2011

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BUILDING ASSESSMENT

Brentwood Community Center

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Executive Summary

The City of Brentwood requested GBA to perform an assessment of the Brentwood Recreation Complex located at 2505 South Brentwood Boulevard. The Recreation Complex, originally constructed in 1975, contains a total of 40,000 square feet (sf) dedicated to serving the community. An ice rink and several meeting rooms are available for public use. Schedules and league information are maintained by the Parks and Recreation Staff whose offices are located within the building.

This report includes tasks identified for analysis with the purpose of determining the long term viability of the Brentwood Recreation Complex, commonly referred to as the Community Center. Tasks identified within this assessment are intended to evaluate:

- Building code compliance
- Building repair or replacement
- Opinion of probable cost
- Phases for improvements
- Maximum expansion capabilities
- Site work repair or replacement

Limitations of this assessment revolve around significant items observed during the general walk-through survey. Exclusions apply.

After the assessment of the Community Center, GBA considers the building to have structural integrity and architectural viability. The assessment of the Community Center resulted in three (3) options:

- Update Existing
- Concept 1 –Single Story Expansion
- Concept 2 – Gym Expansion

1. Task One: Review Drawings

The City of Brentwood provided information about the existing building as a part of the initial assessment. GBA reviewed:

- Original Construction Documents
  Hastings + Chivetta, Architects, March 1st, 1974.
- Heat Recovery System drawings
  WVP Corporation and The Richardson Engineering Group, Inc., April 5th, 1994
- Parking lot renovation drawings
  Terraspec dated April 1st, 1996
- Geotechnical Report
  SCI Engineering, Inc. 2009
- Original soil boring logs
  Brucker and Associates Engineering, 1973
- Indoor Air Quality Study
  CDG Engineers, October 16, 1997

2. Task Two: General Walk-Through Survey

Site visits took place between September and November of 2010. During the site visit existing conditions of the building were noted and photographed. GBA surveyed the interior and exterior of the building including the roof. All rooms were accessible at the time of each site visit. These GBA individuals visited the site:

09.02.10	Fred Lauer	Building Mechanical and Electrical
09.02.10	Ed Bolin	Building Structural
11.29.10	John Choinka	Parking Lot and Site Work
11.29.10	Suzanne Berkey	Building Architectural

a. Structural Condition

The existing building utilizes structural steel framing to support precast concrete double tee roof members above the meeting room and locker room areas, and supports long span steel roof joists above the ice rink. Building foundations are drilled piers that extend 18’ to 20’ below the floor elevations to bear on solid bedrock.

There is one small crack in the exterior brick façade. No other signs of distress are apparent on the building structure. Therefore, the structure of the building appears to be in good condition. However, there are signs of floor slab settlement along the east (front) portion of the meeting room area. The estimated area of settled floor slab is approximately 3,500 square feet. Some settled slabs were mud jacked in 2005, but settled again soon afterwards. A soils report was prepared on April 3, 2009 by SCI Engineering, Inc., which investigated the cause and possible solutions for the settled slabs. Existing sinkholes are located on the southeast corner of the building. SCI Engineering, Inc., theorized sinkholes became unplugged during construction (possibly during nearby blasting) or other sinkholes have become active.

Possible Solutions for Existing Settled Slabs:

i. Do Nothing –
The settled slabs are not a life safety concern. Therefore, if the settled slabs do not greatly affect the intended use of this space, the City could consider not addressing the slab settlement.

ii. Temporarily Level Slab –
A temporary, economical, repair would be to either place self leveling grout over the settled slabs or mudjack the settled slabs to provide level slabs once again. It should be emphasized that this is most likely a temporary solution and is not recommended.

iii. Underpin the Settled Slabs –

This is a process where the slab is cored; small micropiles are augered down to rock and filled with steel bars and grout. These micropiles will support the slab from the underlying rock and allow the slab to bridge over any subsequent subgrade settlement. With the thin 4” slab that exists, the piers shall be spaced around 4’ to 5’ apart. The slabs would also need to be mudjacked or covered with self leveling grout to once again provide a level surface. The underpinning should prevent future settlement. An approximate cost for this solution is around $225,000.

iv. Structural Floor Slab Replacement –

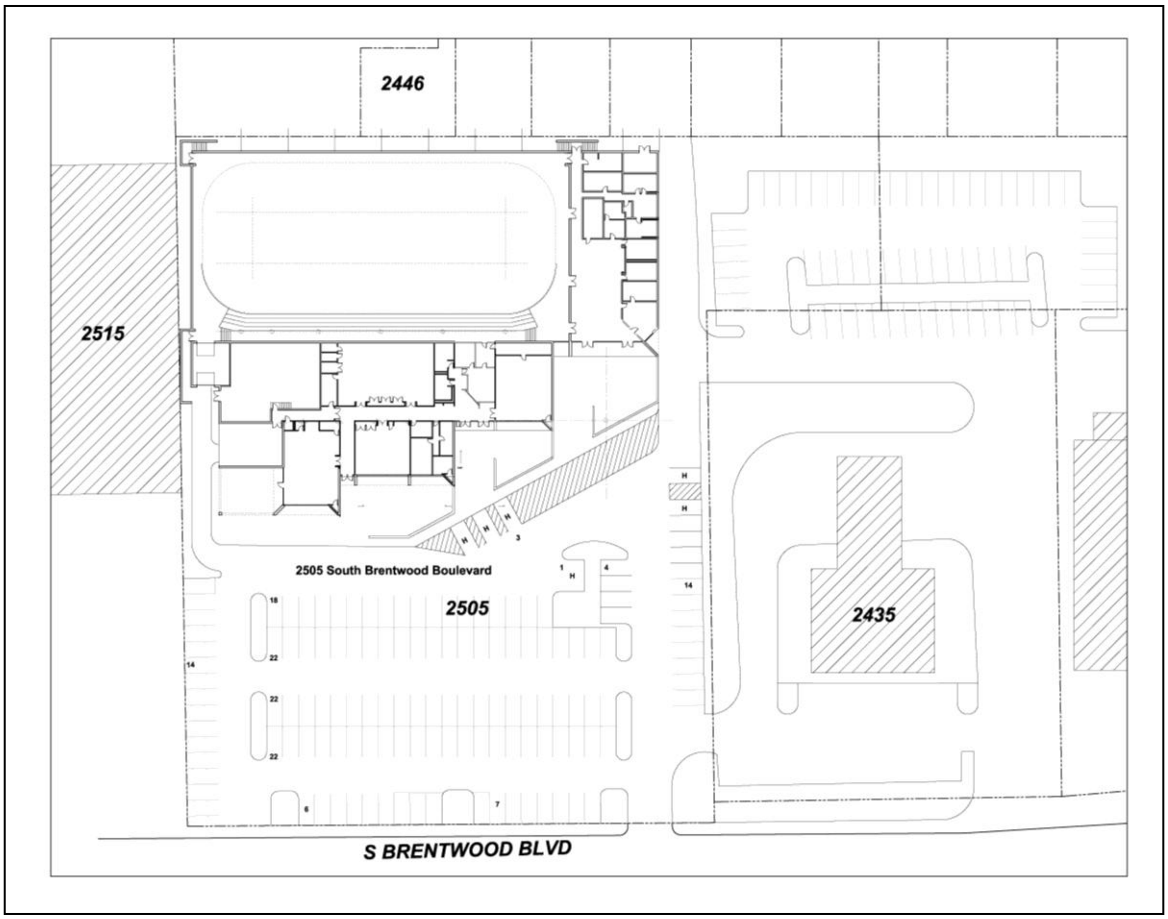
The existing settled slabs could be removed and replaced with thickened floor slabs that could be supported by micropiles extending to the underlying rock. The slab would be designed to span further than the existing slab and allow the micropiles a spacing of greater than 5’ apart. This larger spacing would reduce the number of micropiles needed to support the new slab. Since the micropiles would extend to the underlying rock, they should prevent future settlement. An approximate cost for this solution is around $250,000.

GBA recommends the Structural Floor Slab Replacement for these reasons:

- costs are moderately more than the next best solution
- prevents future settlement
- provides a new slab

b. As-Built Architectural Plans

During the general walk-through survey of the facility, dimensional "as-built" information was recorded, and has been transposed into an electronic building base floor plan drawing. These as-built drawings show the main functions of the existing space with the approximate size of the spaces. Parking lot information was derived from Exhibit A and B-2 from the Equity Land Title Letter Report dated November 10, 2010 on pages 14 and 17 from an electronic document. Drawings and the Equity Land Title document are included as Appendix A.



c. Mechanical Systems

The mechanical systems in the Community Center are comprised of three (3) air handling units and corresponding roof mounted condensing equipment, three (3) hot water heaters/boilers, three (3) exhaust fans, the ice rink floor refrigeration system, and a heat recovery system. The following descriptions are based on visual observations during site visits by GBA, from information shown on City provided drawings issued by Hastings & Chivetta Architects (dated 03/01/1974) and The Richardson Engineering Group (dated 04/05/1994), and from the following assumptions:

- All mechanical equipment has been regularly maintained by city staff or by outside mechanical contractors and is in current good working order.
- The hot water boiler electric elements/coils have been replaced in the last fifteen years.

Additionally, all mechanical system changes related to renovations of the Community Center that are not captured on the original construction documents are not included in the descriptions.

HVAC Equipment


Figure c.1 AHU-1

AHU-1 (Figure c.1) is a single zone, dual deck, air handler (Air Dyne Model AH3.50M, Serial Number 2832, Cooling Capacity = 75 tons, Heating Capacity = 300 KW, 40 HP, 32000 CFM) serving the ice rink arena. The supply air is routed through metal ductwork and discharged on the east side of the ice rink arena over the bleachers. The return air is collected in a large return air plenum located just outside the ice machine room and routed underground back to AHU-1. A thermometer placed over the return air grilles indicated a return air temperature of around 50˚F. Cooling is provided by DX coils in the unit with refrigerant provided by the ice rink floor refrigeration skid, RRP-1. The condensing equipment for the ice rink refrigeration skid is an evaporative cooling tower located exterior to the building just to the east of the mechanical equipment room. Heating is provided by a 300 kW duct heater located at the unit installed as original equipment as well as a hot water reheat coil installed in 1994 as part of a heat recovery upgrade project. Outside air to the unit is provided by an air intake hood located on the roof above unit. This intake hood also supplies outside air to AHU-2. AHU-1 and the ice rink refrigeration skid are original equipment making the equipment approximately 36 years old.

