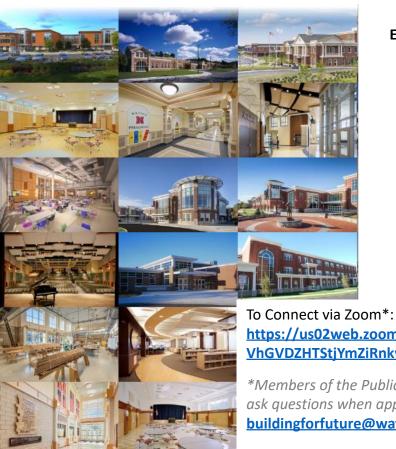
Watertown Public Schools Building Committee

# **Design Watertown**



#### **Elementary Schools Project**

Hill International, Inc. Ai3 Architects, LLC Agenda – March 20, 2024

- Call to Order
- Review and Approval of Meeting Minutes

Elementary School Projects – February 21, 2024

- Review and Approval of:
  - Three Elementary Schools Projects Invoices
    - Lowell Elementary School
  - CTA Change Order No.14
- Lowell Elementary School Updates
  - Ai3 Lowell ES Chiller Noise Attenuation
  - Executive Summary
- Elementary School Questions / Comments

To Connect via Zoom\*: Passcode: **899084** https://us02web.zoom.us/j/85782901747?pwd=UnF1U VhGVDZHTStjYmZiRnkwOGF6UT09

\*Members of the Public: Please use the Q&A button to ask questions when appropriate or email questions to: buildingforfuture@watertown-ma.gov

# Watertown Public Schools Building Committee Call to Order

Watertown Public Schools Building Committee

## Approvals

- Meeting Minutes
  - Elementary School Meeting Minutes February 21, 2024



- Flomontory
- Elementary Schools Project Invoices February 2024
- Lowell Elementary School
  - CTA Change Order No. 14

#### Approvals Summary of Invoices Elementary Schools Project

For work completed during February 2024

Vendor	Project	Invoice Date	Invoice Number	Invoice Amount
Ai3 Architects	Elementary Schools	02/29/24	0072B-1610.00	\$8,923.06
CTA Construction Managers	Elementary Schools	02/29/24	Application #24	\$220,931.94
<b>Ridgeline Energy Analytics</b>	Hosmer Elementary Schools	03/04/24	1730	\$1,225.00
				4
			TOTAL	\$231,080.00

#### Approvals

#### Change Order No. 14 Elementary Schools Project

For work related to Lowell Elementary School

PR#	PCO#	Brief Description	Date Received	Proposed Cost
	122.1	CE #132 - RFI #247 - Roof Detail Modifications	2/14/2024	-\$2,998.00
	232.1	CE #254 - Misc. Demolition	2/27/2024	\$23,479.30
		CE #372 - PVC Panels and Trim Furnish and Install Only @ Boiler Flue Enclosure	1/24/2024	\$10,867.40
	5521	CE #392 - Hollow metal Frames and for Room 107C (Contract Owned), Crawl space, 212, and Existing electrical closet.	2/14/2024	\$6,189.35
	336.1	CE #397 - Door 190A size modification for Switchgear per RFI 151R1	2/14/2024	\$3,469.73
	354	CE #423 - Owner requested Sargent Degree interior key blanks	2/13/2024	\$841.63
	355	CE #425- T&M to rework Wood Ceiling for electrical devices	2/13/2024	\$4,070.82
		CTA CHANGE ORDER #14 TOTAL		\$45,920.23

Watertown Public Schools Building Committee

### Lowell Elementary School Update Ai3 Architects Lowell ES Chiller Noise Attenuation

#### **Lowell Elementary School** Chiller Sound Attenuation March 2024

**Chiller Specification** 

Daikin Model AWV 018B with internal discharge compressor muffler

#### **Outdoor Chiller Radiated Sound Report**

Report completed by Cavanaugh Tocci December 21, 2023 Final Report Release February 5, 2024

