running trims, flush wood panelling, site applied interior ornamental woodwork, stairs and rails, and frames and jambs. Millwork to be factory finished, delivered to the jobsite, including, but not limited to: Decorative laminate finished cabinets Stainless steel clad casework in kitchen / concession. Wood veneer finished cabinets and panelling Hardware forming a part of cabinets by this Section All millwork to be shop and site inspected and meet AWMAC Standards. AWMAC GIS required. Wood Panel Finishes: rift sawn, white oak, clear solid.	06 20 00

Finish Millwork	Flush overlay cabinets finished with plastic laminate exteriors and interiors, AWMAC Premium Grade in accordance with Section 300 of “The Manual" conform to AWMAC quality grades for interior wood finish. The average moisture content shall not exceed 6%. The colour and grain of all pieces shall be consistent within a compatible range to be reviewed with the RDC. Solid hardwood shall be AWMAC premium grade, with clear low VOC finish. Softwood plywood (CSP) to CSA 0141. Hardwood plywood to CSA 0153. Medium Density Fibreboard (MDF) to ANSI A208.2, density: 720 Kg/m3 High Density Particleboard (HDF) to ANSI A208.1, furniture grade Melamine panels to CSA A172. Plastic Laminate for all flat and vertical applications to CSA A172; general-purpose grade with a minimum 1.60 mm thickness All cabinet hardware to CAN/CGSB-69.25. Clear silicone sealants to CAN/CGSB-19.37, Shore A hardness 15-25.	06 20 00 06 40 00
Countertops	solid surfacing: acrylic composite Accessories: adhesives, fasteners, joint sealants as required.	06 61 16

WINDOW TREATMENT		
Window Shades	Acceptable manufacturers, subject to compliance with stated requirements include: Vertican Solarfective Products Ltd. Nysan Shading Systems 4. Silent Gliss USA Inc. MechoShade Systems Inc. Typical Sun Shade System to be manually operated 'sun screen' product with 3% openness. Power operated for clerestory and high elevation Sun Shade System to be 'sun shade' product with 3% openness. Dual Sun Shade System to be manually operated to consist of 'sun shade' product with 3% openness and 'black out' shade product with 0% openness. These shade to be placed on exterior south and west facing windows. Power operated Dual Sun Shade System to be manually operated to consist of 'sun shade' product with 3% openness and 'black out' shade product with 0% openness. These shade to be placed on high elevation windows on exterior south and west facing windows. Roller shade fabric to be Fabric Weight: 8 oz/sq. yd. Fabric Thickness: 19 mil Break Strength: warp 240daN/5cm Flame Res: 0.0 sec after flame Fuel Contributed Value: 0 Colour fastness to light: 7/8 Composition: Fabric made with 100% Polyester yarn, completely PVC free Waterproof, washable, rot proof Shade Finish: Aluminum facia (not exposed roll tops) Testing in accordance with ASHRAE Standard 74073 and flame spread to NFPA 701-1999 TM#1 (Small Scale) Toxicity: UPITT Fungal resistance: ASTM G21 Bacterial Resistance, ASTM G22 Fabric shall be laser cut to seal edges with no fraying Colour/Pattern: To be approved by RDC.	12 50 00

END OF ARCHITECTURAL OUTLINE SPECIFICATION

APPENDIX J:
BACKGROUND INFORMATION

LIST OF RELEVANT ISSUED REPORTS

RECREATION MASTER PLAN (2010)
CONCEPT PLAN FOR FOOTHILLS AND GLENMORE ATHLETIC PARKS STAGE I (2010)
CONCEPT PLAN FOR FOOTHILLS AND GLENMORE ATHLETIC PARKS - STAGE II (2012)
CONCEPT PLAN FOR FOOTHILLS AND GLENMORE ATHLETIC PARKS - MASTER SITE DEVELOPMENT PERMIT APPLICATION (2012)
FOOTHILLS FIELDHOUSE ALTERNATE CONSTRUCTION PHASING EXPLORATION REPORT (2012)
FOOTHILLS FIELDHOUSE REVISED CONCEPT PLAN (2013)
FOOTHILLS FIELDHOUSE CONSILIDATED CONCEPT PLAN (2016)

LIST OF POLICY IN SUPPORT

RECREATION MASTER PLAN (2010)
CALGARY CIVIC SPORT POLICY STRATEGIC PLAN
10 YEAR STRATEGIC PLAN GUIDING PRINCIPLES
10 YEAR STRATEGIC PLAN FACILITY DEVELOPMENT CRITERIA
THE CALGARY PLAN (1998)
TRANSIT ORIENTED DEVELOPMENT (T.O.D.) POLICY GUIDELINES (2005)
IMAGINE CALGARY PLAN: FOR LONG RANGE URBAN SUSTAINABILITY (2006)
TRIPLE BOTTOM LINE FRAMEWORK (2006)
TEAM SPIRIT: ADVANCING AMATEUR SPORT FOR ALL CALGARIANS. A 10 YEAR STRATEGIC PLAN FOR SPORT FACILITY DEVELOPMENT AND ENHANCEMENT (2008)
PLAN IT CALGARY (2009)

BACKGROUND INFORMATION INCLUDED FOR REFERENCE

FOOTHILLS ATHLETIC PARK TRAFFIC IMPACT ASSESSMENT - EXCERPT TASK B - PARKING
AMENITY DESIGN DIMENSIONS
OPERATIONAL PLANNING UPDATED REPORT
FOOTHILLS FIELDHOUSE RECONCILED ORDER OF MAGNITUDE ESTIMATE (OCT 21,2016)
FOOTHILLS ICE AND AQUATICS RECONCILED ORDER OF MAGNITUDE ESTIMATE (FEB 2017)

5.0 TASK B: PARKING AND LOADING ASSESSMENT

5.1 Introduction:

A comprehensive parking study was completed as part of the Foothills Athletic Park redevelopment program. Specific tasks included in this exercise were as follows:

- Data collection, including a review of parking and loading conditions on the site, parking occupancy and accumulation counts, and review of any study and literature related to uses on this site.
- Parking Analysis and forecasting including the review of site plans, verification of proposed parking supply, review of available off site parking opportunities and restrictions, review of the existing Bylaw parking requirements, forecast of future parking needs and estimation of parking surplus or deficit.
- Loading Analysis and forecast including a review of site plan to identify the number and locations of loading spaces, review of Bylaw parking requirements, identification of off site and on-site loading routes as well as sweep path analysis to determine the ease of access and egress of loading trucks. It is noted that the available plans were still conceptual at the time of this review and as such, the sweep path analysis was deferred pending more detailed site plan information. This task would best be undertaken at the time of submission of site plans for the purpose of acquiring a Development Permit.

5.2 Existing Uses and Bylaw Parking Requirements

Foothills Athletic Park is composed of many indoor and outdoor recreational facilities. It is also the home of the Calgary Vipers. Major uses at the Park are the Arenas, the Swimming Pool and the Volley Dome. Others are the Track Fields, Soccer Fields and a Little League Baseball Diamond. The observed parking supply at the site was 734 stalls. The intent of this exercise is to apply the Land Use Bylaw (where applicable) to the existing uses and determine what the parking requirement would have been and later compare the Bylaw parking estimate with the observed parking demand. **Table 5.1** shows the existing uses and their Bylaw Parking Needs. Although is it understood that the Park was built before the new Land Use Bylaw (1P2007), this estimate will use the current Bylaw so as to obtain a comparative estimate for the expanded site.

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Table 5.1: Existing Uses and Bylaw Parking Requirements

Amenity	Description	Gross Floor Area sm (sf)	Bylaw Parking Ratio	Bylaw Parking Requirement
Arena	2 Ice arenas for 2050 spectators (including change rooms, concession, office and administration space)	12,858 (138,352)	5 stalls/100 sm of GUFA or 1 stall per 4 persons	463 (based on number of spectators)
Indoor Recreational	Aquatics, fitness/training building and Gymnasium	6,581 (70,810)	5 stalls/100 sm of GUFA	329
Outdoor Facilities	4 soccer fields, 8 tennis courts, 1-400 outdoor track for 1000 spectators, I baseball Stadium and 1 little league field	72, 287 (81,0083)	No Bylaw ratio is available for these uses but apply ITE ratio to soccer and baseball fields (38.3/field) and 1 stall per 4 persons to spectator	429
Total				1221

As can be seen from Table 5.1, the strict application of the Bylaw parking requirement would be 1221 stalls. This is clearly not reasonable, and it does not reflect the supply currently available on-site. As indicated earlier, the observed existing parking supply is 734 stalls. If the Bylaw were to e strictly applied, there would be a deficit of 487 stalls on site.

As can be seen, the Bylaw parking requirement appears excessive for the parking need of the site; as a result, Bunt & Associates conducted parking counts on two different days that are considered typical and one day during a Vipers' game. The results of the counts are summarized in the section that follows.