Figure c.2 Evapco Evaporative Cooling Tower Supporting Refrigeration Skid and AHU-1

The Evapco cooling tower (Figure c.2) appears to be newer although name plate information could not be found to estimate its age. Installation occurred in 1992 according to building management. The 2007 ASHRAE Handbook – HVAC Applications (Chapter 36, Table 3) indicates the median service life for DX air distribution equipment is approximately 24 years and 22 years for metal cooling towers. However, ASHRAE service life estimates do not cover specialty equipment like the ice rink refrigeration skid. While AHU-1 appears to have been maintained well over the years, the unit is long past its useful life and should be replaced as funds become available. Since the refrigeration skid and associated equipment were not part of this building assessment scope, further investigation is recommended on the skid and Evapco cooling tower in order to determine the age and amount of useful life remaining in the equipment. The condition of the filters for AHU-1 could not be observed.


Figure c.3 AHU-2


Figure c.4 Condenser ACC-1 Supporting AHU-2

AHU-2 (Figure c.3) is a multi-zone, dual deck, air handler (Air Dyne Model ME170-RF, Serial Number 2932, Cooling Capacity = 50 tons, Heating Capacity = 190 KW, 20 HP, 16550 CFM) serving a total of six (6) zones comprised of the meeting rooms and offices in the eastern portion of the building. The temperature for each zone is controlled by a zone thermostat that adjusts the mixture of hot and cold air from the dual deck system at the air handling unit. The supply air for each zone is routed through separate metal ductwork to the discharge supply diffusers. The return air is collected in plenums and routed back to AHU-2. Cooling is provided by DX coils in the unit with a refrigerant system piped to a condensing unit ACC-1 (Figure c.4), located on the roof (Carrier Model 38AH-054-621, Serial

Number 1407Q08235). Heating is provided by a 190 kW duct heater located at the unit. Outside air to the unit is provided by an air intake hood located on the roof above unit. This intake hood also supplies outside air to AHU-1. AHU-2 is original equipment making the unit approximately 36 years old. The Carrier condensing unit was manufactured in 2007 and is three (3) years old. The 2007 ASHRAE Handbook – HVAC Applications (Chapter 36, Table 3) indicates the median service life for DX air distribution equipment is approximately 24 years. While AHU-2 appears to have been maintained well over the years, the unit is long past its useful life and should be replaced as funds become available. ACC-1 is only three years old and can be utilized for a while longer with proper maintenance, although consideration of refrigerant R-22 phase out should be considered (see below). The condition of the filters for AHU-2 could not be observed.

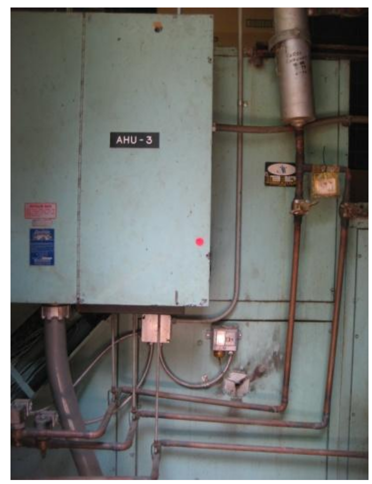


Figure c.5 AHU-3


Figure c.6 Condenser ACC-2 Supporting AHU-3

AHU-3 (Figure c.5) is a multi-zone, dual deck, air handler (Air Dyne Model ME100-M, Serial Number 2932, Cooling Capacity = 35 tons, Heating Capacity = 190 KW, 10 HP, 10450 CFM) serving a total of four zones comprised of the lockers, warming room, meeting room, and offices in the northern portion of the building (Figure c.5). The temperature for each zone is controlled by a zone thermostat that adjusts the mixture of hot and cold air from the dual deck system at the air handling unit. The supply air for each zone is routed through separate metal ductwork to the discharge supply diffusers. The return air is collected in an overhead plenum. Cooling is provided by DX coils at the unit with a refrigerant system piped to a condensing unit, ACC-2, located on the roof (Trane Model RAUA-4001-FB, Serial Number D-10453) (Figure c.6). Heating is provided by a 190 kW duct heater located at the unit. Outside air to the unit is provided by an air intake hood located on the roof above unit. AHU-3 and ACC-2 are original equipment making the equipment approximately 36 years old. The 2007 ASHRAE Handbook – HVAC Applications (Chapter 36, Table 3) indicates the median service life for DX air distribution equipment is approximately 24 years. While both AHU-3 and ACC-2 appear to have been maintained well over the years, the units are long past their useful life and should be replaced as funds become available. The condition of the filters for AHU-3 could not be observed.

Additional reasons supporting the replacement of the three (3) air handling unit systems:

- The existing dual deck, single and multi zone air handling systems currently installed are energy inefficient. The heating and cooling coil output of these units remains constant while a constant amount of supply air flows over the coils and the ratio of hot and cold air is constantly adjusted to maintain the set-point temperature. Installation of new air handling equipment that utilizes more energy efficient operation, such as variable air volume systems with terminal reheat, may result in significant energy savings.

- All three (3) air handling systems utilize the refrigerant HCFC-22, also known as R-22. R-22 has been the refrigerant of choice for commercial heat pump and air-conditioning systems for more than four decades. However, releases of R-22, such as those from leaks, contribute to ozone depletion. In addition, the manufacture of R-22 results in a by-product (HFC-23) that contributes significantly to global warming. US regulations are phasing out the manufacture of R-22 over the coming years in compliance with international treaties. By 2020, all production and importing of R-22 in the US will be eliminated. A limited amount of R-22 stockpiles and reclaimed refrigerant will still be available after 2020, but pricing for this refrigerant will be subject to supply and demand and all indications are future price increases will be substantial as increases in R-22 prices are already evident. Some air handling equipment can be converted to alternate refrigerants after modifications to the equipment. However, the conversion can be costly depending on the system and efficiencies of the equipment are reduced increasing operation costs. Given the age of the air handling equipment, replacing with existing units with new units utilizing approved, alternative refrigerants is recommended over conversion.

The approximate 2010 cost to replace AHU-2 and AHU-3 is $140,000. This cost includes new indoor air handlers of similar size, roof-mounted condensers, and new copper refrigerant piping. The cost of replacing AHU-1 and an evaporative cooling tower sized just for the air handler load is approximately $135,000. The cost of replacing the ice rink refrigeration system is outside the scope of this project.

Indoor Air Quality

The condition of the supply ductwork could not be assessed as part of the walkthrough. However, GBA observed no exterior insulation on the supply ductwork indicating interior duct liner was likely installed for this purpose. The use of duct liner was a common practice during the timeframe the Community Center was built. Typically, duct liner material contained an open cell structure, which resulted in the duct liner absorbing moisture from the supply air and becoming coated by air particle contaminants including dust. Given the age of the ductwork, the duct liner is likely dirty and may even contain mold and bacteria growth. **While there are no code regulations requiring the replacement of the duct liner, GBA recommends the City should replace the ductwork as funds become available to minimize any future indoor air quality issues.** While another alternative to duct replacement is removal of the duct liner, the cost of removal typically equals or exceeds the cost of replacement. The approximate 2010 cost to replace the ductwork in the existing building is $70,000.

GBA recommends the City investigate the current ventilation rates of outdoor air for each air handler in the building for the following reasons:

- To confirm the ventilation rates meet or exceed the minimum required amount stipulated by code for the maximum occupant loads of the building.
- To ensure the ventilation rates reasonably match the minimum code requirements, the amount of exhaust air, and the amount of duct and building leakage. Extremely high ventilation rates will result in the City cooling/heating more outside air than required, providing the potential for energy usage reduction and cost savings.

Any Testing and Balance (TAB) Contractor should be able to examine the equipment and measure the ventilation airflows to support this investigation. The City should also review a study from CDG Engineers submitted in 1997 examining the indoor air quality of the Brentwood Recreation Center. The study concluded that while all three (3) air handlers had the capability of supplying ventilation air, none were being operated in that particular mode. In addition, the study concluded the air handling units were sized adequately for the code required ventilation rates in effect at the time of the study, but the equipment cooling/heating could be undersized if future adopted code requirements become more stringent. GBA could not determine what, if any, changes were implemented as a result of the 1997 study.

Demand controlled ventilation is a system other building owners employ to save on energy costs. This system utilizes carbon dioxide (CO2) sensors to continuously monitor the amount of CO2 in the building and control the amount of ventilation required to keep CO2 levels at safe and comfortable concentrations. Many times this approach utilizes less ventilation air than the code prescribed amount and saves energy and the costs associated with the additional energy. However, such a system must be designed properly and the impacted systems must be assessed and potentially upgraded (e.g. existing air handlers, controls, and ductwork).

In addition, the City could consider investigating the carbon monoxide (CO) discharge from the existing ice making equipment and the impact on air quality. This topic was briefly mentioned in the 1997 study and is still relevant today.

Figure c.7 Hot Water Electric Boiler SHP-1.

Equipment

SPH-1 (Figure c.7) is a hot water electric boiler (Precision Electric Boiler, Model Number HWS3048V48070, Serial Number 6845, 70 kW) serving the coil in the snow melting pit in the ice machine room. The snow melting pit heating hot water system includes a 15 gallon expansion tank with a makeup water line and a recirculation pump, HWP-1. The original construction documents indicate the supply hot water from SPH-1 and the return water from the snow melting pit are mixed in a two-way modulating valve to maintain a return water temperature of 100˚F. SPH-1 appears to be original equipment making the boiler approximately 36 years old. The 2007 ASHRAE Handbook – HVAC Applications (Chapter 36, Table 3) indicates the median service life for a gas hot water boiler is approximately 22 years (it is assumed the same service life applies to electric boilers as well). While SHP-1 appears to have been maintained well over the years, the unit is long past its useful life. If this unit has undergone the proper maintenance over the years including replacement of the critical components, the boiler could continue to operate for some time into the future. However, if the City elects to take this course of action, the amount and condition of the boiler insulation should be investigated and potentially upgraded to improve the energy efficiency of the unit. The condition of the supply/return piping and the recirculation pump for this system was not observed.

ZWH-1 (Figure c.8) is a 200 gallon hot water electric boiler (National Steel Construction Co Model Number M2000-70, ASME Number 3E74-Y-5216, 70 kW) serving the Zamboni hot water tank filling station. DWH-1 (Figure c.8) is a 200 gallon hot water electric boiler (National Steel Construction Co Model Number M2000-50, ASME Number 3E74-Y-5217, 50 kW) serving the domestic water usage for the Community Center. Both ZWH-1 and DWH-1 appear to be original equipment making the boilers approximately 36 years old. The 2007 ASHRAE Handbook – HVAC Applications (Chapter 36, Table 3) indicates the median service life for a gas hot water boiler is approximately 22 years (it is assumed the same service life applies to electric boilers). While both units appear to have been maintained well over the years, the boilers are long past their useful life. If the units have undergone the proper maintenance over the years including replacement of the critical components, the boilers could continue to operate for some time into the future. However, if the City elects to take this course of action, the amount and condition of the boiler insulation should be investigated and potentially upgraded to improve the energy efficiency of the unit.