#### **Chiller Operating Parameters**

Days & Times	Maximum Chiller Capacity*
Weekday (M-F) Daytime (7am-4pm)	80% Capacity
Weekday (M-F) Evening (4pm-8pm)	50% Capacity
All Other Times: Nighttime (8pm-7am), Weekdays, Holidays	30% Capacity

\*Parameters confirmed with Mechanical Engineer of Record

### **Lowell ES Factory Sound Attenuation Options Provided**

Includes low noise construction as standard feature

Sound attenuation material wrapped on the entire length of the discharge (outlet) line

Sound reduction mode to reduce fan speed and lower sound levels settable by time schedule



Lowell ES Chiller (Discharge / Outlet)



Lowell ES Chiller Compressor

#### **Baseline Sound Survey**

10 day Average of the lowest hourly L90 taken from the Sound Monitor (SM1) while chiller was not in operation

#### Sound Monitor Location



#### **Noise Criteria**

Watertown City Code & MassDEP

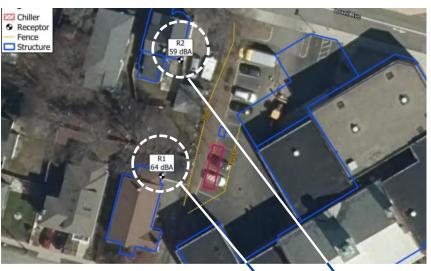
Days & Times	Ambient (LAF90,1-hr)	MassDEP Limit (Ambient + 10dBA)	Watertown Limit (Ambient + 5dBA)
Weekday (M-F) Daytime (7am-4pm)	45	55	50
Weekday (M-F) Evening (4pm-8pm)	39	49	44
All Other Times: Nighttime (8pm-7am), Weekdays, Holidays	34	44	39
			**********

. . . . . . . . . . . . . .

#### Lowell Elementary School Chiller Sound Attenuation

March 2024

#### Sound Level Receptors



#### **Existing Sound Levels @ Receptors**

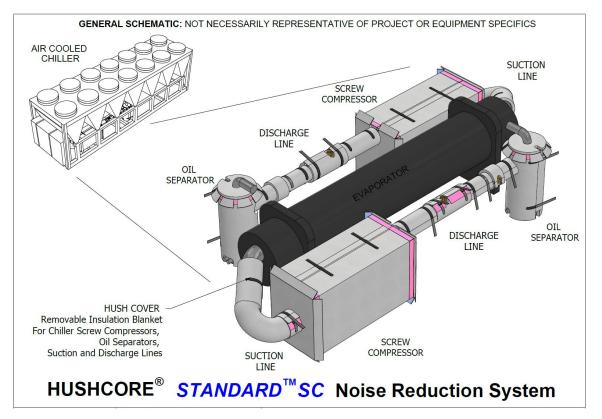
Days & Times	Maximum Chiller Design Capacity	Watertown Limit (Ambient + 10dBA)	Existing C	R2	
Weekday (M-F) Daytime (7am-4pm)	80%	50	64	59	<b>14</b> dBA
Weekday (M-F) Evening (4pm-8pm)	50%	44	57	51	Reduction Required
All Other Times: Nighttime (8pm-7am), Weekdays, Holidays	30%	39	52	46	Ai3 architects, LLC

# **Solution**

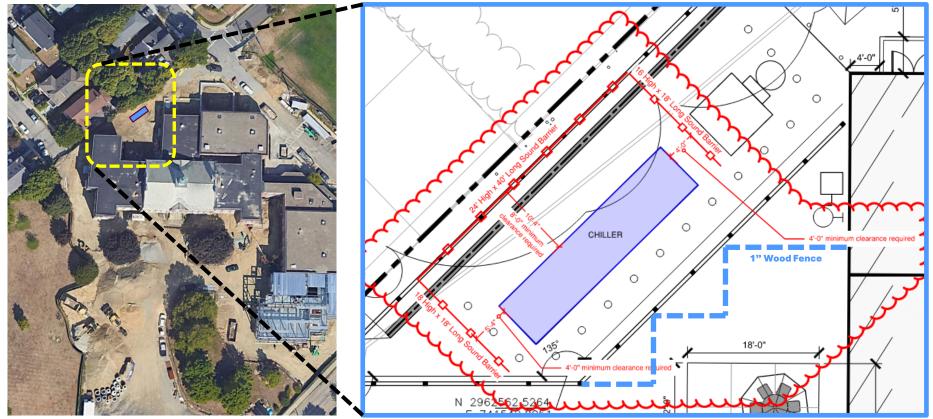
### 14 dBA sound reduction at Receptor 1

