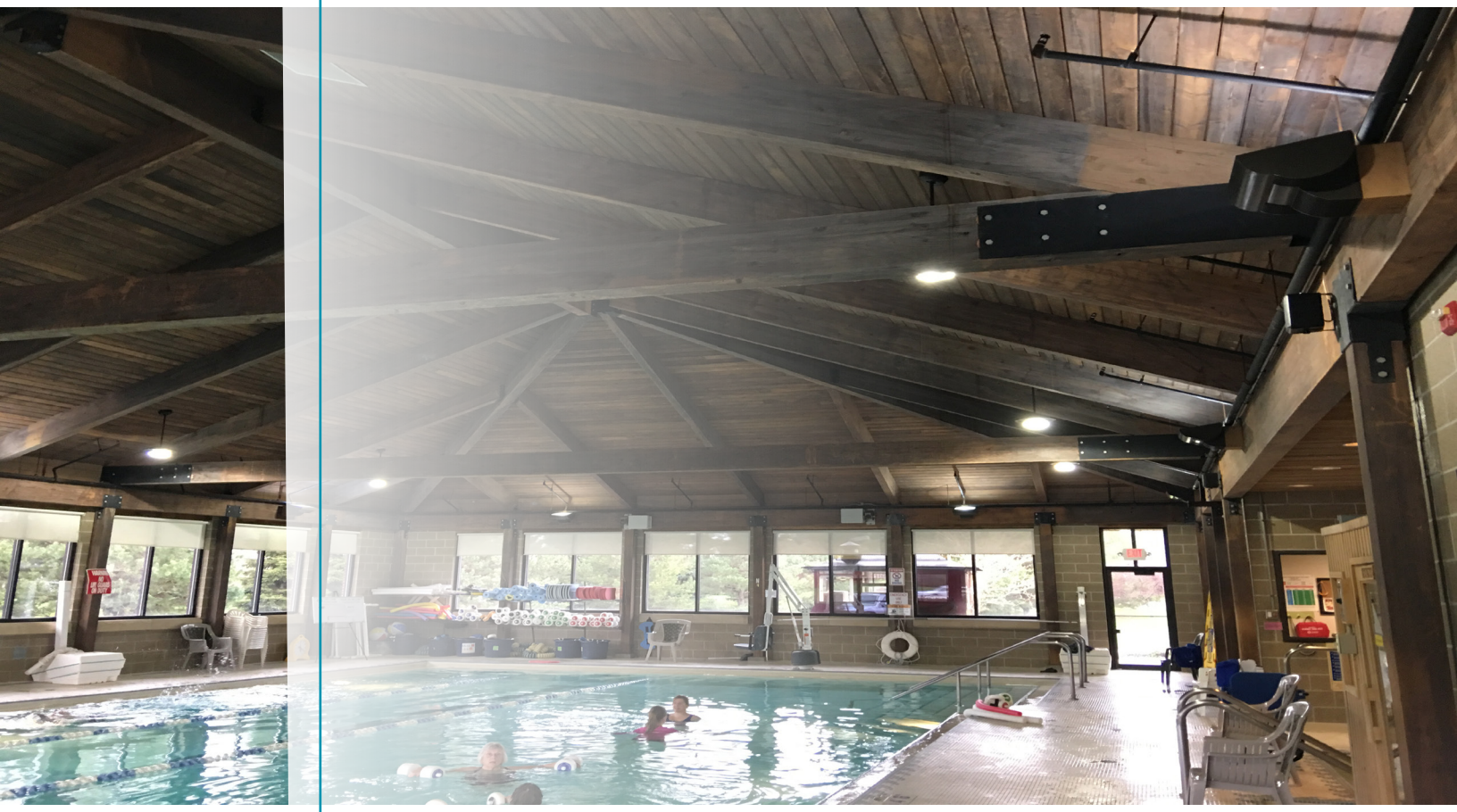
City of Northfield

Northfield Community Resource Center Pool
Pool Mechanical Systems Conditions Assessment



Contact
Blayne Parkos, Associate Partner
ATS&R Planners/Architects/Engineers
bparkos@atsr.com
p: 763.525.3274
f: 763.525.3289

ATS&R
PLANNERS / ARCHITECTS / ENGINEERS

Table of Contents

1.0 INTRODUCTION

Recognizing the need for a facility assessment and the value of a long range plan for building condition, the City of Northfield commissioned the team of ATS&R Planners, Architects and Engineers, to conduct a study to assess the mechanical systems condition of the Northfield Community Resource Center Pool and identify issues and deferred maintenance needs of those systems.