Figure c.8 Hot Water Electric Boilers ZWH-1 and DWH-1


Figure c.9 Exhaust Fan EF-2

Three (3) exhaust fans are located in the Community Center: EF-1 serves the restroom located next to the meeting room 103, EF-2 (Figure c.9) serves the men’s and women’s restrooms located in the


Figure c.10 Air Compressor

eastern portion of the building, and EF-3 serves the locker rooms, dressing rooms, and electrical room in the northern part of the building.

A small air compressor (Figure c.10) providing pneumatic air for the controls for the air handlers is located in the southwest corner of the mechanical room.


Figure c.11 City Water Entrance to the Building

The water feed (Figure c.11) for the Community Center is a 3" diameter line located in the southeast corner of the mechanical room. The water system serves the three hot water boilers, a 1-1/2" make-up water line to the evaporative cooling tower, and the potable cold water needs in the Community Center. Water services are provided by Missouri American. Plumbing drawings were not provided by the City and as a result, this building assessment contains limited information on the plumbing systems.


Figure c.12 Ice Rink Refrigeration Skid

The ice rink floor refrigeration skid, RRP-1 (Figure c.12), consists of three compressors, a tank, an outside evaporative cooler, and refrigerant lines serving a network of piping underneath the rink floor. The system utilizes R-22 refrigerant. The scope of this building assessment does not include an evaluation of this specialized equipment and additional investigation by the City will be necessary to determine the condition and operational effectiveness of this system. However, based upon the age of this equipment, the City should consider replacing the equipment as funds become available. In determining the time frame for replacement, the City should also take into consideration the rising costs associated with the continued operation of an R-22 refrigerant based system (refer to the above discussion of potential price increases due to the current phase-out of HCFC based refrigerants).

A heat recovery system was installed in 1994 to transfer heat from the higher temperature refrigerant suction lines of the ice rink refrigeration system to a new, supplemental hot water system (Figure c.13 -14). The heat recovery system equipment included two new heat exchangers, a 140 gallon storage tank, and three recirculation pumps. The hot water generated from the heat recovery system provided “free” hot water to a new reheat coil in AHU-1 and the three hot water boilers systems. The scope of this building assessment does not include an evaluation of this specialized equipment and additional investigation will be necessary to determine the condition and operational effectiveness of this system.

Figure c.13 Heat Recovery System Heat Exchanger


Figure c.14 Heat Recovery System Hot Water Storage Tank

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d. Electrical Systems

The following descriptions are based on visual observations from site visits conducted by GBA, from information shown on City provided drawings issued by Hastings & Chivetta Architects (dated 03/01/1974). Additionally, all electrical system changes related to renovations of the Community Center that are not captured on the drawings are not included in the descriptions.

The entire facility is supplied through a single underground electrical service. The main switchboard is located in the building mechanical equipment room on the south end of the building. The local utility (Ameren UE) transformer (Figure d.1) is located on a pad adjacent to the building east of the mechanical equipment room on the south end of the building.

Figure d.1 Ameren UE Transformer and Heating and General Service Meters

The building electrical service voltage is 277/480 volt, 3 Ph, 4 Wire with dual metering for separate heating and general service usage. The main switchboard has a 1600 amp incoming bus with two (2) main switches: a general service main switch rated at 800 amps and the heating service main at 1200 amps which is equipped with ground fault protection as required by code. The building heat is 100% from electric resistance heating. The switchboard is original equipment made by Federal Pacific Electric (FPE), installed 1974 with no apparent modifications to it. The overall condition of the main switchboard (Figure d.2) appears to be well maintained and is adequate for the existing building in its current function.

Figure d.2 Main Switchboard

FPE is no longer in business and replacement parts are not readily available, so used or rebuilt replacement parts would need to be utilized. This is also of concern if modifications to the building will require different size switches than currently exist in the switchboard. Modifications to the building would require the existing service and switchboard be brought up to current code making the total amperes of the main switches equal the bus ampere rating. The service entrance conductors are currently rated for 1,520 amps and should have the same capacity as the main switches (2,000A total) per current code. Due to the age and lack of availability of new replacement parts, the main switchboard should be replaced or upgraded when modifications to the building are made. Opinion of probable cost for this improvement is $50,000.00


Figure d.3 Panelboard LDP-1

Two (2) distribution panelboards are used to supply heating and lighting power distribution. HHDP1 is 400Amps, 480V, 3Ph 3 Wire with three other 277/480V, 3 Ph, 4 Wire panelboards. A 150kVA dry-type transformer feeds LDP1 which is 600 Amps, 120/208 V, 3Ph, 4 Wire. There are four (4) 120/208V, 3 Ph, 4 Wire panelboards fed from LDP-1 (Figure d.3). The distribution panelboards and branch panelboards are all original by FPE (installed in 1974) and are at the end of their useful life. Due to the age and lack of availability of new replacement parts, panels should be replaced or upgraded on an as needed basis or when modifications to the building are made. Opinion of probable cost for installing panelboards range between $2,000-$7,500 meaning $25,000 for replacement of all the existing panelboards.

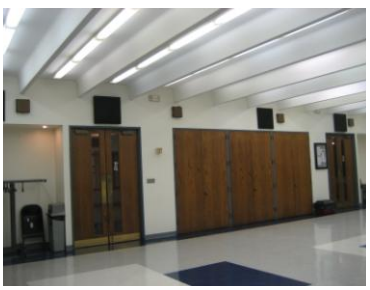


Figure d.4 meeting room lighting


Figure d.5 Lighting in Corridor

Lighting is a combination of fluorescent, HID and incandescent (Figure d.4). Some spiral type compact fluorescent lamps have been used to replace incandescent lamps. In general, the light fixtures are original, and condition and energy efficiencies are below current standards. No interior lighting controls are used. All lighting is 120V with the exception of the HID fixtures in the ice arena which are 277V. Corridors are poorly lit and may be below recommended lighting levels (Figure d.5). The ice rink lighting is metal halide HID and appears to be adequate. The lighting for the bleachers in the rink are original fixtures with yellowed lenses (Figure d.6). Exterior accent and site lighting was not operating during the daytime, but appears to be original; light level readings were not collected. Parking lot fixtures are HID and accent lights under soffit and decorative poles appear to be incandescent. **Lighting system**

upgrades to install high efficiency lighting and controls are recommended. Probable cost for this improvement is $96,000.00.

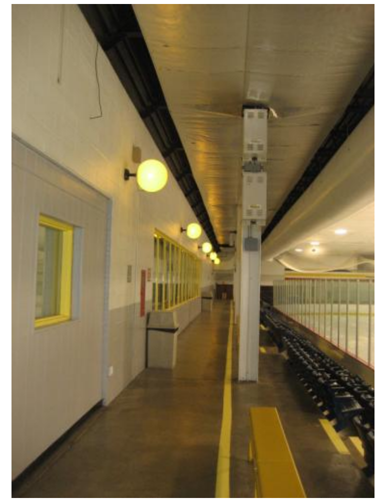


Figure d.6 Bleacher Lighting

Emergency lighting (Figure d.7) in the building exists, but does not meet current code requirements. The emergency lighting panels ELP-1 and EPL-2 are original Siltron battery (Figure d.8) inverters and were not tested to determine if they function properly. A limited number of self contained battery units that have been added since the building was constructed. These should be tested to confirm their functionality. **GBA recommends the addition of emergency lighting.** Opinion of probable cost for this improvement is $7,500.00

Figure d.7 Emergency Light - Self contained battery unit

According to building operating personnel, the ice arena does not have an electric under-floor freeze protection system. The ice rink must close for several weeks for installation of a freeze protection system. Prior to installation the ice is melted allowing the subgrade to thaw. The scope of this building assessment does not include an evaluation of this specialized equipment, and additional investigation by the City will be required to determine the benefits of this system.

Figure d.8 Siltron battery inverter

The capacity of the existing electrical service should be able to support the proposed building modifications and expansion. The proposed energy efficiency improvements to the existing facility further substantiate this claim by potentially reducing the electrical energy requirements.

e. Fire Protection Systems

Fire Sprinkler

The entire facility is non-sprinklered. The building is required to be fully sprinkler protected to meet the current edition of the International Fire Code (IFC). Providing sprinkler protection in the existing facility would be difficult. Exposed structural precast, double tees in portions of the facility are considered “obstructed construction” by the fire code and may require sprinkler piping and sprinklers in each “bay.” **GBA recommends that suspended ceilings be installed to reduce the amount of sprinkler piping and sprinklers and conceal the sprinkler piping.**

A new water line from the city main into the building is recommended. The existing water supply pressure and flow is assumed to be adequate for adding fire sprinklers without the use of a fire pump by a comparison of surrounding sprinkler protected buildings. Probable cost for the installation of a new Fire Sprinkler system is estimated at $6/sf which totals approximately $240,000 for the existing building.


Figure e.1 Water Entrance

Original construction documents show a possible plan for a future fire sprinkler system using the existing 4” water supply entrance pipe (Figure e.1) which exists in the mechanical equipment room adjacent to the domestic water entrance. The condition of the underground pipe for the spare 4” water entrance is unknown. If building expansions or additions are pursued a new water main could be brought in and riser located in the new expansion to avoid disturbing existing footings and slab. Installation of a new fire sprinkler system will most likely require larger size pipe than the 4” existing water entrance. **GBA does not recommend using the existing 4” water entrance for fire sprinklers.**

Kitchen Fire Suppression

An Amerex kitchen hood suppression system exists to protect the range (Figure e.2-3). The suppression system is monitored by the fire alarm panel. It is not known whether an electrical shunt is provided with suppression system activation to meet National Fire Protection Association (NFPA) requirements.

Figure e.2 Kitchen Ansul Suppression

GBA is unsure about the reasons for the existing kitchen hood suppression system. The IFC requires hood suppression only where a Type I hood is utilized. Either the suppression system is not required, or the kitchen hood should be replaced with a Type I hood. Further investigation of the cooking operations and discussions with the code official will be required. Shunting of electrical power upon suppression system activation should be verified and provided.