5.2 Data Collection

Parking Data collection exercises were conducted on three different dates that were considered typical by the operators of the Foothills Athletic Park. Discussions with the Park indicated that uses on site are affected by seasonal demand. It was understood that the Arena is mostly heavily used between October and April (though use is made of the facility year round) while the outdoor fields are typically most heavily used between April and September. It was further understood that some of the existing parking stalls are made available to the University of Calgary as part of shared parking agreement during regular academic session; that is, September to April. This latter information allowed Bunt & Associates to isolate the actual Park's demand as the university was not in session a the time of the data collection exercises**. Table 5.2** shows the count dates and facilities in use during the count periods.

Table 5.2: Count Dates and Facilities in Use

Counts Date	Counts Time	Facilities in Use
Tuesday, May 31, 2011	4:00 PM to 8:00 PM	1 Ice Rink (Norma Bush Arena), 2 Soccer Fields, 1 Little League Baseball Field, Baseball Practice Dome, Baseball Academy, Swimming Pool, Volley Dome, Beach Volley Court, Tennis Courts and Sports Clinic
Saturday, June 4, 2011	8:30 AM to 1:30 PM	1 Ice Rink (Norma Bush Arena), 2 Soccer Fields, 1 Little League Baseball Field, Baseball Practice Dome, Baseball Academy, Swimming Pool, Volley Dome, Beach Volley Court and Sports Clinic
Tuesday, June 7, 2011	6:00 PM to 8:00 PM	1 Ice Rink (Norma Bush Arena), 2 Soccer Fields, Baseball Diamond (Foothills Stadium), Baseball Practice Dome, Baseball Academy, Swimming Pool, Volley Dome, Beach Volley Court and Sports Clinic

5.3 Existing Parking Demand:

Bunt & Associates observed parking demand at the site on three different days as noted in Table 5.1. The counts are summarized in **Tables 5.3, 5.4 and 5.5.**

Table 5.3: Existing Parking Demand on Tuesday May 31, 2011

Time of Day	Observed Parking Demand
4:00 PM -5:00 PM	277
5:00 PM -6:00 PM	251
6:00 PM -7:00 PM	293
7:00 PM -8:00 PM	**295**

Table 5.4: Existing Parking Demand on Saturday June 4, 2011

Time	Observed Parking Demand
8:30-9:30 AM	173
9:30 AM – 10:30 AM	250
10:30 AM – 11:30 AM	**318**
11:30 AM -12:30 PM	309
12:30 PM -1:30 PM	272

Table 5.5: Existing Parking Demand on Vipers' Game Day (June 7, 2011)

Time	Observed Parking Demand
4:00 PM -5:00 PM	262
5:00 PM -6:00 PM	295
6:00 PM -7:00 PM	359
7:00 PM -8:00 PM	414

As can be seen from Tables 5.3 and 5.4, the maximum observed weekday parking demand on a non-Vipers' game day was 295 stalls. The maximum weekend parking demand was 318 stalls. The counts on Vipers' game day was intended as a check and on event parking demand and was not intended to be used as the basis for estimating regular Park's operation parking demand. That said, the all-weather track was unavailable for use at the time of the data collection exercises and would have likely been occupied for club practice activities. To account for this, Bunt & Associates applied a first principle assessment of estimated parking demand based on the S2 Architects analysis contained in the Glenmore Athletic Park Concept Plan document. That suggested a parking requirement of approximately 60 stalls for his use, which was added to the observed parking occupancy for the site to develop a realistic design level for parking demand. As such, the total on-site parking demand during typical operating and design conditions would be 378 stalls (318 observed plus 60 for the unavailable track).

In addition to the track, there were other facilities on site that were not being used during the count period. While the intensity of use on the count days were deemed typical for design periods by the Park management, Bunt & Associates sough to investigate the parking needs for a higher use scenario. The higher use would not and should not be used for design purposes, but it was assessed as a cross-check to verify the sensitivity of the site parking supply to surges in parking demand should a-typical activity occur on site at a level that would perhaps not be great enough to warrant a special event management program for parking. This is discussed in the following section.

5.4 Estimation of Parking Demand for Full Use

On the count days, one of the two arenas were in use, 2 of the 4 soccer field were in use and there were no track and fields practice/event taking place. As noted, the track was accounted for in the base estimate, but the other absent uses were not. Bunt & Associates estimated the parking needs of the facilities that were not in use during the survey periods in order to obtain the most conservative parking need for the site if all the facilities are in use. **Table 5.6** summarizes the extra parking that would be needed if all the facilities were being used simultaneously. The parking ratios applied to these uses were based on ITE parking ratios, Urban Systems estimates and Bunt & Associates' experience.

Table 5.6: Estimate of Parking Needs Under Full Utilization

Facility	Parking Ratio	Parking Needs
2 Soccer Fields	38.3 stalls/field[2]	77
1 Ice Arena	35 stalls/arena[3]	35
4 Tennis Courts	3.16 stalls/court[4]	13
Total		**125**

As can be seen from Table 5.6, parking needs of the facilities that were not in use at the time of the parking occupancy counts could be up to 125 stalls. Therefore, if all the facilities are in use the existing site is likely to need up to 503stalls (378+125 =503). As noted earlier, this figure should not be used for design purposes, as it represents a condition that is unlikely to occur on-site on more than a few occasions per year. However, it is useful in assessing the robustness of the parking supply and its ability to deal with atypical surges in demand for activity levels that are higher than expected under design conditions, but not high enough to warrant a special event management plan.

[2] ITE land use code 488
[3] Based on Bunt & Associates' counts at Norma Bush Arena
[4] ITE land use code 490

5.5 Future Parking Forecast

In order to estimate the future parking needs for the site, the Land Use Bylaw parking ratios were assembled for each use, and where a Bylaw ratio was not available, industry literature was consulted as well as Bunt & Associates' databases for counts and studies completed elsewhere for similar facilities in Calgary, Airdrie and Vancouver. In addition, assessment of needs based on first principles was applied as necessary to round out the analysis process and to fill in any missing gaps. The parking ratios and their sources are summarized in **Table 5.7**. The estimated parking needs are summarised in **Table 5.8.** Note that in these tables, the parking demands are shown only for the additional uses being added to the site; in essence, the "new" parking that needs to be added to the existing demand.

Table 5.7: Parking Ratios

Use	2007 LUB Parking Ratio	ITE Parking Ratio	Bunt Recommended Parking Ratio
Community Components (Outdoor Amphitheatre)	1.5 stalls/100 SM of GUFA for non- assembly area and a minimum of 1 stalls/4 person capacity of the largest assembly area in the building. *(Part 4, Div 2, #169)*	0.26 stalls/seat *(LU 444)*	Default to Bylaw
Community Components (Playgrounds)	Based on Parking Study *(Part 4, Div 2, #248)*	5.10/acre weekend *(LU 411)*	Default to ITE
Pool (4-lanes and multi-purpose rooms)	5 stalls/100 SM GUFA *(Part 4, Div 2, #211*	3.20 stalls/1000sf GFA weekday & 4 stalls/ 1000 sf GFA Sunday *(LU 495)*	1 stall/34 SM GFA[5]
Multi-purpose rooms and T.I. Spaces	1.5 stalls/100 SM of GUFA for non- assembly area and a minimum of 1 stalls/4 person capacity of the largest assembly area in the building. *(Part 4, Div 2, #169)*	3.20 stalls/1000sf GFA weekday & 4 stalls/1000 sf GFA Sunday *(LU 495)*	1 stall/34 SM GFA [6]
T.I. Spaces (sports medicine, physiotherapy, etc.)	6 stalls/100 SM GUFA *(Part 4, Div 2, #233*	3.20 stalls/1000sf GFA *(LU 720)*	Default to Bylaw
Weight Training	5 stalls/100 SM GUFA *(Part 4, Div 2, #211*	3.20 stalls/1000sf GFA weekday & 4 stalls/1000 sf GFA Sunday *(LU 495)*	1 stall/34 SM GFA[7]
Volleyball Courts	Based on Parking Study *(Part 4, Div 2, #248)*	Not Available	22 stalls/court[8]
Soccer Field	Based on Parking Study *(Part 4, Div 2, #248)*	38.3/field weekday & 58.8/field weekend *(LU 488)*	45 stalls/field[9]
Tennis Courts	Based on Parking Study *(Part 4, Div 2, #248)*	3.16 stalls/court *(LU 490)*	4 stalls/court[10]

[5] Occupancy counts conducted at City of Airdrie East Lake Recreation Centre by Bunt & Associates (2007)
[6] Same as 7
[7] Same as 7
[8] From first principles, usually 14 players per team plus 2 officials equals 30, all arriving in single occupancy vehicles.
[9] 2011 counts at the Foothills Athletic Park indicated a peak demand of 48 stalls per field, 2011 counts at Southeast Soccer Centre indicated 45 stalls per field and 2007 counts at West Calgary Indoor Soccer Centre indicated 46 stalls on a weekend and 73 stall on weekday.
[10] Assuming doubles and no spectators, but each player arrived in single occupancy vehicle.