### A1. Compressor Wrap / Enclosure

- Typical noise reduction is 4 to 6 dBA
- Acoustical Composite with Velcro flaps
- Clothe strap connectors with "D" rings for wrapping <u>compressor(s), discharge line(s),</u> <u>suction line(s) and oil</u> <u>separator(s)</u> with 100% coverage.
- Finished surface mass of 3 lbs. per sq. ft.
- System meets all environmental conditions



### **A2. Chiller Sound Barrier**



Ai3 architects, LLC

### **Estimates: Option A1 & A2**

Lowell Elementary School	'						
Chiller Sound Attenuation							
(Daikin AWV Chiller Includes low noise contruction as standard)	Option 1 En	npire			<b>Option 2 Silenti</b>	um	
	Material	Labor		TOTALS	Material	Labor	TOTALS
A. Acoustical Engineering Report	NA	NA	\$	9,900	NA	NA	\$ 9,900
Background Noise Data							
Chiller Compliance Review							
Engineering Recommendations							
		SUBTOTA	. \$	9,900.00		SUBTOTAL	\$ 9,900.00
B. Compressor Wrap /Enclosure							
BRD Noise Control	\$ 23,583	\$ 20,000	\$	43,583	\$ 23,583	\$ 20,000	\$ 43,583
C. Chiller Sound Barrier							
(3) sound panels at various sizes: 16'Tx18'L, 24'Tx40'L, 18'Tx18'L	\$ 34,584	NA	\$	34,584		NA	\$ 118,000
Structural Steel: Powder Coated	\$ 40,000	NA	\$	40,000		NA	
Flashing: Galvanized	\$ 1,000	NA	\$	1,000		NA	
Installation		\$ 65,000	\$	65,000			\$ 47,000
Engineering		\$ 5,500	\$	5,500			Included
Delivery		\$ 7,500	\$	7,500			Included
Permit Drawings(if required by City estimated cost)		\$ 4,500	\$	4,500			Included
D. Wood 1" thick fence @ Café					_		
10'H x 70'L (700sf) Separates outdoor student dining and chiller			\$	7,700.00	_		\$ 7,700.00
		SUBTOTA	. \$	209,367.00		SUBTOTAL	\$ 216,283.00
E. Contingency							
12% Construction Contingency: Foundations, Foundation Peer Review		12%	5 \$	25,124.04		12%	\$ 25,953.96
		ΤΟΤΑ	. \$	244,391		TOTAL	\$ 252,137

• Excludes cost for final noise level readings after construction

• Excludes replacement cost work-in-place disturbed during demo/construction

Assumptions made for foundation pricing.

# Discussion

- 24' Proposed acoustical fence height exceeds City height limit
  - Investigate full sound enclosure around chiller
    - Increase dBA reduction from 14 to 16



### **INCREASE** sound reduction from

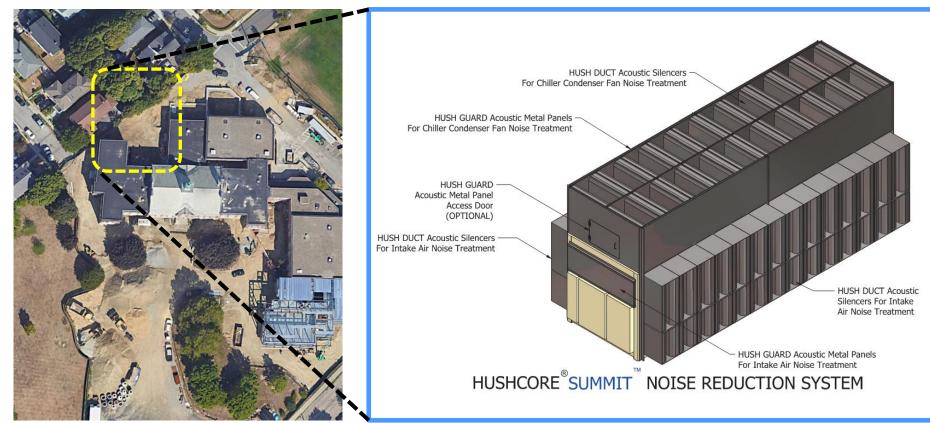
#### 14 dBA to 16 dBA at Receptor 1 (nearest abutter)