Figure e.3 Kitchen Ansul Suppression

Fire Extinguishers

Fire Extinguishers are located throughout the facility. Their type, quantities and locations were not verified for code compliance. In the kitchen area, a multi-purpose dry chemical extinguisher is located closer to the cooking appliances than approved for use on cooking fires (Figure e.4). **GBA recommends the multi-purpose dry chemical extinguisher be relocated.**

Figure e.4 Kitchen Fire Extinguishers

Fire Alarm

The facility is equipped with a fire alarm system. The fire alarm panel - BOSCH D7024 (Figure e.5) is located in the mechanical equipment room. Fire alarm manual pull stations are located at all exits. Spot smoke and heat detectors are selectively located. Duct smoke detectors are located on the supply and return side of the three HVAC units. The fire alarm system monitors the kitchen hood suppression system. Occupant notification exists throughout in the form of horn/strobes and strobes and is connected to a remote notification power supply, BOSCH D7038. Notification device types and models vary throughout. Strobes are provided in restrooms. The candela and decibel ratings could not be verified for proper coverage and synchronization. It was noted that one (1) fire alarm strobe has been painted and should be replaced (Figure e.6). Probable cost for the installation of a new Fire Alarm System is estimated at $1/sf which totals approximately $40,100 for the existing building.


Figure e.5 Fire Alarm Panel


Figure e.6 Painted Strobe

The building is required to have an emergency voice/alarm communication system due to the occupant loading. This will require replacement of existing occupant notification system including strobes, horn/strobes, and notification power supply. The existing fire alarm panel could remain and communicate with the emergency voice/alarm communication system. If the building is fully sprinklered, the manual pull stations could be removed.

Miscellaneous

A knox box exists at the main entrance for emergency access into the facility. The knox box will likely require relocation if any modifications are performed to the existing building entrance.

f. Roof Condition

The existing roof is a 45 mil EPDM Ballasted Roof manufactured by Carlisle, and installed after November 22, 1988 (Figure f.1-14). GBA confirmed age of the roof with John Lucas, a Carlisle manufacturer representative in the St. Louis area. Mr. Lucas determined the roof installation most likely occurred in 1989 based on a printed code found on the membrane (Figure f.15). A roof patch dated 8-18-04 probably denotes a repair date of the roof membrane (Figure f.16). Building management confirmed the roof was originally installed in February 1989. Repairs occurred in 1991, 1993, 1996, 1997, 1999, 2004, 2005, 2008, and 2010.

The 15-year warranty for the roof membrane expired in 2004. The existing ballast appears very coarse; not in the required densities. Round river rock is recommended for a ballasted roof system. There are many locations were ballast is inadequate or needs supplemental material to meet the manufacturers recommended density (lbs/sf) in the corners, perimeter and field. Necessary maintenance and repair has extended the roof lifespan to approximately 22 years. **With new technologies for roofing materials, GBA recommends, that the roof be replaced with a more energy efficient membrane.**

Figure f.1 Screen Wall

Figure f.2 Southwest Corner

Figure f.3 Base of Parapet

Figure f.4 Front Entry Parapet


Figure f.5 Front Entry Corner


Figure f.6 Looking South


Figure f.7 Rooftop Units


Figure f.8 Looking north

There are two membrane systems by Carlisle that are Energy Star rated and Cool Roof Rating Council (CRRC) certified.

- Thermoplastic polyofefin (TPO)
- Sure-White EDPM.

Existing insulation under the membrane can remain, unless water damage prevents reuse. Further investigation will need to occur when the existing EPDM membrane is removed. The new membrane could be fully adhered to insulation. No ballast would be required.

Opinion of probable replacement cost for both roofs (ice rink and administration) without replacement of the insulation would be approximately $7 to 8/sf. With approximately 40,100 sf of roof area, the cost for materials and labor to remove and replace with new membrane would be approximately $280,000 to $320,000. If the insulation has to be replaced, this would add approximately $80,000 to the above number for a total of approximately $360,000 to $400,000.


Figure f.9 Ballast


Figure f.10 Looking north east


Figure f.11 Looking north west


Figure f.12 Roof Hatch


Figure f.13 Roof

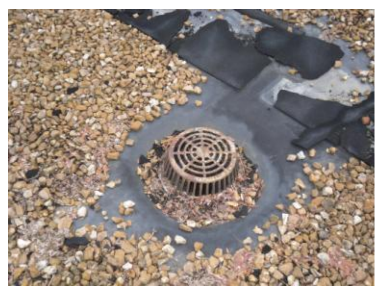


Figure f.14 Roof Drain

Figure f.15 Roof Membrane


Figure f.16 Repair 8-18-04

g. Non-Compliance Code Issues

Code classification for the existing facility separates the building into three (3) portions based on use, function and size (Figure g.1). Portion 1 is considered an A-4 occupancy and A-3 occupancy for Portions 2 and 3 according to the International Building Code (2009 IBC). The City of Brentwood adopted the 2009 IBC in 2011. The existing building does not currently comply with 2009 IBC.

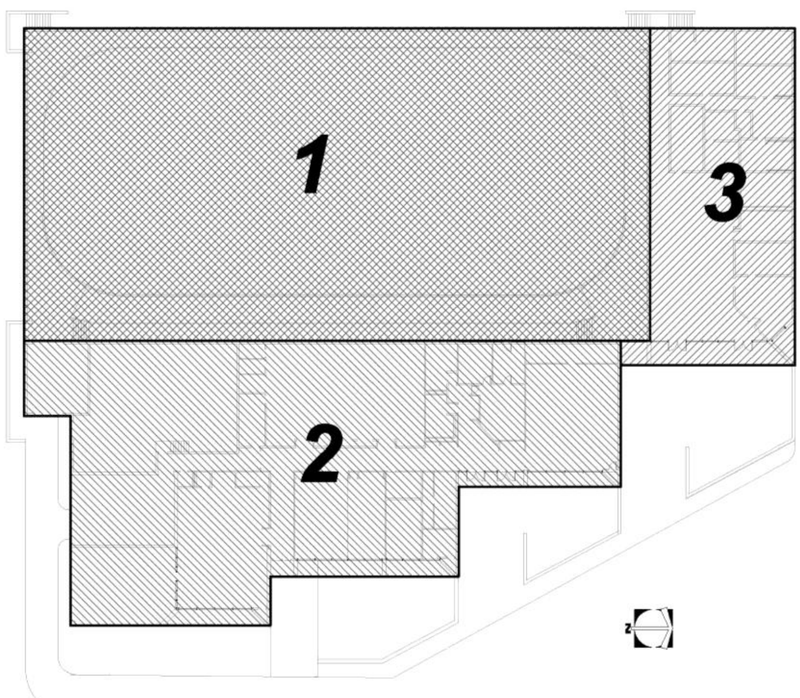


Figure g.1 Code classification of existing facility

Commonly Referenced:

Portion 1 – Ice Rink and Bleachers

Portion 2 – Meeting Rooms

Portion 3 –Ice Rink Support Areas

Note: The existing building can be evaluated by portions as depicted above or in its entirety. Depending on the degree or amount of renovation performed an exception to the code maybe possible.

Existing Building Code Issues:

- Interior Structural Members –

Fire proofing is required on all structural steel framing to meet code. This would require any interior steel columns of beams to have a 2-hour fire rated assembly.

- Roof above Ice Rink Bleachers–

To meet code, the existing portion of roof must comply with a 1-hour fire rated assembly. Any roof area constructed of metal frame and below 20'-0" must also have a 1-hour fire rated assembly.

- Occupancy Load –

The existing occupancy load of the building is calculated at 1,231 people, per Table 1004.1.2 in the 2009 IBC. This includes an occupant load for the ice rink and bleacher area of 795 people. For the ice rink, the exits and exit egress path of travel is in compliance. In the bleacher area, the west exit path is blocked by a chain which would impede the second means of egress from this area.

- Means of Egress-

All four (4) front meeting rooms require two (2) means of egress per 2009 IBC Chapter 10 Section 1014 Table 1014.1. The amount of square footage in all meeting rooms is over the limit allowed for one (1) means of egress. Currently, only two (2) of the meeting rooms comply with this code requirement. The party room located in the ice rink support area does not have enough square footage to require more than one (1) means of egress.

Code Exceptions

A majority of the existing Community Center meets current code requirements. Any alterations performed on the building beyond normal maintenance and mechanical, electrical and plumbing upgrades will require the existing building to be brought up to current code standards. An exception or “grandfather clause” to the code is found in Chapter 34 of the IBC 2009. This Chapter briefly states that unaltered building areas may remain as built. Depending on the interpretation of the code official, there may be some lenience in regards to required improvements of the existing building if a renovation occurs.

Conversations with Bob Kurtz, Assistant Fire Chief for the City of Brentwood, indicate the following:

- With any modification or renovation, a fire alarm and sprinkler system needs to be installed. There is no exception. The fire alarm system shall be installed during the first stage of any construction. A complete sprinkler system installation is required within a maximum of 3 years. See Task 2, Section e for a discussion of Fire Protection Systems.

- Other code issues with the existing building (as discussed in this Section) require further analysis on an individual basis depending on the final design. There will be a possibility for exception to the code.

Refer to Task Three: Building Expansion Options for additional discussion of Code.

h. Non-Compliance ADA Issues

The existing facility has been updated in some regard to the ADA code, but there are several areas of non-compliance. Any alterations or additions performed to the exisitng building will require at least 20% of the construction cost be spent bringing the building up to compliance.

Existing Building ADA Issues:

- Door Handles –

In many rooms, doors have a knob type handle that do not comply with ADA. A rough estimate of the number of doors effected totals 82. These doors need a lever type of handle installed that meets ADA standards. The cost estimate for durable, lever handles is $320 per door or approximately $26,240 for updating the existing doors.


h.1 Door Knob

- Handicap Parking Stalls –

ADA requries a slope of less than 2% across accessible parking stalls. The existing stalls have a greater than 2% slope and will require a correction in grading. At the time of construction, further evaluation of the the number, size, and location of handicap stalls will need to be conducted based on the final design. Probable cost for this improvement is estimated in Task Seven.


h.2 Handicap Parking Stalls

- Accessible Route Into the Building –

The ramps, steps, and stair handrail do not meet ADA standards. Probable cost for this improvement is estimated in Task Seven.


h.3 Accessible Route


h.4 Toilet Rooms

- Accessible Toilet Rooms –

It is evident a few upgrades have been performed in the public restrooms. However, these restrooms are not fully compliant. The ice rink restrooms are not compliant either. Estimated cost for updating the restrooms is $75-150 /sf or approximately $135,750 for both public and ice rink restrooms.


h.5 Shower Facilities

- Shower Facilities –

No existing locker room shower facilities in the locker rooms meet ADA requirements. Numerous issues dealing with floor transitions, faucets, grab bars, and clearances need to be addressed. Estimated cost for updating the locker rooms is $75 /sf or approximately $165,000 for new locker rooms and showers.

i. Existing Site Conditions

Background

The existing parking lot for the Community Center provides 150 parking spaces including six (6) accessible (handicapped) parking. Through agreements with neighboring property owners, the City of Brentwood also shares some of their parking spaces with property owners to the north of the recreation facility property. Based on the IBC 2009 occupancy type, the facility has an occupant load of 1,231 (47 of that total is committed to facility staff). The City has parking requirements of one (1) space for every three (3) customers or patrons computed on the basis of maximum servicing capacity at any one time, plus one (1) additional space for every two (2) persons regularly employed on the premises at the peak period of use. With all of these requirements taken into consideration, 395 spaces are required for the existing facility.

