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MENG Analysis

CITY OF LYNNWOOD

2014 FACILITY CONDITION ASSESSMENT

RECREATION CENTER

4 JUNE 2014

r e s e a r c h

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY 2

II. SUMMARY FINDINGS 5

III. FACILITY SUMMARY 10

IV. COST MARK-UPS 33

V. OBSERVED DEFICIENCIES 35

VI. OPPORTUNITIES 45

VII. EQUIPMENT INVENTORY 49

VIII. EQUIPMENT PM SCHEDULING 55

IX. APPENDIX 57

I. EXECUTIVE SUMMARY

1.1 Introduction

The City of Lynnwood commissioned MENG Analysis to conduct building analyses for the Recreation Center in support of its facility maintenance planning and budgeting process. In 2011, when MENG Analysis completed the initial Facility Condition Assessment of most of the City's buildings, the Recreation Center was brand new and therefore not included in that original scope of work. Two years later, however, several building systems had apparent condition deficiencies and MENG Analysis was commissioned to complete a condition assessment of the Recreation Center in December 2013 with system deficiency and predicted renewal costs estimated in 2014.

The scope of work included:

i. Facility Condition Assessments (FCA)
ii. Equipment Inventory
iii. Equipment Preventive Maintenance Schedule

The scope of work excluded: special ADA and current code compliance; seismic analysis, site infrastructure systems; and technology/communications infrastructure.

1.1.1 Findings

Building systems in the Recreation Center were found to be in good to excellent condition overall. The facility appears to be maintained by competent maintenance staff, albeit on a reactive basis. Some building systems, however, are showing premature wear and or deterioration due to exposure to moisture inside the building envelope. This is particularly evident for components in the HVAC, electrical, low voltage and structural systems. Additionally the moisture intrusion to the building envelope, exterior wall and some roof areas can be a problem if not addressed.

Weighted Average Condition Scores (sorted from best – worse condition scores) for City of Lynnwood facilities show the previously scores (from 2011) and the latest Recreation Center condition score:

FACILITIES	Condition Score
Recreation Center (2014)	**1.9**
North Administration Building (2011)	2.5
City Hall, Generator Building and Council Chambers (2011)	2.6
Lynnwood Library (2011)	2.6
Fire Station #15 and Exterior Generator (2011)	2.7
Facilities Maintenance Building (2011)	2.8
Fire Station #14 and Exterior Generator (2011)	2.9
Civic/Justice Center and Generator (2011)	2.9
Park Maintenance Building (2011)	3.3

Summary quantitative findings for the Lynnwood Recreation Center include:

- Current Observed Deficiencies (2014-2019) = $1,101,225
    - Peak Cost Years:
        - 2019 = $480,383
        - 2017 = $154,440
        - 2014 = $146,250
    - Peak System Deficiencies:
        - Plumbing = $443,430
        - HVAC = $277,662
        - Electrical = $140,400

- 20 year Predicted Renewals (2014-2033) = $4,597,810
    - Peak Cost Years:
        - 2022 = $2,220,722
        - 2020 = $881,431
        - 2025= $648,849
    - Peak System Renewals:
        - Lighting and Branch Wiring = $2,109,985 (2022)
        - Roof Coverings = $830,652 (2020)
        - Terminal and Packaged Units = $648,849 (2025)

Building Systems Condition Summary

The Recreation Center was developed with a major addition to the existing City Pool in 2011. Architectural systems are generally in excellent condition. Structural, Mechanical and Electrical systems are generally well maintained and in good condition. It appears that humidity within the building has caused rust and corrosion on the steel structure, piping, lighting, electrical wiring and devices as well as HVAC ductwork. Since no destructive testing was completed, there are additional concerns that moisture and further deterioration of concealed building systems may also exist. Additionally, the roofing has failed in places and the roof drainage systems are not functioning properly and therefore water intrusion is visible and of concern.

1.1.2 Special Studies

Equipment Maintenance Planning: A detailed equipment inventory was taken during the facility condition assessment. This inventory includes 113 pieces of equipment that will added to the City's Cartegraph system to help facilitate more proactive, preventive maintenance planning. Recommendations of preventive maintenance practices for categories of equipment types include: Bi-Annual; Annual; Quarterly; and Monthly maintenance tasks. This Equipment

Preventive Maintenance chart is included in Section VIII – Equipment PM Scheduling of this report.

Conclusions

The condition assessments found that the City of Lynnwood has done a good job maintaining building systems in the Recreation Center. With the exception to the issues reported with completion of the most recent construction contract the maintenance to the building has been reactive, rather than preventive, which is consistent with observations at other City owned facilities.

Next steps in this Facility Condition Assessment for the City of Lynnwood include:

- prioritization of Observed Deficiencies;
- completion and implementation of a preventive maintenance plan: enter equipment inventory into Cartegraph; complete and utilize Equipment Check Sheets;
- serious consideration of destructive testing to identify moisture and corrosion of concealed building systems, specifically:
    - further investigation of certain facility system issues, including, but not limited to:
    - Damage to concealed systems and materials affected by the Roof Drainage system
    - Failure of low voltage systems due to rusting components
    - Interior ventilation, condition of metal duct and negative building pressure
    - Steel structure rust, columns and metal stairs.

II. SUMMARY FINDINGS

2.1 Narrative Summary

The projected costs associated with addressing Observed Deficiencies (OD) at the Recreation Center total $1,101,225. These ODs are driven primarily by system deficiencies being caused by water. This occurs on both the exterior (i.e., roofing and rain water drainage) and the interior (i.e., high humidity that is causing the rapid deterioration of mechanical, lighting, electrical and structural systems. This section reports the ODs on both Systems and Sub-Systems levels.

2.1.1 Observed Deficiency Costs: Systems Level

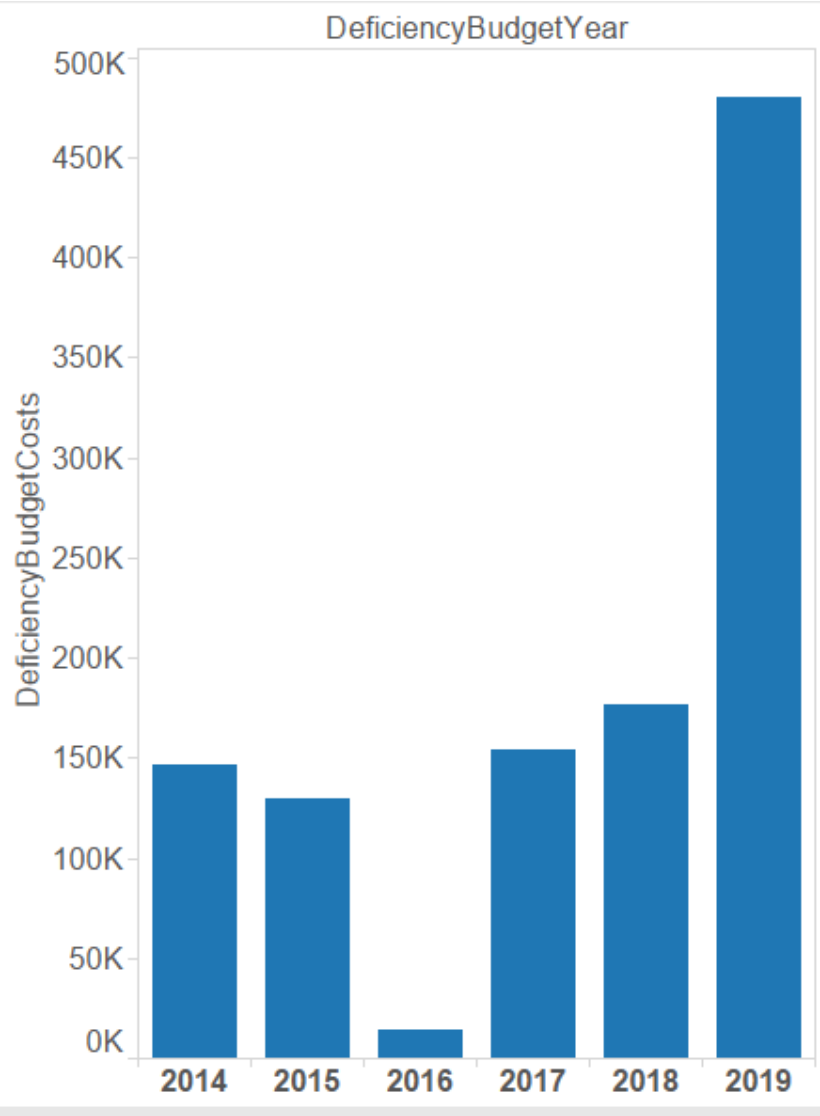
System costs that warrant attention by virtue of magnitude are Plumbing and HVAC.

Title **OD Systems/Year Table**

		DeficiencyBudgetYear						
System..	System	2014	2015	2016	2017	2018	2019	Grand T..
A10	Foundations		28,080				7,020	35,100
B20	Exterior Closure		11,700					11,700
B30	Roofing					136,773		136,773
C10	Interior Construction		4,680			4,680		9,360
C20	Staircases					35,100		35,100
D20	Plumbing			11,700	139,230		292,500	443,430
D30	HVAC	5,850	78,078	2,340	15,210		176,183	277,662
D40	Fire Protection		7,020				4,680	11,700
D50	Electrical	140,400						140,400
Grand Total		146,250	129,558	14,040	154,440	176,553	480,383	1,101,225

Observed Deficiency cost projected to occur in 2019 represent roughly half of the total costs of ODs, again due to Plumbing and HVAC systems. The most immediate are the OD's related to Electrical systems.

Lynnwood Recreation Center Observed Deficiency



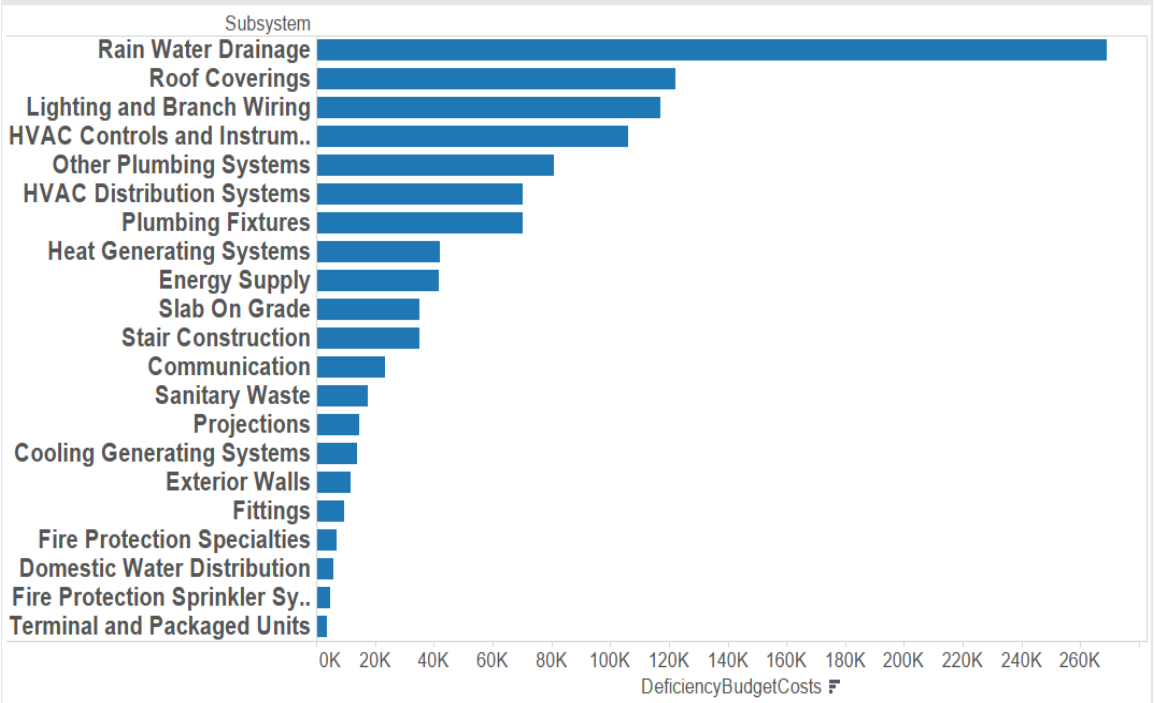
2.1.2 Observed Deficiencies: Sub-Systems

Looking in more detailed at the Sub-Systems level highlights the Rain Water Drainage, Roof Coverings and Lighting and Branch Wiring as the greatest cost categories.

Title **OD Subsystems Table**

		DeficiencyBudgetYear						
SubSys..	**System**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Grand T..**
A1030	Foundations		28,080				7,020	35,100
B2010	Exterior Closure		11,700					11,700
B3010	Roofing					122,265		122,265
B3030	Roofing					14,508		14,508
C1030	Interior Construction		4,680			4,680		9,360
C2010	Staircases					35,100		35,100
D2010	Plumbing				58,500		11,700	70,200
D2020	Plumbing						5,850	5,850
D2030	Plumbing						17,550	17,550
D2040	Plumbing			11,700	23,400		234,000	269,100
D2090	Plumbing				57,330		23,400	80,730
D3010	HVAC		41,808					41,808
D3020	HVAC	5,850	24,570		11,700			42,120
D3030	HVAC		11,700	2,340				14,040
D3040	HVAC						70,200	70,200
D3050	HVAC				3,510			3,510
D3060	HVAC						105,983	105,983
D4010	Fire Protection						4,680	4,680
D4030	Fire Protection		7,020					7,020
D5020	Electrical	117,000						117,000
D5030	Electrical	23,400						23,400
Grand Total		146,250	129,558	14,040	154,440	176,553	480,383	1,101,225

Title **OD Subsystems Graph**

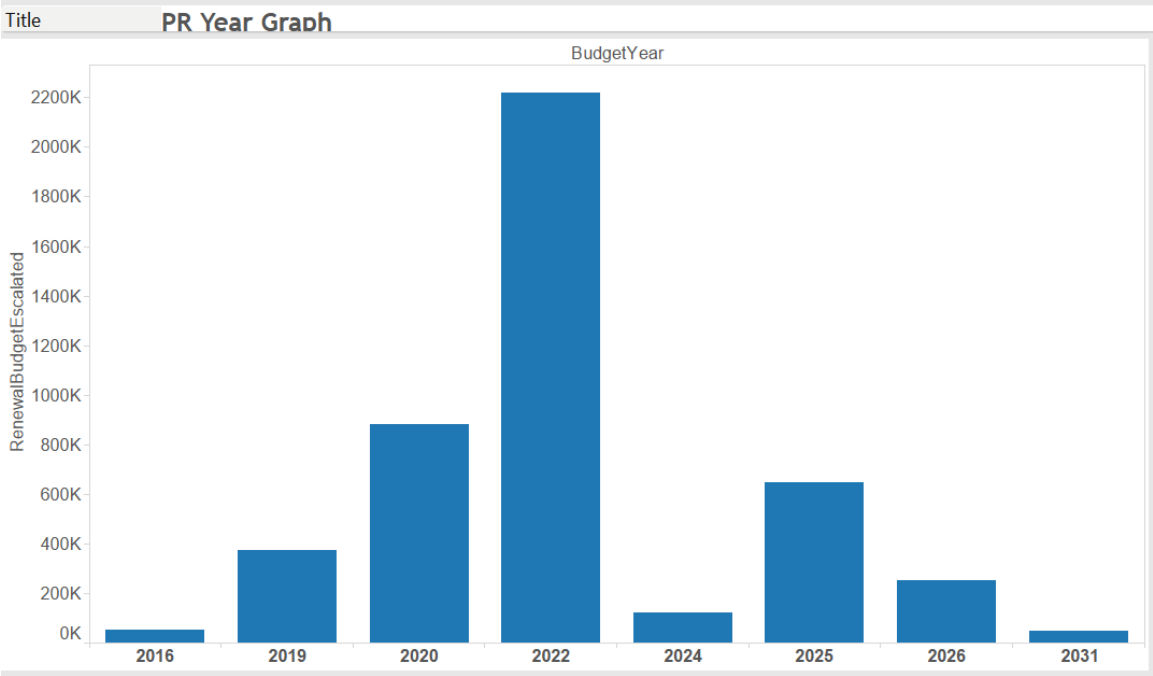


II SUMMARY FINDINGS – Predicted Renewals

2.2 Predicted Renewals for Building Systems are based on 2014 dollars for the 20 Year period ranging from 2014 to 2033.

2.2.1 20 Year Predicted Renewals

Predicted Renewal (PR) costs total $4.6 million for this 20 year period. Costs associated with PRs are generated by a theoretical model that takes several factors into account, including: the age of systems; the condition ratings assigned by the condition assessment survey team; typical system lifecycle renewals and relative system costs within the cost model for each facility (e.g., recreation center/natatorium). The predictive model shows years 2020 and 2022 as the peak years.

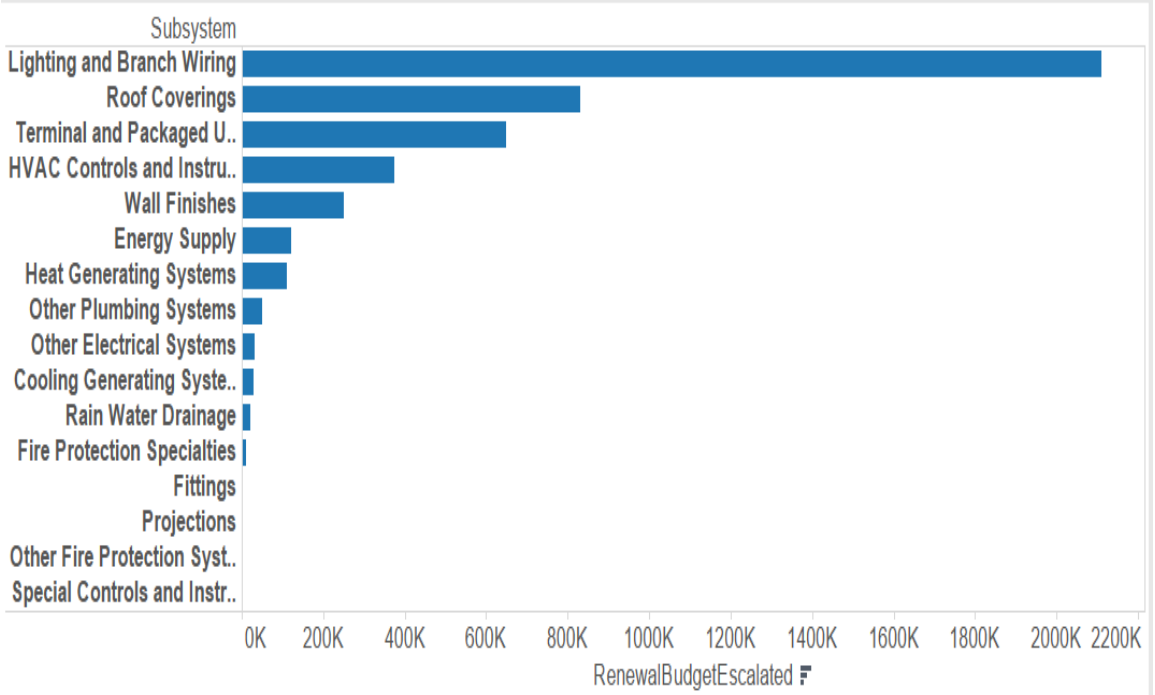


Better understanding of these two peak years for PRs comes from examining the following PR Sub-Systems Table, and recognition that the two greatest cost categories are related to the Lighting and Branch Wiring and Roof Coverings. These systems alone represent well over half of the projected costs for PRs. In the case of Lighting and Branch Wiring, the FCA team identified failed lighting controls in the natatorium section of the building, which dramatically lowers the assessed condition score of this system. Since Lighting and Branch Wiring is one of the top five system cost categories as a percentage of the facility's Current Replacement Value (CRV), the model also projects similarly high PR costs for this system. Given that a system is scored with relatively poor condition scores, this also rapidly accelerates (i.e., shortens) the typical system renewal cycle.

Title PR Sub-Systems Table

		BudgetYear								
Subsyst..	Subsystem	2016	2019	2020	2022	2024	2025	2026	2031	Grand T..
B3010	Roof Coverings			830,652						830,652
B3030	Projections	522								522
C1030	Fittings								3,905	3,905
C3010	Wall Finishes							251,516		251,516
D2040	Rain Water Drainage	20,887								20,887
D2090	Other Plumbing Syst..			50,779						50,779
D3010	Energy Supply					121,714				121,714
D3020	Heat Generating Syst..				110,737					110,737
D3030	Cooling Generating S..	30,078								30,078
D3050	Terminal and Packag..						648,849			648,849
D3060	HVAC Controls and I..		375,231							375,231
D4030	Fire Protection Speci..								10,413	10,413
D4090	Other Fire Protection ..								0	0
D5020	Lighting and Branch ..				2,109,985					2,109,985
D5090	Other Electrical Syste..								32,542	32,542
Grand Total		51,487	375,231	881,431	2,220,722	121,714	648,849	251,516	46,860	4,597,810

Title PR Sub-Systems Graph



III. FACILITY SUMMARY

Report Title: Facility Summary – Lynwood Recreation Center Building (22 pages)

This is a standardized FCA Database report formatted to provide:

a. General facility information;
b. Summary condition information;
c. Summary cost information, including Current Replacement Value, 20 Year Predicted Renewals*, Observed Deficiencies and Opportunities;
d. Facility Condition Summary with general narrative descriptions of the facility and systems;
e. Facility Component documentation of year of installation and major system renewal, condition scores, survey information and UniFormat Level III System comments.