As a part of the building assessment process ATS&R mechanical engineer and a balancer subcontractor, conducted a review of the pool building noting current conditions of the mechanical systems and the airflows from those systems.

2.0 MECHANICAL SYSTEMS ASSESSMENT

While on site, ATS&R and TAB subcontractor completed a test of the Seresco pool air handling unit to verify its current operation for airflow and temperatures as well as reviewing the exhaust systems serving the pool, Jacuzzi and locker room areas.

While performing the test of the Seresco unit, it was found to be providing less than design airflow. The design according to the provided unit shop drawing is 6,100 CFM supply, 1,500 CFM outdoor air and 2,000 CFM of exhaust, the TAB reading for supply air was 4,512 CFM, with outdoor air of 1,298 CFM and return CFM of 2,701 CFM as measured.

We reviewed the exhaust system serving the pool, Jacuzzi and locker room areas and found that none of these exhaust fans were operating. The Pool exhaust fan had the belt off, we put it back on, but it fell off again only a few minutes later. The Jacuzzi exhaust fan was seized up, motor was rusted as well as the fan shaft being seized up, and this unit will need a complete replacement. The locker room fan had a broken belt and was also in need of some bearing lube as they appeared to not rotate freely which may have caused the belt to burn up the way that it did.

We took readings of room air temperatures as well as pool water temperatures. The pool water temp at the surface was 90.2 Degrees. The room temperature and relative humidity ranged from 87 Deg/70% RH to 91.5 Deg/55% RH as was checked at various times and locations around the pool. The warmest and most humid area was near the Jacuzzi, while the general pool area was fairly consistent at around 88 Deg and 60% RH.

ATS&R reviewed the existing Pool Seresco unit calculations and found the following data:

Pool Area: 1,850 sqft
Wet Deck Area: 2,100 sqft
Pool room volume: 78,000 cubic feet
Pool Water Temp: 88 Deg F
Pool Air Temp/RH: 89/55%
Outdoor Air: 1,500 CFM
Activity Level: 1.0

Northfield Community Resource Center Pool
Pool Mechanical Systems Conditions Assessment
August 2, 2017

Pool Exhaust: 2,000 CFM

This data then produced the selection of the unit that was provided by Johnson controls in 2008. This unit that was providing 4.9 air changes per hour at the measured airflow rate which is within the recommended zone for airflow. It also appeared that the unit was dehumidifying the air as the measured RH was 30%.

Natatorium recommended design conditions:
Air Changes: 4-6 for typical activities without spectators 5-7 with spectators
Space Conditions: 82 – 84 degrees Fahrenheit and 50-60% RH, otherwise 2-4 Deg F above pool water temperature.
Pool Water Temps: 75 - 90 max typical, see chart below for recommended conditions.

Typical Natatorium Design Conditions

Pool Type	Air Temperature (°F)	Water Temperature (°F)
Competition	75 to 85	76 to 82
Diving	80 to 85	84 to 88
Elderly Swimmers	84 to 85	85 to 90
Hotel	82 to 85	82 to 86
Physical Therapy	80 to 85	90 to 95
Recreational	82 to 85	80 to 85
Whirlpool/spa	80 to 85	102 to 104

Activity levels: 0.65 for senior pool, see chart below.