Since the existing facility is currently 245 spaces, the City's Director of Planning and Development, Ellen Dailey Rottjakob, AICP, was contacted to discuss the existing deficiency with the parking space requirement. Ms. Rottjakob indicated that the recreational facility doesn't have capacity issues related to parking based on its current use. She indicated there had been previous discussions about modifying the parking requirement section of the city code for recreational facilities. Ms. Rottjakob also indicated that if the parking requirement for recreational facilities was strictly enforced, no facilities in the city of this type would be capable of meeting the current requirement. She explained that when a recreational facility is proposed the applicant is encouraged to meet with the city planning department, and the fire protection district to discuss the proposed uses and parking requirements. Based on the discussions, a reduction in the required spaces based on the city code is considered and often granted. Ms. Rottjakob concluded that since the existing facility doesn't have parking related issues, consideration of a building expansion would be possible without providing additional parking spaces.

Assessment

The general condition of the existing asphalt parking lot is in fair to good condition. With routine maintenance consisting of crack sealing, patching and the occasional milling and overlay, the parking lot is capable of serving the existing facility for the foreseeable future. **However, GBA recommends improvements to the deficiencies found with accessibility and the building exterior.**

Accessibility Deficiencies

None of the six (6) existing handicap spaces meet current Americans with Disability Act requirements. The "Parking Renovation" plan prepared by Terraspec and dated April 1, 1996, indicated a total of five (5) handicapped parking spaces were to be located adjacent to the curb at the front entrance. Three (3) of the handicapped spaces were to be located near the center entrance of the recreation center, and two (2) were to be located near the ice rink entrance. The three (3) spaces near the center of the recreational facility are currently present; however, the two (2) handicapped spaces adjacent to the ice rink entrance have been eliminated or relocated farther away from the recreation center building to allow for a "drop off" zone for the ice rink. In addition, another handicap space has been added for a total of six (6) spaces.


i.1 - Cross Slope Exceeds 2%

Existing cross slope of handicap spaces near entrance exceeds the allowable 2% according to ADA requirements (Figure i.1). The cross slopes of these spaces falls from south to north. These three (3) spaces are located near the center entrance of the recreational facility.


i.2- Spaces not Close to Entrance, Slope Exceeds 2%

One (1) of the relocated handicap parking spaces has been placed near the landscaped area in the parking lot, east of the entrance of the ice rink, drop off area and drive aisle (Figure i.2). The pavement slope of this parking space exceeds the allowable 2% slope. Furthermore, the parking space is approximately 105 feet from the nearest entrance (main entrance) of the facility.

The remaining two (2) handicap spaces are located in the northeast corner of the parking lot of the recreational facility, northeast of the entrance doors to the ice rink and the drop off zone to the ice rink (Figure i.3). To access the ice rink from these parking spaces, individuals are required to cross a drive aisle and the ice rink drop off zone. Pavement slopes from these spaces exceed the allowable 2% slope and travel distance is approximately 135 feet from the northernmost door of the facility (ice rink entrance).

i.3 - Spaces are not close to entrance, slope exceeds 2%

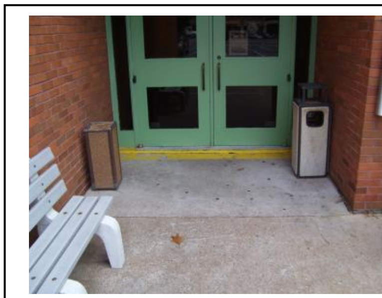
The ramp at the main entrance from the parking area to the sidewalk is not level to provide the required landing area (Figure i.4). In addition, the ramp from the sidewalk up to the area level with the entrance doors exceeds a 12:1 slope and does not meet ADA requirements. Also, the existing handrail does not meet current ADA requirements.

i. 4 - Ramp exceeds 12:1 slope, hand rail is not compliant (main entrance)

At the northern-most entrance of the facility, the ramp from the parking area to the sidewalk is not level to provide the required landing area (Figure i.5). In addition, the ramp from the sidewalk down to the area level with the entrance doors exceeds a 12:1 slope which is required to meet ADA requirements. Also, the existing handrail does not meet current ADA requirements.

i.5 - Ramp exceeds 12:1 slope, hand rail is not compliant (ice rink entrance)

The ramp from the parking area to the sidewalk is not level to provide the required landing area. It also appears that the sidewalk in front of the doors has settled causing a 1" to 1.5" elevation difference between the finish floor of the facility and the entrance sidewalk at the doors (Figure i.6). This has caused a potential trip hazard, as well as being inaccessible for wheelchairs.



i.6 - Floor elevation of building is 1" to 1.5" above sidewalk

Building Exterior Deficiencies


i.7 - Sidewalk trip hazard

Currently, there is a 4' foot sidewalk adjacent to the recreational facility's transition between the parking lot and building structure. Most of the sidewalk is in good condition with the exception of an elevation differential between two (2) slabs on the east side of the facility. This differential is likely caused by tree roots (Figure i. 7).


i.8 - Failing retaining wall

The short retaining wall and fence supports on the exterior of the courtyard at the ice rink entrance are cracking and chipping (Figure i.8). A few of the fence columns are not fully secured due to the deterioration of the retaining wall. Observations of these issues were noted during site visits, but do not require immediate attention for safety and well-being.


i.9 - Parking lot joints/cracks


i.10 - Parking lot condition

There are a few longitudinal and horizontal cracks in the asphalt parking lot that have been recently sealed (Figure i.9-10). It appears that the parking areas have been routinely maintained to extend the life of the pavement.


i.11 - Trench settlement

There is one area of the parking lot that is in need of patching to prevent a trip hazard (Figure i.11). The area is located in the northeast quadrant of the parking lot adjacent to Brentwood Boulevard. It appears that this area was excavated to repair or install a storm sewer. Since the repair/installation the fill material has settled causing the pavement to settle as well.

The landscaped areas along the front southern portion of the building is elevated above the finish floor elevation of the structure and potentially traps water between the building the landscaped areas (Figure i.12-13). In addition, an egress door from a meeting room does not provide a landing pad on the exterior. A minimum of a 4' x 4' paved pad is required on the exterior of all egress doors.


i.12 - Mulch traps stormwater


i.13 - No egress pad

The original construction documents identify a sinkhole (Figure i.14) near the southeast corner of the building. According to the construction documents, a drain was to be constructed above the sinkhole to drain storm water from the landscaped area above the sinkhole.


i.14 - Sinkhole location

This would indicate one of the following occurrences:

- The proposed drain was never constructed.
- The proposed drain was constructed and has been removed.
- The proposed drain has been silted in and is not functioning.

Field investigations did not provide evidence of the proposed drain. Further investigations would be required to determine if the drain exists.

Building Expansion – Stormwater Impacts

Stormwater Quantity (Detention)

The Metropolitan St. Louis Sewer District (MSD) has the following requirement for stormwater detention on properties that are currently developed and seek to expand or redevelop:

> *"Subsequent development or redevelopment of sites without prior stormwater detention shall provide detention or retention, when*

> *cumulative differential increase, since January 15, 2000, equals 2 cfs or greater. Projects with prior detention shall provide additional detention or retention for increasing runoff irrespective of the 2 cfs threshold. The degree of commonality between subsequent or concurrent projects, sites or parcels within same watershed shall be as determined by the District for purposes of this section."*

Since the existing site is nearly 100% impervious, the addition options will not provide an increase in the differential above 2 cfs; therefore, stormwater detention is not anticipated with either of the proposed building expansions.

Stormwater Quality

The Metropolitan St. Louis Sewer District (MSD) has the following requirement for stormwater quality on properties that are currently developed and seek to expand or redevelop:

> *"On 'redevelopment' sites, controls shall be designed and implemented to prevent or minimize water quality impacts by effectively utilizing water quality strategies and technologies, including those that reduce runoff volume, to the maximum extent practicable. When micro-detention is required in the combined sewer area to address sewer capacity problems, these controls should also apply runoff reducing strategies and technologies."*

Based on MSD's stormwater quality requirements, it should be anticipated that some form of water quality control measures will be required. Some of these could include rain gardens, permeable pavement, vegetated swales. A cost figure for this has been added to the cost estimate.

3. Task Three: Building Expansion Options

Several options for expansion of the Community Center were evaluated to determine the best solution. Of these design options, there were two possible outcomes vertical or lateral expansion.