The FCA surveys report the apparent (i.e., non-invasive, non-destructive) conditions of the City owned facilities. The facility condition reports provide comprehensive assessments of the major systems for each facility. The FCAs include qualitative condition assessments as well as a listing of major maintenance needs and observed deficiencies with their estimated costs for repairs for each of the systems. The FCA surveys were conducted by a team of FCA experts to assess architectural, structural, electrical and mechanical issues for the Lynnwood Recreation Center.

This report and its supporting data is intended as a tool for the City to make important facility preservation decisions and determine requirements for effective major maintenance planning.

Observed Deficiencies for the Lynnwood Recreation Center include a detailed itemization of facility system components that are in need of major maintenance or repair in order to maintain functionality. All building systems (e.g., exterior shell, mechanical systems, electrical systems, etc.) are evaluated and estimates presented for noted deficiencies on the basis of UNIFORMAT Level IV Systems.

The data supporting this FCA analysis is maintained in a relational database (Microsoft Access) and Tableau is an analytical dashboard that was used to generate the tables and graphs in Section I – Executive Summary of this report.

Supporting Documents
Section IV: Deficiency Repair Cost Markups by System (1 page)
Section V: Detailed Assessment – Observed Deficiencies
2014-2019 Section VI: Opportunity by Subsystem (3 page)

Facility Summary

City of Lynnwood
Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Code	
Facility Size - Gross	45,292
Year Of Original Construction	1977
Facility Use Type	Natatorium
Construction Type	Medium
# of Floors	1
Energy Source	Gas
Year Of Last Renovation	2011
Historic Register	No

			Undiscounted/ Unescalated	Present Value
FCI DM + Renewal (6 yrs worth)	5.44%	**DM Only**	$1,056,665	
Current Replacement Value (CRV)	$26,251,242	**Renewal Budget (6 yrs worth)**	$372,210	$340,704
		Renewal Budget (20 yrs worth)	$3,627,521	$3,116,103
		Observed Deficiencies	$1,101,225	$1,029,667

Facility Condition Summary

ARCHITECTURAL:
Description: One-story recreation facility with multiple pools, exercise rooms, racketball courts, multi-purpose rooms, locker rooms, offices, mechanical & electrical rooms, rooftop equipment, administrative offices, and common areas.

Condition: The building is generally in excellent condition. Roofing and flashing issues need immediate attention. The stair to the slide / mechanical mezzanine is deteriorating at an unacceptable rate and needs attention.

STRUCTURAL:
Description: The structure has several roof framing systems, consisting of structural insulated wood panels that span between glu-lam beams over the north pool room and tapered glu-lam beams with Kalwal over the south pool room. The walls are predominantly wood studs with reinforced CMU walls in the pool room. Red brick veneer occurs throughout the building exterior wall as a finish material. Steel HSS posts support steel wide-flange beams and composite metal deck in areas where mechanical equipment and boiler rooms are located.

Condition: The building finishes are generally well-maintained, except for some local moisture-related problems that occur at the west elevation. The mortar joints appear to be well-maintained and the brick is crack-free. Very minor cracking of the concrete stemp was observed at the building perimeter.

MECHANICAL:
Description: One-story recreation facility with multiple pools, exercise rooms, racketball courts, multi-purpose rooms, locker rooms, offices, mechanical & electrical rooms, rooftop equipment, administrative offices, and common areas. HVAC: Pool heat recovery air handling units with gas-fired boiler hot water heat and heat recovery chiller chilled water coils; all electric roof top heat pump units (RTUs) serving larger non-pool areas, and variable refrigerant flow (VRF) with heat recovery ventilation (HRV) for smaller non-pool areas, plus miscellaneous exhaust fans, unit heaters, and wall heaters. Plumbing: City water & sewer, gas-fired domestic hot water (DHW) heaters with small solar thermal array on roof, and specialty pool systems. Fire Protection: City fire service supplying wet and dry-pipe fire sprinkler throughout.

Condition: The original 1977 facility was modernized and expanded in 2010, adding a new family pool space to north, new exercise room to northeast, and new electrical room to south center, along with site improvements. The 2010 pool HVAC systems failed to control moisture, damaging building structure and systems; in 2013 both pool room HVAC units were replaced with higher capacity units, including a heat recovery chiller, and new north pool room floor return air duct and exhaust fan. HVAC, plumbing, and fire protection systems not damaged by high moisture and chlorine atmosphere are in good condition; systems damaged by the poor atmophere from 2010 to 2013 are in fair condition. Energy performance is unknown, but despite new HVAC equipment, there are signs of latent damage to the thermal envelope that deserve further

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investigation, particularly at the north wall of the new pool space addition.

ELECTRICAL:
Description: Electrical service served by Snohomish PUD underground primary Meter No. 1357797 to a 750KVA pad mount transformer, provide 480/277v 3-phase 4-wire power to building electrical system. Service and distribution: 480/277v main distribution with 208/120v sub-distribution. Lighting system: 277v, fluorescent and LED lighting. Power system: 120/208v provided by step down transformer, 120v serving branch wiring outlets, receptacles, motor controls, small mechanical equipment load, low voltage system equipment and appliances.
Large Motor Mechanical equipment: served by 480v 3-phase power. Security intrusion alarm system: coverage at entry doors by motion sensors. Fire alarm system: coverage include horn speaker strobes, pull station, smoke detectors in special rooms, with alarm monitoring. Security camera system: coverage's include ceiling mounted doom cameras in corridors.
Data/voice communication system: consists of MDF/IDF in comm room, Cat-6 wiring system. Sound system: Dukan equipment with speakers. Emergency generator: outdoor self-contained enclosed units with diesel base tank, 480/277v 125KW/156.2KVA rating.

Condition: All electrical system and low voltage systems are in good condition. Some lighting and controls in the locker rooms and life guard offices have been damaged by moisture and rust accumulation.

Weighted Avg Condition Score **1.9**

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date	Comments

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Facility Summary

City of Lynnwood
Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
A Substructure			**2.1**				
Foundations							
Standard Foundations	1977	2011	1	50	ML	01/01/14	Reinforced cast-in-place concrete footings are continuous below walls and pads at columns. A continuous reinforced concrete stem wall occurs at the perimeter of the building. The building foundations are largely concealed from view. The portions of stem wall that are visible are generally in very good condition, with only insignificant shrinkage cracks occurring randomly in a few places.
Slab On Grade	1977	2011	3	50	ML	01/01/14	Reinforced concrete slabs-on-grade are used throughout the building. Thickness varies from 3 1/2 to 4 inches. The slab-on-grade is in excellent condition throughout most of the building. There are, however, a few localized areas where cracking has developed and, in one area in the pool deck south of the south pool, there is exposed reinforcement that is corroding. The basement pump room sump slab has some deterioration where the steel drain is corroding, which may lead to concrete spalling in the future. Repair work does not appear to be critical or necessary at this time. Cost is estimated at less than $2.5k.
Basements							
Basement Walls	1977	2011	2	50	ML	01/01/14	Cast-in-place concrete basement walls, between 10 to 12 inches in thickness, only occur at the mechanical and pump rooms below in the original construction. The walls are reinforced with conventional deformed rebars. The walls are generally very sound and have no significant cracking. No wall repairs are required at this time, although removal of corrosion streaking, which appears to be due to corrosion of miscellaneous exposed steel connectors, may be considered as a housekeeping activity. The estimated cost of removing corrosion from the surface of the steel connectors and cleaning the stained surface of the concrete is less than $2.5k.

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City of Lynnwood
Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/	Survey Date	Comments
B Shell			**1.6**				
Superstructure							
Floor Construction	2011	2011	2	50	ML	01/01/14	The mezzanine floor that supports mechanical equipment and the access floor to the pool slides is constructed with steel wide flange beams beneath a composite concrete/metal deck floor. The mezzanine floor structure is generally in very good condition. Exceptions occur where steel embedments are corroding and, if not mitigated, will lead to premature failure of the concrete. A repair can potentially be made by removing the threshold, sandblast the steel and remove all corrosion; apply primer and a high-end epoxy paint coating to the steel, then replace the threshold. The cost of this repair is likely < $2,500 if done in conjunction with other work.
Roof Construction	1977	2011	1	50	ML	01/01/14	According to the design drawings, the roof is generally framed with sawn 2x12 wood joists or manufactured wood I-joists spaced @ 24-inches on center. Plywood sheathing bears on the wood framing. The roof framing over the new pool consists of 8 1/4-inch thick structural insulated panels that are constructed with sawn lumber and plywood sheathing. Glu-lam beams support the joists. The roof framing is concealed from observation by the roof membrane from above and the insulation/ceiling from below. There were no visible signs of leaking or sagging of any portions of the roof, although there was inadequate slope for the water to drain from the original.

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Facility Summary

City of Lynnwood
Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Exterior Closure							
Exterior Walls	1977	2011	2	23	DP	01/01/14	1976 - Masonry veneer over both reinforced Concrete Masonry Unit (CMU) and wood framing. 2010 - Masonry veneer over both reinforced CMU and metal stud framing. Cast-in-place (CIP) glu-lam support piers at natatorium. Generally in excellent condition with exception of water penetration behind the masonry veneer creating efflorescence on the surface at the NW corner of the building. A significant amount of efflorescence is visible below upper floor mechanical room exterior access. Upon inspection from the mechanical room level, it was observed that there was no sill flashing over the top of the masonry wall at the opening. Water is running directly into the wall cavity behind the masonry veneer. At the CIP piers the anchor bolts and other embeds are cut flush with concrete. These should be drilled back from the surface and coated with epoxy to prevent rust streaking. The horizontal trim flashing is cut at wall penetrations and does not properly return to the substrate WRB exposing the underlying construction. This allows water to penetrate the wall.
Exterior Windows	1977	2011	1	44	DP	01/01/14	Aluminum curtain wall and operable folding panels with low-e insulated glazing One window was broken on this visit at the Exercise Room. All other exterior window components are in excellent condition.
Exterior Doors	1977	2011	2	49	DP	01/01/14	Aluminum Storefront system with low-e insulated glazing and HM doors and frames. Appear in excellent condition except the upper mechanical loft 201 equipment accesses; This door is dangerous. Needs device to limit door swing out and a device to pull the door closed with out hanging out over the edge of the opening. In addition it should have two safety chains installed across the opening. Signage installed to notify of potential dangerous condition. Anticipated cost is <$1,000.

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Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Roofing							
Roof Coverings	1977	2011	3	10	DP	01/01/14	Prefinished standing seam metal roofing and fixed plastic translucent panels on high slope roofs and TPO membrane over rigid insulation on low slope roofs. Generally the standing seam metal roofing is in good condition. Reportedly there is water trapped under the TPO membrane roof saturating the protection board and the rigid insulation. This was found to occur mostly at the composite concrete deck areas below the roof top mechanical equipment. When portion of roof was removed during inspection by BCRA it was discovered that no vapor retarder membrane was placed between the concrete and the rigid insulation. Warm vapor drives from the interior space through the concrete and condenses below the insulation and the membrane. Vapor retarder was found correctly placed at other portions of the roof constructed with plywood sheathing. Reportedly, further testing and mitigation work will be continuing when conditions allow. This reviewer estimates that possibly as much as 5000 to 5500 square feet might be involved in equipment removal and roof system replacement. The other portions of membrane roof is in good condition. The high roof over the "group exercise" area drains over the edge to the roof below. Due to build up of roofing components at the edge is creating a dam. The water ponds behind this dam and drains predominately at one point over and down onto a through wall duct penetration. There is a potential leak issue here. The main duct is also damaged at a seam that is not well sealed and could also be a potential leak area. The mechanical condensation drains are currently draining directly onto the roof.
Roof Openings	1977	2011	1	39	DP	01/01/14	Natatorium - retractable, insulated translucent panels. One roof access hatch with a folding aluminum ladder. All appear to be in good working order.

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Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Projections	1977	2011	4	20	DP	01/01/14	GLB and HT overhang at Exercise Room and water park natatorium. Wood frame mansard overhang. The older mansard overhang fascia wood is severely UV and weather checked (sun damage south side) and the new finish coating does not fill cracks - there is some dry rot type of degradation. In a couple of cases the roof overflow tube is flush with the mansard overhang soffit. Water tension adhesion and wind blowback is causing the soffit board to become saturated at the overflow drain outlet -The painted soffit has water damage in several locations. Add 3-inch wide sheet aluminum inside existing overflow drain in bead of sealant and attach with sheet metal screws. Extend aluminum sheet 1-inch below existing soffit.

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
C Interiors			**1.2**				
Interior Construction							
Partitions	1977	2011	1	50	DP	01/01/14	Combination of wood frame and metal stud frame with 5/8-inch gypsum wall board on each side. Generally in excellent condition.
Interior Doors	1977	2011	1	40	DP	01/01/14	Most are flush solid core wood doors with HM frames. Utility steel doors and frames. Generally in excellent condition.
Fittings	2011	2011	2	30	DP	01/01/14	Lockers - wood and polylaminate (p-lam) construction. Locker Bases - could be metal framed with backer board and ceramic tile finish. Counters and vanities - wood and plam construction. Plastic sleeved metal hand rails at stairs to slide / mechanical mezzanine. Other hand rails in water park natatorium are powder coated metal. Hand rails and associated hardware at the slide tower showing signs of excessive corrosion. Other powder coated handrails look to be in excellent condition. Locker bases - rust streak emanating was observed coming from the bottom of the base at the trench drain which might suggest metal frame corrosion in wet environment. Locker bases in shower rooms should be constructed with CIP concrete.Many toilet accessories are poorly mounted and lose. Plumbing control shower fixtures are loose and not properly sealed. This will cause degradation of the wall when moisture penetrates the wall cavity. Two fold-up ADA shower seats in the family changing rooms have failed and have been removed. It is not clear if other in the seven changing rooms are also failing or will possibly fail. Owner should make sure that water tight integrity is maintain in all of these locations. Owner should also consider fixed shower seats that meet ADA requirements that are more structurally substantial to hold up to public abuse.

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Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Staircases							
Stair Construction	2011	2011	2	10	DP	01/01/14	Steel construction with steel or fiberberglass treads. The stair and associated hardware of the stair leading to the slide and mechanical loft mezzanine is becoming rapidly corroded. Multiple coats of special coating suitable to the pool environment such a TENEMEC should have been utilized on all exposed ferrous and alum metals. Plastic sleeved hand rails and brackets are severely corroding. Sprinkler piping and duct support systems are severely corroded. Chlorine laden moisture and condensation is the cause.
Interior Finishes							
Wall Finishes	1977	2011	2	21	DP	01/01/14	Paint, ceramic tile, vinyl wall covering and FRP. Generally in excellent condition.
Floor Finishes	1977	2011	1	23	DP	01/01/14	Ceramic tile, exposed concrete, vinyl, VCT and carpet. Generally in excellent condition.
Ceiling Finishes	1977	2011	1	32	DP	01/01/14	Paint on GWB, wood slat on GWB, acoustic panels and variety of suspended acoustic ceiling tiles. Generally in excellent condition.

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City of Lynnwood
Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
D Services			**2.2**				
Vertical Transportation							
Other Conveying Systems	2011	2011	5	0	DS	01/01/14	Service doors for boiler and chiller rooms, but no rigging systems. No rails or rigging systems for pool pump room. Opportunity to install rigging systems before they are needed for emergent repairs or planned replacements.

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Plumbing							
Plumbing Fixtures	1977	2011	2	28	DS	01/01/14	Porcelain water closets, urinals, and lavatories with automatic chrome trim. Stainless steel sinks with chrome trim. Dual height drinking fountains in multiple locations. Gang and individual showers with one-touch faucets. Most fixtures in good condition, except shower faucets which are nearly all failing, and automatic lavatory faucets, many with marginal water flow and temperature. Custodial mop sink fixture is cracked (<$2K). Opportunity to upgrade to premium efficiency fixtures and trim and they are replaced.
Domestic Water Distribution	1977	2011	2	30	DS	01/01/14	Four-inch city water service. Outside hosebibs in security boxes. Three (3) gas-fired 199 mbh DHW tank-type heaters, plus solar thermal DHW heating system with one rooftop 30-tube vacuum solar thermal collector array, thermal storage tank, recirculation pump, and controls. City water service appears to be original and may be oversized - possible opportunity to reduce. Largely copper domestic water distribution, with insulated DHW piping. Some prematurely corroded copper piping where exposed to excessively high moisture and/or corrosive atmosphere between 2010 and 2013.
Sanitary Waste	1977	2011	2	33	DS	01/01/14	City sewer. Some older cast iron (CI) drain, waste, & vent (DW&V) piping in original (1977) construction; but mostly newer (2010) non-metallic ABS DW&V piping. Extensive floor drains, trench drains, special drains, pits & sumps, and sump pumps through-out. Most or all exposed lavatory sink drain piping is insulated. System is largely concealed, excepting vents-to-roof (VTRs) which are mostly in good condition. Trench drains in some high traffic areas are wearing and/or discoloring prematurely. Concrete floors often not sloping well to drain to trench and floor drains resulting in excessive standing water in some locations. Floor condition may not meet health code requirements in locker rooms, particularly at men's room urinals. While there are no reported waste back-up problems, some fixtures seem slow to flush. There may be cross-connection between storm and sanitary systems with needless storm water entering the sanitary sewer system; specifically from the foundation drainage system.

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Rain Water Drainage	1977	2011	4	15	DS	01/01/14	Roof drain (RD) and overflow roof drain (OD) at flat roof; gutter & downspout at sloped metal roof. Original construction RDs at mansard roof drain to underside of mansard falling to perimeter landscape rockery below; with OD scuppered to mansard, then sheet flow drop to grade. New construction RD fully piped to site storm drain system; with OD piped to daylight tounges approximately 18-inches above grade. Butterfly roof(s) to exterior downspout (no OD). A sump with sump pumps is present at the north play yard area. Original RD tail pipes are too short with water damaging recently replaced soffit gypsum wall board (GWB); original OD scuppers are marginal. New RD & OD body recessess are nearly all dirty, with many improperly set, resulting in excessive standing water and resultant mold & midew growth. Several awkwardly located recesses are near mechancial equipment and narrow passages, requiring repeated stepping on weak insulation edges near the recesses, resulting in damage to rigid insulation below. Lack of roof travel path protection exacerbates the problem. The exercise room addition to NE has insufficient RD capacity (limited to one exterior downspout, and unclear OD), reportedly resulting in back-ups during heavy rains, leading to rain water leakage into the exercise room below. Opportunity for rain water harvesting system to reduce or elmiinate city water make-up to pool from fall through spring seasons. The north play yard sump pump was not observed, as it is outside the building footprint; however, the associated alarm or controller is in the NE storeroom.

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Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Other Plumbing Systems	1977	2011	3	15	DS	01/01/14	Swimming pool equipment for five (5) pools: A) Competition, B) Wellness, C) Adult Whirlpool, D) Leisure, and E) Family Whirlpool, plus two (2) Water Slides. Major equipment includes: 1) Filtration pumps & strainers, 2) Filters, 3) Specialty pumps (slides, jets, current, toy, etc.), 4) Autofill, 5) Chemical controller, 6) Chlorine system, 7) Caustic soda system, 8) UV system, 9) Heat exchangers, and 10) Piping, valves, controls, and other support systems. Most the pool piping is non-metallic, but pumps are metallic. Tanks and vessels are a mix of steel, fiberglass, and other materials. Pits are field cast-in-place concrete. Sumps are pre-fabricated. Two of the new pool area pumps have failed multiple times, and may be incorrect for the higher temperature water application in these pools (90+ deg F). High moisture and corrosive environment has prematurely corroded some materials; much of the metallic equipment, such as pumps, have the appearance of systems in operation for 5 to 10 years, despite actual operation of only 2 to 3 years. Bulk chemicals and other consumable materials are stored in the pump room area; some of these might be better stored in the adjacent storage room(s). Some details in the pump room are not constructed per the 12/11/09 bid set, for example the ladder to the pump pit is a vertical ladder, not a ships ladder, making maintenance access somewhat more difficult. The pump pit sump cover is left open to allow easy inspection from the main floor above, making this sump an unguarded fall hazard. Reportedly original building foundation drains flow into this sump and are pumped to the sanitary sewer system.

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Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
HVAC							
Energy Supply	1977	2011	3	30	DS	01/01/14	Natural gas from Puget Sound Energy (PSE) via rotary meter with 5,000 cfh capacity. Thermal envelope a mix of original (1977) and new (2010) code insulation and sealing. No site steam, hot, or chilled water distribution (but hot and chilled water is generated and distributed within the building itself). Natural gas piping is prematurely corroded in several locations due to high humidity and corrosive atmosphere from 2010 to 2013, but otherwise in good condition. Original (1977) construction thermal envelope integrity is unclear, particularly in the ceiling plenum, attic, and especially mansard roof space, and should be further investigated. New (2010) construction thermal envelope is presumed compromised by excessive humidity, condensation, and improper building pressurization, as indicated by high wall construction moisture in some locations, including: 1) South pool SE wall MC = 18%, 2) North pool tile wall MC = 10.5%, 3) North pool NW stairwell under windows MC = 20% to 30% and more with visible signs of high moisture and/or chemical exposure damage; for reference non-pool area wall MC was typically about 8%; structural wood columns in north pool room MC was about 8% (good). These moisture content (MC) readings were taken from a hand-held Flir Extech Pinless Moisture Meter, Model No. M0280; the surface contact meter was simply held firm against the material surface in question, and the MC reading taken when stabilized; these quick and simple readings are best for relative MC comparison, not definitive absolute MC measurement. Both destructive testing and infrared thermography are recommended to fully characterize thermal envelope and possible structural damage. Completion of commissioning (Cx) requirements from both 2010 construction and 2013 remedial work is unclear.