Basis of design will be a maximum of 3 dBA (5 dBA Watertown Ordinance) above ambient background noise during Weekday (M-F) Daytime (7AM-4PM) which would equate to **48dBA @ 30'-0"** allowable at 80% Maximum chiller design capacity

(Would require a total reduction of 16 Dba at Receptor R1 identified in the acoustical report).

March 2024

### B1. Chiller Sound Enclosure (open plenum & side baffles)

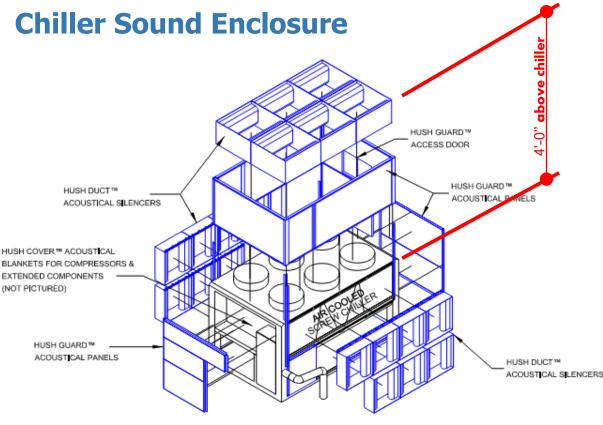


#### Lowell Elementary School Chiller Sound Attenuation

SUMMIT<sup>™</sup>HDE 3I-2E, Systems: Combination of a UNITARY<sup>™</sup> SM-SB system mounted to the condenser fan deck to attenuate condenser section discharge noise, a STANDARD<sup>™</sup> SL System (wraps) for compressor noise a LOUVER<sup>™</sup>HD system component for attenuation of condenser/compressor section intake noise.

**UNITARY<sup>TM</sup> SM-SB** System is a "unit-mounted" source control system using HUSH GUARD<sup>TM</sup> HG-2/400 modular acoustical panels to create a plenum barrier wall and includes HUSH DUCT<sup>TM</sup> Acoustical Silencers, 24" long (**2E**), inserted and supported by the acoustical plenum barrier wall to attenuate condenser fan noise. The system shall be supported by structural steel angles that will mount to the Chiller frame. The HUSH GUARD<sup>TM</sup> Acoustical Panel Barrier Wall End (1), shall contain (1) 2' x 2' access door to facilitate access to the condenser fan section.

**LOUVER**<sup>™</sup>**HD** system is a source control component of HUSH DUCT<sup>™</sup> Acoustical Silencers, 36" long (**3**I), independently mounted on the side of the chiller frame covering the intake coil and compressor section sides of the chiller. All materials are constructed from varying gauges of unpainted, galvanized steel (all structural steel is HDG finish).