- Vertical Expansion –

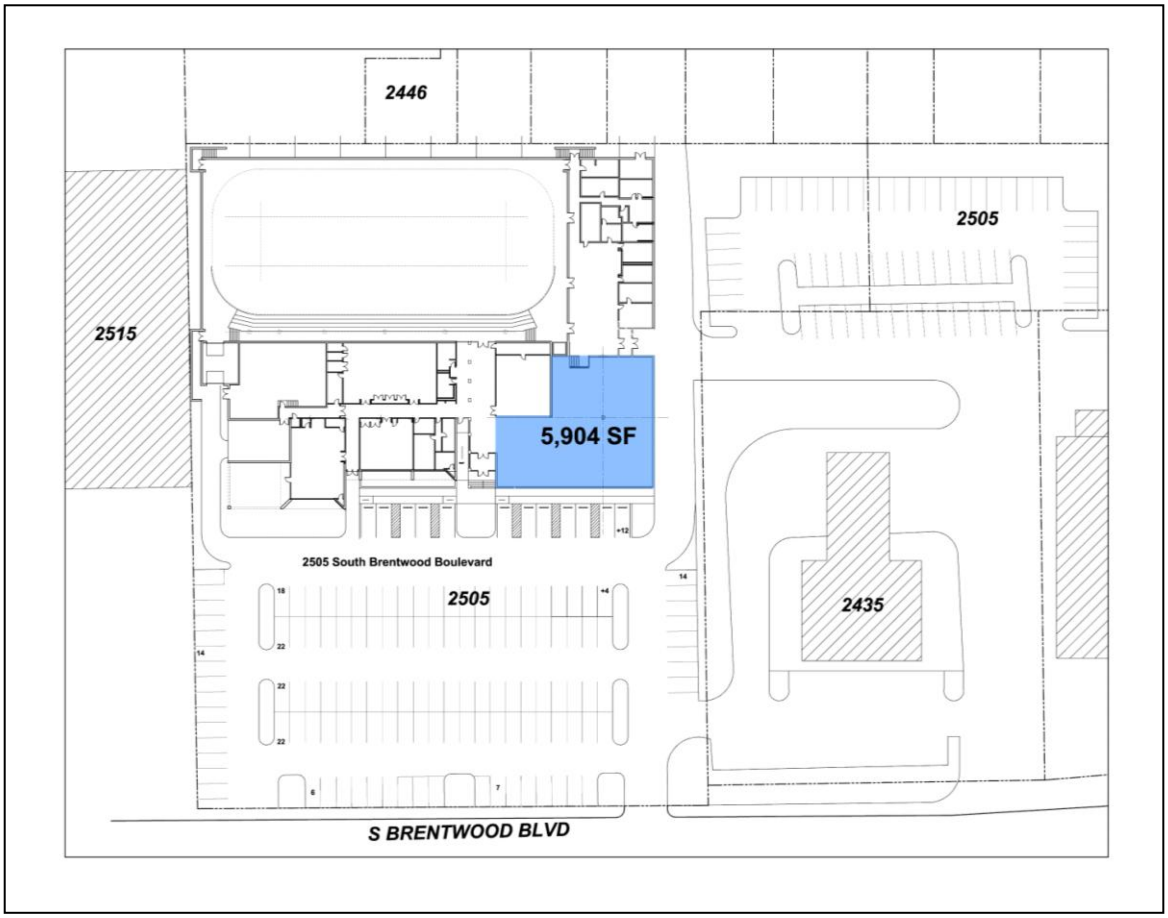
The existing building roof above the meeting room and locker room areas consists of precast, pre-stressed, concrete double tees supported by structural steel beams that were designed for 30 psf of snow load. If the building was expanded upward above these areas, it would need to be able to carry at least a 50 psf office load and preferably an additional 15 psf of partition load. Therefore, the existing roof structure is only designed for half of what it needs to carry for vertical expansion.

> *Note: There is a possibility that the double tees could be externally reinforced with carbon fiber strips to provide the required capacity, but the steel beams, columns, and piers supporting the double tees could also become overstressed with the higher floor load. Also, the vertical expansion of the existing building would increase the seismic forces enough to require upgrading the existing lateral load resisting system to meet today's codes. In this situation, if vertical expansion becomes the only available option, experience tells us that it would be more cost effective and efficient to demolish the existing building and build a new building.*

- Lateral Expansion –

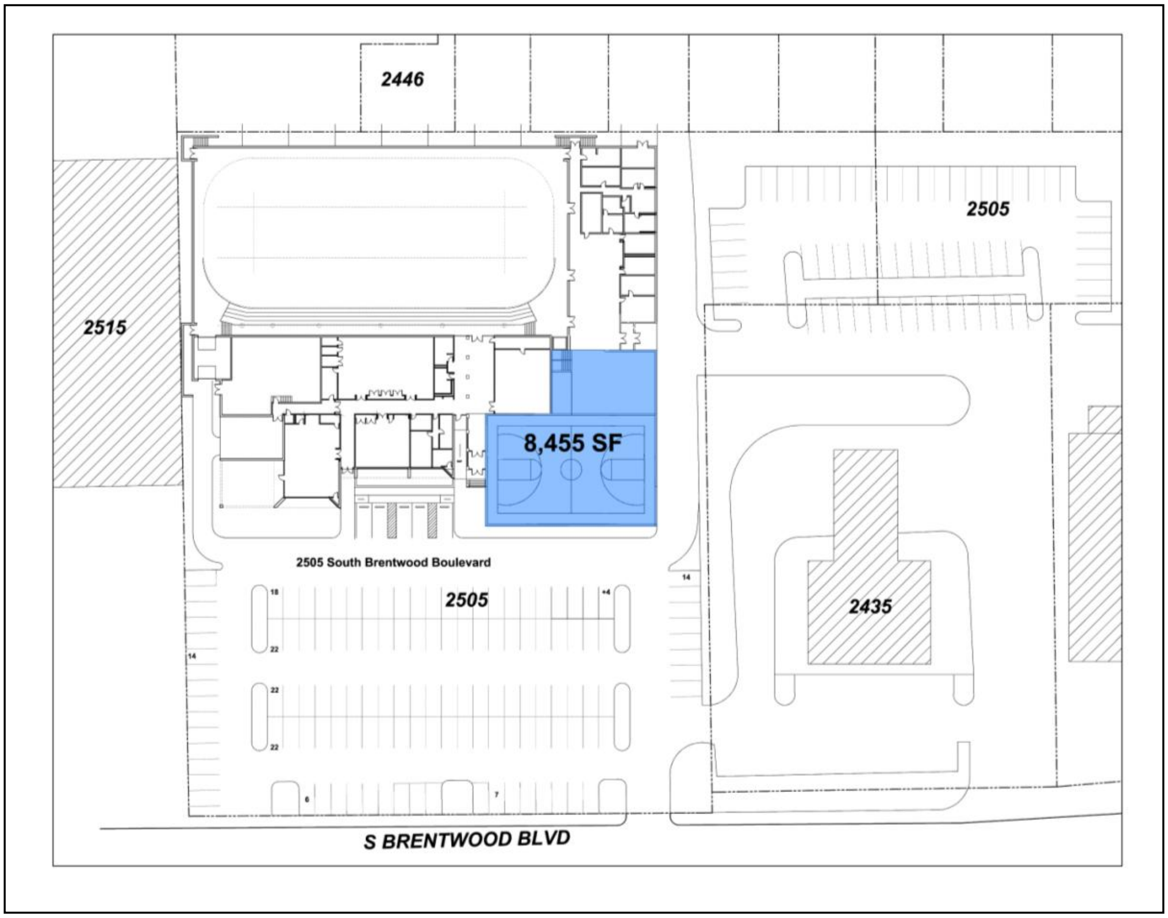
Structurally speaking, the building could be expanded laterally. The International Building Code specifies that if an existing structure is expanded and the addition does not increase the lateral loads on the existing structure more than 10%, then the lateral load-carrying elements of the existing building do not need to be upgraded to meet current standards for new construction. Therefore, the building can be expanded without any additional costs to upgrade the existing structure for seismic forces.

From these possible outcomes of design, two concepts emerged which make the most economical sense, Concept 1 and 2. The goals of design were to maximize opportunities based on current zoning, building configuration and site constraints. Both concepts expand upon the vacant northeast corner of the existing building site. A more cohesive design, these concepts utilize the area between the meeting rooms and ice rink to tie the two existing building entrances together.



Concept 1 – Single Story Expansion

Parking has been optimized with a new 5,904 sf lateral expansion on the northeast corner of the building. The new parking lot design will accommodate up to 12 accessible parking stalls, and the installation of a wheel chair lift will allow accessibility between the 4'-8" change in floor level. This addition provides better circulation and connectivity. The space provided will work great for administrative offices, locker rooms, an indoor pool, an aquatic play ground, spas, saunas, fitness classes, and work-out equipment.



Concept 2 – Gym Expansion

Maximizing usable square footage was the primary concern for the design of Concept 2. Among other uses, this 8,455 sf lateral expansion could incorporate a high school -sized basketball court (50'x84'). The gym area could be at the same floor level as the ice skating rink and share locker room facilities. With the added vertical exposure, there will be an enhanced street presence for the building. Since the new roof will be taller than the existing roof, a small portion of the existing roof may need strengthening or replacement to handle the resulting snow drift loading.

Expansion Code Compliance

Any expansion to the existing building shall be Type 1B construction per Table 503 and 601 in the 2009 IBC. This type of construction allows the amount of building area limited by only the physical site available. With any expansion the existing building can be addressed in two (2) possible outcomes. It will either be evaluated in parts, as the three (3) portions identified in Figure g.1, or as a whole. Depending on the amount or degree of modification to the existing building non-compliant code issues may need to be addressed. To reiterate the conversation with Bob Kurtz, the effects on the existing building will be evaluated once there is a final design concept. Exemptions to the IBC 2009 may be possible.

Structural Expansion

Any expansion eastward should be placed on piers that extend 18' to 20' below grade and bear on the underlying rock formation. The original construction documents say that the underlying rock formation can support foundations that exert as much as 30 kips per square foot of pressure. Therefore, this rock is strong enough to support an expansion. To prevent slab settlement in the building expansion area, GBA recommends a structural slab supported by micropiles as described in the Structural Floor Slab Replacement solution found in Task 2 Section a. Structural Condition.

4. Task Four: Implementation of Improvements

The implementation of improvements will vary to accommodate the building operation. For short periods of time, services may need to relocate or make temporary adjustments. There are three different scenarios to evaluate which include, update existing, Concept 1 and Concept 2. Concept 1 and 2 share a similar implementation, and each scenario may take several phases to complete with some phase overlap during construction.

Update Existing

No expansion. ADA and energy efficiency are the improvement priorities. Minimal work falls under general maintenance.

Phase I – modification of main entrance ramp and stair, handicap parking stalls, fire alarm system, restroom remodel, door knobs, energy efficient lighting, chair lift installation and minimal interior finishes.

Phase II – modification of south and north entrance, structural slab repair and installation of fire sprinkler system

Phase III – locker room remodel

Phase IV – roof replacement and mechanical equipment upgrade

Phase V – window replacement

Concept 1 – Single Story Expansion

Phase I – modification of south and new north entrance, handicap parking stalls, fire alarm system, restroom remodel, door knobs, energy efficient lighting, chair lift installation and minimal interior finishes.
Phase II – 1-story expansion, completion of parking lot, structural slab repair and installation of fire sprinkler system
Phase III – locker room remodel
Phase IV – roof replacement and mechanical equipment upgrade
Phase V – window replacement

Concept 2 – Gym Expansion

Phase I - modification of south and new north entrance, handicap parking stalls, fire alarm system, restroom remodel, door knobs, energy efficient lighting, chair lift installation and minimal interior finishes.
Phase II – 2-story expansion, completion of parking lot, structural slab repair and installation of fire sprinkler system
Phase III - locker room remodel
Phase IV – roof replacement and mechanical equipment upgrade
Phase V – window replacement

5. Task Five: Sustainable Approaches

Sustainable practices must be considered when dealing with new construction, remodeling or regular building maintenance. In most cases, increased energy efficiency can relate to operational cost savings. The initial costs may prove more economical over the lifespan of the equipment or materials. Cost savings over the building lifespan are not evaluated in this assessment. GBA has identified building improvements where opportunities for sustainability are greatest.