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Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Heat Generating Systems	1977	2011	3	20	DS	01/01/14	Two (2) Cleaver Brooks Clearfire high-efficiency condensing direct vent gas-fired boilers with onboard controls interfaced with building DDC control system; each boiler with constant speed recirculating (primary) pump. Boilers are Model No. CFC-700-1800-60 with 1,750 mbh maximum heat input; see equipment inventory for additional details. Two (2) secondary hot water distribution pumps are variable speed drive, and also located in the boiler room. Stainless steel flue to high-high roof above new chiller room. Certain boiler components are excessively corroded from exposure to high humidity and/or corrosive atmosphere, for example the induced draft blower aluminum housing, natural gas piping and controls, and boiler controls; see . The boiler flues have been recently extended up above the new (2013) chiller room resulting in near complete cooling of flue gas with resultant increase in condensate, enough external to the flue to drip back down the outside, with potential damage to wall and especially membrane roof below; inside condensation may lead to internal damage as well if not well drained. Boiler condensate neutralization system has not been maintained resulting in untreated condensate acid etching concrete around the boiler room floor drain, with potential damage to the drain body and downstream piping. One of the secondary hot water circulating pumps is misaligned, despite multiple attempt to align, requiring excessive re-builds (every 6 to 12 months); the coupling safety screen is currently removed. Glycol concentration and auto-fill system operation is unclear and should be confirmed (<$2K).

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Cooling Generating Systems	2011	2013	4	20	DS	01/01/14	One (1) new (2013) 80-ton Trane heat recovery chiller in new high roof penthouse including evaporator (chilled water) and condenser (hot water) circulating pumps. Three (3) ductless split cooling systems with inside evaporator fan coils and rooftop condensing units; one serves the main distribution frame (MDF) room, the other two reportedly serve the pool pump room. One (1) variable refrigerant flow (VRF) rooftop condensing unit. No cooling tower. The new heat recovery chiller does not have an ultimate heat rejection device, such as a cooling tower; it appears heat can only be rejected to the pool water via the hot water system. The chiller room is not finished, and while it has freeze protection heating, there is no cooling or ventilation. The chiller package is set on air cushioned leveling and/or vibration isolation bases with a dedicated compressed air system and complicated and delicate control system. New chilled water and heat recovery piping to and from new chiller room is marginally jacketed, with pre-mature failure already evident. MDF cooling system runs even during cold outside weather; an air-side economizer might be considered, or tie-in to the VRF system for heat recovery, if connections are available. The VRF CU is in the middle of the SE roof screen wall and may be subject to heat rejected from the adjacent heat pump RTUs; but no comfort issues were reported in the associated spaces.

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
HVAC Distribution Systems	1977	2013	2	25	DS	01/01/14	Two (2) new heat recovery air handling units, one for each large pool space (north & south), plus exhaust fans. See equipment inventory for details. Overhead ductsox supply air distribution to pool rooms. Low return air grills at west-end pool room walls, with new multiple low point pick-up exhaust or return air duct along south wall of family pool space. Hydronic fan coil units serving several smaller spaces such as life guard office and training room. General and source specific exhaust fans. Installation of 2013 Natatorium HVAC Replacement work appears 95% complete with some closeout work still in progress, but mechanical construction work is substantially complete, with all equipment operable, if not optimized. The new AHUs do not appear properly fastened to their roof curbs. There are still holes and leakage in the ductwork. The pool room exhaust air discharge on west side of the family pool space unit is condensing on the surface of the new unit. There are still dead air flow pockets in the family pool room, particularly in the NW stairwell, resulting in dripping wet metal and glass surfaces, particularly near the door to the outside play area. The new AHU condensate drain system has no insulation or heat trace, and reportedly froze-up during recent cold weather, causing extensive damage to the condensate drainage system, and potentially to internal AHU components; the air filter banks were still near soaking wet during the field survey. Some of the new large ductwork is oil-canning, such as the supply air plenum on top of the family pool AHU; may not be rated for pressure class or constructed per SMACNA. Large sheet metal duct hanger rods and hoops are excessively corroded, and should all be cleaned, inspected, and coated, if not replaced in the near future.

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Terminal and Packaged Units	1977	2011	2	18	DS	01/01/14	Eight (8) heat pump on roof top units (RTUs) with electric resistance auxiliary heat serving larger non-pool spaces. Electric resistance wall heaters with on-board t-stats for utility spaces. Sheet metal ductwork to served spaces. VRF system services smaller non-pool spaces, including several heat recovery units. Ceiling fans in exercise room and dance room. Ventilation air and/or cooling capacity appears inadequate for some spaces, such as the dance studio, as evidenced by staff use of large portable fans and free weights to block open self-closing egress doors to outside. Some electric resistance wall heaters inoperable or unreliable (<$2K). Rooftop duct to dance room oil-canned in, resulting in standing water which will eventually corrode and leak into ductwork (if not already).
HVAC Controls and Instrumentation	1977	2011	3	20	DS	01/01/14	Combination of standalone, semi-networked, and building automation system controls including Siemens DDC, on-board controls for RTUs, proprietary controls for Daikin VRF system, special controls for pool systems, on-board t-stats for wall heaters, on-board controls for boilers, and others. The new (2010) Siemens DDC is reportedly still being set-up for proper operation, particularly for control of the new 2013 pool room HVAC equipment. Some controls have been damaged by high humidity and/or corrosive atmosphere from 2010 to 2013. Reportedly boiler and RTU on-board controls do not interface well with the Siemens DDC system; and Aaon RTU on-board control boards have been failing pre-maturely. Opportunity to fully commission all control systems to optimize building and system performance.

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Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Fire Protection							
Fire Protection Sprinkler Systems	1977	2011	2	30	DS	01/01/14	Six-inch city fire service enters fire sprinkler riser room to west via post indicator valve (PIV). Service entry static pressure is 50 psig. Four-inch fire department connection (FDC) also enters at riser room. One wet-pipe and one-dry pipe fire sprinkler system, with dry system protecting several large roof eve/canopy areas. Mix of exposed and concealed sprinkler heads. Sprinkler piping in overhead of pool and pool equipment rooms may have been damaged from high moisture and corrosive atmosphere from 2010 to 2013, and should be closely inspected and serviced as needed. The FDC was not observed on the site, but is assumed present. PIV access is blocked by pool materials stored in the congested area just outside the sprinkler riser room (<$2K). Riser room piping arrangement is awkward and hampering access
Fire Protection Specialties	1977	2011	2	23	DS	01/01/14	Fire extinguishers in plastic surface mounted fire extinguisher cabinets. While most extinguisher inspection tags are current, some extinguisher cabinets are missing or damaged, with extinguishers loose on the floor. There appears to be too few extinguishers.
Other Fire Protection Systems	2011	2011	2	20	DS	01/01/14	While not observed, at least one AED is assumed present. Emergency breathing gas mask in pool pump room. Verify AED(s) are installed per applicable codes, standards, and City policy; at the least one should be installed in the main entry lobby/front desk area, if not already (<$2K). Emergency breathing gas mask does not appear to be properly maintained; one mask appears to be missing (<$2K).

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Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Electrical							
Electrical Service and Distribution	1977	2011	1	37	RA	01/01/14	Building main switchboard and distribution panels are located in the main electrical room. One 480v 150kva dry type transformer provides 208/120v normal power and one 30kva dry type transformer provides 208/120v emergency power. Additional branch distribution panels and transformer are further located in hallway mechanical room and pump room with 480v and 208v equipment. Main switchboard is 2000A 480/277v rated, with ground fault main breaker, with proper metering and TVSS protection. All main service equipment and distribution panels are newly installed in 2010. All Cutler-Hammer equipment, in excellent condition. Equipment and electrical panels have sufficient capacities with plenty of spares and spaces for additional load. No deficiency and component failure are found. Only one panel in the pump room is found having minor surface rust at the panel door hinges, and can be cleaned up easily. Snohomish PUD Pad mount transformer #A-45779, 750KVA 480/277V, connecting main switchboard in main electrical room with underground conduits, in excellent condition.
Lighting and Branch Wiring	1977	2011	3	27	RA	01/01/14	Interior lighting system has fluorescent T5 fixtures in all interior rooms, front desk, locker rooms, hallways, offices, conference rooms, fitness and racquetball courts. LED fixtures are used in the front desk, shower and some pool perimeter area. Occupancy sensors are used in the rooms to control lights as required by energy code. Branch wiring and devices are installed in conduits. Devices are 20A grounding type, flush mounted in all finished area. General area lighting fixtures, lighting level and branch wiring are in good condition. Front landscape ground lights have water leaks. Deficiency: low voltage switches are not working in life guard office. LED light fixture driver and control failures at West end of North Natatorium and all locker room shower stalls. Opportunity: add building perimeter lighting to East and West.

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Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
Communication	1977	2011	1	22	RA	01/01/14	Building has a fire alarm system. Main fire alarm Gamewell E3 series evacuation control panel is located in the fire sprinkler room. Remote fire alarm annunciator panel is located in the front lobby. Devices consist of smoke detectors in special control rooms, speaker strobes located throughout building rooms, hallways and pull stations at main exits. Building has a security alarm system with keypads and motion detectors at major exits. Building has a data/voice Cat-6 wiring device system with MDF/IDF in communication room. Building has a Dukane sound system with ceiling speaker and wall speaker distribution. Building has a security camera system with ceiling mounted boom cameras at major corridors provide building security surveillance. All system equipment and devices are newly installed in 2010 and In excellent condition. Deficiency: ground water in Communication room through underground conduits.
Other Electrical Systems	1977	2011	1	17	RA	01/01/14	Building has an outdoor diesel generator located at south side of building. Generator underground feeder connecting main emergency automatic transfer switch located in main electrical room. Generator provides emergency power to building emergency lighting and emergency equipment through emergency branch panels and step down transformer. Remote annunciator panel is located in the front circulation desk office. Generator, in one single outdoor enclosure with a diesel base tank generator is a Onan Cummins 125KW/156.7KVA 480/277V unit, has a 400A/3 phase output circuit breaker on the generator. All generator, automatic transfer switch, emergency transformers and electrical panels are installed in 2010 in excellent conditions.

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Facility Summary

City of Lynnwood
Lynnwood Recreation Center Site
Lynnwood Recreation Center Building

Facility Components

Systems	Original System Date	Last Major System Renewal	Scores	Remaining Useful Life - Yrs	Surveyor/ Survey Date		Comments
E Equipment and Furnishings			**1.0**				
Equipment							
Commerical Equipment	2011	2011	1	24	DP	01/01/14	Washer / Dryer and office equipment. Washer dryer assumed to be in good condition.
Institutional Equipment	2011	2011	1	24	DP	01/01/14	Wood and laminate shelving. Generally in excellent condition.
Other Equipment	2011	2011	1	24	DP	01/01/14	Gym and exercise equipment. Generally in excellent condition.
Furnishings							
Fixed Furnishings	2011	2011	1	29	DP	01/01/14	Wood / laminate casework. Generally in excellent condition. All or most polylaminate. Counter tops in 'wet' locations do not appear to have been properly sealed. Cost estimated at $200 to seal counters where needed.
F Special Construction			**2.0**				
Special Construction							
Integrated Construction	2011	2011	1	34	DP	01/01/14	Suana. Generally in excellent condition.
Special Construction Systems	2011	2011	1	34	DP	01/01/14	Alluminum and steel exterior gates. Generally in excellent condition.
Special Facilities	1977	2011	2	30	DS	01/01/14	Ensuring all the pools are addressed; North and south pool rooms each include multiple pools and other special aquatic systems and equipment. Swimming pool tank and water park tank and associated equipment generally appear to be in excellent condition.
Special Controls and Instrumentation	1977	2011	3	10	DS	01/01/14	Chlorine room gas leak detection and alarm system. Chlorine alarm system condition appeared to be somewhat marginal/fair condition - may be consmetic, therefore clean and verify proper operation (<$2K).

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Section IV: Cost Mark-ups

Report Title: Deficiency Repair Cost Markups by System

This Deficiency Repair Cost Markups by System report first aggregates Subsystem (e.g., Exterior Walls) costs into System (e.g., Exterior Closure) costs. For planning and budgeting purposes, these Direct Construction Costs (i.e., labor and materials for installation) are then marked up as follows:

Contingency			30%
General Contractor Mark-ups (overhead & profit)			20%
Project Soft Costs			50%
Includes:	9.5%	WSST	
	8%	Administration	
	4%	Escalation	

Supporting Documents

a) Detailed Assessment – Observed Deficiencies 2014 – 2019 (9 pages)

Deficiency Repair Cost Markups By System

City of Lynnwood

Site: Lynnwood Recreation Center Site

Facility	System	Construction Cost	Contingency 30%	Contractor's OH & P 20%	Project Soft Cost 50%	Total Project Cost (Undiscounted/ Unescalated)	Total Project Cost (Present Value)
Lynnwood Recreation Center Building	Foundations	$15,000	$4,500	$3,900	$11,700	$35,100	$33,922
	Exterior Closure	$5,000	$1,500	$1,300	$3,900	$11,700	$11,477
	Roofing	$58,450	$17,535	$15,197	$45,591	$136,773	$126,646
	Interior Construction	$4,000	$1,200	$1,040	$3,120	$9,360	$8,924
	Staircases	$15,000	$4,500	$3,900	$11,700	$35,100	$32,501
	Plumbing	$189,500	$56,850	$49,270	$147,810	$443,430	$405,578
	HVAC	$118,659	$35,598	$30,851	$92,554	$277,662	$259,081
	Fire Protection	$5,000	$1,500	$1,300	$3,900	$11,700	$11,137
	Electrical	$60,000	$18,000	$15,600	$46,800	$140,400	$140,400
	Facility Total	**$470,609**	**$141,183**	**$122,358**	**$367,075**	**$1,101,225**	**$1,029,667**
	Site Total	**$470,609**	**$141,183**	**$122,358**	**$367,075**	**$1,101,225**	**$1,029,667**

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V. OBSERVED DEFICIENCIES

Report Title: Detailed Assessment – Observed Deficiencies 2014 – 2019

This report reflects each of the Observed Deficiencies identified by the FCA survey team in the field to require repair or replacement within the next six (6) years (i.e., immediate + 5 years). Using a major maintenance threshold of $2,000 (i.e., minor maintenance < $2,000), surveyors documented UniFormat Level IV Materials and their remaining useful life, which generates the projected year of repair/replacement. Specific Deficiencies are noted in Red, while specific Actions are noted in Green. Quantities and unit pricing is then detailed to generate Direct Construction Costs (i.e., labor and materials for installation). The header of this report sums all Observed Deficiency Costs and also provides present value of all Observed Deficiencies for both the building and infrastructure system.

It should be noted that the condition scores relate directly to the UniFormat Level IV - Material that is described in each Observed Deficiency. These Level IV condition scores frequently differ from the UniFormat Level III – Subsystem condition scores found in the Facility Summary report. For example, one particular area of a system may be scored 4-Poor, but overall, the system may be scored 3-Fair.

Detailed Assessment w/ Archived Deficiencies

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site BMAR Cost: $470,609

Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Facility: Lynnwood Recreation Center Buildi									
System: Foundations				**Total System Deficiency RepairCost: $15,000**					
Slab On Grade									
Cast-in-Place Concrete (1)	5	1		There is a portion of the recently placed reinforced concrete pool deck where the reinforcing bars are exposed with no clear cover at the surface. Given the chloride-rich environment, the condition of the concrete will deteriorate rapidly, leaving an unsafe walking surface.	Determine the extent of pool deck slab where reinforcing bar cover is less than 1 inch. Remove that area of concrete and replace with new concrete and reinforcing bars located with 1.5 inches of clear cover at surface.	400	$30.00	sf	$12,000
Cast-in-Place Concrete (2)	4	5		Given the corrosive environment in the pool area, there is a significant crack that runs nearly the width of the original pool, located on the east side at the step in concrete elevation.	Epoxy inject cracks in the pool room slab-on-grade larger than 1/32-inch thick.	50	$60.00	ft	$3,000
Facility: Lynnwood Recreation Center Buildi									
System: Exterior Closure				**Total System Deficiency RepairCost: $5,000**					
Exterior Walls									
Masonry Veneer	4	1		Significant efflorescence is visible below upper floor mechanical room exterior access door. There no sill flashing over the top of the masonry wall below. Water is running directly into the wall cavity behind the masonry veneer. Masonry veneer with air cavity over weather resistant barrier.	Further investigation needed to determine what damage if any has occurred to the masonry ties, substrate or wall structure and if the masonry needs to be replaced. At a minimum mechanically dry out the wall cavity. Install sill/masonry cap flashing with end dams and seal weather tight.	1	$5,000.00	ls	$5,000

Note: Cost estimates shown are raw construction costs and do not include any mark-ups or escalation.

Print Date: 05/30/14

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Detailed Assessment w/ Archived Deficiencies

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site BMAR Cost: $470,609

Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Facility: Lynnwood Recreation Center Buildi									
System: Roofing				**Total System Deficiency RepairCost: $58,450**					
Roof Coverings									
Composite Deck	4	4		Water was found to occur at the composite concrete deck areas below the roof top mechanical equipment. Reportedly further testing and mitigation work will be continuing when conditions allow. This reviewer estimates that possibly as much as 5000 to 5500 square feet might be involved in equipment removal and roof system replacement. Other portions of membrane roof are in good condition.	Remove and replace affected roof assembly - Dry out, install vapor barrier, new rigid insulation and new TPO membrane as designed and specified.	5,500	$9.50	sf	$52,250
Projections									
Soffit	2	4		The older mansard overhang fascia wood is severely UV and weather checked, the new finish coating does not fill cracks and there is some dry rot type of degradation. In a couple of cases the roof overflow tube is flush with the mansard overhang soffit. The soffit board is saturated at the overflow drain outlet. The soffit has water damage in several locations. Wood soffit areas	Repair and repaint soffit. Add 3 inch wide sheet aluminum inside existing overflow drain in bead of sealant and attach with sheet metal screws. Extend aluminum sheet 1 inch below existing soffit. Remove damaged tough and ground cedar siding and replace with matching material and paint.	1	$6,200.00	ls	$6,200
Facility: Lynnwood Recreation Center Buildi									
System: Interior Construction				**Total System Deficiency RepairCost: $4,000**					
Fittings									
Locker Bases	3	4		Rust streaks are appearing at all locker bases at the trench drain. Rust streaks are appearing at all locker bases at the trench drain. This would suggest that the locker bases may be metal framed providing a source for the rust in a wet condition.	Remove tile to determine source and correct with proper sealant system; restore finishes.	1	$2,000.00	LS	$2,000

Note: Cost estimates shown are raw construction costs and do not include any mark-ups or escalation.