Type of Pool	Activity Factor
Elderly swim	0.65
Fitness club – Aquafit	0.65
Hotel	0.8
Institutional - School	0.8 – 1.0
Physical Therapy	0.65
Public / YMCA	1.0
Residential	0.5
Swim Meet	0.65
Wave Pool	1.5 – 2.0
Whirlpool	1.0

Space Pressure: Negative (0.05 – 0.15”wc negative pressure)

As this pool is typically used for seniors, they tend to like warmer water temps and air temps, so we will base our calculations on the following information to review sizing and airflows of the system.

ATS&R calculations:
Pool Area: 1,967 S.F. (This includes the Jacuzzi, 1,856 pool + 111 Jacuzzi)
Wet Deck Area: 1,942 S.F. (Total Pool area – water surface area)
Pool room volume: 54,726 cubic feet
Pool Water Temp: 90 degrees Fahrenheit (as field measured)
Pool Air Temp/RH: 90/55%
Outdoor Air: 1,500 CFM
Activity Level: 0.85 (A blended rate between the senior level and Jacuzzi)
Pool Exhaust: 2,000 CFM

We found from our calculations (see attached calculation sheet) that the unit has the proper amount of capacity, but is in need of a complete balancing on all outdoor air flow, return and supply airflow to get it to the noted design conditions in its original selection of 6,100 Supply, and 1,500 Outdoor air. The calculation sheet will show that the desired unit should have roughly 6,800 CFM, but the moisture removal capacities are nearly the same as the original calculation. Original unit capacity 81.4lbs/hr moisture removal, updated calculation, 86.7 lbs/hr moisture removal.

CONCLUSSIONS AND RECOMMENDATIONS

Dehumidification Unit:

The existing Seresco unit is in good condition but is using a refrigerant that is now on the EPA list so that it is no longer being produced (R-22). The unit is capable of producing the proper amounts of dehumidification for the space, but will need rebalancing of all the airflows to accomplish the correct conditions. We would also recommend having the refrigeration system pressure checked to verify that it does not need additional refrigerant added to keep up its dehumidification system in proper working order.

Exhaust fans:

The exhaust fans are all in poor condition and/or not operational.
EF-7 serving the locker space needs a new belt and bearings lubed if the bearings are in a good enough condition for re-use.
EF-8 serving the Jacuzzi is completely seized up and needs a total replacement unit.
EF-9 serving the pool is having issues with keeping its belt on as well as having bearing issues, the lower bearing is making noise and should be replaced.

We would recommend replacing all of these fans with units with direct drive EC motors. The following make and model numbers would be recommended.

EF-7: Manufacturer: Greenheck Model: G-123-VG; ½ hp, 1,400 CFM unit.
EF-8: Manufacturer: Greenheck Model: G-123-VG; ½ hp, 1,200 CFM unit.
EF-9: Manufacturer: Greenheck Model: G-163-VG; 1hp, 2,000 CFM unit.

3.0 APPENDIX

PICTURE OF POOL EXHAUST FAN UNIT; Belt is off, but motor is spinning.

PICTURE OF JACUZZI EXHAUST FAN; Both the fan and the motor are seized.

PICTURE OF LOCKER ROOM EXHAUST FAN; Motor is spinning, fan does not move well as bearings appeared to be in poor condition, belt was worn and broken.

AIR BALANCE REPORT OF SERESCO POOL UNIT ATTACHED

SERESCO POOL UNIT CALCULATION ATTACHED

PRO CONTROL
HVAC CONTROLS • AIR AND HYDRONIC BALANCING • HVAC COMMISSIONING

AIR BALANCE REPORT
NORTHFIELD SENIOR CENTER POOL
1651 JEFFERSON PKWY
NORTHFIELD, MN
JULY 21, 2017

We tested, measured the air flows & provided a report for PRV-8, PRV-9 & MUA-1

Following is a brief summary of the results.

AIR BALANCE REPORT

UNIT NO.	DESIGN CFM	ACTUAL CFM	% OF DESIGN	REMARKS
PRV-8	1200	0		Unable to measure due to seized motor
PRV-9	4800	743	16%	Fan Belt Faulty
MUA #1				
Supply Air		4512		
Return Air		2701		
Outside Air		1298		

The following pages contain the Detailed Test Data for the systems tested. If there are any questions, please call.