Sustainable Opportunities:

- Ductwork Replacement (Section 2.c) –
  Existing ductwork contains insulation within the duct, commonly referred to as duct liner. While an acceptable design at the time of construction, this practice has been found to encourage the growth of mold and other contaminants. At the same time, the actual amount of usable duct is reduced which limits the amount air supply.

- Ground-Source Heat Pump (Section 2.c) –
  A ground-source heat pump can potentially replace existing DX units. Heat pumps will both heat and cool a building by utilizing the natural stability of the earth's temperature. In many cases, heat pumps offer a cost savings over the lifespan of the equipment.

- Efficient Lighting (Section 2.d) –
  New technologies in lighting provide sustainable solutions for many buildings. The overall amount of Watts can be reduced by replacing the existing with fluorescent lamps. The required amount of footcandles can be maintained, even improved, with a lesser amount of Watts through the use of reflectors to control the projection of light.

  Another approach to efficient lighting incorporates the use of daylighting or natural light. Daylighting opportunities can offer the ability to reduce energy consumption by eliminating the need for artificial light. For instance, the ice rink could possibly benefit from in installation of skylights at the time of roof replacement. Other frequently occupied space throughout the building will also benefit from improved natural light. Daylight sensors could be integrated to monitor the amounts of natural versus artificial lighting.

- Roof Replacement (Section 2.f) –
  The existing roof is in need of replacement. The advantage of an Energy Star, reflective roof membrane deals with heat transfer. Basic principles of heat conductivity indicate dark colors absorb more heat, therefore, light colored or white roofs are defined as “cool” roofs because they do not attract heat. A “cool” roof factors into the sizing of mechanical equipment which can equal cost savings for the building.

- Windows Replacement –
  Exterior window replacement is recommended to improve the performance of the building shell. A dual glazed system provides an air space between the sheets of glass that acts as a thermal break. In addition, application of tinting or reflective coatings to the exterior glazing can prevent a certain degree of heat transfer. The eastern orientation of most existing windows does not require additional reflective coatings. At the very least, tinted glazing will suffice. Window replacement should be considered with improvements to the mechanical equipment. The building shell greatly influences the equipment efficiency.

- Vestibules –
  When vestibules are incorporated into a design the amount of air transfer is significantly reduced. A double set of doors in sequence prevents the escape of heated or conditioned air which normally occurs at public entrances and exits. Additionally, vestibules allow space for the installation of a walk-off matt which reduces the amount of contaminants brought into the building.

- Finish Materials –
  Oftentimes, the importance of finish material selection can be overlooked. Materials selected with appropriate durability and maintenance contributes to sustainability efforts.

6. Task Six: Schedule for Improvements

The length of construction will vary depending on weather conditions and ability to accommodate the City's needs. For the building to remain in operation during the construction it may cause delay and increase the cost of construction. Given the present economy and climate of construction we predict a length of approximately nine (9) months from start to completion. The duration of construction for work included in all phases will take relatively the same length of time. As described in Task 4, the implementation of construction phases varies between concepts.

Update Existing

Months	0 1 2 3 4 5 6 7 8 9 10 11 12
Phase I	
Phase II	
Phase III	
Phase IV	
Phase V	

Concept 1

Months	0 1 2 3 4 5 6 7 8 9 10 11 12
Phase I	
Phase II	
Phase III	
Phase IV	
Phase V	

Concept 2

Months	0 1 2 3 4 5 6 7 8 9 10 11 12
Phase I	
Phase II	
Phase III	
Phase IV	
Phase V	

7. Task Seven: Budgetary Opinion of Probable Cost

Various building material components and labor costs are used to determine an opinion of probable cost. Publications, such as, RS Means 2010 and Engineering News Record 2010 (ENR) provide the necessary resources for developing numbers for a cost estimate. These published reports of probable costs paired with building design experience produce budgetary opinion of probable costs based on reasonable assumptions.

For preliminary estimation purposes, a 20% contingency has been included into the total. Without knowing the exact timing of construction and industry climate the 20% should account for inflation. This 20% also serves as a buffer for a margin of error allowance this early in the design process. To preserve a level of comparison, the cost per square foot for each design option is consistent. In reality, this number may fluctuate depending on scope of work and subcontractor performing the work. As conceptual design nears completion a more accurate cost estimate will provide a more realistic perspective.

Update Existing

Phase I	Count	SF	Cost	Total Cost
Main Entrance		1,171	$300	$351,300
Restroom Remodel		405	$150	$60,750
Door Hardware	82		$320	$26,240
Fire Alarms		40,100	$1	$40,100
Lighting				$96,000
Emergency Lighting				$7,500
Electrical Switchboard				$50,000
Electrical Panel Boards				$25,000
Chair Lift Installation				$24,500
Site Work				$115,990
Interior Finishes				$50,000
				$847,380
Phase II				
South Entrance		656	$300	$196,800
North Entrance		1,972	$300	$591,600
Micropile & Structural Slab		3,500	$72	$252,000
Fire Sprinklers		40,100	$6	$240,600
				$1,281,000
Phase III				
Locker Rooms		2,200	$75	$165,000
Ice Rink Restrooms		1,000	$75	$75,000
				$240,000
Phase IV				
Roof		40,100	$8	$300,750
Mechanical Equip.				$275,000
				$575,750
Phase V				
South Windows (100'x9')		900	$65	$58,500
Main Windows (25'x9')		25	$65	$1,625
Ice Rink Windows (50'x14')		700	$65	$45,500
				$105,625
				$3,049,755
20% Contingency				$609,951
Estimated Total Construction				$3,659,706
Alt.				
Ice Rink Sprinkler Deduct	(200'x85')	17,000	$6	-$102,000
Replace Ductwork Additional				$70,000
				-$32,000
				$3,627,706

Concept 1

Phase I	Count	SF	Cost	Total Cost
South Entrance		656	$300	$196,800
North Entrance		325	$300	$97,500
Restroom Remodel		405	$150	$60,750
Door Hardware	82		$320	$26,240
Fire Alarms		40,100	$1	$40,100
Lighting				$96,000
Emergency Lighting				$7,500
Electrical Switchboard				$50,000
Electrical Panel Boards				$25,000
Chair Lift Installation				$24,500
Site Work				$140,260
Interior Finishes				$50,000
				$814,650

Phase II				
1-Story Expansion, inclusive		6,000	$175	$1,050,000
Micropiles & Structural Slab		3,500	$72	$252,000
Fire Sprinklers existing SF		40,100	$6	$240,600
Fire Sprinklers new SF		6,000	$3	$18,000
				$1,560,600

Phase III				
Locker Rooms		2,200	$75	$165,000
Ice Rink Restrooms		1,000	$75	$75,000
				$240,000

Phase IV				
Roof existing SF		40,100	$8	$300,750
Mechanical Equip.				$275,000
				$575,750

Phase V				
South Windows (100'x9')		900	$65	$58,500
				$58,500
				$3,249,500
20% Contingency				$649,900
Estimated Total Construction				$3,899,400

Alt.				
Ice Rink Sprinkler Deduct	(200'x85')	17,000	$6	-$102,000
Replace Ductwork Additional				$70,000
				-$32,000
				$3,867,400

Concept 2

Phase I	Count	SF	Cost	Total Cost
South Entrance		656	$300	$196,800
North Entrance		325	$300	$97,500
Restroom Remodel		405	$150	$60,750
Door Hardware	82		$320	$26,240
Fire Alarms		40,100	$1	$40,100
Lighting				$96,000
Emergency Lighting				$7,500
Electrical Switchboard				$50,000
Electrical Panel Boards				$25,000
Elevator				$24,500
Site Work				$157,120
Interior Finishes				$50,000
				$831,510

Phase II				
Gym Expansion, inclusive		8,455	$200	$1,691,000
Micropiles & Structural Slab		3,500	$72	$252,000
Fire Sprinklers existing SF		40,100	$6	$240,600
Fire Sprinklers new SF		8,455	$3	$25,365
				$2,208,965

Phase III				
Locker Rooms		2,200	$75	$165,000
Ice Rink Restrooms		1,000	$75	$75,000
				$240,000

Phase IV				
Roof existing SF		40,100	$8	$300,750
Mechanical Equip.				$275,000
				$575,750

Phase V				
South Windows (100'x9')		900	$65	$58,500
				$58,500
				$3,914,725
20% Contingency				$782,945
Estimated Total Construction				$4,697,670

Alt.				
Ice Rink Sprinkler Deduct	(200'x85')	17,000	$6	-$102,000
Replace Ductwork Additional				$70,000
				-$32,000
				$4,665,670

8. Task Eight: Summary of Findings

The existing building is structurally sound and provides enough architectural viability for renovation and/or addition; therefore, improvements to the building make sense from an economical standpoint. Buildings, in general, are meant to undergo maintenance and modifications to extend the life and function for future generations to enjoy. In some cases, bulldozing and starting from scratch makes sense. In this case, the existing Community Center for the City of Brentwood needs basic improvements and manageable maintenance. There are multiple possibilities for expansion depending on the desired functionality and performance of the building.

The cost comparison indicates an increase for construction costs as shown in the chart below. However, the cost for updating the existing and Concept 1 differs by only $200,000. This data concludes that if the decision is made to renovate the existing building, an expansion similar to Concept 1 should be seriously considered.