Table 5.8: Parking Needs Assessment for Additional Uses

Use	Parking Ratio			Net Change in Size	Bylaw	ITE	Bunt
	Bylaw	ITE	Bunt				
Community Components (Outdoor Amphitheatre)	1.5 stalls/ 100 sm GUFA +1 stalls/4 person	0.26 stall/seat	1.5 stalls/ 100 sm GUFA +1 stalls/4 person[11]	1,654 sm (17,800 ft²))(Assume 500 capacity)[12]	138	130	138
Community Components (Playgrounds)	5.10/ acre[13]	5.10/ acre	5.10/acre[14]	1 playground (assume ½ acre /playground)	3	3	3
Pool (4-lanes and multi-purpose rooms)	5 stalls/ 100 sm	3.20 stalls/ 1000sf GFA	1 stall/4 sm[15]	1,740 sm (18,720 ft²)	87	60	52
Multi-purpose rooms and T.I. Spaces	1.5 stalls/ 100 sm GUFA +1 stalls/4 person	3.20 stalls/ 1000sf GFA	1 stall/34 sm GFA	334 sm (3,592 ft²) (Largest room for 45 persons)	17	15	10
T.I. Spaces (sports medicine, physiotherapy, etc.)	6 stalls/ 100 sm	3.20 stalls/ 1000sf GFA	6 stalls/100 sm[16]	676 sm (8,429 ft²)	41	27	41
Weight Training	5 stalls /100sm	3.2 stalls/93sm	1stall/34sm	1,915 sm (1603 sm GUFA) (19,604 ft²)	80	63	54
Volleyball Courts	22 stalls/ court[17]	22 stalls/court	22 stalls/court	4 courts	88	88	88
Soccer Field	45 stalls/ field	38.3 stalls/field	45 stalls/field	-1	-45	-38	-45
Tennis Courts	4 stalls/ court[18]	3.16/ court	4 stalls/court	-2 courts	-8	-6	-8
Total					401	342	333

[11] Default to Bylaw
[12] Assume half of the space for non assembly area and capacity of 500 spectators.
[13] Defaults to ITE
[14] Default to ITE
[15] Based on counts conducted at the East Lake Recreation Centre. This is the ratio for the entire site, so it may be a little conservative as a proxy for swimming pools.
[16] Bunt defaults to Bylaw
[17] Based on first principles
[18] Based on first principles.

Based on the review outlined above and the results of the analysis summarized in Tables 5.7 and 5.8, it can be seen that the base increase in parking demand for the site to accommodate the new uses would be in the order of 333 to 401 additional stalls. Combined with the current observed demand for 378 stalls for the existing uses, this suggests an overall post-expansion parking supply of 711to 779 stalls. The proposed site parking supply are 778 stalls, and so the expected demand for typical design conditions can indeed be accommodated by the proposed supply.

In fact, if the atypical full utilization parking supply estimated earlier to be 503 stalls for existing conditions were to be used as a basis for analysis, then the overall parking demand for full utilization of all on-site facilities would be in the order of 904 stalls (503+401 =904). As noted, such a scenario is neither reasonable nor desirable in terms of design, as it would call for an excessive parking supply that would be seldom utilized (not unlike a shopping centre being design to accommodate Boxing Day parking demands) and would create a less favourable environmental footprint for the site through the provision of unnecessary parking stalls. Again, site observation and discussions with the Park's manager indicated that the count dates and times were typical for the site. Therefore, the proposed parking supply of 778 stalls is adequate for the peak demand of the redeveloped site.

Having said this, it is also Bunt & Associates' opinion that the swimming pool and volleyball court rates may be overstated, in which case, the actual on-site parking supply could be reduced. For example, in the case of the pool, programming information provided for the site suggested that the pool area would be designed for a load of approximately 141 people. If vehicle occupancy of 2.0 was to be assumed, then the associated pool parking demand would be in the order of 71 stalls and not 87 as proposed by the By-law. Similarly, if only three of the four volleyball courts were to be occupied concurrently, and if similar auto occupancy figures were applied, then the demand for parking for that use would be 66 stalls instead of 88 stalls.

In any event, the current plan is indeed adequate to accommodate typical design conditions for the site, and in Bunt & Associates' opinion, opportunities do exist to reduce the parking requirement should other factors reduce the ability to provide the base forecast parking supply on-site.

5.5.1 Parking Forecast Cross-Check

S2 Architecture, in its programming report, estimated the number of parking spaces needed by the site based on first principles. Specifically, their estimate was based on (a) the number of people that were expected to be on-site as user loads in different areas of the park, (b) probability of concurrent uses facilities and (c) possibility of transit use. Since this represented a different approach from the analysis based on observed parking demand rates as used by Bunt & Associates, it was viewed as a means to cross-check the assessment. The S2 estimate is presented here in **Table 5.9**.

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Table 5.9: Future Parking Needs Based on S2 Architecture Estimates

Components	Maximum Predictable Occupancy	Transition Occupancy	Maximum Predicable Total	Maximum Design Factor	Design Maximum Occupancy	Parking Factor	Recommended Parking
Fieldhouse							
Soccer	4 teams at 14 participants = 56	2 teams at 14 participants = 28	84	0.8	71	0.67	48
Track	2 teams at 30 participants = 60	2 teams at 30 participants = 60	120	0.8	102	0.67	68
Gymnasia (10 courts)	20 teams at 10 participants = 200	10 teams at 10 participants = 100	300	0.8	255	0.67	171
Coaches/Assistants	26 teams at 1.33 participants = 35	14 teams at 1.33 participants = 19	54	0.8	46	0.67	31
Staff	2	2	4	0.9	3	0.67	2
Ice Arena							
Sheet 1	2 teams at 22 participants = 44	1 team at 22 participants = 22	66	0.8	56	0.67	38
Sheet 2	2 teams at 22 participants = 44	1 team at 22 participants = 22	66	0.8	56	0.67	38
Coaches/Assistants	4 teams at 2 coaches = 8	2 teams at 2 coaches = 4	12	0.8	10	0.67	7
Staff	2 sheets at 3 staff = 6	2 sheets at 1.5 staff = 3	9	0.9	8	0.9	7
Pool							
Competition Pool	10 lanes at 10 swimmers = 24?	10 lanes at 10 swimmers = 24?	48	0.8	41	0.67	27
Coaches/Teachers /Guardians	14	4	18	0.8	15	0.9	14
Teach/Dive/Leisure	65	10	75	0.8	64	0.75	48
Fitness							
Weight training	80—100 stations = 100	Participants waiting =50	150	0.8	128	0.85	108
Group Exercise	2 rooms at 32 participants = 64	1 room at 32 participants = 32	96	0.8	82	0.85	69
Meeting/ Classroom	Maximum occupancy = 105	Staggered schedule = 74	179	0.8	152	0.85	129
Staff	3	2	5	0.9	4	0.67	3

Table 5.9 - Continued

Components	Maximum Predictable Occupancy	Transition Occupancy	Maximum Predicable Total	Maximum Design Factor	Design Maximum Occupancy	Parking Factor	Recommended Parking
Administration/Sports Medicine							
Operations	Full and Part time staff = 20	NA	20	0.8	17	0.95	16
Sports Medicine	Staff and patients =12	NA	12	0.9	10	0.95	10
TOTAL			1318		1120		834

As can be seen in Table 5.9, the S2 Architecture estimate of parking need resulted in a calculated value of 834 stalls based on estimated user loads. This was very comparable with 779 stalls estimated by Bunt & Associates in Table 5.8 but 56 stalls (7%) more than the 778 stalls proposed for the site. As a result, the 778 stalls planned for the redeveloped site continued to be considered adequate for the needs of the site.

5.6 Loading Analysis and Forecasting

Bunt & Associates estimated the loading requirement for the site based on Bylaw requirement as well as operational needs. The existing building area that could generate loading needs is 39,359 square metres (422,426 square feet) and the future floor area that could generate loading is 55,244 square metres (594,666 square feet). **Table 5.10** shows the existing and future uses that could generate loading activities.

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Table 5.10: Uses and Floor Areas Likely to Generate Loading

Uses	Floor Area	
	Existing	Proposed
Ice Centre	12,858 sm (138,352 sf)	12,503 sm (134,587 sf)
Community/ Training Building	399 sm (4,288 sf)	4,947 sm (53,251 sf)
Aquatic Centre	2,582 sm (27,786 sf)	4,320 sm (46,506 sf)
Outdoor facilities	NA	31 sm (336 sf)
Field house	23,420 sm (252,000 sf)	33,443 sm (359,986 sf)
Total	39,359 sm (422,426 sf)	55,244 sm (594,666 sf)

5.6.1 Loading Forecast Based on Bylaw

The current Bylaw (1P2007) defaults to the previous Bylaw (2P80) for loading requirements. Generally, and for most uses, the Bylaw loading requirement is 1 loading stall for every 9,300 square metres.