PRO CONTROL

HVAC CONTROLS • AIR AND HYDRONIC BALANCING • HVAC COMMISSIONING

DUCT TRAVERSE READINGS

PROJECT: Northfield Senior Pool **LOCATION:** Northfield, MN

SYSTEM: MUA #1 Supply Air **AREA SERVED:** Pool

.3182"	940	733	1137	894						
	968	826	1206	878						
	947	844	1120	902						
	794	672	1132	710						
	762	591	845	665						
	615	520	707	624						
			1265	1398	1197	923				
.3226"			1501	1207	1081	973				
			1539	1191	1073	1030				
			1447	1230	1134	1171				
			1582	1249	1187	1003				
			1711	1525	1486	752				
	Zone	#1	Zone	#2						

TOTAL	20,032	29,855	**REMARKS**
DIV. BY	24	24	
=AVE.VEL.	835	1244	
DUCT WIDTH	26"	26"	
X DUCT HEIGHT	12"	12"	
=NET AREA (SQ.FT.)	2.17	2.17	
VEL X AREA=CFM	1812	2700	= 4512
DESIGN CFM			6100
PERCENT OF DES.			74%

DATE 07/21/17 BY R.A / M.P. SHEET 1 OF 3

PRO CONTROL

HVAC CONTROLS • AIR AND HYDRONIC BALANCING • HVAC COMMISSIONING

DUCT TRAVERSE READINGS

PROJECT: Northfield Senior Pool **LOCATION:** Northfield, MN

SYSTEM: MUA #1 RA / OA **AREA SERVED:** Pool

-1.082"	566	704	506	385	406	451				
	568	617	661	563	437	393				
	504	509	593	601	348	308				
	525	389	469	512	307	300				
	410	179	269	339	241	206				
			1148	1225	997	1270				
-.2249"			1017	993	1066	1114				
			899	712	706	533				
			745	465	545	405				
			702	431	262	344				
	RA		OA							

TOTAL	13,266	15,579		**REMARKS**		
DIV. BY	30	20		SA	4512	
=AVE.VEL.	442	779		RA	2701	
DUCT WIDTH	40"	24"		OA	1811	40%
X DUCT HEIGHT	22"	10"				
=NET AREA (SQ.FT.)	6.11	1.67		RA	2701	
VEL X AREA=CFM	2701	1298		OA	1298	
DESIGN CFM	-	-		SA	3999	33%
PERCENT OF DES.	-	-				