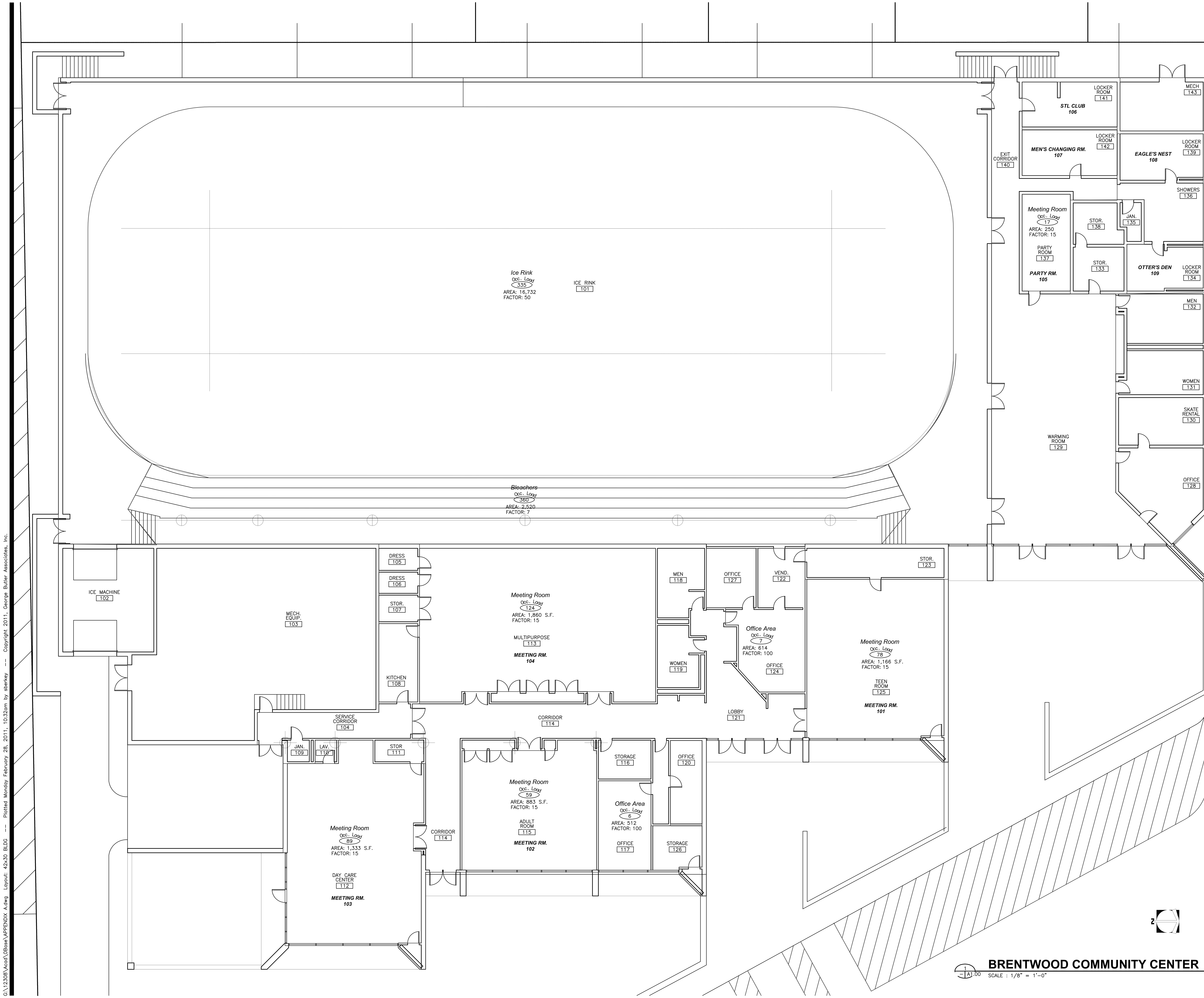
Brentwood Community Center	Total Construction
Update Existing	$3,659,706
Concept 1	$3,851,280
Concept 2	$4,697,670

Appendix

(also provided as electronic files)

Appendix A – As Built Drawings

Appendix B – Picture Index



C:\12308\Acad\DBase\APPENDIX A.dwg --- Layout: 42x30 BLDG --- Plotted Monday February 28, 2011, 10:32am by sberkey --- Copyright 2011, George Butler Associates, Inc.

GBA
architects
engineers
9801 Renner Boulevard
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www.gbateam.com

AS BUILT DRAWINGS FOR:

BRENTWOOD COMMUNITY CENTER

2505 S BRENTWOOD BLVD
BRENTWOOD, MO
63144

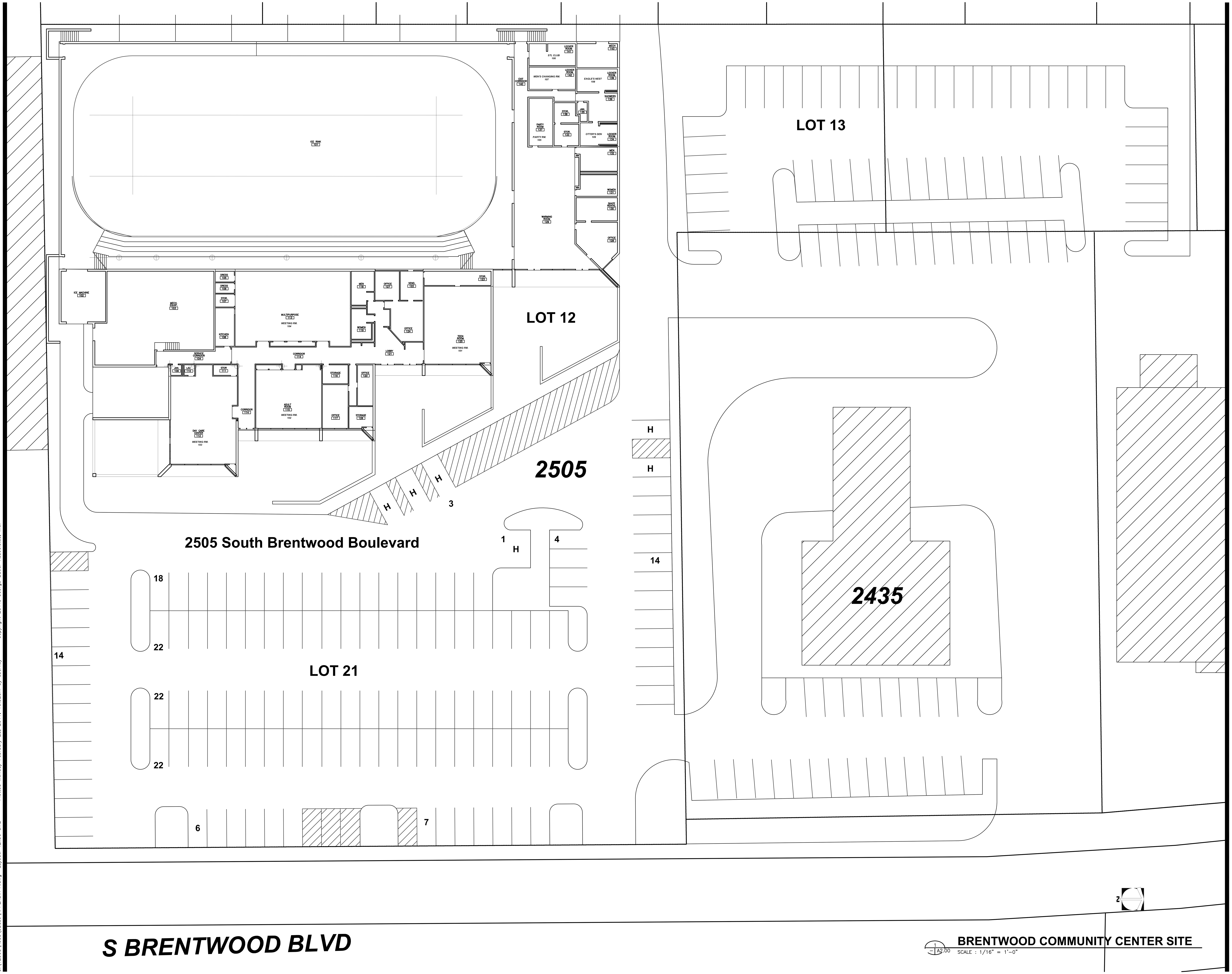
REVISION

PROJECT NUMBER
12308.00
DATE
03/07/11

DESIGNED
SEB
DRAWN
SEB
REVIEWED
CDR

SHEET TITLE
APPENDIX A
BUILDING

SHEET NUMBER
A1.00



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AS BUILT DRAWINGS FOR:

BRENTWOOD COMMUNITY CENTER

2505 S BRENTWOOD BLVD
BRENTWOOD, MO
63144

REVISION

PROJECT NUMBER
12308.00
DATE
03/07/11

DESIGNED
SEB
DRAWN
SEB
REVIEWED
CDR
SHEET TITLE

APPENDIX A
SITE

SHEET NUMBER
A200


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Figure c.1.jpg


Figure c.2.jpg


Figure c.3.JPG


Figure c.4.JPG

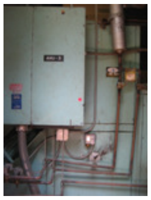
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Figure c.6.JPG


Figure c.7.jpg


Figure c.8.jpg


Figure c.9.JPG


Figure c.10.jpg


Figure c.11.jpg


Figure c.12.jpg

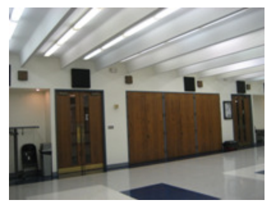

Figure c.13.jpg


Figure c.14.jpg


Figure d.1.jpg


Figure d.2.jpg


Figure d.3.jpg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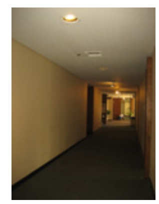
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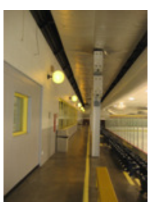
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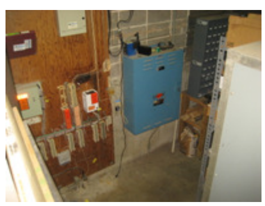
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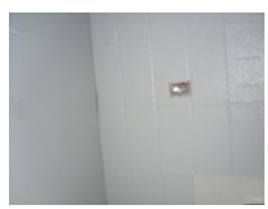
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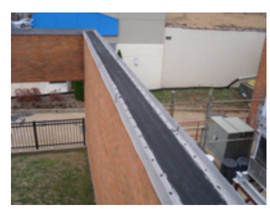
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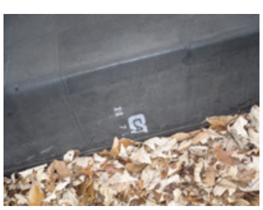
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Figure f.9.JPG


Figure f.10.JPG


Figure f.11.JPG


Figure f.12.JPG


Figure f.13.JPG


Figure f.14.JPG

Figure f.15.JPG


Figure f.16.JPG


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Figure h.2.JPG


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Figure h.4.JPG

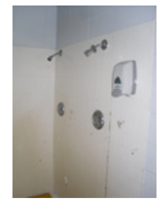
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Figure i.3.JPG


Figure i.4.JPG


Figure i.5.JPG


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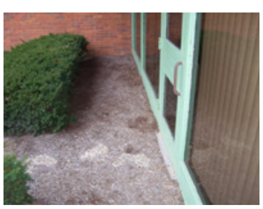
Figure i.7.JPG


Figure i.8.JPG


Figure i.9.JPG


Figure i.11.JPG


Figure i.12.JPG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