Based on Table 5.6, 55,244 square metres of building floor would generate a need for loading spaces. By applying the Bylaw parking ratio, 6 loading spaces would be required (55,244/9,300 = 6). The proposed loading supply is two, which would result in a Bylaw deficit of four loading spaces.

5.6.2 Loading Forecast Based on S2 Architecture Estimate

S2 Architecture indicated that the net floor area for which loading is appropriate is 39, 663 square metres. This floor area was obtained by subtracting the areas occupied by the fieldhouse, pool enclosure and ice sheets from the total floor area. By applying the Bylaw loading ratio of 1 stall per 9,300 square metres to this floor area, a total of five loading spaces would be necessary.

5.6.3 Loading Forecast Based on Existing Operation

The existing site has only one loading space for large deliveries to the site. The parking occupancy counts conducted at the Park showed that only one loading truck was at the site during the observation period. This truck was parked at the loading dock attached to Father Bauer Arena. However, interviews with the site manager identified the presence of additional loading activities, mainly courier services, occurring in front of the Canadian Hockey Centre and the Sports Clinic. The Park confirmed that when bulk supplies are being delivered, it is usually accommodated at the loading area in the arena building and that the available one loading space is adequate for occasional big deliveries.

As shown in Table 5.10, the increase in floor area that may generate loading activities is approximately 40 percent of the existing floor area, indicating that a maximum of two loading spaces would be adequate for the needs of the site. This assessment suggests that the proposed two loading spaces would be adequate for the needs of the expanded site.

5.6.4 Loading Summary

The loading needs associated with the Foothills site were assessed using three different methodologies. Based on this assessment it is Bunt & Associates' opinion that two loading stalls will be adequate to accommodate the needs of the site. That said, S2 has confirmed that the site plans do allow sufficient flexibility to accommodate up to five docks should the need arise. For the purpose of design, however, it is recommended that two docks be provided.

5.7 Bus Loading

The proposed site plan shows a bus loading zone on the west side of the site. It is noted that the available plans were still conceptual at the time of this review and as such, the bus zone layout and the adequacy of the number of bus parking spaces were deferred pending more detailed site plan information. This task would best be undertaken at the time of submission of site plans for the purpose of acquiring a Development Permit.

6.0 TASK C: SAMPLE SPECIAL EVENT MANAGEMENT PLAN

The issue of Special Event conditions is related to both traffic and parking, and may already exist under existing conditions. Certainly this was evident at the Canadian Track and Field Championships held at the site in June 2011, and as well at another major track meet held at the Glenmore Track during the same season. It is important to understand that each event is unique and may require specific planning to accommodate the various stakeholders involved. This section seeks to highlight the main points that should be considered when developing a Special Event Management Plan, but a detailed plan for the specific event would need to be developed in advance of each event. Based on Bunt & Associates observations the Glenmore Athletic Park site, the anticipated threshold for requiring a Special Event Management Plan under existing conditions appears to be in the order of approximately 600 parked vehicles; however, this is likely to be a lower limit for Foothills given the availability of parking in the area and the proximity to regional transit and automobile routes. As such, it is recommended that further calibration be completed based on the various experiences from different events of assorted intensity and type. The goals of managing travel for planned special events include achieving predictability, ensuring safety, maximizing efficiency, and meeting public and event patron expectations.

The Federal Highway Administration (FHWA) lists three primary categories that should be focused on when planning and managing a special event: Motorist Information, Traffic Management, and Travel Demand Management. Providing motorists with accurate and timely information allows motorists to select the most appropriate route to the site, to direct them to appropriate parking areas, reduce driver frustration, and inform non-event traffic to encourage the use of alternate routes. Traffic management includes the use of traffic control devices, patrols, electronic surveillance, signalization, and geometric modifications. Finally, Travel Demand Management includes techniques used to reduce or spread the demand of automobile travel over time. Aspects of all three of these categories should be considered in the development of the Event Management Plans completed for the Athletic Park.

As part of this exercise it will be necessary to establish a sample program that seeks to manage both aspects of transportation demand (traffic and parking) while concurrently seeking to reduce the demand for either through the implementation of Transportation Demand Management (TDM) measures. The following outlines the key steps in creating a Special Event Management Plan.

Task 1: Base Map and Critical Issue Development

- Collect and organize base mapping to identify all off-site parking locations (on street and off street).
- Identify critical issues in the study areas. These could include but not necessarily be limited to such things as the following:
    - Regional access locations and their interface with the skeletal road network.

- Expected queuing locations at access points and intersections within the study area, and the means by which those queues can be better accommodated under inbound load conditions.
- Parking management, both on-site (through fast track access, stall assignment and internal routing) and off-site (through the provision of shuttles or other means to move patrons between the sites and any off-site parking areas).
- Outbound traffic management, specifically on and off-site bottleneck locations, queuing and interface of traffic with pedestrians.

Task 2: Development of Transportation Accommodation Strategy

- Focus #1: Seek to provide motorists with accurate and timely information.

  Providing motorists with accurate and timely information allows motorists to select the most appropriate route to the site, to direct them to appropriate parking areas, reduce driver frustration, and inform non-event traffic to encourage the use of alternate routes.

  After preliminary consideration is given to the routing of attendees and the anticipated Traffic Control Plan, messaging should be considered with consideration given to both the regional and local contexts. These messages would inform drivers of a detour or lane closure, areas of congestion, wayfinding to or from the site, or even how to navigate around the site with reduced delay. Advertising alternative routes to motorists in the area, in hopes that some may choose to change their route, can subsequently reduce the number of vehicles at a major choke points and benefit both attendees of the special events and the general public. The messaging can be in the form of media releases, roadside signage, social media, websites, or other marketing tools.

- Focus #2: Seek to reduce the traffic volume arriving at the site.

  The most desirable way to reduce the impact of special event traffic and parking is to reduce the proportion of people arriving at the site by auto modes and increase the proportion arriving by non-auto modes such as transit, charter bus/shuttle, walking, biking etc.). Car pooling is another means to achieve this end, as it increases the number of people per vehicle and therefore reduces the number of vehicles.

  This task will involve the development of a conceptual TDM plan that seeks to identify realistic, affordable and feasible means by which the volume of traffic arriving at the site to seek parking could be reduced. The program will be developed in several stages. The first stage would be the development of a list of ideas and option. Second, the list would be assessed and items weighted against each other and ranked. Third, a discussion and summary would be prepared that outlines how best to implement the program, and how it will affect the plans for the site. Since this exercise is intended to be sample for use as a template, a limited amount of effort will be put to the task of ranking and weighting items.

It is expected that there will be recommendations forthcoming related to signage, parking assignment, information distribution and the like that may need to be incorporated into the drawing set for the site. This TDM program will serve as a template for further review and enhancement once more is known about the nature of special events. Although out of scope for this particular exercise, it will be necessary to promote an on-going management of TDM at the site so as to ensure that opportunities are seized as they become available, and without waiting until after the facility is complete.

- Focus #3: Seek to manage the traffic that arrives at the site.

Given that the TDM program will seek to reduce the volume of traffic itself, the remaining task will be to optimize the management of the traffic that does arrive at the event. The process of developing an effective Traffic management Strategy will be to understand where the traffic is coming from, over what length of time it is likely to arrive, and how it will be filtered/sorted into the parking areas. Outbound activities will include the optimization of exit capacity and corridor efficiency so as to reduce congestion and idling (pollutants) while maintaining safety and providing clear corridors for pedestrians and other non-auto modes to traverse or otherwise compete with the traffic flows.