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Detailed Assessment w/ Archived Deficiencies

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site BMAR Cost: $470,609

Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Accessories	5	1		Fixtures and accessories not properly fixed and sealed to tile walls. ADA fold-up benches are failing.	Fix and seal all lose and unsealed fixtures. Recommend removal of existing fold-up bench and replacement with fixed stationary benches designed for impact loads of children standing on bench.	1	$2,000.00	LS	$2,000
				Many toilet accessories are poorly mounted and lose. Plumbing control shower fixtures are loose and not properly sealed. This will cause degradation of the wall when moisture penetrates the wall cavity. Two fold-up ADA shower seats in the family changing rooms have failed and have been removed. It is not clear if other benches in the seven changing rooms are also failing or will possibly fail.					
Facility:	**Lynnwood Recreation Center Buildi**								
System:	**Staircases**			**Total System Deficiency RepairCost: $15,000**					
Stair Construction									
Stair Carriage and Column Support	4	4		The current protective coating is failing.	Sand blast existing coating and apply TENEMEC or other appropriate epoxy protective coating.	1	$15,000.00	LS	$15,000
				The stair and associated hardware of the stair leading to the slide and mechanical loft mezzanine are becoming rapidly corroded. Multiple coats of special coating suitable to the pool environment such a TENEMEC should have been utilized on all exposed ferrous and aluminum metals. Plastic sleeved hand rails and brackets are severely corroding. Sprinkler piping and duct support systems are severely corroded.					
Facility:	**Lynnwood Recreation Center Buildi**								
System:	**Plumbing**			**Total System Deficiency RepairCost: $189,500**					
Plumbing Fixtures									
Shower Faucets	4	3		Most or all shower faucets failing, including loose or damaged face plates, weak stems, and sloppy operation.	Replace all shower faucets with institutional, not residential or light commercial rated faucets. Clean and inspect shower walls; repair moisture damage as needed. Modify shower wall openings as needed to accommodate new shower faucets.	25	$1,000.00	ea	$25,000

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Print Date: 05/30/14

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Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Lavatory Faucets	3	5		Inconsistent lavatory automatic faucet flow and pressure at some lavatories.	Test, adjust, and replace as needed.	10	$500.00	ea	$5,000
Domestic Water Distribution									
Copper Tubing	3	5	3	Prematurely corroded copper domestic water tubing where exposed to excessive high moisture and/or corrosive enviroment.	Clean, inspect, and protect or replace as needed. While most the corrosion is in the pool and pool mechanical rooms, other areas, such as locker rooms, office, and fitness areas should be spot checked. Piping in walls should similarly be spot checked. If significant corrossion is found in spot checked areas, the inspection should be expanded as appropriate.	500	$5.00	lf	$2,500
Sanitary Waste									
Floor and Trench Drains	4	15		Various floor and trench drains not properly draining the served floor area. 1. Floor drains. 2. Trench drains.	Reslope floor areas for positive drainage to nearest floor or trench drain; especially in locker rooms. Assume 500 sf.	500	$15.00	sf	$7,500
Rain Water Drainage									
Downspout at Exercise	4	2		Downspout at new NE exercise room back-ups during heavy rain, resulting in leakage to space below.	Enlarge existing or provide additional DS per code to adequately drain the butterfly roof area; ensure overflow drainage is provided per code; ensure integrity of roof covering for weather tightness; inspect and repair any damage from past water leakage.	1	$5,000.00	lot	$5,000
Roof Drainage at Original Structure	4	3		Roof drain tail pieces too short with water damaging GWB soffit. 1. Roof drains (RDs). 2. Scuppers.	Extend RD tail pieces to well below GWB soffit (3 to 4 inches beyond soffit); install new downspout (DS), approximately 10 ft vertical each; pipe to site storm drain system.	10	$1,000.00	ea	$10,000

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Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Rain Drainage at New Flat Roof	4	5		Roof drains & overflow bodies not set correctly. Roof not draining to roof drain & overflow roof drain recesses. Some recesses poorly located and already damaged. 1. Roof drains (RDs). 2. Overflow roof drains (ORDs).	Reslope roof to drain properly. Reset roof drain & overflow roof drain (especially roof drain) to properly drain the recessess without excessive standing water. Relocate awkardly located recesses or provide maintenance access "bridge". Ensure standing water is not accumulating near RTU and other HVAC system outside air intakes.	20,000	$5.00	sf	$100,000
Other Plumbing Systems									
Pumps	4	3		Pump materials are failing, requiring re-build semi-annually. 1. Family whirlpool pump (205 gpm @ 70 ft tdh, 10 hp). 2. Family jet pump (260 gpm @ 80 ft tdh, 15 hp).	Replace pumps with new units including materials of construction suitable for pool chemistry and temperature.	2	$5,000.00	ea	$10,000
Pool Plumbing	3	5		Equipment, pumps, and controls were exposed from 2011 to 2013 to excessive humiditiy and corrossive environment; all should be more closely cleaned, tested, and serviced as needed to optimize remaining service life. 1. Equipment. 2. Pumps. 3. Controls.	Clean, inspect, test, and repair or replace as needed.	1	$10,000.00	lot	$10,000
Material Storage	4	3		Dry and wet chemicals in bags, buckets, and bottles stored incorrectly in pump room. Filter cartriges and other bulk supplies similarly stored in pump room. Improper storage may be damaging capital equipment and systems, creating safety hazards, and reducing operational effeciveness. 1. Chemicals, 2. Filter media.	Provide organized storage including shelving, bins, lockers, and/or racks to safely and cost effectively store pool chemicals and consumables.	3	$1,500.00	ea	$4,500
Access	4	3		Pump pit ladder is vertical, not a ships ladders as called-out in the construction documents. Pump pit sump lid is removed to facilitate inspection from main level; has no inspection hatch. Access to some equipment difficult at best, such as many of the plate & frame heat exchangers, several closely spaced pumps, and pipe & valve nests. 1. Ladders. 2. Inspection ports.	Provide ships ladder to pump pit, inspection hatch for pump pit sump, adequate maintenance access to equipment requiring periodic maintenance.	1	$10,000.00	lot	$10,000

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Detailed Assessment w/ Archived Deficiencies

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site BMAR Cost: $470,609

Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Facility:	**Lynnwood Recreation Center Buildi**								
System:	**HVAC**			**Total System Deficiency RepairCost: $118,659**					
Energy Supply									
Thermal Envelope	4	1		Original thermal envelope integrity not confirmed, particularly in ceiling plenum, attic, and mansard roof space. New thermal envelope in pool area likely compromized by high moisture and corrosive atmopshere from 2011 to 2013. 1. Original (1977) construction. 2. New (2011) construction.	Conduct exterior and interior infrared thermography, and selected destructive testing of suspect roof and wall assemblies.	44,292	$0.25	sf	$11,073
Commissioning	4	1		Completion of commissioning (Cx) requirements per WA State Energy Code and LEED is unclear; for example sequences of operation in construction documents have some inconsistencies and several incomplete elements. Equipment is not properly labeled or tagged, particularly in the pool pump room. Controls integration is not clear; reportedly there are issues with onboard controls, such as for boilers, not fully interfacing with the building DDC system; same for the Aaon heat pump roof top units (RTUs). 1. Fundamental commissioning.	Complete Cx as required by WSEC and/or LEED, with full report to Owner, O&M and/or Systems Manual, and O&M staff training on both 2011 and 2013 construction systems. If fully compeleted previously, consider Re-Cx to a LEED Enhanced Cx level to optimize performance (see Opportunity). Budget here is for City staff to manage completion of the Cx process, assumed to be already under contract to others.	45,292	$0.15	sf	$6,794
Heat Generating Systems									
Hot Water Pump	4	1		One of the two secondary hot water distribution pumps is out of alignment, requiring re-builds every 6 to 12 months, which is excessive; likely to require complete replacement in several years, with complete failure possible at any time. 1. Secondary circulating pump.	Remove existing pump for refubishment as a spare, or sell as surplus as desired. Check for excessive cold-spring upon disconnect; re-align or modify piping if needed. Procure and install new pump, meeting original specification requirements. Align and test new pump. Update CMMS database upon completion of this work.	1	$7,500.00	ea	$7,500

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Detailed Assessment w/ Archived Deficiencies

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site BMAR Cost: $470,609

Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Boiler Flue	4	3		Recently extended boiler flue has excessive condensate, potentially leading to damage of wall, roof covering below, and flue interior.	Insulate, capture and direct condensate to approved location, protect wall and roof covering, and repair any damage as needed.	2	$2,500.00	ea	$5,000
Boilers (2)	4	1		Excesssive corrosion from high moisture and/or corrosive atmphere from 2011 to 2013. 1. Components	Clean, inspect, protect, and repair or replace as needed.	2	$1,500.00	ea	$3,000
Boilers (1)	5	0		Acid neutralization chemical charges exhausted; have caused floor slab and potentially floor drain and piping damage. 1. Condensate neutralization.	Clean, service, and re-charge both acid neutralization reservoirs. Clean, inspect and repair boiler concrete pad, floor, floor drain, and downstream drain piping.	2	$1,250.00	lot	$2,500
Cooling Generating Systems									
Chilled and Condensed Water Piping	4	2		Jacketing is improperly installed with readily visible openings in jacket. Insulation jacketing.	Fully jacket and seal new (2013) chilled water and condenser water piping per construction specifications, code, and good industry practice.	100	$10.00	ft	$1,000
Chiller Room	4	1		Chiller room wall is not painted. Chiller room has neither cooling nor ventilation. Chiller package leveling system delicate mechanism is unprotected. 1. Wall finish. 2. Cooling. 3. Ventilation. 4. Leveling and vibration isolation system.	Paint chiller room. Provide chiller room ventilation cooling system. Install sheet metal proection shroud for pneumatic chiller package leveling system (one shroud at each of four corners).	1	$5,000.00	lot	$5,000
HVAC Distribution Systems									

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Print Date: 05/30/14

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Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Pool Air System	4	5		Potentially inadequate AHU anchorage to roof curb. Wet internals and wet filters. Freeze damaged condensate drain system. Excessively oil-canned supply air duct plenum. TAB test holes, and miscellaneous duct and equipment joint air leakage. Exhaust air condensing on AHU exterior skin. Inadequate air circulation to some areas, especially at family pool room NW stair area. Excessively rusty inside sheet metal duct hanger rods and hoops. 1. Curb. 2. AHU enclosure. 3. Duct plenums. 4. Duct mains outside. 5. Condensate piping. 6. General arrangement. 7. Inside flex duct. 8. Inside sheet metal duct and support.	Investigate, inspect, test, and correct as needed.	2	$15,000.00	ea	$30,000
Terminal and Packaged Units									
Ductwork	4	3		Portions of duct oil-canned down with standing water. Rooftop exposed duct.	Reshape and stiffen duct to shed water.	1	$1,500.00	lot	$1,500
HVAC Controls and Instrumentation									
Controls	4	5		Damage from exposure to high humidity and/or corrosive atmosphere. Poor communications between boiler and RTU on-board controls and building DDC. In-operable occupant temperature adjustment input to DDC. Pre-mature failure of RTU on-board controls. Some RTU sensors, such as for economizer control have not been properly set-up or commissioned (some sensors still have shipping tape covering sensors, preventing their proper operation). 1. DDC. 2. On-board proprietary controls.	Inspect, clean, and test all controls for conformance to design intent. Complete incomplete work, including programming of DDC to accommodate the 2013 Natatorium HVAC Replacement work.	45,292	$1.00	sf	$45,292

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Detailed Assessment w/ Archived Deficiencies

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site BMAR Cost: $470,609

Material	Cond.	Useful Life	Mag. Of Severity	Deficiency Condition Notes	Action	Qty	Unit Cost	Unit	Cost
Facility: Lynnwood Recreation Center Buildi									
System: Fire Protection				**Total System Deficiency RepairCost: $5,000**					
Fire Protection Sprinkler Systems									
Fire Sprinkler	4	5		Portions of fire sprinkler distribution piping and heads excessively corroded from exposure to high moisture and/or corrosive environment from 2011 to 2013.	Clean, inspect, coat, and test all corroded sprinkler distribution piping and sprinkler heads in the pool rooms and pool equipment room areas.	1,000	$2.00	ea	$2,000
Fire Protection Specialties									
Fire Extinguishers	4	1		May be too few fire extinguishers to meet current code and/or Fire Marshall requirements. Extinguishers were not found in many spaces; and were not found near some egress doors, as is common. 1. Cabinets. 2. Extinguishers.	Install additional fire extinguishers per code, Fire Marshall, and insurer requirements as applicable.	10	$300.00	ea	$3,000
Facility: Lynnwood Recreation Center Buildi									
System: Electrical				**Total System Deficiency RepairCost: $60,000**					
Lighting and Branch Wiring									
Lighting and Branch Wiring	4	0		Locker room shower lights, life guard office and adjacent area at pool have failed low voltage switches, LED lights and push buttons due to moisture and accumulation of corrosion. natatorium Interior lighting fixtures, switches and wiring	Replace low voltage switches, LED lights, push buttons and further evaluation of wiring.	1	$50,000.00	LS	$50,000
Communication									
Communication Equipment	5	0		Ground water entering to communication room through (2) underground conduits. Water will cause damage to communication room flooring and equipment. Underground conduits.	Remove (2) underground conduits to building point of entry.	1	$10,000.00	LS	$10,000

Note: Cost estimates shown are raw construction costs and do not include any mark-ups or escalation.

Print Date: 05/30/14

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VI. OPPORTUNITIES

Report Title: Opportunity by Subsystem

This is a special report that goes above and beyond documentation typically reflected by the industry standard Facility Condition Report because it does not document any system deficiency, per se. In strict terms, an FCA will document system or subsystem deficiencies that may prevent a facility or system from performing as originally design and permitted at the time of construction. However, leveraging the FCA process, many system may benefit from upgrades to meet current code requirements or the specific objectives of an asset manager (e.g., energy efficiency, improved security, etc.). Such opportunities are documented using a form formatted virtually identical to the Detailed Assessment – Observed Deficiencies 2013 – 2018 report. The costs in this Opportunities report reflect Direct Construction Costs. These costs then appear with markups and Total Project Cost in the Facility Summary.

4.4 - Opportunity Summary By Subsystem

City of Lynnwood

Site: Lynnwood Recreation Center Site

Total Site Opportunity Cost: $61,252

Subsystem	Opportunity	Action	Qty	Unit Cost	Unit	Cost
Facility: Lynnwood Recreation Center Buildi						
System: Vertical Transportation	**Total Cost: $10,000**					
Elevators and Lifts						
	No ADA lift to family pool area slides.	Install ADA-rated manually operated commercial pool lift; powder-coated stainless steel with chlorine resistant seat & back materials and safety belt; 400 lb minimum weight rating.	1.00	$10,000.00	ea	$10,000
Facility: Lynnwood Recreation Center Buildi						
System: Plumbing	**Total Cost: $8,000**					
Plumbing Fixtures						
	Most or all plumbing fixtures are code minimum. Opportunity to reduce water use and associated city water bill by installing high-efficiency plumbing fixtures and trim as existing fails.	Upgrade to high efficiency plumbing fixtures as existing fixtures fail. Assume 50 fixtures over time at an incremental cost of $100 each over code minimum fixtures. Defray cost with water utility grants and/or rebates as available.	50.00	$100.00	ea	$5,000
Domestic Water Distribution						
	Original 1977 water service is four-inch, which may be over-sized for now fully enclosed pools with modern pool water chemistry control and code compliant plumbing fixtures throughout. Following further study water meter size may potentially be reduced one size to reduce monthly city water bill.	Study domestic water load and reduce meter size from 4-inch to 3-inch if study indicates flow will be sufficient to meet the load. Consider load management strategies, such as night-fill.	1.00	$3,000.00	study	$3,000

Note: Cost estimates shown are raw construction costs and do not include any mark-ups or escalation.

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4.4 - Opportunity Summary By Subsystem

City of Lynnwood

Site: Lynnwood Recreation Center Site **Total Site Opportunity Cost: $61,252**

Subsystem	Opportunity	Action	Qty	Unit Cost	Unit	Cost
Facility: Lynnwood Recreation Center Buildi						
System: HVAC	**Total Cost: $34,352**					
Energy Supply						
	Active building system optimization opportunities abound; controls and sequences are unclear; some installed control features, such occupant temperature adjustment are currently disabled or non-functional; building pressurization may be sub-optimized; historical energy use is unknown; there are few or no signs of enhanced commissioning (Cx); and no observed or reported Systems Manual, but reportedly an O&M Manual may exist. Opportunity to Re-commission and/or Enhance Retro-commission the Lynnwood Recreation Center building facility, including HVAC, Plumbing, Lighting, Thermal Envelope, Plug Load, Occupant Behavior, and especially pool specialty systems.	Conduct enhanced retro-Cx.	45,292.00	$0.35	sf	$15,852
Cooling Generating Systems						
	MDF runs continuously in cooling mode, even during cool/cold winter weather. Opportunity to install heat recovery ductless split unit and connect to existing VRF system for heat recovery; alternately simply use ventilation cooling from adjacent corridor space during the heating season.	Install VRF terminal unit in MDF room for heat recovery to other spaces during heating season.	1.00	$3,500.00	ea	$3,500
Terminal and Packaged Units						
	Several non-pool spaces, including Group Exercise 145 and Multi-purpose 153 appear under-cooled and/or under-ventilated as evidenced by staff use of large portable fans, and free weights to prop open doors, including self-closing egress doors to outside. Opportunity to increase cooling and/or ventilation capacity to meet space use requirements without use of portable equipment of blocking doors open.	Install supplemental space ventilation equipment in Group Exercise, Multi-purpose 1, and Multi-purpose 2 spaces. May include additional ceiling fans in Group Exercise.	3.00	$5,000.00	ea	$15,000
Facility: Lynnwood Recreation Center Buildi						
System: Fire Protection	**Total Cost: $2,500**					
Fire Protection Sprinkler Systems						
	Fire sprinkler riser room piping is awkwardly installed, wasting space, and making for needlessly difficult access to sprinkler risers and other equipment and materials in the riser room.	Reconfigure sprinkler piping for improved space function.	1.00	$2,500.00	lot	$2,500

Note: Cost estimates shown are raw construction costs and do not include any mark-ups or escalation.

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4.4 - Opportunity Summary By Subsystem

City of Lynnwood

Site: Lynnwood Recreation Center Site **Total Site Opportunity Cost: $61,252**

Subsystem	Opportunity	Action	Qty	Unit Cost	Unit	Cost
Facility: Lynnwood Recreation Center Buildi						
System: Electrical	**Total Cost: $6,400**					
Lighting and Branch Wiring						
	Provide building perimeter lighting at building East, and building South.	Provide wall mounted LED fixtures.	8.00	$800.00	ea	$6,400

Note: Cost estimates shown are raw construction costs and do not include any mark-ups or escalation.

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VII. EQUIPMENT INVENTORY

Report Title: CMMS Inventory

This is an Excel based document used to inventory major pieces of equipment warranting preventive maintenance tasks on a Bi-Annual; Annual; Quarterly; and Monthly basis. This data is also being provided in electronic format to facilitate the upload by the City into its CMMS System: Cartegraph.

SITE: Recreation Center

BUILDING: Recreation Center

Component	Cartegraph ID	Description	Location	Manufacturer	Model #	Manuf Part No	Serial #	Install Date	Maintenance	Comments
BLR-1		Condensing Boiler	MECH LOFT 201	Cleaver Brooks	CFC-700-1800-60HW		16010180010006	2010	Blr-Q1, A3, A4	1.75 mmbtu
BLR-2		Condensing Boiler	MECH LOFT 201	Cleaver Brooks	CFC-700-1800-60HW		16010180010008	2010	Blr-Q1, A3, A4	1.75 mmbtu
BP-1		Boiler Recirc Pump	MECH LOFT 201	B&G	60		Illegible	2010	Pump-Q1, A1	85 gpm
BP-2		Boiler Recirc Pump	MECH LOFT 201	B&G	60		Illegible	2010	Pump-Q1, A1	85 gpm
HP-1		Heating Hot Water Pump	MECH LOFT 201	B&G	1510-2BC		C112157-02H01	2010	Pump-Q1, A1	180 gpm
HP-2		Heating Hot Water Pump	MECH LOFT 201	B&G	1510-2BC		Illegible	2010	Pump-Q1, A1	180 gpm
VFD HP-1		Variable Frequency Drive for HP-1	MECH LOFT 201	ABB	Unknown		Unknown	2010	VFD-A1	
VFD HP-2		Variable Frequency Drive for HP-2	MECH LOFT 201	ABB	Unknown		Unknown	2010	VFD-A1	
HRP-1		Heat Recovery Pump	POOL MECH 173	GOULDS	NPE- 1 1/4 X 1 1/2 -6		Illegible	2010	Pump-Q1, A1	40 gpm
HRP-2		Heat Recovery Pump	POOL MECH 173	GOULDS	NPE- 1 1/4 X 1 1/2 -6		Illegible	2010	Pump-Q1, A1	60 gpm
DWH-1		Domestic Water Heater	MECH 112	AO SMITH	BTH-199-100		1031M001469	2010	DWH-Q1, A1, B1	100 gal
DWH-2		Domestic Water Heater	MECH 112	AO SMITH	BTH-199-100		1031M002027	2010	DWH-Q1, A1, B1	100 gal
DWH-3		Domestic Water Heater	MECH 112	AO SMITH	BTH-199-100		1031M002013	2010	DWH-Q1, A1, B1	100 gal
HWRP-1		Domestic Hot Water Recirc Pump	MECH 112	TACO	0011		Illegible	2010	RP-A1	6 gpm
HWRP-2		Domestic Hot Water Recirc Pump, for ST-1	MECH 112	TACO	007		Illegible	2010	RP-A1	2 gpm
HX-1		Hydronic Heat Exchanger	POOL MECH 173	B&G	P14-23-TK		Illegible	2010	HX-A1	for Lap Pool
HX-2		Hydronic Heat Exchanger	POOL MECH 173	B&G	P14-9-TK		Illegible	2010	HX-A1	for Wellness Pool
HX-3		Hydronic Heat Exchanger	POOL MECH 173	B&G	P14-8-TK		Illegible	2010	HX-A1	for Adult Whirlpool
HX-4		Hydronic Heat Exchanger	POOL MECH 173	B&G	P14-23-TK		Illegible	2010	HX-A1	for Leisure Pool
HX-5		Hydronic Heat Exchanger	POOL MECH 173	B&G	P14-7-TK		Illegible	2010	HX-A1	for Family Whirlpool
HX-6		Heat Recovery Heat Exchanger	POOL MECH 173	GEA EXOFLEX	NT50M V		Illegible	2013	HX-A1	for NAH-2
HX-7		Heat Recovery Heat Exchanger	POOL MECH 173	GEA EXOFLEX	NT50T		Illegible	2013	HX-A1	for NAH-1
SP-1A & B		Sump Pump, Duplex	POOL MECH 176	WEIL			Illegible	2010	SP-A1	130 gpm
SP-2A & B		Sump Pump, Duplex	POOL MECH 173	WEIL			Illegible	2010	SP-A1	65 gpm
SWH-1		Solar Water Heating Collector	ROOF	APRICUS	AP-30		APKE-30-13597/15840	2010	SWH-Q1	30-tube
ST-1		Solar Water Heating Storage Tank	MECH 112	OVENTROP	540-0017K		(21) C31Q16849	2010	ST-A1	200 gal