DATE 07/21/17 BY R.A / M.P. SHEET 2 OF 3

PRO CONTROL

HVAC CONTROLS • AIR AND HYDRONIC BALANCING • HVAC COMMISSIONING

DUCT TRAVERSE READINGS

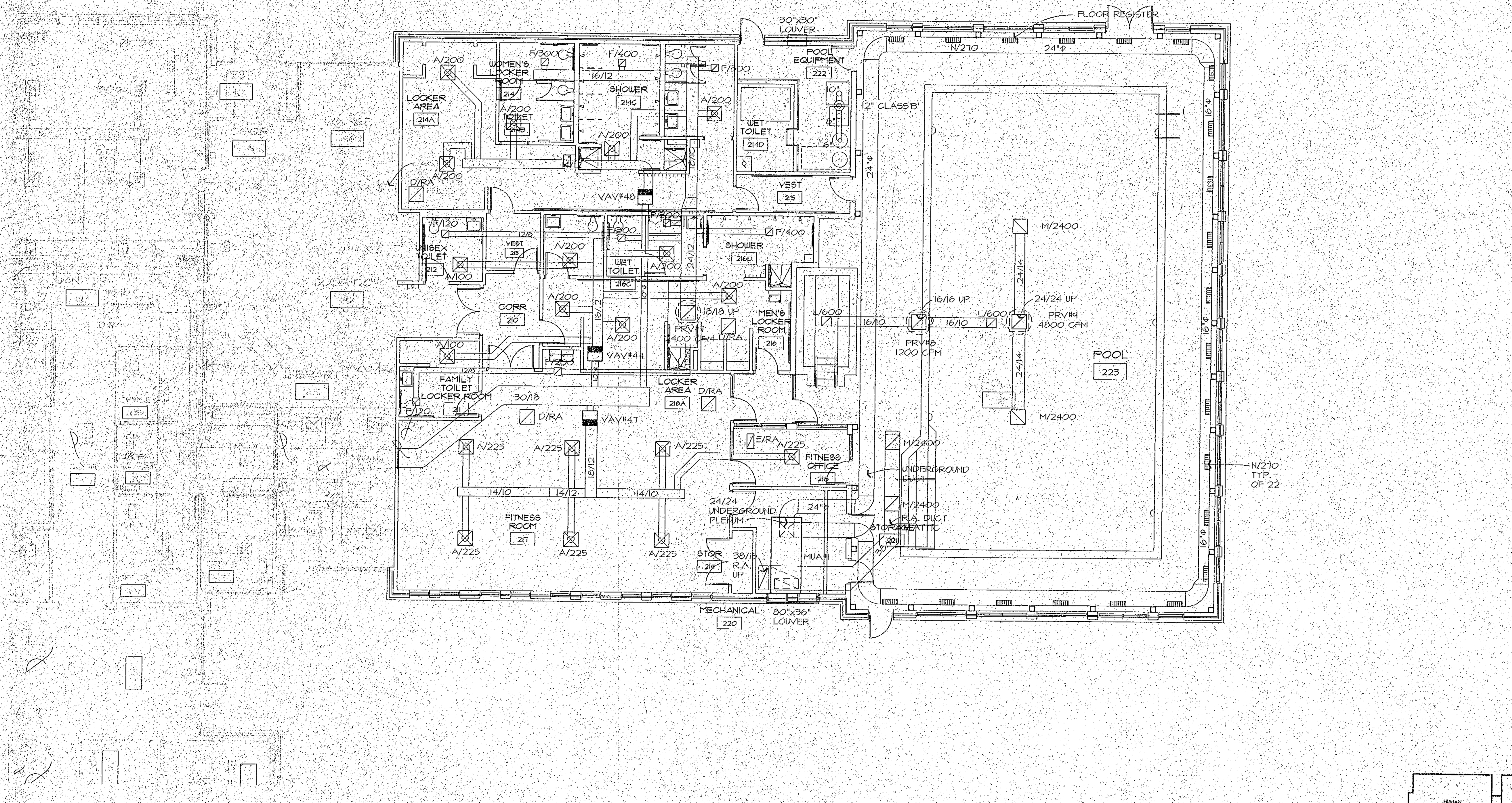
PROJECT: Northfield Senior Pool **LOCATION:** Northfield, MN

SYSTEM: PRV-9 **AREA SERVED:** Pool

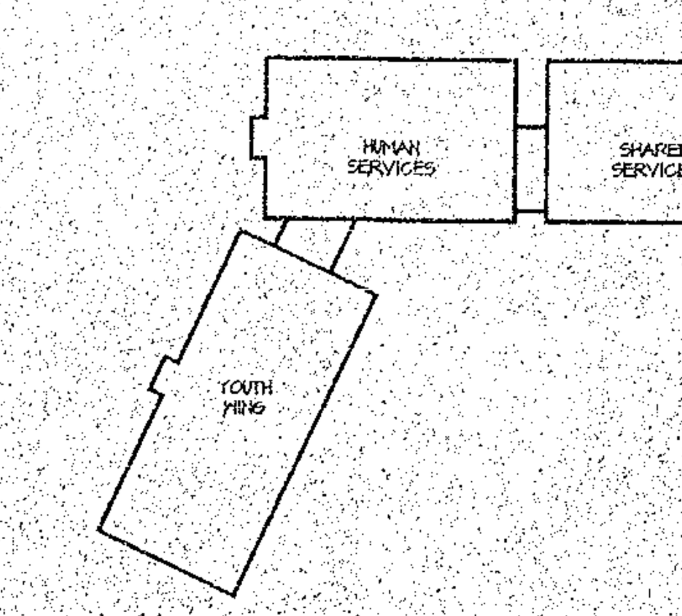
-.0553"	151	130	164	114	93					
	453	244	226	193	177					
	500	249	257	227	216					
	580	204	205	219	232					
	428	179	151	177	197					
	309	132	95	69	129					