### **Estimate: Option B1**

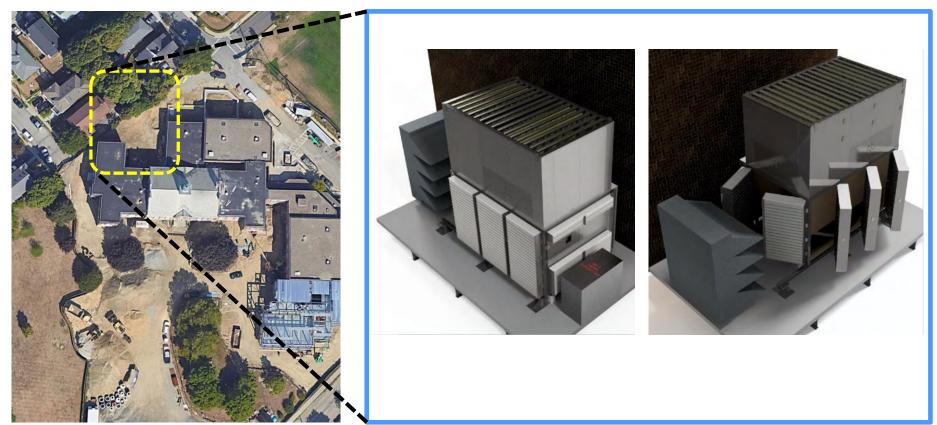
Lowell Elementary School				
Chiller Custom Sound Enclosure				
	Chiller Custon	n Sound Enclosure: B	RD Hu	ushcore
	Material	Labor		TOTALS
A. Acoustical Engineering Report	NA	NA	\$	9,900
Background Noise Data				
Chiller Compliance Review				
Engineering Recommendations				
		SUBTOTAL	\$	9,900
B. Compressor Wrap /Enclosure				
BRD Noise Control	Included Belo	w Included Below	\$	-
C. Chiller Sound Barrier				
(1) Summit HDE #I-2E System Combination of Unitary SM-SB	\$ 134,263	NA	\$	134,263
System mounted to the condenser fan deck to attenuate				
condenser section discharge noise				
Installation		\$ 72,675	\$	72,675
Engineering	Included	\$ -	\$	-
Delivery	Included	\$ -	\$	-
Permit Drawings(if required by City estimated cost)	If Required	\$ 4,500	\$	4,500
D. Wood 1" thick fence @ Café				
Not Required			\$	-
		SUBTOTAL	\$	211,438
E. Contingency				
10% Construction Contingency		10%	\$	21,144
		TOTAL	\$	242,482

Excludes cost for final noise level readings after construction

• Does not include special rigging if required

March 2024

### B2. Chiller Sound Enclosure (enclosed baffles & plenum)



### **Chiller Sound Enclosure**

Parklane designed a custom louvered enclosure and discharge silencers to bring the facility into compliance with the local municipal code while accounting for physical limitations on the rooftop and street access. The final solution also ensured that all the louvers were hinged, providing full accessibility for maintenance. The design required Parklane to collaborate closely with the owner, owner's engineers, and consultants over several months to create a solution that

reduced the noise enough to mitigate impacts to the nearby suites and businesses. The proximity of buildings in the area introduced new challenges to designing a compact, and

highly-performing enclosure.

Absorptive – PMA Absorptive Acoustic Panels consist of free draining, non-combustible acoustic media, embedded between a solid sheet metal top skin and perforated metal back skin (steel gauges vary based on application). Conventional profiles are a nominal 2'' - 6''.

High Transmission Loss – the PMA-HTL Panel contains added layers of mass to introduce

increased transmission loss through the panel

PMA Plenum Silencer Attentuates Fan Noise

#### Integrated Steel Structure

Efficiently transfers forces for specified roof locations and facilitates a modular design.

#### Hinged Acoustic Louvers

Attenuate intake air and compressor noise, while providing clear service access.



### **Estimate: Option B2**

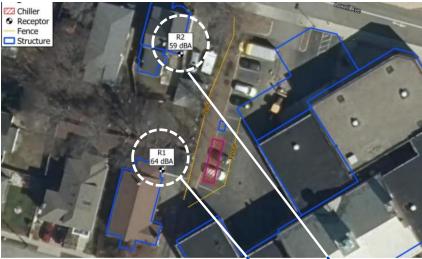
Lowell Elementary School				
Chiller Custom Sound Enclosure				
	Chiller Custom S	Sound Enclosure: P	arklaı	ne
	Material	Labor		TOTALS
A. Acoustical Engineering Report	NA	NA	\$	9,900
Background Noise Data				
Chiller Compliance Review				
Engineering Recommendations				
		SUBTOTAL	\$	9,900
B. Compressor Wrap /Enclosure				
BRD Noise Control	Included Below	Included Below	\$	-
C. Chiller Sound Barrier				
(1) Summit HDE #I-2E System Combination of Unitary SM-SB	\$ -	NA	\$	225,000
System mounted to the condenser fan deck to attenuate				
condenser section discharge noise				
Installation	Included	\$ -	\$	-
Engineering	Included	\$ -	\$	-
Delivery	Included	\$ -	\$	-
Permit Drawings(if required by City estimated cost)	If Required	\$ 4,500	\$	4,500
D. Wood 1" thick fence @ Café				
Not Required			\$	-
		SUBTOTAL	\$	229,500
E. Contingency				
10% Construction Contingency		10%	\$	22,950.00
		TOTAL	\$	262,350