Component	Cartegraph ID	Description	Location	Manufacturer	Model #	Manuf Part No	Serial #	Install Date	Maintenance	Comments
RTU-1		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-006-3-0-E60E-111		201006-ANEF03429	2010	RTU-Q1, A1	1800 cfm, Racquet Ball
RTU-2		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-006-3-0-E60E-121		201007-ANEF03449	2010	RTU-Q1, A1	2200 cfm, Group
RTU-3		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-006-3-0-E609-111		201007-AMED14006	2010	RTU-Q1, A1	1200 cfm, Multi-purpose 2
RTU-4		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-013-3-0-E60S-132		201006-ANEK03425	2010	RTU-Q1, A1	5000 cfm, Cardio
RTU-5		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-006-3-0-E60E-111		201007-ANEF03430	2010	RTU-Q1, A1	1800 cfm, Multi-purpose 1
RTU-6		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-008-3-0-E60E-121		201007-ANEH03431	2010	RTU-Q1, A1	3000 cfm, General
RTU-7		Packaged Roof Top Unit, All Electric	ROOF	AAON	RM-A04-3-0-E609-121		201007-AMED14007	2010	RTU-Q1, A1	1200 cfm, Family
RTU-8		Packaged Roof Top Unit, All Electric	ROOF	AAON	RN-013-3-0-E60S-132		201007-ANEF03432	2010	RTU-Q1, A1	2000 cfm, Locker
FC-1		Hydronic Fan Coil Unit	TRAINING	ENVIRO-TEC	HPP-10		Illegible	2010	FC-Q1, A1	700 cfm
FC-2		Hydronic Fan Coil Unit	NEW POOL	ENVIRO-TEC	HPP-12		Illegible	2010	FC-Q1, A1	800 cfm
FC-3		Hydronic Fan Coil Unit	AQUATICS OFF	ENVIRO-TEC	HPP-08		Illegible	2010	FC-Q1, A1	525 cfm
CU-1		Air cooled condensing unit	ROOF	CARRIER	38HDR018-311		0410X93368	2010	CU-Q1, A1	1.5 ton, for FC-1
CU-3		Air cooled condensing unit	ROOF	CARRIER	38HDR018-311		0509X91378	2010	CU-Q1, A1	1.5 ton, for FC-3
HRU-1		Air to Air Heat Recovery Unit	HALL C101	RENEW AIRE	EV450IN		Illegible	2010	HRU-Q1, A1	500 cfm, for Hallway
HRU-2		Air to Air Heat Recovery Unit	STORAGE 139	RENEW AIRE	EV200		D109811R	2010	HRU-Q1, A1	180 cfm, for Storage Rm
EH-1		Electric Heater	RISER ROOM 177B	MARKEL	E3055T20WB		Illegible	2010	EH-A1	Wall-type
EH-2		Electric Heater	MECH LOFT 201	MARKEL	E3055T20WB		Illegible	2010	EH-A1	Wall-type
SSFC-1		Split-system A/C, fan coil	TELECOM 151	CARRIER	40QNC030---3		Unknown	2010	FC-Q1, A1	1.5 ton
SSFC-4		Split-system A/C, fan coil	MDF	CARRIER	40QNC030---3		0609Y50091	2010	FC-Q1, A1	1.5 ton
SSCU-1		Split-system A/C, condensing unit	Roof	CARRIER	Unknown		Unknown	2010	CU-Q1, A1	Observed on roof
SSCU-4		Split-system A/C, condensing unit	Roof	CARRIER	38HDF030-301		3210X92456	2010	CU-Q1, A1	Observed on roof
VRF-1		Variable Rfgnt Flow (VRF) Fan Coil Unit	CONF 135	Daikin	FXDQ18MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VRF-2		Variable Rfgnt Flow (VRF) Fan Coil Unit	CUST 108	Daikin	FXDQ09MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VRF-3		Variable Rfgnt Flow (VRF) Fan Coil Unit	WORK 104	Daikin	FXDQ09MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VRF-4		Variable Rfgnt Flow (VRF) Fan Coil Unit	AQUATICS 105	Daikin	FXDQ24MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VRF-5		Variable Rfgnt Flow (VRF) Fan Coil Unit	MKTG 106	Daikin	FXDQ24MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VRF-6		Variable Rfgnt Flow (VRF) Fan Coil Unit	YOUTH 107	Daikin	FXDQ24MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VRF-7		Variable Rfgnt Flow (VRF) Fan Coil Unit	AQUATICS 113	Daikin	FXDQ07M7VJU		Illegible	2010	FC-Q1, A1	Served by VHP-1

Component	Cartegraph ID	Description	Location	Manufacturer	Model #	Manuf Part No	Serial #	Install Date	Maintenance	Comments
VRF-8		Variable Rfgnt Flow (VRF) Fan Coil Unit	OFF 143	Daikin	FXDQ07MVJU		Illegible	2010	FC-Q1, A1	Served by VHP-1
VHP-1		Variable Rfgnt Flow (VRF) Condensing Unit	ROOF	Daikin	RXYQ96PYDN		A000310	2010	CU-Q1, A1	Serves VRF FCs
EF-1		Exhaust Fan	ROOF	COOK	120 ACE 120C3B		033SD21389-00/0000701	2010	EF-Q1, A1	Restrooms
EF-1 (2nd EF-1)		Exhaust Fan	ROOF	GREENHECK	CUBE-180		Illegible	2013	EF-Q1, A1	3000 cfm, New
EF-2		Exhaust Fan	ROOF	COOK	100 ACRUM 100R10DM		033SD21389-00/0003301	2010	EF-Q1, A1	PH 177
EF-3		Exhaust Fan	ROOF	COOK	100 ACRUH 100R15DM		033SD21389-00/0004401	2010	EF-Q1, A1	Cl 177A
EF-4		Exhaust Fan	ROOF	COOK	120 ACE 120C5B		033SD21389-00/0005501	2010	EF-Q1, A1	Elec 111
EF-5		Exhaust Fan	ROOF	COOK	165 ACE 165C6B		033SD21389-00/0006701	2010	EF-Q1, A1	Mech 173 & 176
EF-6		Exhaust Fan	ROOF	COOK	GC-740		Illegible	2010	EF-Q1, A1	Mech 201
EF-7		Exhaust Fan	ROOF	FANTECH	DBF 110		Illegible	2010	EF-Q1, A1	Wash/Dry 129
EF-8		Exhaust Fan	ROOF	COOK	90 ACEH 90015DH		033SD21389-00/0007901	2010	EF-Q1, A1	Multi-2
EF-9		Exhaust Fan	ROOF	COOK	90 ACEH 90015DH		033SD21389-00/0009101	2010	EF-Q1, A1	Multi-1
EF-10		Exhaust Fan	ROOF	COOK	100 ACE 100C2B		033SD21389-00/0002101	2010	EF-Q1, A1	Cust 142
EF-11		Exhaust Fan	ROOF	COOK	195 ACRU 19 5R6B		033SD97034-00/0000701	2010	EF-Q1, A1	Unknown
UH-1		Unit Heater	Chiller Room	REZNOR	WS		Illegible	2013	EH-A1	
NAH-1		Air Handling Unit	ROOF	TEAM AIR	CAH42000S		032813-557-NAH-1	2013	NAH-Q1, A1	911 mbh
NAH-2		Air Handling Unit	ROOF	TEAM AIR	CAH42000S		032813-557-NAH-2	2013	NAH-Q1, A1	911 mbh
P-1		Pump	Chiller Room	ARMSTRONG	2x2x10		Illegible	2013	Pump-Q1, A1	102.5 gpm
P-2		Pump	Chiller Room	ARMSTRONG			Illegible	2013	Pump-Q1, A1	162 gpm
VFD P-2		Pump VFD	Chiller Room	ABB	Unknown		Unknown	2013	VFD-A1	
A1A		Filtration Pump	POOL MECH 176	AURORA	340-ES 5X6X11		Illegible	2010	Pump-Q1, A1	Pool A - Competition (aka Lap Pool)
A1C		Filter	POOL MECH 176	NATIONAL	NPC-066-0633		NFS-L07-029	2010	F-A1	
B1A		Filtration Pump	POOL MECH 176	AURORA	340-ES 4X5X9		Illegible	2010	Pump-Q1, A1	Pool B - Wellness
B1C		Filter	POOL MECH 176	NATIONAL	NPC-042-0218		NFS-L08-030	2010	F-A1	
C1A		Filtration Pump	POOL MECH 176	STA-RITE	EQK500		Illegible	2010	Pump-Q1, A1	Pool C - Adult Whirlpool
C2A		Jet Pump	POOL MECH 176	PENTAIR	CCSPHK3		Illegible	2010	Pump-Q1, A1	
C1C1 & 2		Filter	Pool Mech South	Unknown	Unknown		Unknown	2010	F-A1	
D1A		Filtration Pump	POOL MECH 176	AURORA	PCS-42-0240		PCS-L09-019	2010	Pump-Q1, A1	Pool D - Leisure Pool

Component	Cartegraph ID	Description	Location	Manufacturer	Model #	Manuf Part No	Serial #	Install Date	Maintenance	Comments
D2A		Pump	POOL MECH 176	AURORA	340-ES 6X6X11		Illegible	2010	Pump-Q1, A1	Inner tube slide pump
D3A		Pump	POOL MECH 176	AURORA	340-ES 4X5X9B		Illegible	2010	Pump-Q1, A1	Body slide pump
D1C		Filter	POOL MECH 176	NATIONAL	NPC-072-0775		NFS-L07-032	2010	F-A1	Leisure pool filter
D1D		Filter Bulk Tank	POOL MECH 176	NATIONAL	PCS-42-0240		PCS-L09-019	2010	F-A1	Media mixing tank
D4A		Pump	POOL MECH 176	AURORA	340-ES 6X6X11		Illegible	2010	Pump-Q1, A1	Leisure activity pump
D5A		Pump	POOL MECH 176	AURORA	340-ES 6X6X12B		Illegible	2010	Pump-Q1, A1	Current channel pump
D6A		Pump	POOL MECH 176	AURORA	340-ES 4X5X9		Illegible	2010	Pump-Q1, A1	Vortex pump
E1A		Filtration Pump	POOL MECH 176	AURORA	340-ES 2.5X3X9		Illegible	2010	Pump-Q1, A1	Pool E - Family Whirlpool
E2A		Jet Pump	POOL MECH 176	AURORA	340-ES 2.5X3X9		Illegible	2010	Pump-Q1, A1	
E1C1 & 2		Filter	North Pool Mech 176	Unknown	Unknown		Unknown	2010	F-A1	
ET-1		Thermal Expansion Tank, Heat Recovery	Chiller Room	B&G	D15V (confirm)		274454	2013	ET-Q1, A1, B1	
ET-2		Thermal Expansion Tank, Heat Recovery	Chiller Room	B&G	D40V		269566	2013	ET-Q1, A1, B1	
ET-H		Thermal Expansion Tank, Heating Hot Water	MECH LOFT 201	B&G	Unknown		Unknown	2010	ET-Q1, A1, B1	
ET-DHW		Thermal Expansion Tank, Domestic Hot Water	MECH 112	B&G	Unknown		Unknown	2010	ET-Q1, A1, B1	
CF-1		Chemical Feed Tank	Unknown	Wingert	HP-5-LEG/AR		0912	2010	CF-Q1, A1	
CF-2		Chemical Feed Tank	Unknown	Wingert	HP-5-LEG/AR		0911	2010	CF-Q1, A1	
CH-1		Heat Recovery Chiller	Chiller Room	Trane	RTWO-080F		U13J07616	2013	CH-M1, Q1, A1	
AC-1		Chiller Air Compressor	Chiller Room	Ingersoll Rand	P1.51U		P21014T13-086B	2013	AC-A1	
GF-1		Glycol Feed Tank	MECH LOFT 201	Unknown	Unknown		Unknown	2010	GF-Q1, A1	
PSP-1		Patio Sump Pump	Patio	Unknown	Unknown		Unknown	2010	SP-A1	
UV-LP		Ultra-violet Treatment & Control, Leisure Pool	Pool Mech Room	ETS	Unknown		Unknown	2010	UV-Q1, A1	Aka D1R
UV-CP		Ultra-violet Treatment & Control, Comp Pool	Pool Mech Room	ETS	Unknown		Unknown	2010	UV-Q1, A1	Aka A1R
UV-WP		Ultra-violet Treatment & Control, Wellness Pool	Pool Mech Room	ETS	Unknown		Unknown	2010	UV-Q1, A1	Aka B1R
UV-AP		Ultra-violet Treatment & Control, Adult W-Pool	Pool Mech Room	ETS	Unknown		Unknown	2010	UV-Q1, A1	Aka C1R
UV-FP		Ultra-violet Treatment & Control, Family W-Pool	Pool Mech Room	ETS	Unknown		Unknown	2010	UV-Q1, A1	Aka E1R
CS-X		Caustic Soda System	Caustic Soda Room	Various	Various		Various	2010	CS-M1, Q1, A1	Built-up system with multiple components
CL-X		Chlorination System	Chlorine Room	Various	Various		Various	2010	CL-M1, Q1, A1	Built-up system with multiple components
CA-1		Chlorine Alarm	Chlorine Room	Siemens	Unknown		Unknown	2010	CL-M1, Q1, A1	

Component	Cartegraph ID	Description	Location	Manufacturer	Model #	Manuf Part No	Serial #	Install Date	Maintenance	Comments
Gen-1		Diesel Generator	South Yard	Cummins	DSGAB-4789077		F100126698	2010	Gen-Q1, A1	125 kW
DDC-1		Direct Digital Control	Through-out	Unknown	Unknown		Unknown	2010	DDC-M1, Q1, A1	
FS-1		Fire Sprinkler System	Riser Room 177B	Various	Various		Various	2010	FS-A1	Wet and dry pipe (with air compressor)

VIII. EQUIPMENT PM SCHEDULING

Report Title: Preventive Maintenance (PM) Schedule Tasks

This is an Excel based file designed to categorize PM Schedule Tasks for various categories of equipment that appear individually in Section VII. Equipment Inventory.

Supporting Documents

a) CMMS Inventory (5 pages)

Project:	City of Lynnwood		
Subject:	Preventive Maintenance (PM) Schedule Tasks		
PM Task No.	**Equipment**	**Frequency**	**PM Task Description**
Bi-Annual			
DHW-B1	Domestic water heater	Bi-annual	State boiler & pressure vessel inspection, by WA State Labor & Industries (L&I).
BLR-B1	Heating water boiler	Bi-annual	State boiler & pressure vessel inspection, by WA State Labor & Industries (L&I).
ET-B1	Expansion tank	Bi-annual	State boiler & pressure vessel inspection, by WA State Labor & Industries (L&I).
Annual			
RTU-A1	Roof top unit	Annually	Replace belts, lubricate bearings, check alignment, check electrical connections, clean outside air pre-filter/screen, clean coils, and perform visual inspection; for units with Dx cooling, service CU section per CU-A1.
BLR-A3	Boiler, condensing	Annually	Check gas pressures, check combustion levels, check electrical connections, check for condensate blockage, clean combustion chamber and flue, and perform visual inspection.
BLR-A4	Boiler, condensing	Annually	Clean condensate neutralization tank and check neutralization charge - replace as needed.
EF-A1	Exhaust fan	Annually	Replace belts, lubricate bearings, check alignment, check electrical connections, and perform visual inspection.
AHU-A1	Air handling unit	Annually	Replace belts, lubricate bearings, check alignment, check electrical connections, clean coils, and perform visual inspection; service furnace and visually inspect VFD where applicable.
F-A1	Furnace	Annually	Clean burner assembly, inspect flue, check fuel gas train, other service per manufacturer.
CU-A1	Condensing unit	Annually	Clean coils, check refrigerant levels, check electrical connections, and perform visual inspection.
Comp-A1	Air Compressor	Annually	Replace belts, check electrical connections, replace oil, clean filter, drain tank and perform visual inspection.
TU-A1	Terminal unit	Annually	Check electrical connections, check fan alignment, and perform visual inspection.
DC-A1	Dust collector	Annually	Clean and service unit per manufacturer, including motor, blower, and controls.
Gen-A1	Generator	Annually	Perform annual service per manufacturer, including full load test and change all fluids.
HRU-A1	Heat recovery unit	Annually	Clean heat exchanger, evap cooler media and basin; lubricate bearings, check alignment, check electrical connections, and perform visual inspection.
UH-A1	Unit heater	Annually	Clean, visually inspect, and adjust/repair as needed.
Pump-A1	Pump	Annually	Adjust packing, replace as needed.
VFD-A1	Variable frequency drive	Annually	Clean, test, and inspect per O&M manual.
DHW-A1	Domestic water heater	Annually	Clean and service DHW heater per O&M manual, including burner, combustion chamber, flue, and condensate drain; clean condensate neutralization assembly and replace neutralization charge as needed. Flush tank.
ST-A1	Solar water heating tank	Annually	Check for leaks; check P&T relief valve; flush tank.
SP-A1	Sump pump	Annually	Raise pumps, clean sump, clean floats and sensors, test all modes of operation including alarms.
HX-A1	Heat exchanger	Annually	Inspect for corrosion and leaks, check heat transfer performance per O&M manual, open and clean if needed; replace seals as needed.
RP-A1	Recirc pump	Annually	Clean, inspect and test for proper operation.
FC-A1	Fan coil unit	Annually	Clean, test, and inspect per O&M manual, including clean coil; check connections to ductwork.
HRU-A1	Heat recovery unit	Annually	Clean, test, and inspect per O&M manual, including clean heat recovery core; check connections to ductwork; test all modes of operation.
EH-A1	Electric heater	Annually	Clean, inspect, and test for proper operation including local t-stat where applicable.
NAH-A1	Natatorium air handler	Annually	Lubricate bearings, check alignment, check electrical connections, clean coils, clean heat recovery core, clean condensate pans/unit floor, and perform visual inspection; clean and visually inspect fan motor VFD as applicable. Check motor operated dampers for proper operation. Check all modes of operation.
ET-A1	Thermal expansion tank	Annually	Check air bladder for proper operation (not water-logged); repair or replace if needed.
CF-A1	Chemical feed	Annually	Check for corrosion and operability; clean/repair as needed.
CH-1	Heat recovery chiller	Annually	Perform annual service per manufacturer, including full on-board diagnostics.
AC-1	Chiller air compressor	Annually	Clean, test, and adjust air compressor per manufacturer's O&M Manual, including filter replacement as needed.
GF-1	Glycol feed tank	Annually	Clean, test, and replenish glycol feed tank as needed.
UV-A1	Ultra-violet unit & control	Annually	Clean, test, inspect, and service per O&M Manual; including cooling air filter.
CS-A1	Caustic soda system	Annually	Clean, test, service, and inspect per O&M Manual, and applicable health & safety requirements.
CL-A1	Chlorine system	Annually	Clean, test, service, and inspect per O&M Manual, and applicable health & safety requirements.
CA-A1	Chlorine gas alarm	Annually	Clean, test, service, and inspect per O&M Manual, and applicable health & safety requirements.
FS-A1	Fire sprinkler system	Annually	Performance annual service per Fire Marshall and Insurance requirements; including dry pipe sprinkler system air compressor.
DDC-A1	Direct digital control	Annually	Clean, test, and adjust, including panel cooling air filters/screens, back-up battery, archive trend-logs, and reset over-ridden setpoints in conjunction with annual control system tune-up.

PM Task No.	Equipment	Frequency	PM Task Description
Quarterly			
RTU-Q1	Roof top unit	Quarterly	Lubricate bearings, check alignment, check electrical connections, change air filters, and perform visual inspection; for units with Dx cooling, service CU section per CU-Q1.
BLR-Q1	Boiler	Quarterly	Check electrical connections, check condensate and flue, perform visual inspection.
EF-Q1	Exhaust fan	Quarterly	Perform visual inspection.
AHU-Q1	Air handling unit	Quarterly	Check operation, check electrical connections, change air filters, and perform visual inspection.
F-Q1	Furnace	Quarterly	Check for proper operation.
CU-Q1	Condensing unit	Quarterly	Check operation, check electrical connections, and perform visual inspection.
Comp-Q1	Air compressor	Quarterly	Check oil, check electrical connections, inspect belt, clean filter, drain tank and perform visual inspection.
TU-Q1	Terminal unit	Quarterly	Check operation, change filters.
Pump-Q1	Pump	Quarterly	Lubricate bearings, check for vibration, check electrical connections, check packing and seals for leaks, and perform visual inspection.
DC-Q1	Dust collector	Quarterly	Empty container and change filters as needed.
Gen-Q1	Generator	Quarterly	Exercise generator, load as required; check fluids including coolant, oil, battery, and fuel.
HRU-Q1	Heat recovery unit	Quarterly	Check for proper operation, including make-up water and blow-down for evap cooling section.
DHW-Q1	Domestic water heater	Quarterly	Check for proper operation, including combustion, flue, condensate, and T&P valve.
SWH-Q1	Solar collector	Quarterly	Clean heat collector surface; check for leaks.
FC-Q1	Fan coil unit	Quarterly	Replace filter.
HRU-Q1	Heat recovery unit	Quarterly	Clean or replace filter, check core and drain line for cleanliness and proper operation.
NAH-Q1	Natatorium air handler	Quarterly	Replace outside air and return air filters; check condensate drain system for proper operation; check supply and exhaust fans for noise & vibration.
ET-Q1	Thermal expansion tank	Quarterly	Check bladder for proper pressure; fill as needed; check for leaks if excessive.
CF-Q1	Chemical feed	Quarterly	Check served system chemistry, bleed & feed, flush, and/or add chemicals as needed.
CH-Q1	Heat recovery chiller	Quarterly	Perform quarterly checks and service per manufacturer's O&M Manual including on-board diagnostics.
GF-Q1	Glycol feed tank	Quarterly	Test heating hot water system glycol concentration and charge glycol as needed to maintain concentration; replenish glycol in tank as needed; investigate leakage if make-up is significant.
UV-Q1	Ultra-violet unit & control	Quarterly	Check lamp operation.
CS-Q1	Caustic soda system	Quarterly	Service per O&M Manual.
CL-Q1	Chlorine system	Quarterly	Service per O&M Manual.
CA-Q1	Chlorine gas alarm	Quarterly	Service per O&M Manual, and health & safety requirements.
DDC-Q1	Direct digital control	Quarterly	Confirm proper operation as seasonal conditions change; review trend-logs and adjust as needed for optimal performance.
Monthly			
CH-M1	Heat recovery chiller	Monthly	Check for normal operation per O&M Manual, including abbreviated on-board diagnostics.
CS-M1	Caustic soda system	Monthly	Check caustic soda stock; replenish as needed.
CL-M1	Chlorine system	Monthly	Check chlorine stock; replenish as needed.
CA-M1	Chlorine gas alarm	Monthly	Perform monthly alarm check per O&M Manual and/or health & safety requirements.
DDC-M1	Direct digital control	Monthly	Review warnings and alarms; check, correct, and reset as needed.
Notes:			
1. Excludes day-to-day and week-to-week pool and pool water chemistry control service, custodial and housekeeping requirements.			

