Tarek M Birkdar

Mount Carmel Fitness & Health Center

Lewis Center, Ohio

Mechanical Option

Advisor: Stephen Treado

Presentation Outline

I. Introduction
II. Building Overview
    a. Site Location (1 Screen)
    b. Building's Functions & Façade (1 Screen)
    c. Existing Mechanical System
        i. Systems Overview (1 Screen)
        ii. Ventilation & Cooling (1 Screen)
        iii. Heating (1 Screen)
    d. Energy Consumption, Cost , and Emissions (1 Screen)
III. Mechanical Depth
    a. Geothermal System + RTU WSHP Design
        i. System Schematic & Operation (1 Screen)
        ii. System Sizing & Layout (1 Screen)
        iii. Equipment Selection (1 Screen)
    b. Geothermal System + DOAS Design
        i. System Schematic & Operation (1 Screen)
        ii. System Sizing & Layout (1 Screen)
        iii. Equipment Selection (1 Screen)
    c. Energy Consumption
        i. Overview, Energy Usage, and Utility Cost (1 Screen)
    d. Pollutant Emission Comparisons (1 Screen)
IV. Acoustical Breadth
    a. Room Acoustics Analysis Due to Existing Mechanical Equipment (1 Screen)
    b. Analysis Due to Proposed System & Equipment (1 Screen)
    c. Solutions & Comparison (1 Screen)
V. Overall Evaluation (1 Screen)
VI. Conclusion / Acknowledgements (1 Screen)

Total : 19 Screens

Mount Carmel Fitness & Health

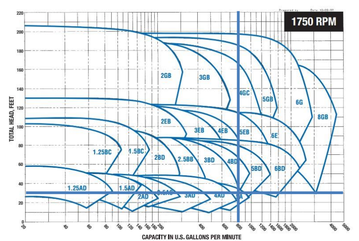
7100 Graphics Way,
Lewis Center,
OH 43045

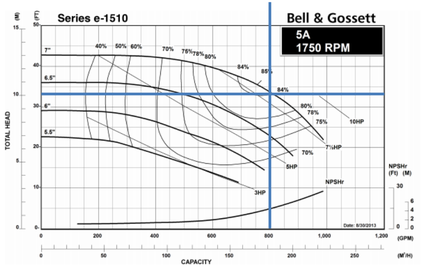
Mechanical Depth

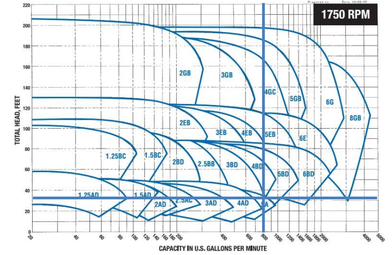
Geothermal System + RTU WSHP Design
- System Schematic & Operation
- System Sizing & Layout
- Equipment Selection

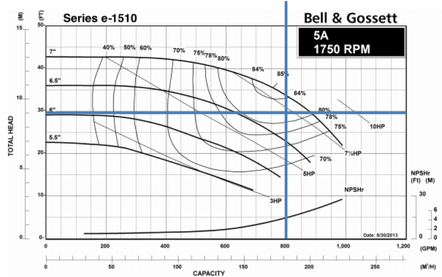
Geothermal System + DOAS Design
- System Schematic & Operation
- System Sizing & Layout
- Equipment Selection

Geothermal Well Field Layout









Mechanical Depth

Geothermal System + RTU WSHP Design
- System Schematic & Operation
- System Sizing & Layout
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Geothermal System + DOAS Design
- System Schematic & Operation
- System Sizing & Layout
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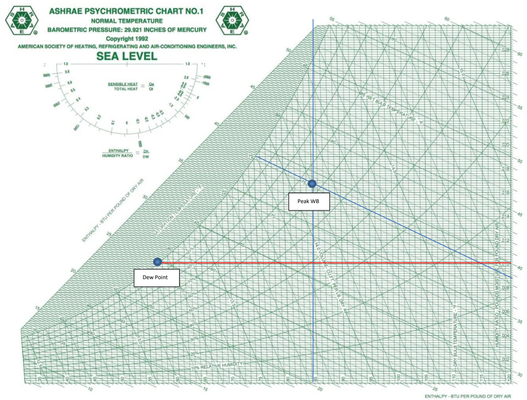
Calculating Pressure Loss - Equivalent Pipe Length Method							
Pipe Size (inches)	Flow (gal/min)	Pressure Loss (ft/100ft)	System Components	Equivalent Length of Component (ft)	Number of Components	Equivalent Length (ft)	Section Pressure Loss (ftH2O)
3	807	128.87	90 deg Elbows	2.7	5	13.5	-
-			Straight Pipe	1	7	7	
			45 deg Elbow	1.3	2	2.6	
Total	807	128.87				23.1	29.76897

Amount of Vertical Bores Required		
Well Depth	Bore Length Required (ft)	Amount of Wells
100	148148.9	1481
200	148148.9	741
300	148148.9	494
400	148148.9	370
500	148148.9	296
550	148148.9	269

Calculating Pressure Loss - Equivalent Pipe Length Method							
Pipe Size (inches)	Flow (gal/min)	Pressure Loss (ft/100ft)	System Components	Equivalent Length of Component (ft)	Number of Components	Equivalent Length (ft)	Section Pressure Loss (ftH2O)
3	807	128.87	90 deg Elbows	2.7	6	16.2	-
-			Straight Pipe	1	10	10	
			-	-		-	
Total	807	128.87				26.2	33.76394

Zone Latent Load		
Zone	Total Area (ft2)	Latent Load (Btu/hr)
Health Center / Aerobic Rooms	30,340	864,000

System	Room Name	Room Number	Occupancy Type	Zone Floor Area (Az)	Outdoor Airflow Rate/Unit Area (Ra)	Outdoor Airflow Rate/Person (Rp)	Maximum # of People in the Ventilated Zone (Pz)	Breathing Zone Outdoor Airflow (Vbz)	Zone Air Distribution Effectiveness (Ez)	Design Zone Outdoor Airflow (Voz)	Exhaust
				(SF)	(CFM/SF)	(CFM/Person)	(# of People)	(CFM)		(CFM)	(CFM)
Zone	Health Center & Aerobic Rooms	2020, 2003, 2001, 2004, 2016, 2005, 2010, 2024, 2207, 2205	Health Club/Aerobic Rooms	30340	0.06	20	1200	25820.4	1	25820.4	25820.4

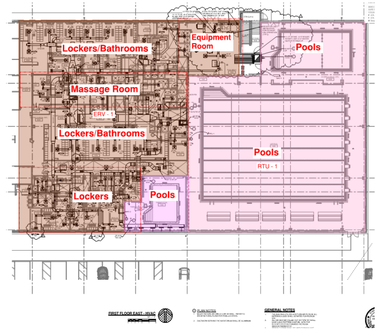


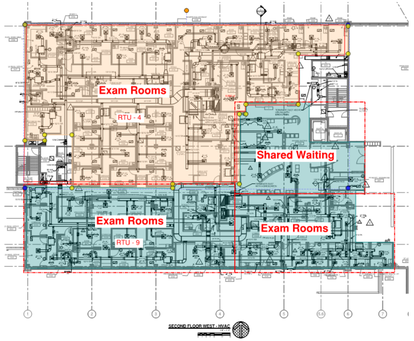
RN Series (6-140 tons)

Acoustical Breadth

Room Acoustics Analysis Due to Existing Mechanical Equipment

Analysis Due to Proposed System & Equipment Solutions & Comparison





COMFORT™ 15 HEAT PUMP

25HBC5