- Excludes cost for final noise level readings after construction
- Does not include special rigging if required

#### Lowell Elementary School Chiller Sound Attenuation

March 2024

#### Sound Level Receptors



Increased to **16 dBA** Per 1.26.24 meeting

#### **Existing Sound Levels @ Receptors**

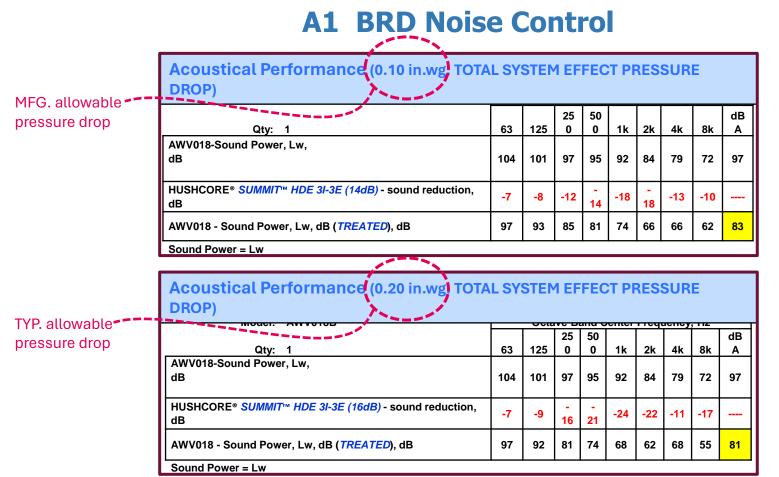
Days & Times	Maximum Chiller	Watertown	Existing C	nditions	1
	Design Capacity	Limit (Ambient + 10dBA)	(R1)	R2	
Weekday (M-F) Daytime (7am-4pm)	80%	50	64	59	<b>14</b> dBA
Weekday (M-F) Evening (4pm-8pm)	50%	44	57	51	Reduction Required
All Other Times: Nighttime (8pm-7am), Weekdays, Holidays	30%	39	52	46	Ai3 architects, LLC