IX. APPENDIX

Maintenance Checklist Sheets

MAINTENANCE CHECK SHEET

BUILDING INFORMATION **PG 1**

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: AC-X Unit Man:

Model #: _____ Serial #: _____

Electrical Connections OK	☐	Pump Rotates Freely	☐
Condensate Drain OK	☐		
Lubrication level OK	☐		

Motor 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

Pressures

System Pressure	

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____
Address: _____

UNIT INFORMATION

Unit Location: _____ Unit Tag: B-1 Unit Manf: _____
Model #: _____ Serial #: _____
Burner Model # _____ Burner Serial # _____
Burner Control _____ Scanner _____ Rated Input _____

COMBUSTION TEST

Fuel	Natural Gas ☐	Oil ☐
Fire Rate	High	Low
Efficiency %		
O2 %		
CO2 %		
NOX – PPM		
Draft Outlet		
Temp Outlet		
Gas Inlet Pressure		
Flame Signal (v)		
Manifold Pressure (wc)		

SAFETY CONTROL CHECK

Low Water Cut-off	☐	Model #			
Limit Control	☐	Model #		Setting	
Operating Control	☐	Model #		Setting	
Firing Rate Control	☐	Model #		Setting	
Pilot Turn Down Test	☐				
Flame Failure Test	☐				
Low Gas Pressure SW	☐	Setting			
High Gas Pressure SW	☐	Setting			
Combustion Air SW	☐	Setting			
Boiler Pressure Relief Valve Setting					
Water Flow Switch Operational			☐		
Circulation Pump Operational			☐		
Wiring Terminals Tight			☐		
Boiler Operating Pressure					
Leaving Water Temperature					
Entering Water Temperature					
Expansion Tank Level OK			☐		

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: CA-X Unit Manf: Siemens

Model #: _____ Serial #: _____

GENERAL

Sensor	☐		☐
Control Panel	☐		
Alarm	☐		

SPECIFIC

Perform maintenance per O&M Manual(s) and applicable codes & standards. Observe good health & safety practice. Chlorine Room Alarm photo to right for reference.

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size Chiller Unit Tag: CH-1 Unit Manf: Trane

Model #: RTWD Serial #: U13J07616

GENERAL

Chiller Room	☐	Control Panel	☐
Air Compressor	☐		
Water Pumps	☐		

SPECIFIC

Performance maintenance per O&M Manual (first page to right for reference).

COMMENTS

Service and Maintenance

Overview

This section describes preventative maintenance procedures and intervals for the RTWD unit. Use a periodic maintenance program to ensure optimal performance and efficiency of the Series R units.

An important aspect of the chiller maintenance program is the regular completion of the "Series R Operating Log"; an example of this log is provided in this manual. When filled out properly the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.

For example, if the machine operator notices a gradual increase in condensing pressure during a month's time, he can systematically check for and then correct, the possible cause(s) of this condition (e.g., fouled condenser tubes, non-condensables in the system).

Maintenance

⚠WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

⚠WARNING

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Weekly Maintenance and Checks

After the unit has operated for approximately 30 minutes and the system has stabilized, check the operating conditions and complete the procedures below:

- Log the chiller.
- Check evaporator and condenser pressures with gauges and compare to the reading on the CH530. Pressure readings should fall within the specified ranges listed under Operating Conditions.

Note: For RTWD units, optimum condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of the refrigerant at a temperature 2 to 5°F above that of leaving condenser water at full load.

Monthly Maintenance and Checks

- Review operating log.
- Clean all water strainers in both the chilled and condensing water piping systems.
- Measure the oil filter pressure drop. Replace oil filter if required. Refer to "Service Procedures".
- Measure and log the subcooling and superheat.
- If operating conditions indicate a refrigerant shortage, leak check the unit and confirm using soap bubbles.
- Repair all leaks.
- Trim refrigerant charge until the unit operates in the conditions listed in the note below.

Note: AHRI conditions are: condenser water: 85°F and 3 GPM per ton and evaporator water: 54-44°F.

- Clean condenser coils.

Table 124. RTWD Operating Conditions at Full Load

Description	Condition
Evaporator pressure	30-45 psig
Condensing pressure	75-125 psig
Discharge superheat	10-15 F
Subcooling	5-10 F

Note: All conditions stated above are based on the unit running fully loaded, running at AHRI conditions.

- If full load conditions can not be met. Refer to note below to trim the refrigerant charge

Note: Conditions at minimum must be: entering condenser water: 85°F and entering evaporator water: 55°F

Table 125. RTWD Operating Conditions at Minimum Load

Description	Condition
Evaporator approach	*less than 7°F (non-glycol applications)
Condensing approach	*less than 7°F
Subcooling	2-3°F
EXV percent open	10-20% open

* ≅1.0°F for new unit.

Note: RTUD operating conditions are the physical configuration of the installation.

Annual Maintenance

Shut down the chiller once each year to check the following:

RLC-SVX09H-EN 181

Service and Maintenance

Overview

This section describes preventative maintenance procedures and intervals for the RTWD unit. Use a periodic maintenance program to ensure optimal performance and efficiency of the Series R units.

An important aspect of the chiller maintenance program is the regular completion of the "Series R Operating Log"; an example of this log is provided in this manual. When filled out properly the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.

For example, if the machine operator notices a gradual increase in condensing pressure during a month's time, he can systematically check for and then correct, the possible cause(s) of this condition (e.g., fouled condenser tubes, non-condensables in the system).

Maintenance

⚠WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

⚠WARNING

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Weekly Maintenance and Checks

After the unit has operated for approximately 30 minutes and the system has stabilized, check the operating conditions and complete the procedures below:

- Log the chiller.
- Check evaporator and condenser pressures with gauges and compare to the reading on the CH530. Pressure readings should fall within the specified ranges listed under Operating Conditions.

Note: For RTWD units, optimum condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of the refrigerant at a temperature 2 to 5°F above that of leaving condenser water at full load.

Monthly Maintenance and Checks

- Review operating log.
- Clean all water strainers in both the chilled and condensing water piping systems.
- Measure the oil filter pressure drop. Replace oil filter if required. Refer to "Service Procedures".
- Measure and log the subcooling and superheat.
- If operating conditions indicate a refrigerant shortage, leak check the unit and confirm using soap bubbles.
- Repair all leaks.
- Trim refrigerant charge until the unit operates in the conditions listed in the note below.

Note: AHRI conditions are: condenser water: 85ºF and 3 GPM per ton and evaporator water: 54-44ºF.

- Clean condenser coils.

Table 124. RTWD Operating Conditions at Full Load

Description	Condition
Evaporator pressure	30-45 psig
Condensing pressure	75-125 psig
Discharge superheat	10-15 F
Subcooling	5-10 F

Note: All conditions stated above are based on the unit running fully loaded, running at AHRI conditions.

- If full load conditions can not be met. Refer to note below to trim the refrigerant charge

Note: Conditions at minimum must be: entering condenser water: 85°F and entering evaporator water: 55°F

Table 125. RTWD Operating Conditions at Minimum Load

Description	Condition
Evaporator approach	*less than 7°F (non-glycol applications)
Condensing approach	*less than 7°F
Subcooling	2-3°F
EXV percent open	10-20% open

* ≅1.0ºF for new unit.

Note: RTUD operating conditions are the physical configuration of the installation.

Annual Maintenance

Shut down the chiller once each year to check the following:

⚠WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

- Perform all weekly and monthly maintenance procedures.
- Check the refrigerant charge and oil level. Refer to "Maintenance Procedures". Routine oil changing is not necessary on a hermetic system.
- Have a qualified laboratory perform an oil analysis to determine system moisture content and acid level.

Note: Due to the hygroscopic properties of the POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.

- Check the pressure drop across the oil filter. Refer to "Maintenance Procedures".
- Contact a qualified service organization to leak check the chiller, to inspect safety controls, and inspect electrical components for deficiencies.
- Inspect all piping components for leakage and/or damage. Clean out any inline strainers.
- Clean and repaint any areas that show signs of corrosion.
- Test vent piping of all relief valves for presence of refrigerant to detect improperly sealed relief valves. Replace any leaking relief valve.
- Inspect the condenser tubes for fouling; clean if necessary. Refer to "Maintenance Procedures".
- Check to make sure that the crank case heater is working.

Scheduling Other Maintenance

- Use a nondestructive tube test to inspect the condenser and evaporator tubes at 3-year intervals.

Note: It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.

- Depending on chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to determine the condition of the compressor and internal components.

Operating Log

A sample of several operating logs and checklists have been included.

Chiller Log			
	Run Time		
Main Tab	**15 min**	**30 min**	**1 hr**
Chiller Mode			
Evap Ent/Lvg Water Temp			
Cond Ent/Lvg Water Temp			
Active Chilled Water Setpoint (F)			
Average Line Current (%RLA)			
Active Current Limit Setpoint (%RLA)			
Software Type			
Software Version			
Reports Tab			
Evaporator			
Evap Entering Water Temperature (F)			
Evap Leaving Water Temperature (F)			
Evap Sat Rfgt Temp (F)			
Evap Rfgt Pressure (psia)			
Evap Approach Temp (F)			
Evap Water Flow Switch Status			
Expansion Valve Position (%)			
Expansion Valve Position Steps			
Evap Rfgt Liquid Level (in)			
Condenser			
Cond Entering Water Temperature (F)			
Cond Leaving Water Temperature (F)			
Cond Sat Rfgt Temp (F)			
Cond Rfgt Pressure (psia)			
Cond Approach Temp (F)			
Cond Water Flow Switch Status			
Cond Head Pressure Ctrl Command (%)			
Compressor 1			
Compressor Starts			
Compressor Run Time			
System Rfgt Diff Pressure (psid)			
Oil Pressure (psia)			
Compressor Rfgt Discharge Temp (F)			
Discharge Superheat (F)			
% RLA L1 L2 L3 (%)			
Amps L1 L2 L3 (Amps)			
Volts AB BC CA			
Compressor 2			
Compressor Starts			
Compressor Run Time			
System Rfgt Diff Pressure (psid)			
Oil Pressure (psia)			
Compressor Rfgt Discharge Temp (F)			
Discharge Superheat (F)			
% RLA L1 L2 L3 (%)			
Amps L1 L2 L3 (Amps)			
Volts AB BC CA			

Settings	
Settings Tab	
Chiller	
Front Panel Chilled Water Setpt (F)	
Front Panel Current Limit Setpt (RLA)	
Differential to Start (F)	
Differential to Stop (F)	
Setpoint Source	
Feature Settings	
Chilled Water Reset	
Return Reset Ratio	
Return Start Reset	
Return Maximum Reset	
Outdoor Reset Ratio	
Outdoor Start Reset	
Outdoor Maximum Reset	
Mode Overrides	
Evap Water Pump	
Cond Water Pump	
Expansion Valve Control	
Slide Valve Control	
Service Pumpdown	
Display Settings	
Date Format	
Date	
Time Format	
Time of Day	
Keypad/Display Lockout	
Display Units	
Pressure Units	
Language Selection	

Service Procedures

Cleaning the Condense (RTWD Only)

NOTICE:

Proper Water Treatment!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Condenser tube fouling is suspect when the "approach" temperature (i.e., the difference between the refrigerant condensing temperature and the leaving condenser water temperature) is higher than predicted.

Standard water applications will operate with less than a 10ºF approach. If the approach exceeds 10ºF cleaning the condenser tubes is recommended.

Note: Glycol in the water system may as much as double the standard approach.

If the annual condenser tube inspection indicates that the tubes are fouled, 2 cleaning methods can be used to rid the tubes of contaminants.The methods are:

Mechanical Cleaning Procedure

Mechanical tube cleaning method is used to remove sludge and loose material from smooth-bore condenser tubes.

⚠WARNING

Heavy Objects!

Each of the individual cables (chains or slings) used to lift the waterbox must be capable of supporting the entire weight of the waterbox. The cables (chains or slings) must be rated for overhead lifting applications with an acceptable working load limit. Failure to properly lift waterbox could result in death or serious injury.

⚠WARNING

Heavy Objects!

The proper use and ratings for eyebolts can be found in ANSI/ASME standard B18.15. Maximum load rating for eyebolts are based on a straight vertical lift in a gradually increasing manner. Angular lifts will significantly lower maximum loads and should be avoided whenever possible. Loads should always be applied to eyebolts in the plane of the eye, not at some angle to this plane. Failure to properly lift waterbox could result in death or serious injury.

Review mechanical room limitations and determine the safest method or methods of rigging and lifting the waterboxes.

1. Waterbox Removal Procedure - Method 1

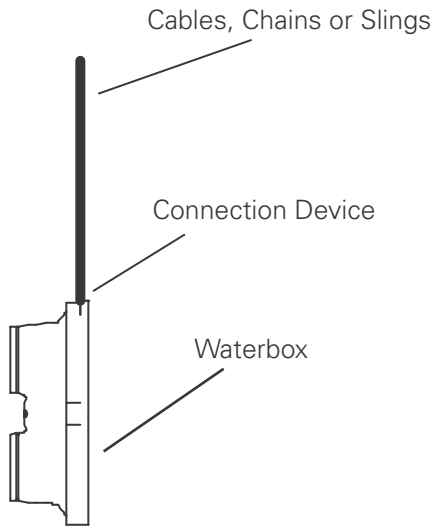
This selection applies to the units and condenser side waterboxes shown in Table 126.

Table 126. Waterbox Removal Procedure - Method 1

Size	Hz	Effic	Condenser Waterbox
80, 90, 100, 110, 120, 130, 140	60	STD	Supply, Return
80, 90, 100, 110, 120, 130	60	HIGH	Supply, Return
70, 80, 90, 100, 110, 120, 130, 140, 150	50	STD	Supply, Return
60, 70, 80, 90, 100, 110, 120	50	HIGH	Supply, Return
150, 160, 180, 200, 220, 250	60	HIGH	Supply
150, 160, 180, 200	60	PREM	Supply
130, 140, 160, 180, 200, 220, 250	50	HIGH	Supply
160, 180, 200	50	PREM	Supply

2. Select the proper lift connection device from Table 131.The rated lifting capacity of the selected lift connection device must meet or exceed the published weight of the waterbox. Reference Table 130, p. 188 for waterbox weights.
3. Ensure the lift connection device has the correct connection for the waterbox. Example: thread type (course/fine, English/metric). Bolt diameter (English/metric).
4. Properly connect the lift connection device to the waterbox. See Figure 83, p. 186. Ensure lift connection device is securely fastened.

Figure 83. Water box lifting



5. Install hoist ring on to the lifting connection on the waterbox. Torque to 28 ft-lbs (37 Nm).
6. Disconnect water pipes, if connected.
7. Remove waterbox bolts
8. Lift the waterbox away from the shell.

Waterbox Removal Procedure – Method 2

This selection applies to the units and condenser side waterboxes shown in Table 127

Table 127. Waterbox Removal Procedure - Method 2

Size	Hz	Effic	Condenser Waterbox
150, 160, 180, 200, 220, 250	60	HIGH	Return
150, 160, 180, 200	60	PREM	Return
130, 140, 160, 180, 200, 220, 250	50	HIGH	Return
160, 180, 200	50	PREM	Return

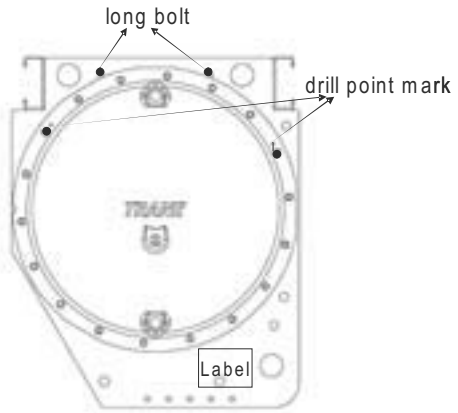
⚠CAUTION

Risk of Injury!

To prevent injury, do not place hands or fingers between waterbox and condenser tubesheet.

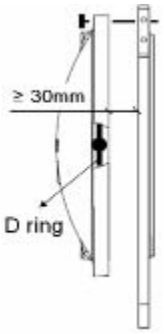
9. Select the proper lift connection device from Table 131, p. 188. The rated lifting capacity of the selected lift connection device must meet or exceed the published weight of the waterbox. Reference Table 130, p. 188 for waterbox weights.
10. Ensure the lift connection device has the correct connection for the waterbox. Example: thread type (course/fine, English/metric). Bolt diameter (English/metric).
11. Disconnect water pipes, if connected.
12. Remove the two bolts with drill point mark. Install the long bolts into these two holes. The long bolts are located on the two thread holes just above the waterbox, as shown in Figure 84.

Figure 84. Waterbox removal - remove bolts



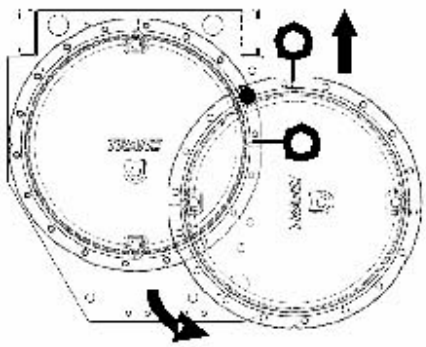
13. Remove the remaining bolts. Slide the waterbox out about 30 mm through two long bolts. Install the Safety Hoist ring (D ring) connection device into the tap drill hole located on waterbox right side (face to waterbox convex). See Figure 85.

Figure 85. Waterbox removal - slide out, install safety hoist ring



14. Remove the left long bolt while supporting waterbox from outside of waterbox. Swing the waterbox outboard. Put lifting chain on Safety Hoist ring and remove the remaining long bolt. See Figure 86, p. 187.

Figure 86. Waterbox removal - swing out, install lifting chain



15. Lift the waterbox away from the shell.

⚠WARNING

Overhead Hazard!

Never stand below or in close proximately to heavy objects while they are suspended from, or being lifted by, a lifting device. Failure to follow these instructions could result in death or serious injuries.

All RTWD Units

16. Store waterbox in a safe and secure location and position.

Important: Do not leave waterbox suspended from lifting device.

17. Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.
18. Thoroughly flush the condenser water tubes with clean water.

Note: (To clean internally enhanced tubes, use a bi-directional brush or consult a qualified service organization for recommendations.)

Reassembly

Once service is complete, the waterbox should be reinstalled on the shell following all previous procedures in reverse.

- Use new o-rings or gaskets on all joints after thoroughly cleaning each joint.
- Torque waterbox bolts.

Note: Torque bolts in a star pattern. Refer to Table 128 for torque values.