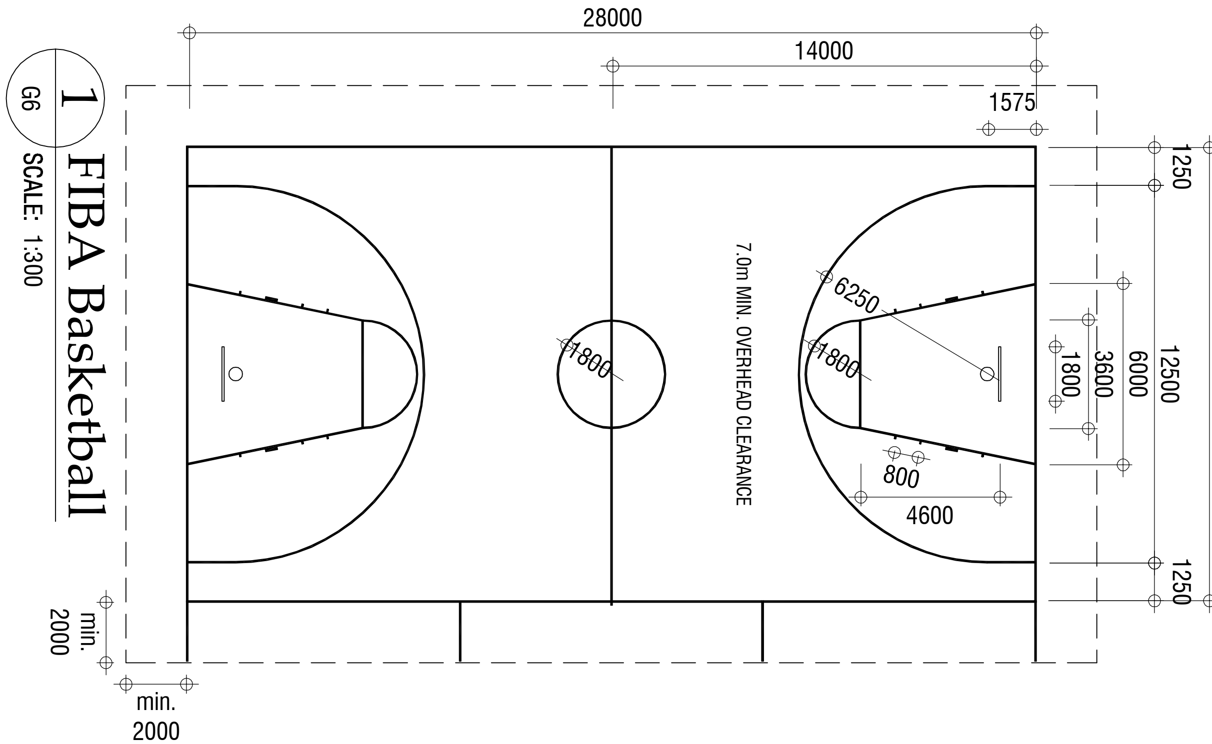
This task will include a conceptual planning process where the critical issues are dissected and mitigation options are prepared. Key bottleneck locations will be identified, as will the manner of parking access protocol to be followed. Several layers of event management staff will be required and identified, and the hierarchy of those staff will be developed. Key layers of event management could include something similar to the following (included here for illustrative purposes only):

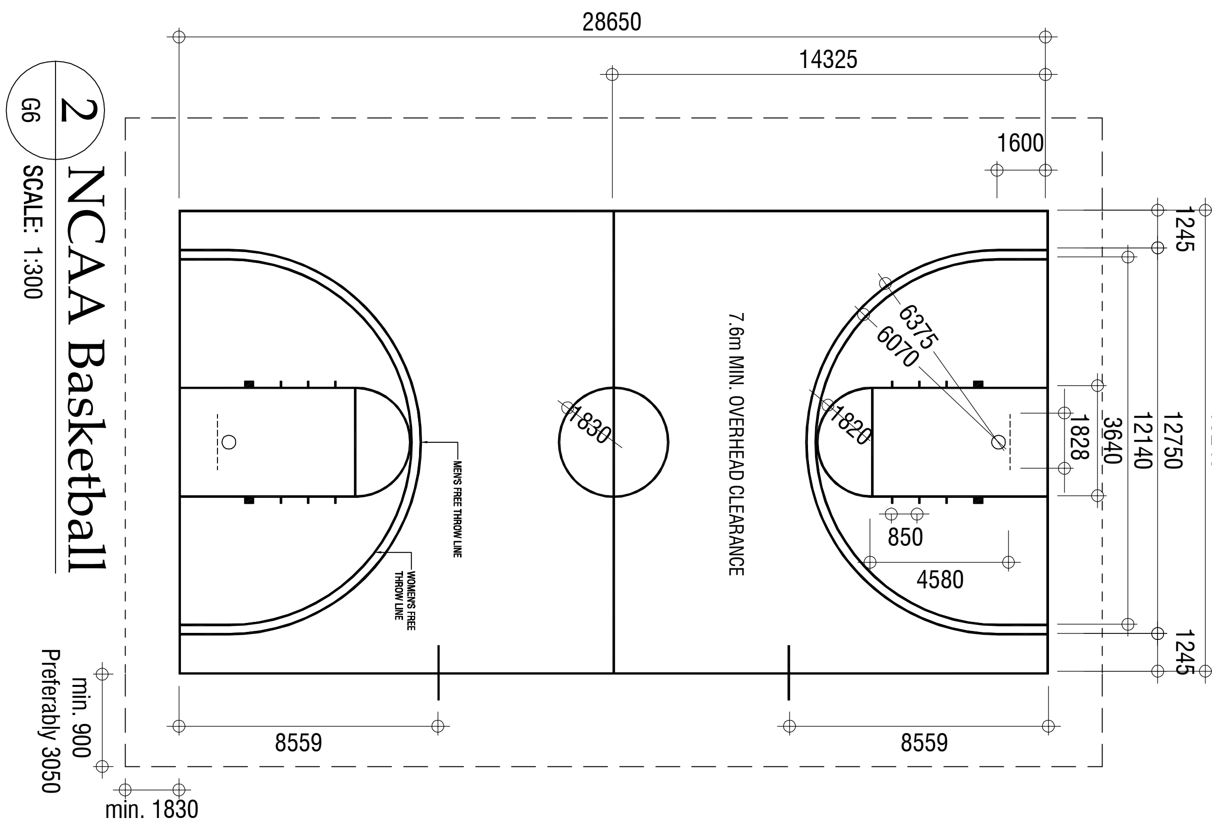
- *Level 1: Event Manager*. One to two people, at least one being City staff with sufficient authority to manage, monitor and adjust the plan in real time. This person or persons will have direct communication with the Level 2 Team Leaders, the Parking Manager and also with Calgary Police Services and required City departments on the day of the event.

- *Level 2: Traffic Control*. This will consist of several groups of individuals, each with a Team Leader. The traffic controllers will manage key access points/corridors to facilitate traffic flow in and out. The various Traffic Controllers would be in communication with their respective Tem Leader, and the Team Leader would be able to communicate with other Team leaders as well as the Event Manager and the Parking Manager.

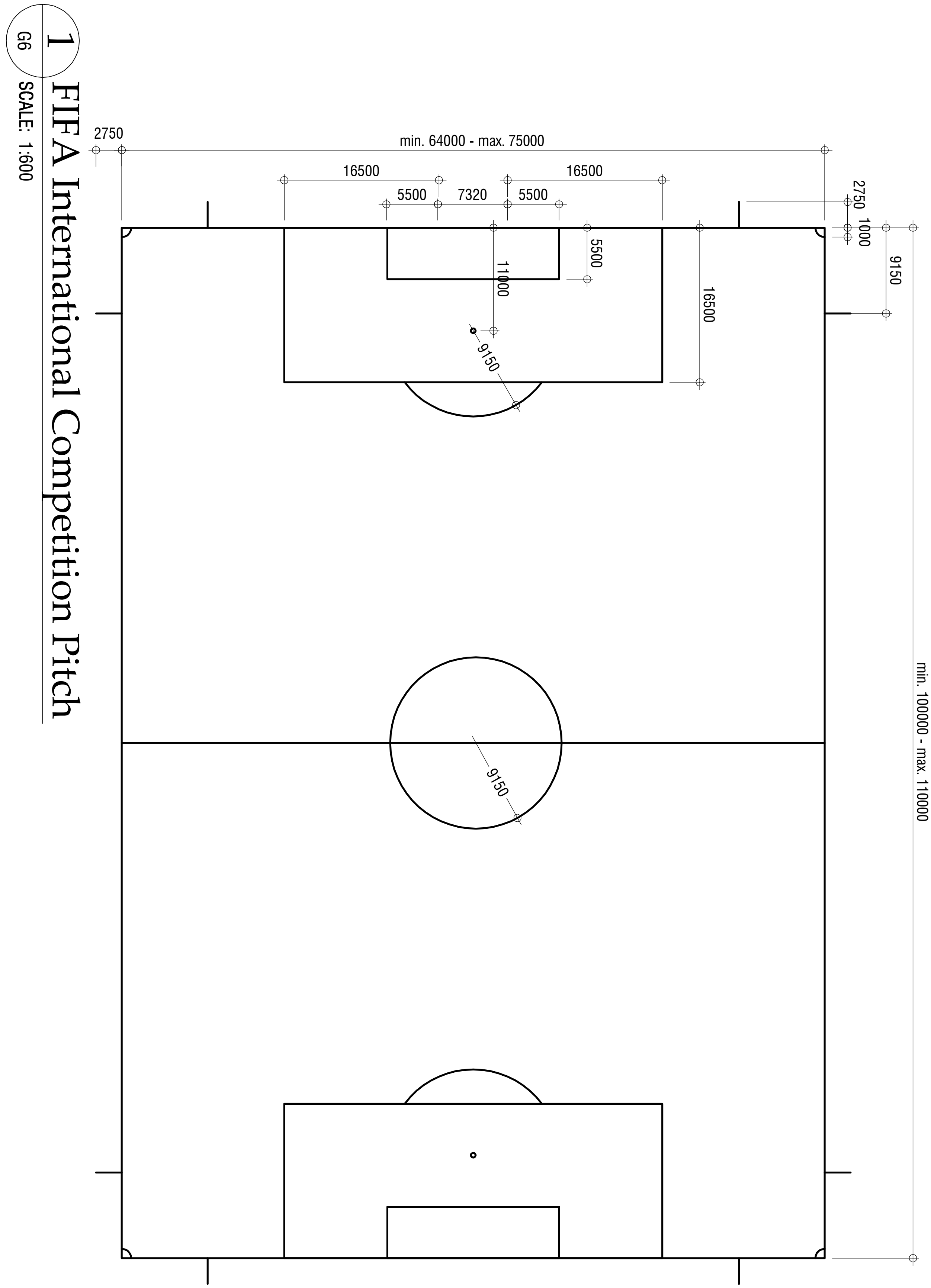
- *Level 3: Parking Assistants:* The parking assistants will be within the parking areas to ensure a logical and expedient placement of vehicles in their stalls. Parking Assistants will have a single Parking Manager to whom they would communicate to notify of capacity conditions. The Parking Manager would then communicate to the Level 2 Team Leaders as to locations of residual capacity, thus allowing for real time adjustments to traffic flow.