#### Vendor Request for Proposals 1.26.24 to 2.19.24

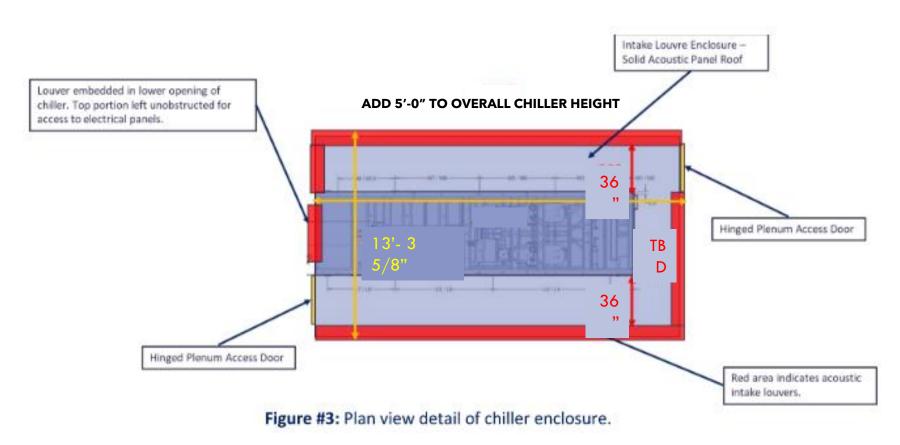
- Release FINAL Acoustical Report and recommendations
- Request proposals and estimates including ALL labor, materials, and installation
  - Proposal to include schedule for Design & Engineering, Fabrication, Delivery, and Installation
- Basis of design will be a maximum of 3 dBA above ambient background noise during Weekday (M-F) Daytime (7AM-4PM) which would equate to 48dBA @ 30'-0" allowable at 80% Maximum chiller design capacity (this would require a total reduction of 16 Dba at Receptor R1 identified in the draft report previously sent).
- The following information from the Chiller Manufacturer will be provided once received:
  - o Condensing Airflow in CFM:180K CFM (10K CFM per fan; 18 fans) This is peak load
  - Maximum external pressure drop: Limit should not exceed an addition of 0.1" APD
- Identify the proposed **sound enclosure dimensions** added to the existing chiller. Identify total outside dimensions for the length, width, and height of the proposed sound enclosure design.
- Identify all relevant sound enclosure features such as compressor wraps, silencers, panels, plenum barrier wall, and louvers to achieve the desired noise reduction of 48 Dba @ 30'-0".
- Additional sound readings to be taken by Cavanaugh Tocci after the installation of the sound enclosure to ensure 48 Dba @ 30'-0" while the chiller is at 80% Maximum Design capacity during Weekday (M-F) Daytime (7AM-4PM). If the reading is not achieved, the Vendor shall provide the necessary adjustments to the sound enclosure at no additional cost to the Owner.
- The Owner has requested a **tour/site visit of local projects** where a similar sound enclosure design was installed in close proximity to Watertown, Massachusetts. Identify your availability for a tour/site visit in February 2024.
- Additional field information provided by Architect

#### Vendor Quotes 2.15.24

March 2024



In. wg. = Static pressure measured by a water gauge- indication of air flow resistance



### **BRD Noise Control**

Lowell Elementary Schoo	l			
BRD Noise Control: Chiller	Custom Sc	ound Enclo	osu	re
Dimensions				
Silencer Height		3'-0"		
Overall Height Above Chill	er			5'-0"
Overall chiller width increa		6'-0"		
Overall Pressure Drop				
Max by MFG	0.10 PD			14dBA
BRD Recommended	0.20 PD			16dBA
Cost			\$	210,535
Not Included in Price Prop	<u>osal:</u> Painti	ng of pane	els a	and
silencers; Engineering calo	culations &	PE Stamp	; Pe	rmitting;
Special Rigging and lifting	(no crane)			

Previous Estimate \$242,482 (with 10% Contingency)

Ai3 architects, LLC

### **A2 Parklane**

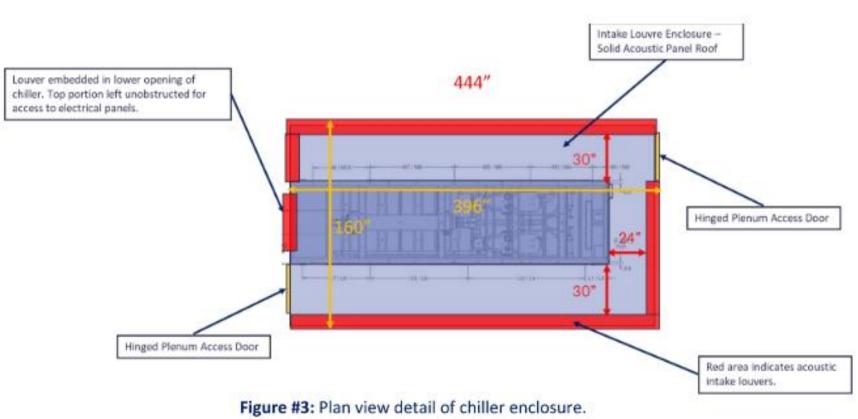
Airflow: 180,000 CFM									
Velocity: 160 FPM (Intake)									
792 FPM (Discharge)									
Maximum Allowable PD: 0.1 in wg to 0.2 in wg EPD (as stated in the bid summary)									
<b>Clearance</b> F	Requiremen	its:	36" on all s	ides					
Acoustic Re	equirement	s:							
60 h-	63 hz   125 hz   250 hz   500 hz   1k hz   2k hz   4K HZ   8K HZ								
63 hz			-23 -22 -19 -18 -15						