Table 128. Torque Values

Evaporator	Condenser (RTWD only)
65 ft-lbs (88 Nm)	65 ft-lbs (88 Nm)

Waterbox Weights

Table 129. RTWD/RTUD Evaporator waterbox weights

					Standard Grooved Pipe Waterbox	
Model	Size	Hz	Effic	Waterbox	Weight - kg (lbs)	Lifting Connection
RTWD	80, 90, 100, 110, 120, 130, 140	60	STD	Supply, Return	20.4 (45)	M12x1.75
RTWD	80, 90, 100, 110, 120, 130	60	HIGH	Supply, Return		
RTWD	70, 80, 90, 100, 110, 120, 130, 140, 150	50	STD	Supply, Return		
RTWD	60, 70, 80, 90, 100, 110, 120	50	HIGH	Supply, Return		
RTWD	150, 160, 180, 200, 220, 250	60	HIGH	Supply, Return		
RTWD	150, 160, 180, 200	60	PREM	Supply, Return		
RTWD	130, 140, 160, 180, 200, 220, 250	50	HIGH	Supply, Return		
RTWD	160, 180, 200	50	PREM	Supply, Return		
RTUD	80, 90, 100, 110, 120, 130	60	HIGH	Supply, Return		
RTWD	150, 160, 180, 200, 220, 250	60	HIGH	Supply	33.6 (74)	M12x1.75
RTWD	150, 160, 180, 200	60	PREM	Supply		
RTWD	130, 140, 160, 180, 200, 220, 250	50	HIGH	Supply		
RTWD	160, 180, 200	50	PREM	Supply		
RTUD	150, 160, 180, 200, 220, 250	60	HIGH	Supply		

Table 129. RTWD/RTUD Evaporator waterbox weights (continued)

					Standard Grooved Pipe Waterbox	
Model	**Size**	**Hz**	**Effic**	**Waterbox**	**Weight - kg (lbs)**	**Lifting Connection**
RTWD	150, 160, 180, 200, 220, 250	60	HIGH	Return	29.9 (66)	M12x1.75
RTWD	150, 160, 180, 200	60	PREM	Return		
RTWD	130, 140, 160, 180, 200, 220, 250	50	HIGH	Return		
RTWD	160, 180, 200	50	PREM	Return		
RTUD	150, 160, 180, 200, 220, 250	60	HIGH	Return		

Table 130. RTWD Condenser waterbox weights

					Standard Grooved Pipe Waterbox	
Model	**Size**	**Hz**	**Effic**	**Waterbox**	**Weight - kg (lbs)**	**Lifting Connection**
RTWD	80, 90, 100, 110, 120, 130, 140	60	STD	Supply, Return	20.4 (45)	M12x1.75
RTWD	80, 90, 100, 110, 120, 130	60	HIGH	Supply, Return		
RTWD	70, 80, 90, 100, 110, 120, 130, 140, 150	50	STD	Supply, Return		
RTWD	60, 70, 80, 90, 100, 110, 120	50	HIGH	Supply, Return		
RTWD	150, 160, 180, 200, 220, 250	60	HIGH	Supply, Return		
RTWD	150, 160, 180, 200	60	PREM	Supply, Return		
RTWD	130, 140, 160, 180, 200, 220, 250	50	HIGH	Supply, Return		
RTWD	160, 180, 200	50	PREM	Supply, Return		
RTUD	80, 90, 100, 110, 120, 130	60	HIGH	Supply, Return		
RTWD	150, 160, 180, 200, 220, 250	60	HIGH	Supply	38.6 (85)	M12x1.75
RTWD	150, 160, 180, 200	60	PREM	Supply		
RTWD	130, 140, 160, 180, 200, 220, 250	50	HIGH	Supply		
RTWD	160, 180, 200	50	PREM	Supply		
RTWD	150, 160, 180, 200, 220, 250	60	HIGH	Return	29.9 (66)	M12x1.75
RTWD	150, 160, 180, 200	60	PREM	Return		
RTWD	130, 140, 160, 180, 200, 220, 250	50	HIGH	Return		
RTWD	160, 180, 200	50	PREM	Return		

Parts Ordering Information

Table 131. Connection devices

Unit	Product	Part Number
RTWD/RTUD - All units	Safety Hoist Ring M12x1.75	RNG01886

Obtain the required parts from your local Trane Parts Center.

Chemical Cleaning Procedure

- Scale deposits are best removed by chemical means. Consult a qualified water treatment specialist (i.e., one that knows the local water supply chemical/mineral content) for a recommended cleaning solution suitable for the job. (A standard condenser water circuit is composed solely of copper, cast iron and steel.) Improper chemical cleaning can damage tube walls.

All of the materials used in the external circulation system, the quantity of the solution, the duration of the cleaning period, and any required safety precautions should be approved by the company furnishing the materials or performing the cleaning.

Note: Chemical tube cleaning should always be followed by mechanical tube cleaning.

RTUD Air Cooled Condenser Applications - High Condenser Pressure Limit and High Pressure Cutout Diagnostics

If a circuit experiences significant time in the High Condenser Pressure Limit mode, or if it experiences High Pressure Cutout trip diagnostics, the air cooled condenser may be the root cause and should be inspected.

The condenser coils should be checked for air flow restrictions and cleanliness, as well as the possibility of recirculated air, in which the air entering the coil is

significantly higher temperature than the ambient outdoor air temperature (5 °F or more).

All of the fans should also be validated to be operational with the proper fan blade rotation direction. Dirty, or fouled coils, or otherwise limited or restricted air flow through the coils, can significantly degrade the efficiency of the chiller as well as result in unnecessary limits and nuisance trips. Refer to the condenser manufacturers' maintenance and cleaning procedures.

Cleaning the Evaporator

Since the evaporator is typically part of a closed circuit, it does not accumulate appreciable amounts of scale or sludge. However, if cleaning is deemed necessary, use the same cleaning methods described for the condenser tubes.

Compressor Oil

NOTICE:

Equipment Damage!

To prevent oil sump heater burnout, open the unit main power disconnect switch before removing oil from the compressor.

Trane Polyolester Oil is the approved oil for the RTWD/RTUD units. Polyolester oil is extremely hygroscopic meaning it readily attracts moisture. The oil can not be stored in plastic containers due to the hygroscopic properties. As with mineral oil, if water is in the system it will react with the oil to form acids. Use Table 132 to determine the acceptability of the oil.

Table 132. POE Oil Properties

Description	Acceptable Levels
Moisture content	less than 300 ppm
Acid Level	less than 0.5 TAN (mg KOH/g)

Note: Mineral oil used in the RTHA and RTHB units has different acceptable levels (< 50 ppm of moisture and < 0.05 mg KOH/g)

Note: Use an oil transfer pump to change the oil regardless of chiller pressure.

Oil Sump Level Check

Running the chiller at minimum load is the best for the quickest return of oil to the separator and sump. The machine still needs to sit for approximately 30 minutes before the level is taken. At minimum load, the discharge superheat should be highest. The more heat in the oil as it lays in the sump, the more refrigerant will boil off in the sump and leave more concentrated oil.

The oil level in the oil sump can be measured to give an indication of the system oil charge. Follow the procedures below to measure the level.

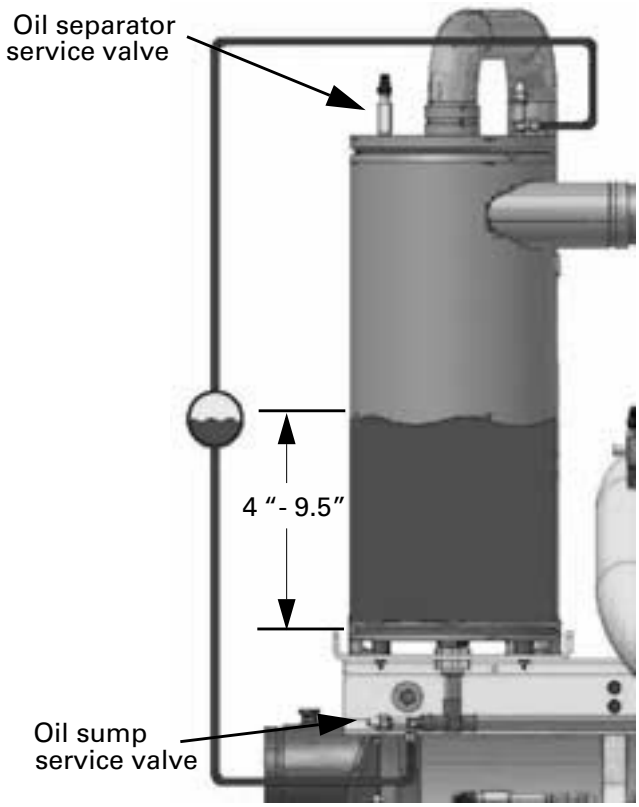
1. Run the unit fully unloaded for approximately 20 minutes.
2. Cycle the compressor off line.

NOTICE:

Equipment Damage!

Never operate the compressor with the sight glass service valves opened. Severe oil loss will occur. Close the valves after checking the oil level. The sump is above the condenser and it is possible to drain the oil.

Figure 87. Determining oil level in the sump



3. Attach a 3/8" or 1/2" hose with a sightglass in the middle to the oil sump service valve (1/4" flare) and the oil separator service valve (1/4" flare).

Note: Using high pressure rated clear hose with appropriate fittings can help speed up the process.

4. After the unit is off line for 30 minutes, move the sightglass along the side of the oil sump.
5. The level should be between 4" and 9.5" from the bottom of the oil sump. If the level appears to be above 9.5", the oil sump is completely full. Most likely more oil resides in the rest of the system and some oil needs to be removed until the level falls between 4" and 9.5" in the oil sump.

Note: Nominal height of oil is 8 inches.

6. If the level is below 4", there is not enough oil in the sump. This can occur from not enough oil in the system or more likely, oil migration to the evaporator. Oil migration can occur from a low refrigerant charge, gas pump malfunction, etc.

Note: If the oil is logged in the evaporator confirm the operation of the gas pump. If the gas pump is not functioning properly all oil will be logged in the evaporator.

7. After the level is determined, close the service valves and remove the hose/sightglass assembly.

Removing Compressor Oil

The oil in the compressor oil sump is under a constant positive pressure at ambient temperature. To remove oil, open the service valve located on the bottom of the oil sump and drain the oil into a suitable container using the procedure outlined below:

NOTICE:

Equipment Damage!

Due to the hygroscopic properties of the POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.

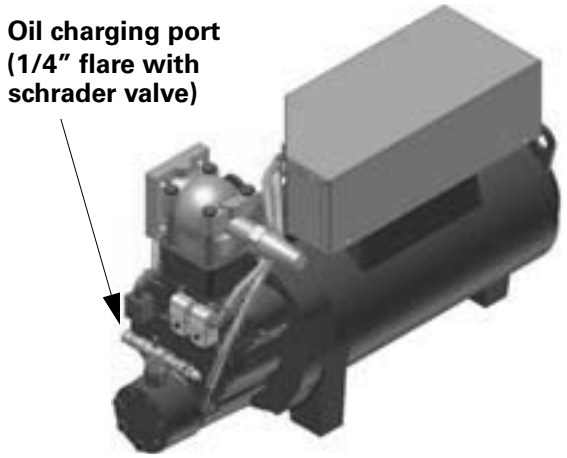
Oil should not be removed until the refrigerant is isolated or removed.

8. Connect a line to the oil sump drain valve.
9. Open the valve and allow the desired amount of oil to flow into the container and close the charging valve.
10. Measure the exact amount of oil removed from the unit.

Oil Charging Procedure

It is critical to fill the oil lines feeding the compressor when charging a system with oil. The diagnostic "Loss of oil at the compressor stopped" will be generated if the oil lines are not full on start-up.

Figure 88. Oil charging port



To properly charge the system with oil, follow the steps below:

1. Locate the 1/4" schrader valve on the end of the compressor.
2. Loosely connect oil pump to schrader valve called out in step 1.
3. Operate oil charging pump until oil appears at the charging valve connection; then tighten the connection.

Note: To keep air from entering the oil, the charging valve connection must be air- tight.

4. Open the service valve and pump in the required amount of oil.

Note: Adding oil at the oil charging port ensures that the oil filter cavity and the oil lines back to the oil separator are filled with oil. An internal oil valve prevents oil from entering the compressor rotors.

Replacing the Oil Filter

The filter element should be changed if the oil flow is sufficiently obstructed. Two things can happen: first, the chiller may shut down on a "Low Oil Flow" diagnostic, or secondly, the compressor may shut down on a "Loss of Oil at Compressor (Running) diagnostic. If either of these diagnostics occurs, it is possible the oil filter needs replacement. The oil filter is not usually the cause of a Loss of oil at Compressor diagnostic.

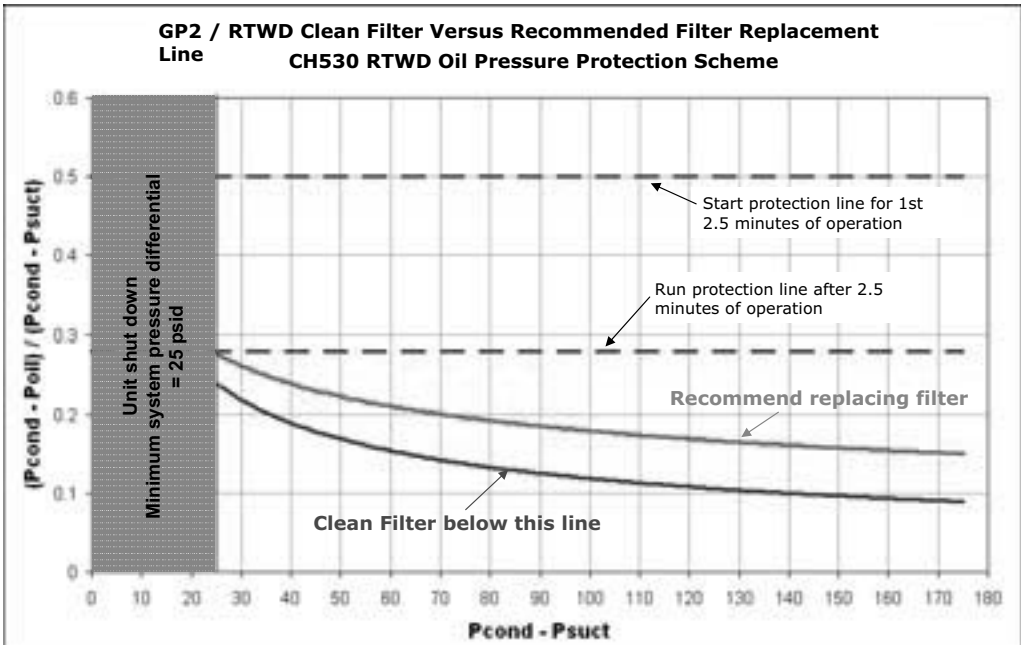
Specifically, the filter must be changed if the pressure drop between the two service valves in the lubrication circuit exceeds the maximum level as given in Figure 89, p. 191. This chart shows the relationship between the pressure drop measured in the lubrication circuit as compared with operating pressure differential of the chiller (as measured by pressures in the condenser and evaporator).

Normal pressure drops between the service valves of the lubrication circuit are shown by the lower curve. The upper curve represents the maximum allowable pressure drop and indicates when the oil filter must be changed. Pressure drops that lie between the lower and upper curves are considered acceptable.

For a chiller equipped with an oil cooler, add 5 psid to the values shown in Figure 89. For example, if the system pressure differential was 80 psid, then the clean filter pressure drop would be approximately 15 psid (up from 10 psid). For a chiller with an oil cooler and operating with a dirty oil filter, the maximum allowable pressure drop would be 28 psid (up from 23 psid).

Under normal operating conditions the element should be replaced after the first year of operation and then as needed thereafter.

Figure 89. Recommended oil filter replacement



Refrigerant Charge

If a low refrigerant charge is suspected, first determine the cause of lost refrigerant. Once the problem is repaired follow the procedures below for evacuating and charging the unit.

Evacuation and Dehydration

5. Disconnect ALL power before/during evacuation.
6. Connect the vacuum pump to the 5/8" flare connection on the bottom of the evaporator and/or condenser.
7. To remove all of the moisture from the system and to insure a leak free unit, pull the system down below 500 microns.
8. After the unit is evacuated, perform a standing rise test for at least an hour. The pressure should not rise more than 150 microns. If the pressures rises more than 150 microns, either a leak is present or moisture is still in the system.

Note: If oil is in the system, this test is more difficult. The oil is aromatic and will give off vapors that will raise the pressure of the system.

Refrigerant Charging

On RTWD Units, once the system is deemed leak and moisture free, use the 5/8" flare connections at the bottom of the evaporator and condenser to add refrigerant charge.

For RTUD Units, once the system is deemed leak and moisture free, use the service valve on the liquid line to add refrigerant charge.

NOTICE:

Equipment Damage!

Add field refrigerant charge only through the service valve on the liquid line, not the service valves on the evaporator, and insure that water is flowing through the evaporator during the charging process. Failure to do the above could result in equipment damage.

See "General Data," p. 9 and Unit nameplate for refrigerant charge information.

Refrigerant and Oil Charge Management

Proper oil and refrigerant charge is essential for proper unit operation, unit performance, and environmental protection. Only trained and licensed service personnel should service the chiller.

Some symptoms of a refrigerant under-charged unit:

- Low subcooling
- Higher than normal discharge superheat
- Bubbles in EXV sight glass
- Low liquid level diagnostic
- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Low evaporator refrigerant temperature limit
- Low refrigerant temperature cutout diagnostic

- Fully open expansion valve
- Possible whistling sound coming from liquid line (due to high vapor velocity)
- High condenser + subcooler pressure drop

Some symptoms of a refrigerant over-charged unit:

- High subcooling
- Evaporator liquid level higher than centerline after shut down
- Larger than normal condenser approach temperatures (entering condenser saturated temperature – leaving condenser water temperature)
- Condenser pressure limit
- High pressure cutout diagnostic
- Higher than normal compressor power
- Very low discharge superheat at startup
- Compressor rattle or grinding sound at startup

Some symptoms of an oil over-charged unit:

- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Low evaporator refrigerant temperature limit
- Erratic liquid level control
- Low unit capacity
- Low discharge superheat (especially at high loads)
- Low liquid level diagnostics
- High oil sump level after normal shut down

Some symptoms of an oil under-charged unit:

- Compressor rattle or grinding sound
- Lower than normal pressure drop through oil system
- Seized or welded compressors
- Low oil sump level after normal shut down
- Lower than normal oil concentrations in evaporator

Refrigerant Filter Replacement Procedure

A dirty filter is indicated by a temperature gradient across the filter, corresponding to a pressure drop. If the temperature downstream of the filter is 4°F (-15.5°C) lower than the upstream temperature, the filter should be replaced. A temperature drop can also indicate that the unit is undercharged. Ensure proper subcooling before taking temperature readings.

1. With the unit off, verify that the EXV is closed. Close liquid line isolation valve.
2. Attach hose to service port on liquid line filter flange.
3. Evacuate refrigerant from liquid line and store.
4. Remove hose.
5. Depress schrader valve to equalize pressure in liquid line with atmospheric pressure.
6. Remove bolts that retain filter flange.
7. Remove old filter element.
8. Inspect replacement filter element and lubricate o-ring with Trane OIL00048.

Note: Do not use mineral oil. It will contaminate the system.

9. Install new filter element in filter housing.
10. Inspect flange gasket and replace if damaged.
11. Install flange and torque bolts to 14-16 lb-ft (19-22 n-m).
12. Attach vacuum hose and evacuate liquid line.
13. Remove vacuum hose from liquid line and attach charging hose.
14. Replace stored charge in liquid line.
15. Remove charging hose.
16. Open liquid line isolation valve.

Freeze Protection

For unit operation in a low temperature environment, adequate protection measures must be taken against freezing.

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: CL-X Unit Manf: Various

Model #: _____ Serial #: _____

GENERAL

Cylinders	☐	Controls	☐
Injectors	☐	Safety	
Tubing	☐		

SPECIFIC

Perform maintenance per O&M Manual(s) and applicable codes & standards. Observe good health & safety practice. Chlorine Room photo to right for reference.

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: CS-X Unit Manf: Various

Model #: _____ Serial #: _____

GENERAL

Tanks	☐	Controls	☐
Pumps	☐	Safety	
Tubing	☐		

SPECIFIC

Perform maintenance per O&M Manual(s) and applicable codes & standards. Observe good health & safety practice. Caustic Soda Room photo to right for reference.

COMMENTS

CONDENSING UNIT

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Condensing Unit Unit Tag: CU-X Unit Manf: _____

Model #: _____ Serial #: _____

Electrical

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐		
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size			
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

OUTDOOR FAN(s)

N/P Volt		N/P Amp		HP		Fan Speed Control	☐	
	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

INDOOR FAN(s) (none)

FAN 1								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				
FAN 2								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				

COMPRESSOR(s)

N/P Volt		RLA		HP		Crank Case Heaters OK	☐	
	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐

Act AMPS								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

COMPRESSOR # 1

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 2

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 3

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 4

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 5

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 6

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F

Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 7

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 8

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: DDC-1 Unit Manf: _____

Model #: _____ Serial #: _____

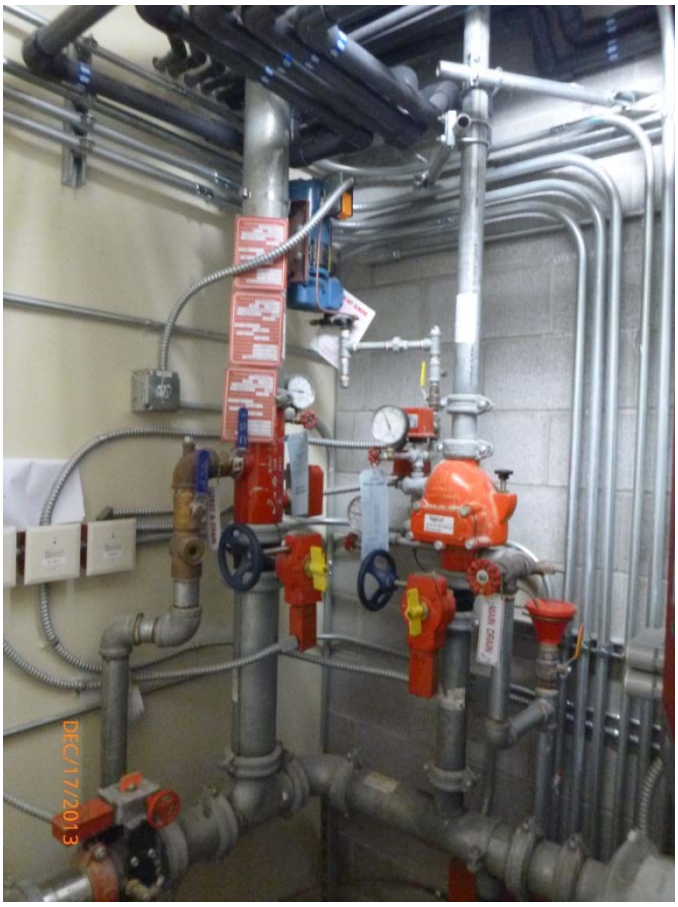
GENERAL

Sensors	☐	Distributed Controls	☐
Actuators	☐	Main Control Panel & Workstation	
Network	☐	Programming	

SPECIFIC

Perform maintenance per O&M Manual(s) and applicable codes & standards. Regularly check for program warnings and alarms; repair failed devices and return over-rides to normal. Review trend logs and check for optimal performance at seasonal changes; especially from heat to cooling and vice-versa.