The development of the program to facilitate the flow of traffic and parking with the required hierarchy will need to include several items. First and foremost would be the drawing plan showing the sites, locations of bottlenecks, traffic control devices and staff. The second would be a hierarchy flowchart to ensure that communication between the three levels of management is clear and that no errant communication occurs. The key to a successful plan is the ability to transfer capacity information quickly and efficiently with the subsequent ability to adjust on the fly to optimize traffic flow and parking management. This template will serve to provide the right framework to accommodate a rigorous plan at such time as a real event may be forthcoming.





FRA2019-0628 Program Overview and Update ATT 3
ISC: Unrestricted


1
G6
FIFA International Competition Pitch
SCALE: 1:600
2750
min. 64000 - max. 75000
16500
16500
5500
7320
5500
2750
1000
9150
5500
11000
16500
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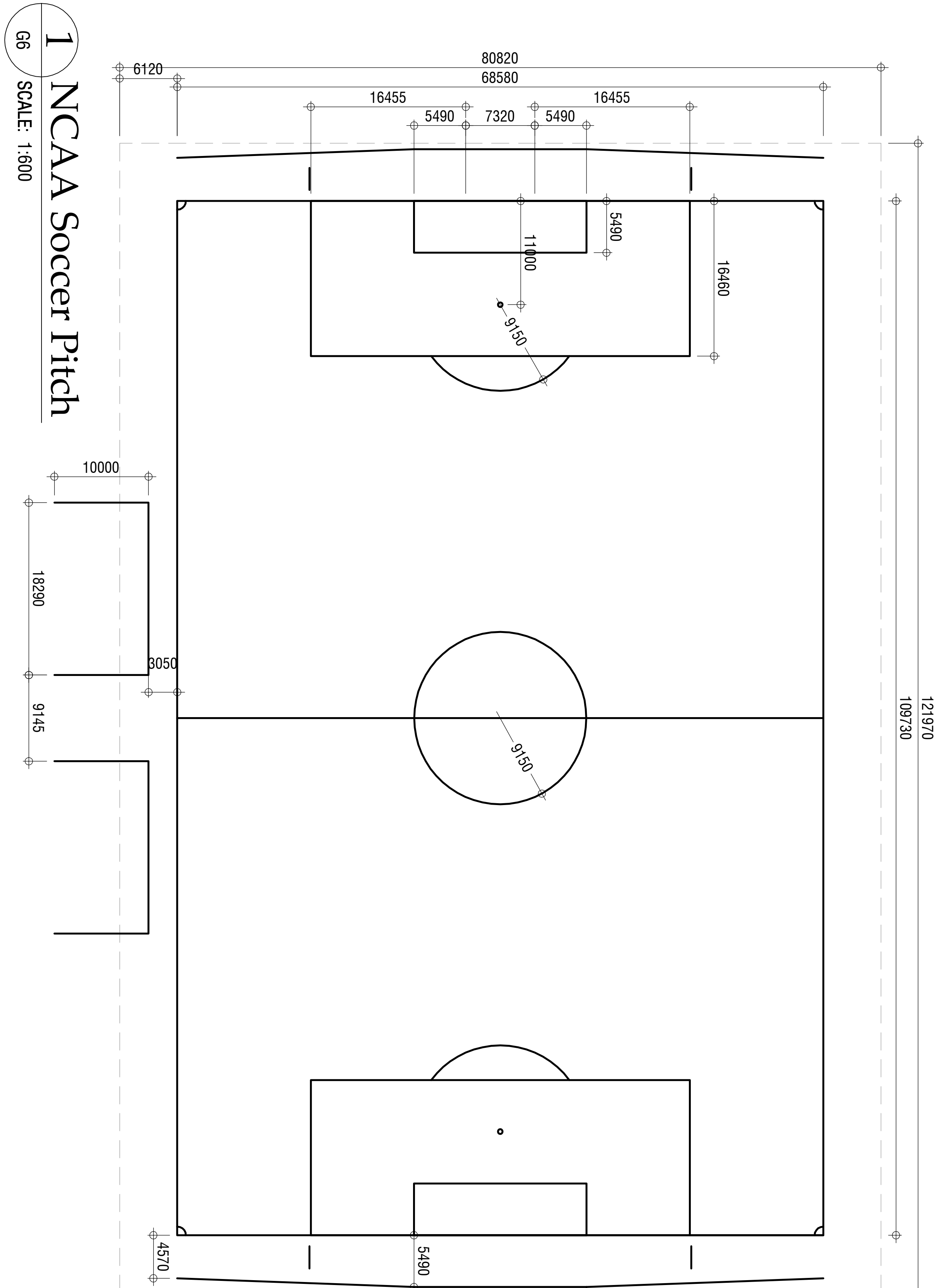
9150
min. 100000 - max. 110000



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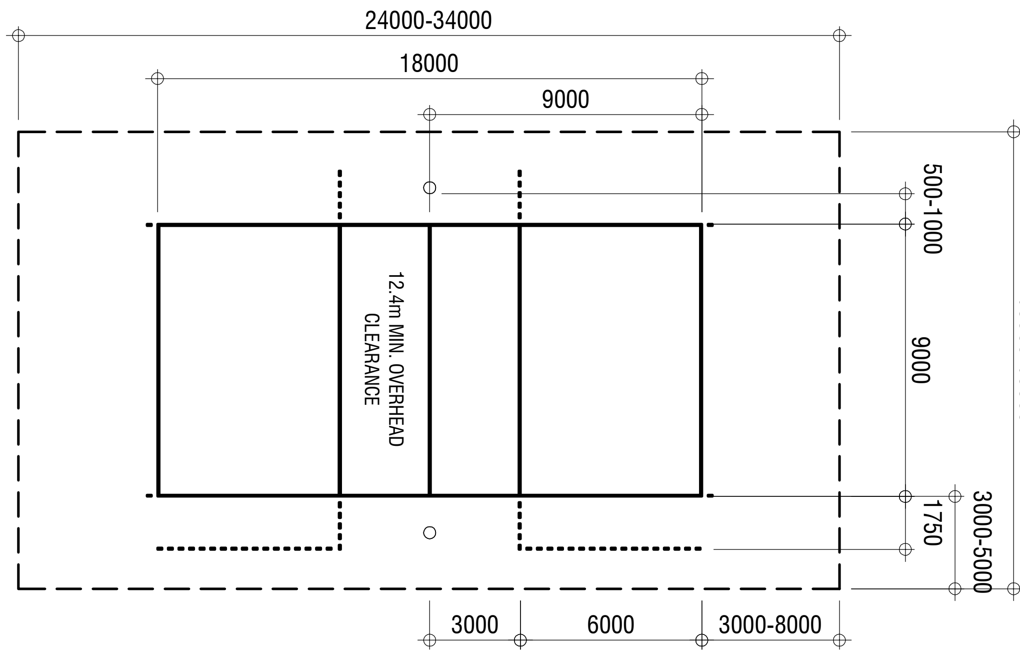
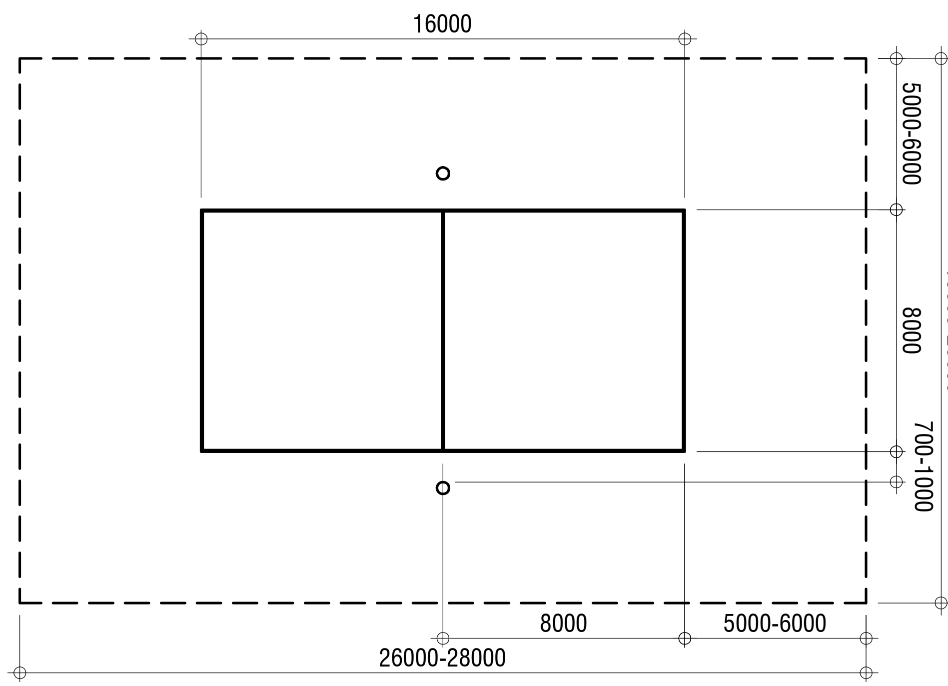
1 FIVB Indoor Volleyball