TOTAL	6,700			**REMARKS**
DIV. BY	30			
=AVE.VEL.	223			
DUCT WIDTH	20"			
X DUCT HEIGHT	24"			
=NET AREA (SQ.FT.)	3.33			
VEL X AREA=CFM	743			
DESIGN CFM	4800			
PERCENT OF DES.	16%			

DATE 07/21/17 BY R.A / M.P. SHEET 3 OF 3



1 WELLNESS CENTER
M-2
SCALE: 1/8"= 1'-0"



KEY PLAN

DESIGNED	TT
DRAWN	AJT
CHECKED	TT
PROJECT	9823
REVISIONS	

RELEASED FOR BIDS
14 SEPT. 1998

I Heareby cerify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Reg. No. 16712
Date

architects plus
203 n.w. first ave.
faribault, minn. 55021
507/334-2251
612/333-6713
507/334/8350 (fax)

NORTHFIELD COMMUNITY WELLNESS CENTER
NORTHFIELD, MINNESOTA

T2 ENGINEERING
3233 Industrial Park
Red Wing, Minnesota 55066
(612)388-0751

WELLNESS CENTER HVAC PLAN

M-2

Natatorium Design

Pools

Pool Name	Surface Area ft^2
Northfield	1967

Room Details

Wet Deck Area (ft^2):

Pool Room Volume (ft^3):

Number of Spectators:

Air Conditions

Room Temperature (˚F): 82

RH Unoccupied (%): 50

RH Occupied (%): 60 51

Unit Design

Number of Units: 1

Supply Air CFM: 0

Pool Water Heating: Yes N

Outside Air Required: Yes N

Outdoor Air Design

Outside Air CFM: 0 (1

Country: U.S.

State/Province: Alabama

City: MINNEAPOLIS-ST PAUL INT'L ARP

Elevation (ft)	Summer db (˚F)	Sumr
837	91.0	7

Moisture Load Summary (lb/hr)

Load Source	Occupied	Unoccupied
Northfield	108.7	65.5
Outside Air	-13.4	
Spectators	0.0	
Total	**95.3**	**65.5**

Recommended Model: NE-016

	Occupied	Unoccupied	Total Occupied
Moisture Removal Capacity (lb/hr):	86.7	84.5	86.7
Max AC Moisture Removal Capacity (lb/hr):	86.1	83.3	86.1
Total Unit Capacity (MBH):	203.3		203.3
Sensible Cooling (MBH):	109.7		109.7
Max AC Sensible Cooling (MBH):	133.3		133.3
Max AC Total Capacity (MBH):	226.3		226.3
Compressor Total Heat Rejection (MBH):	254.1		254.1
Pool Water Heating Capacity (MBH):	144.0		144.0
Standard Unit Supply Air CFM:	6400		6400
CFM Range:	4200 - 6800		
Room Air Changes (per hr):	8.2		

Selected Model: NE-016

	Occupied	Unoccupied	Total Occupied
Moisture Removal Capacity (lb/hr):	86.7	84.5	86.7
Max AC Moisture Removal Capacity (lb/hr):	86.1	83.3	86.1
Total Unit Capacity (MBH):	203.3		203.3
Sensible Cooling (MBH):	109.7		109.7
Max AC Sensible Cooling (MBH):	133.3		133.3

Max AC Total Capacity (MBH):	226.3	226.3
Compressor Total Heat Rejection (MBH):	254.1	254.1
Pool Water Heating Capacity (MBH):	144.0	144.0
Standard Unit Supply Air CFM:	6400	6400
CFM Range:	4200 - 6800	
Room Air Changes (per hr):	8.2	