COMMENTS



DOMESTIC WATER HEATER

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Location: _____ Unit Tag: DHW-X Unit Manf: _____

Model #: _____ Serial #: _____

Burner Model # _____ Burner Serial # _____

Burner Control _____ Scanner _____ Rated Input _____

COMBUSTION TEST

Fuel	Natural Gas ☐	Natural Gas ☐
Fire Rate	Standard	
Efficiency %		
O2 %		
CO2 %		
NOX – PPM		
Draft Outlet		
Temp Outlet		
Gas Inlet Pressure		
Flame Signal (v)		
Manifold Pressure (wc)		

SAFETY CONTROL CHECK

Low Water Cut-off	☐	Model #			
Limit Control	☐	Model #		Setting	
Operating Control	☐	Model #		Setting	
Firing Rate Control	☐	Model #		Setting	
Pilot Turn Down Test	☐				
Flame Failure Test	☐				
Low Gas Pressure SW	☐	Setting			
High Gas Pressure SW	☐	Setting			
Combustion Air SW	☐	Setting			
Boiler Pressure Relief Valve Setting					
Water Flow Switch Operational			☐		
Circulation Pump Operational			☐		
Wiring Terminals Tight			☐		
Boiler Operating Pressure					
Leaving Water Temperature					
Entering Water Temperature					
Expansion Tank Level OK			☐		

COMMENTS

SOLAR WATER COLLECTOR

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: SWH-1 Unit Manf: Apricus

Model #: AP-30 Serial #: APKE-30-13597/15840

GENERAL

Anchorage	☐	Clean	☐
Piping	☐		
Tubes	☐		

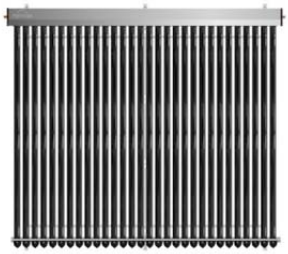
SPECIFIC

Perform maintenance per O&M Manual; ensure tube surfaces are clean for optimal performance.

COMMENTS

AP-30 Solar Collector

The Apricus AP-30 (30 tube) collector is designed for use in a wide variety of solar thermal applications in almost any climate.



MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: EF-X Unit Manf: Cook

Model #: _____ Serial #: O33SD

SHIPPING & SETTING

Back Draft Dampers Operate	☐	Fan Rotates Freely	☐
Dampers Functional	☐		
Electrical Connections OK	☐		
Bearings Lubricated	☐		

CONTROLS

VFD Controlled	☐	Electric Interlocks Complete	☐

FAN 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐	Fan Speed				

BELT AND PULLYS

Belt Tension	☐	Belt Alignment	☐	Set Screws Tight	☐
V - Belt Size		V – Belt Quantity			

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: EH-X Unit Manf: Markel

Model #: E3055T20WB Serial #: _____

Bearings Lubricated	☐	Fan Rotates Freely	☐
Electrical Connections OK	☐		

CONTROLS

Thermostat Operational	☐
Interlock Operational	☐
Hi Limit Reset Operational	☐

FAN 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐	Fan Speed				

FAN 2

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐	Fan Speed				

BELT AND PULLYS

Belt Tension	☐	Belt Alignment	☐	Set Screws Tight	☐
V - Belt Size		V – Belt Quantity			

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4
KW				
AMPERES				
N / P Amps				
Act Amp				
1 & 2				
2 & 3				
1 & 3				
VOLTAGE				
N / P Volts				
Act Volt				
1 & 2				
2 & 3				
1 & 3				
Air Flow Switch Operation	☐			

HEAT (HOT WATER)

Hot Water Valve Strokes Correctly	☐

GAS HEAT (COMBUSTION TEST)

Fire Rate	High	Low
Gas Inlet Pressure		
Manifold Pressure (wc)		

COMMENTS

FAN COIL UNIT

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Fan Coil Unit Unit Tag: FC-X Unit Manf: _____

Model #: _____ Serial #: _____

Electrical

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐		
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size			
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

N/P Volt		N/P Amp		HP		Fan Speed Control	☐	
	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

INDOOR FAN(s)

FAN 1								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				
FAN 2								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4	Stg 5	Stg 6	Stg 7	Stg 8
KW								
AMPERES								
N / P Amps								
Act Amp								
1 & 2								
2 & 3								
1 & 3								
VOLTAGE								
N / P Volts								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

HEAT (HOT WATER)

Hot Water Valve Strokes Correctly	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

AIR ECONOMIZER

Economizer Function	☐	Min OSA Set	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: FS-X Unit Manf: Various

Model #: _____ Serial #: _____

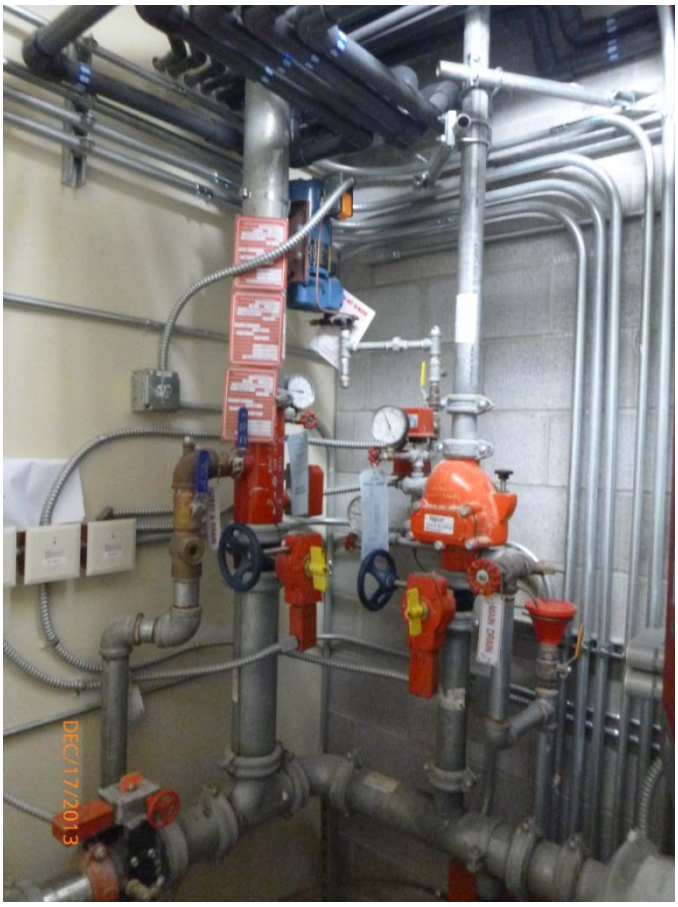
GENERAL

Fire Service	☐	Riser	☐
Backflow	☐	Distribution	
Fire Dept Conn	☐	Alarm	

SPECIFIC

Perform maintenance per O&M Manual(s) and applicable codes & standards; specifically City of Lynnwood Fire Marshall and NFPA standards. Includes wet and dry pipe systems.

COMMENTS



MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date:
Address:

UNIT INFORMATION

Unit Size Diesel Generator Unit Tag: Gen-1 Unit Manf: Cummins
Model #: DSGAB-4789077 Serial #: F1001126698

GENERAL

Enclosure	☐	Control Panel	☐
Fuel Oil Tank	☐		
Power Connections	☐		

SPECIFIC

Perform maintenance per O&M Manual (spec sheet to right for reference; does not show enclosure).

COMMENTS

Specification sheet

Power Generation

Diesel Generator set QSB7 series engine

100-200 kW 60 Hz

Description

Cummins Power Generation commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications.

Features

Cummins® heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Control system - The PowerCommand® 1.1 electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance. The optional PowerCommand 2.2 control is UL 508 Listed and provides AmpSentry™ protection.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Enclosures - Optional weather protective and sound attenuated enclosures are available.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DSGAA	100 (125)		90 (113)				D-3349	
DSGAB	125 (156)		113 (141)				D-3350	
DSGAC	150 (188)		135 (169)				D-3351	
DSGAD	175 (219)		160 (200)				D-3516	
DSGAE	200 (250)		180 (225)				D-3517	

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HEAT RECOVERY UNIT

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Heat Recovery Unit Unit Tag: HRU-X Unit Manf: Renew Aire

Model #: _____ Serial #: _____

ELECTRICAL

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size	

Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

OUTDOOR FAN(s)

N/P Volt		N/P Amp		HP		Fan Speed Control	☐

	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

INDOOR FAN(s)

FAN 1								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension	☐			Belt Alignment	☐			
V - Belt Size				V – Belt Quantity				
FAN 2								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension	☐			Belt Alignment	☐			
V - Belt Size				V – Belt Quantity				

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

AIR ECONOMIZER/BYPASS

Economizer Function	☐	Min OSA Set	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Generic Unit Unit Tag: HVAC-X Unit Manf: _____

Model #: _____ Serial #: _____

ELECTRICAL

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size	
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

OUTDOOR FAN(s)

N/P Volt		N/P Amp		HP		Fan Speed Control		☐
	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

INDOOR FAN(s)

FAN 1								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				
FAN 2								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				

COMPRESSOR(s)

N/P Volt		RLA		HP		Crank Case Heaters OK		☐
	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐

Act AMPS								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

COMPRESSOR # 1

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 2

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 3

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 4

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 5

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 6

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F

Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 7

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 8

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

Heat (GAS)

Natural	☐	LP		☐				
Supply Pressure		W C	Rated Min		W C	Rated Max		W C
Manifold Pressure	High Fire			WC	Low Fire			WC
General Operation								

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4	Stg 5	Stg 6	Stg 7	Stg 8
KW								
AMPERES								
N / P Amps								
Act Amp								
1 & 2								
2 & 3								
1 & 3								
VOLTAGE								
N / P Volts								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

HEAT (HOT WATER)

Hot Water Valve Strokes Correctly	☐

CONTROLS

VFD Controlled	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

AIR ECONOMIZER

Economizer Function	☐	Min OSA Set	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____
Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: HX-X Unit Manf:
Model #: _____ Serial #: _____

CONTROLS

Controlled	☐

HEAT EXCHANGER

Clean	
Test	
Connections	
Leakage	
Support	

Gauges

Pressure	
Temperature	

COMMENTS

NATATORIUM AIR UNIT

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Natatorium AHU Unit Tag: NAU-X Unit Manf: Team Air

Model #: CAH42000S Serial #: 032813-557-NAH-X

ELECTRICAL

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐		
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size			
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

INDOOR FAN(s)

FAN 1							
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐
N/P Volt		Act Volt	1&2		1&3		2&3
FLA		Act AMP	1&2		1&3		2&3
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed	
Belt Tension	☐	Belt Alignment	☐				
V - Belt Size		V – Belt Quantity					

FAN 2							
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐
N/P Volt		Act Volt	1&2		1&3		2&3
FLA		Act AMP	1&2		1&3		2&3
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed	
Belt Tension	☐	Belt Alignment	☐				
V - Belt Size		V – Belt Quantity					

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

HEATING COIL

Coil Clean	☐
Hot Water Valve Strokes Correctly	☐

HEAT RECOVERY COIL (Exhaust)

Coil Clean	☐
Control Valve Strokes Correctly	☐

HEAT RECOVERY COIL (Supply)

Coil Clean	☐
Control Valve Strokes Correctly	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

CONTROLS

VFD Controlled	☐

AIR ECONOMIZER

Economizer Function	☐	Min OSA Set	☐

HEAT EXCHANGER

Exchanger Function	☐	Surfaces Clean	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: P-X Unit Manf:

Model #: _____ Serial #: _____

Electrical Connections OK	☐	Pump Rotates Freely	☐
Pump Aligned Proper	☐		
Bearings Lubricated	☐		

CONTROLS

VFD Controlled	☐

PUMP 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

Pressures

Discharge Pressure	
Suction Pressure	

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Roof Top Unit Unit Tag: RTU-X Unit Manf: Aaon

Model #: RN Serial #: 201007-ANE

Electrical

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐		
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size			
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

OUTDOOR FAN(s)

N/P Volt		N/P Amp		HP		Fan Speed Control	☐	
	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

INDOOR FAN(s)

FAN 1								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				
FAN 2								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				

COMPRESSOR(s)

N/P Volt		RLA		HP		Crank Case Heaters OK	☐	
	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐

Act AMPS								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

COMPRESSOR # 1

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 2

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 3

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 4

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 5

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 6

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F

Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 7

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 8

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

Heat (GAS)

Natural	☐	LP		☐				
Supply Pressure		W C	Rated Min		W C	Rated Max		W C
Manifold Pressure	High Fire			WC	Low Fire			WC
General Operation								

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4	Stg 5	Stg 6	Stg 7	Stg 8
KW								
AMPERES								
N / P Amps								
Act Amp								
1 & 2								
2 & 3								
1 & 3								
VOLTAGE								
N / P Volts								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

HEAT (HOT WATER)

Hot Water Valve Strokes Correctly	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

AIR ECONOMIZER

Economizer Function	☐	Min OSA Set	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: SP-X Unit Manf:

Model #: _____ Serial #: _____

Electrical Connections OK	☐	Pump Rotates Freely	☐
Pump Aligned Proper	☐		
Bearings Lubricated	☐		

CONTROLS

Level Controls	☐

PUMP 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

PUMP 2

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

Pressures

Discharge Pressure	
Suction Pressure	

COMMENTS

SPLIT SYSTEM UNIT

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: Split System Unit Tag: SSFC & SSCU Unit Manf: _____

Model #: _____ Serial #: _____

Electrical

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐		
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size			
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

OUTDOOR FAN(s)

N/P Volt		N/P Amp		HP		Fan Speed Control	☐	
	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

INDOOR FAN(s)

FAN 1								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				
FAN 2								
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐	
N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed		
Belt Tension		☐		Belt Alignment		☐		
V - Belt Size				V – Belt Quantity				

COMPRESSOR(s)

N/P Volt		RLA		HP		Crank Case Heaters OK	☐	
	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐

Act AMPS								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

COMPRESSOR # 1

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 2

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 3

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 4

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 5

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 6

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F

Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 7

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 8

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

Heat (GAS)

Natural	☐	LP		☐				
Supply Pressure		W C	Rated Min		W C	Rated Max		W C
Manifold Pressure	High Fire			WC	Low Fire			WC
General Operation								

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4	Stg 5	Stg 6	Stg 7	Stg 8
KW								
AMPERES								
N / P Amps								
Act Amp								
1 & 2								
2 & 3								
1 & 3								
VOLTAGE								
N / P Volts								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

HEAT (HOT WATER)

Hot Water Valve Strokes Correctly	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

AIR ECONOMIZER

Economizer Function	☐	Min OSA Set	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

GENERIC TANK or FILTER

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: T-X or F-X Unit Manf:

Model #: _____ Serial #: _____

Electrical Connections OK	☐	Pump Rotates Freely	☐
Pump Aligned Proper	☐		
Bearings Lubricated	☐		

CONTROLS

Controlled	☐

TANK

Clean	
Certification	
Connections	
Leakage	
Top/Lid/Access	
Tank Pad	

FILTER

Media Support	
Media	
General	

PUMP

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

Pressures

Discharge Pressure	
Suction Pressure	

COMMENTS

UNIT HEATER

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: UH-X Unit Manf:

Model #: _____ Serial #: _____

Bearings Lubricated	☐	Fan Rotates Freely	☐
Electrical Connections OK	☐		

CONTROLS

Thermostat Operational	☐
Interlock Operational	☐
Hi Limit Reset Operational	☐

FAN 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐	Fan Speed				

FAN 2

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐	Fan Speed				

BELT AND PULLYS

Belt Tension	☐	Belt Alignment	☐	Set Screws Tight	☐
V - Belt Size		V – Belt Quantity			

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4
KW				
AMPERES				
N / P Amps				
Act Amp				
1 & 2				
2 & 3				
1 & 3				
VOLTAGE				
N / P Volts				
Act Volt				
1 & 2				
2 & 3				
1 & 3				
Air Flow Switch Operation	☐			

HEAT (HOT WATER)

Hot Water Valve Strokes Correctly	☐

GAS HEAT (COMBUSTION TEST)

Fire Rate	High	Low
Gas Inlet Pressure		
Manifold Pressure (wc)		

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size UV Treatment Unit Tag: UV-X Unit Manf: ETS

Model #: _____ Serial #: _____

GENERAL

Power Connections	☐	Leakage	☐
Control Panel	☐	UV Lamp Operation	
Treatment Module	☐		

SPECIFIC

Perform maintenance per O&M Manual.

COMMENTS

VRF CONDENSING UNIT

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: VRF Cond Unit Unit Tag: VHP-X Unit Manf: Daikin

Model #: RXYQ96PYDN Serial #: A000310

Electrical

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size	
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

OUTDOOR FAN(s)

N/P Volt		N/P Amp		HP		Fan Speed Control		☐
	Fan 1	Fan 2	Fan 3	Fan 4	Fan 5	Fan 6	Fan 7	Fan 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Actual Amps								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

COMPRESSOR(s)

N/P Volt		RLA		HP		Crank Case Heaters OK		☐
	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8
Rotation (Right)	☐	☐	☐	☐	☐	☐	☐	☐
Act AMPS								
1 & 2								
2 & 3								
1 & 3								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

COMPRESSOR # 1

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 2

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 3

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

COMPRESSOR # 4

	Cooling		Heating	
Suction Pressure		PSIG		PSIG
Suction Temp		Deg F		Deg F
Discharge Press		PSIG		PSIG
Discharge Temp		Deg F		Deg F
Liquid Line Temp		Deg F		Deg F
Sight Glass Full	☐			

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

COMMENTS

100

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Project Address: _____

UNIT INFORMATION

Unit Type: VRF FCU Unit Tag: VRF-X Unit Manf: Daikin

Model #: FXDQ Serial #: _____

ELECTRICAL

Electrical Connection Tight	☐	Control Trans Volt		Trans Prime Taps OK	☐		
(MCA) Min CKT Amps		(MOP) Max Over current Protection		Act Fuse Size			
Supply Volt Unit On	Act Volt	1&2		1&3		2&3	

INDOOR FAN(s)

FAN 1							
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐
N/P Volt		Act Volt	1&2		1&3		2&3
FLA		Act AMP	1&2		1&3		2&3
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed	
Belt Tension		☐		Belt Alignment		☐	
V - Belt Size				V – Belt Quantity			

FAN 2							
HP		Shipping Blocks Removed	☐	Isolation Damper	☐	Damper Operation	☐
N/P Volt		Act Volt	1&2		1&3		2&3
FLA		Act AMP	1&2		1&3		2&3
VFD	☐	Rotate (Right)	☐	Fan Speed Tap	☐	Fan Speed	
Belt Tension		☐		Belt Alignment		☐	
V - Belt Size				V – Belt Quantity			

CONDENSATE

P-Trap	☐	Drain Line Slope	☐	Condensate Pump	☐	CK Operation of Condensate Pump	☐

HEAT (ELECTRIC)

	Stg 1	Stg 2	Stg 3	Stg 4	Stg 5	Stg 6	Stg 7	Stg 8
KW								
AMPERES								
N / P Amps								
Act Amp								
1 & 2								
2 & 3								
1 & 3								
VOLTAGE								
N / P Volts								
Act Volt								
1 & 2								
2 & 3								
1 & 3								

THERMOSTAT / CONTROLLER

Type				
Location	☐	Smoke Detector	Yes ☐	No ☐

AIR ECONOMIZER

Economizer Function	☐	Min OSA Set	☐

FILTER SIZES

Type	Height	Length	Width	Qty

COMMENTS

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: XYZ Unit Manf:

Model #: _____ Serial #: _____

Electrical Connections OK	☐	Pump Rotates Freely	☐
Pump Aligned Proper	☐		
Bearings Lubricated	☐		

CONTROLS

VFD Controlled	☐

PUMP 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

Pressures

Discharge Pressure	
Suction Pressure	

COMMENTS

JET
PUMP

MAINTENANCE CHECK SHEET

BUILDING INFORMATION

Bldg Name: Rec Center Date: _____

Address: _____

UNIT INFORMATION

Unit Size _____ Unit Tag: XYZ Unit Manf:

Model #: _____ Serial #: _____

Electrical Connections OK	☐	Pump Rotates Freely	☐
Pump Aligned Proper	☐		
Bearings Lubricated	☐		

CONTROLS

VFD Controlled	☐

PUMP 1

N/P Volt		Act Volt	1&2		1&3		2&3	
FLA		Act AMP	1&2		1&3		2&3	
Vibration / Noise Level Acceptable	☐	Rotate (Right)	☐					

Pressures

Discharge Pressure	
Suction Pressure	

COMMENTS