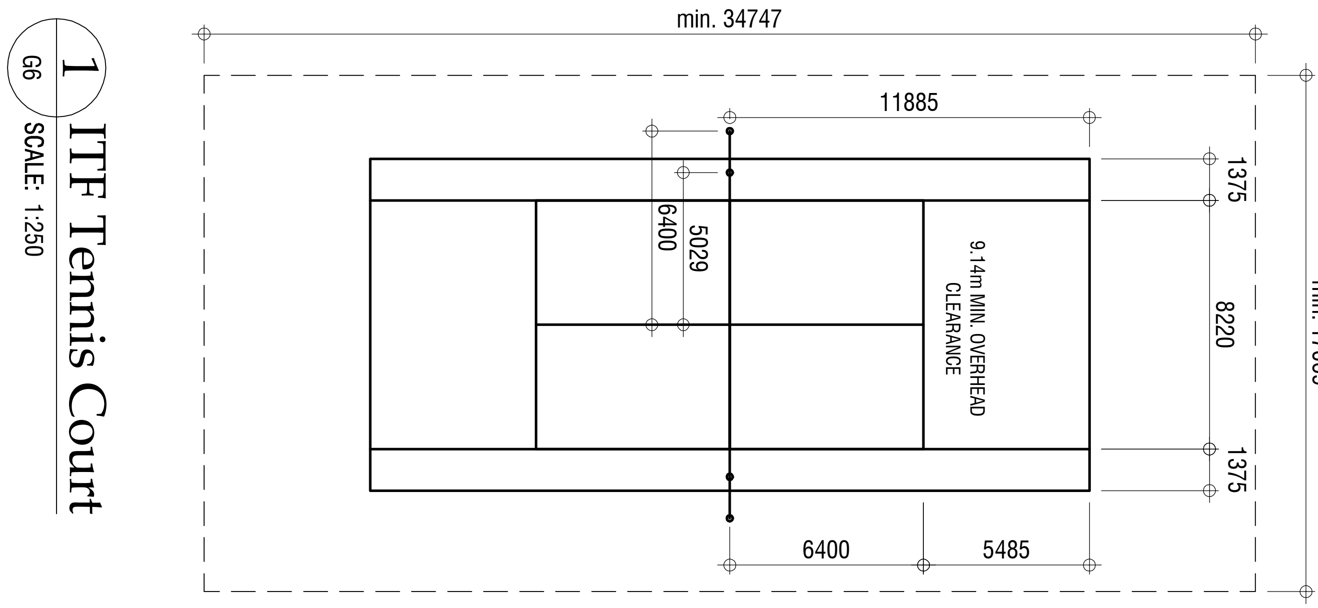
G6 SCALE: 1:250



1 FIVB Beach Volleyball

G6 SCALE: 1:250





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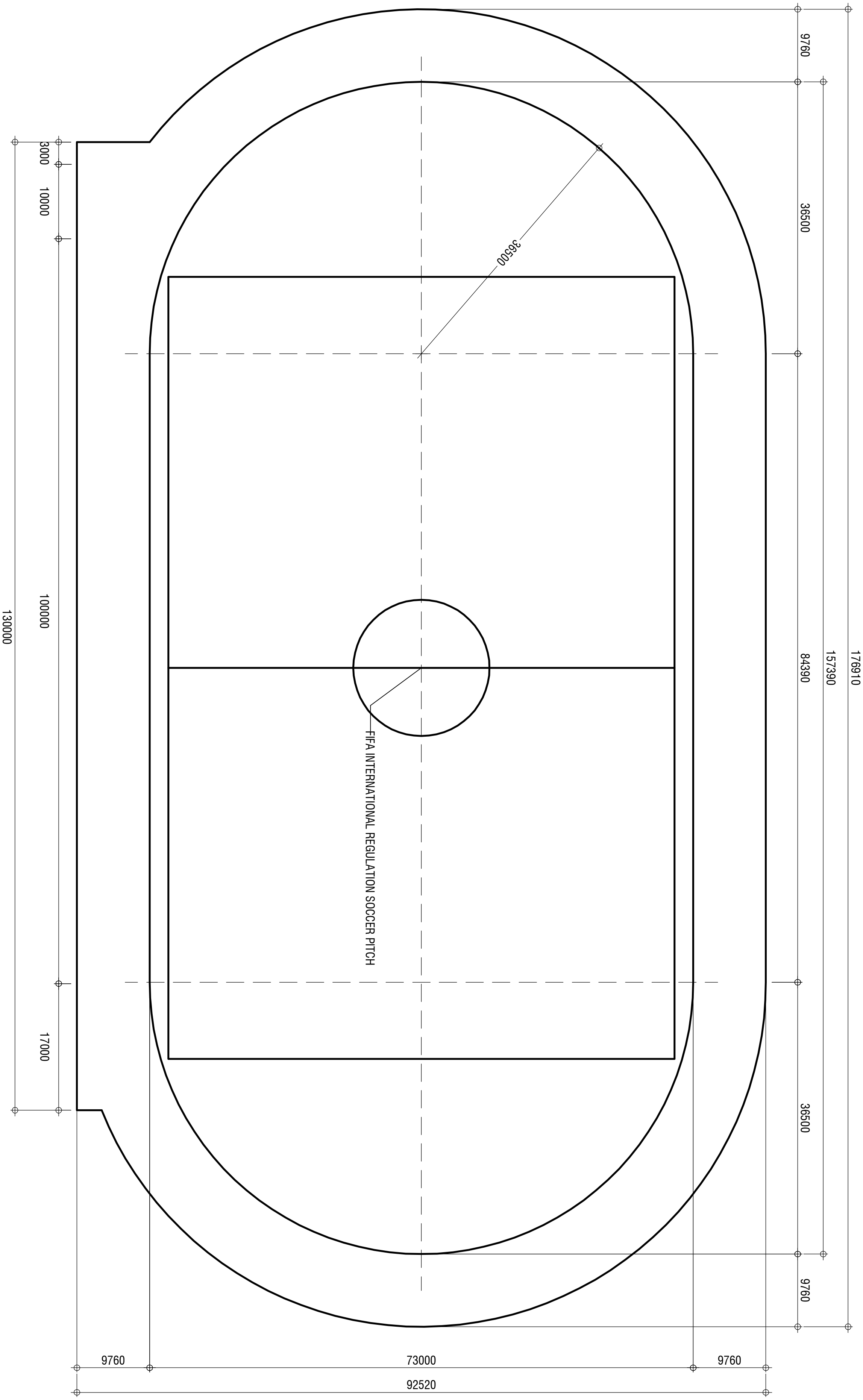
1
G6

IAAF 400m Standard Track (Radius 36.50m)

SCALE: 1:750



FRA2019-0628 Program Overview and Update ATT 3
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APPENDIX K:
BUILDING CODE ANALYSIS
BYLAW REVIEW

BUILDING CODE ANALYSIS

FOOTHILLS ATHLETICS VENUE AND FIELDHOUSE - CALGARY

THE CONSTRUCTION PROCEDURES OUTLINED IN THESE DOCUMENTS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE ALBERTA BUILDING CODE 2014 AND ITS SUPPLEMENTS.

1. **PROJECT DESCRIPTION**

   A competition viewing and practice sports facility with integrated sports performance and weight trainings facility. Preliminary building code analysis completed to confirm conceptual design only.

2. **BUILDING OCCUPANCY AND EXTENTS**
   1. MAJOR OCCUPANCIES: A3 - assembly, Group D – business use, Group F3 - parking
   2. BUILDING HEIGHT: 25m - 30m
   3. BUILDING AREA: 40,348m^2

3. **BUILDING SIZE AND CONSTRUCTION RELATIVE TO OCCUPANCY**
   1. **GROUP A3 MAJOR OCCUPANCY**

      BUILDING HEIGHT: Any Height
      BUILDING AREA: Any area
      CONSTRUCTION: Non-combustible Construction
      FLOOR ASSEMBLIES: Fire Separation with 2 HR F.R.R.

4. **MAJOR OCCUPANCY SEPARATIONS**
   1. GROUP A3 & GROUP D: 1 HR F.R.R. - TABLE 3.1.3.1 (1)
      CLOSURES – 45 min TABLE 3.1.8.4

5. **COMPONENT FIRE SEPARATIONS AND CLOSURES**
   1. EXIT LOBBY: 0 MINUTE FIRE SEPERATION – **3.4.4.2**
      CLOSURES: 0 MINUTE
   2. EXITS: 1 HOUR FIRE SEPARATION– **3.4.4.1**
      CLOSURES: 45 min – **TABLE 3.1.8.4**
   3. SERVICE ROOMS: 1 HR F.R.R. – **3.6.2.1**
      CLOSURES: 45 min – **TABLE 3.1.8.4**
   4. JANITOR ROOMS:1 HR. F.R.R. – **3.3.1.21 (3)**
   5. VERTICAL SERVICE SPACE 1 HR F.R.R. – **3.6.3.1 (1)**

7. **BUILDING SERVICES PENETRATIONS**

   PENETRATIONS THROUGH FIRE SEPARATIONS WILL BE FIRE STOPPED AS PER THE REQUIREMENTS OF 3.1.9.1 (1) & 3.10.9.6 (1)

8. **OCCUPANT LOAD CALCULATIONS**

- Permanent seating	2500 seats
- participants	100
Total	2600

9. **AUTOMATIC FIRE SUPPRESSION SYSTEM**

   FULLY SPRINKLERED TO MEET N.F.P.A. 13 REQUIREMENTS

10. SPATIAL SEPARATION AND EXPOSURE PROTECTION – To be Calculated in detail as design progresses Note that the North and East faces and proximity to the property line and to the future road right-of-way may impact the design. The smallest limiting distance calculation shown here for reference.

ELEVATION	North					
COMPARTMENT	EXPOSED BLDG FACE (m^2)	LIMITING DISTANCE (m)	OPENINGS ALLOWED (%)	OPENINGS PROVIDED (%)	CLADDING CONSTRUCTION	WALL RATING
Fieldhouse	TBC	19.5m	100	TBC	Any	TBC

11. ADDITIONAL REQUIREMENTS FOR HIGH BUILDINGS – N/A

12. EXITING AND EGRESS

1. MINIMUM STAIR WIDTH – 1100 – 3.4.3.2 (8)(c)
2. MAXIMUM TRAVEL DISTANCE TO EXIT – 45m – 3.4.2.5 (c)
3. MAXIMUM DEAD END CORRIDOR – 3m – 3.3.1.9 (7)
4. AS PER THE REQUIREMENTS OF 3.3.1.5 & 3.4.2.1, #### MEANS OF EGRESS ARE REQUIRED FOR FLOOR AREAS, ROOMS OR SPACES EXCEEDING THE FOLLOWING AREAS OR TRAVEL DISTANCES:
   - GROUP XXXX OCCUPANCY – MAXIMUM AREA: XXXXXm^2 – MAXIMUM TRAVEL DISTANCE: XXXXX
   - GROUP D OCCUPANCY – MAXIMUM AREA: 300m^2 – MAXIMUM TRAVEL DISTANCE: 25m
5. EXIT THROUGH LOBBIES MAXIMUM TRAVEL DISTANCE – XXXXX – 3.4.4.2 (2)(b)

13. ASSEMBLY OCCUPANCY

3.3.2.5 AISLES THE DESIGN REQUIREMENTS OF THIS SECTION WILL APPLY TO THIS BUILDING
3.3.2.11 BLEACHERS THE DESIGN REQUIREMENTS OF THIS SECTION WILL APPLY TO THIS BUILDING

14. HEALTH REQUIREMENTS

WASHROOM CALCULATION
FIELDHOUSE 12 MALE, 22 FEMALE

15. BARRIER FREE DESIGN REQUIREMENTS

THE BARRIER-FREE DESIGN REQUIREMENTS OF SECTION 3.8 WILL APPLY TO THIS BUILDING AS PER 3.8.1.1. AREAS OF THE BUILDING NOT BEING RENOVATED WILL NOT BE SUBJECT TO THESE REQUIREMENTS AS PER DIVISION A, 1.1.1.2 (2)

BYLAW REVIEW
FOOTHILLS ATHLETICS VENUE AND FIELDHOUSE - CALGARY

FURTHER ANALYSIS OF APPLICABLE BYLAWS TO BE COMPLETED DURING DETAILED DESIGN.

1. **PROJECT DESCRIPTION**
   A competition viewing and practice sports facility with integrated sports performance and weight trainings facility. Preliminary Bylaw analysis completed to confirm conceptual design only.

2. **BUILDING AND SITE DATA**

Municipal address:	2424 University Drive NW
Legal Address:	Plan 0018547241 Block 2345JK Lot 1
Parcel area:	TBD
Proposed uses:	Indoor Recreation Facility Community Recreation Facility

GFA:	Main Floor	35,162 m^2
	Second Floor	4, 433 m^2
	Mech. Penthouse	503.7 m2
	Total	40 100 m^2

Area of completion / spectator space 27,140 sqm
Area of Recreation and training facility 11,895 sqm

3. **RULES GOVERNING ALL DISTRICTS**

61 Requirements for Parking, Bicycle Parking and Loading:
Refer to S-R district Rules.

62 Lighting conforming to Part 3 Division 4

67 Signs conforming to part 3 division 5

116 Parking conforming to standard layout and sizes in part 3, Division 6

4. **USE RULES APPLICABLE TO ASSUMED BUILDING USE**

211 Indoor Recreation Facility, as primary use
Does not require Bicycle Parking stalls
Requires 5 vehicle parking stalls / 100 sqm. 39, 035 / 100 = 391 parking stalls

Less 10% reduction for LRT = 352

If Primary Building Use assumed to be Indoor Recreation Facility
Vehicle parking requirements = 352 Stalls

169 Community Recreation Facility, as primary use
Does not require Class 1 bicycle Stalls
Requires 1 Class 2 Bicycle stall / 250 sqm of GFA.
40 100 / 250 = 160 bicycle stalls

Requires parking stalls of 1.5 per 100 sqm and 1 per 4 capacity of largest assembly area
11895 / 100 *1.5 = 179
Permanent capacity 2,500 / 4 = 625 Stalls
Total 804 Stalls

PARKING Summary:
11895 / 100 *1.5 = 179
Permanent capacity 2,500 / 4 = 625 Stalls
Total 805 Stalls

Less 10% reduction for LRT = 725

If Primary Building Use assumed to be Community Recreation Facility
Vehicle parking requirements = 725 Stalls

5. S-R SPECIFIC RULES

1043 (1) DISCRETIONARY USES
d) Indoor Recreation Facility
b) Community Recreation Facility

1045 Maximum use areas
(2) The maximum cumulative use area for all:
(a) Medical Clinics is 1000.0 square metres;
(b) Child Care Services is 1000.0 square metres.

1046 Front SETBACK AREA
Minimum depth 3.0m

1047 Rear setback area
Minimum depth 3.0m

1048 Side setback Area
(1b) Minimum depth 3.0m
(2) Minimum depth 3.0m

1049 Landscaping In Setback Areas
(1) All setback areas on a parcel, not including those portions specifically required for motor vehicle access, sidewalks, or any other purpose allowed by the Development Authority, must be a soft surfaced landscaped area.

(2) Where a setback area shares a property line with an LRT corridor, street or parcel designated as a residential district, the setback area must provide a minimum of:

(a) 1.0 trees and 2.0 shrubs for every 30.0 square metres; or

(b) 1.0 trees and 2.0 shrubs for every 50.0 square metres, where irrigation is provided by a low water irrigation system.

(3) Where a setback area shares a property line with a lane or parcel designated as a commercial, industrial or special purpose district, the setback area must provide a minimum of:

(a) 1.0 trees and 2.0 shrubs for every 45.0 square metres; or

(b) 1.0 trees and 2.0 shrubs for every 60.0 square metres, where irrigation is provided by a low water irrigation system.

1052 Reduction to parking requirement for being within 400m of LRT
10% factor applied in calculations above.

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