Proposal excludes the following:

- Concrete pad load capacity and connection detail
- Removal of existing bollards

Parklane



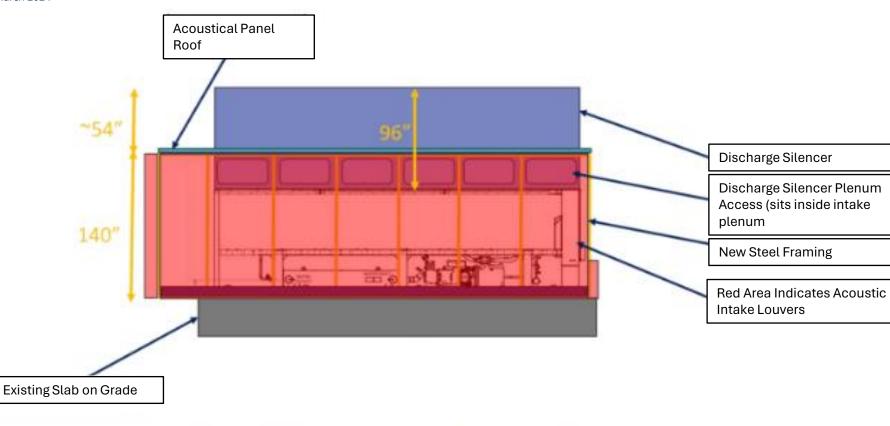
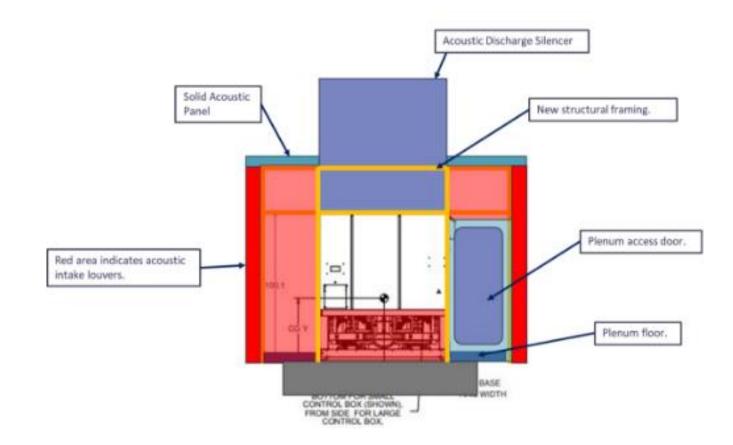


Figure #1: Side elevation view of proposed chiller enclosure.

#### March 2024



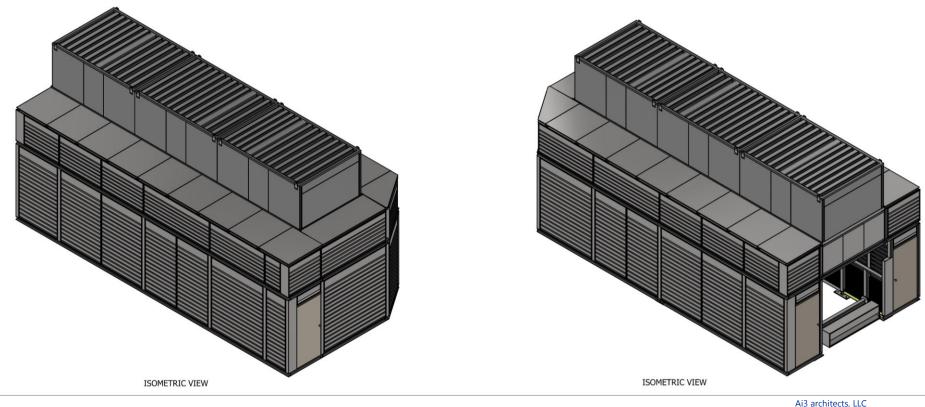
#### **Parklane**

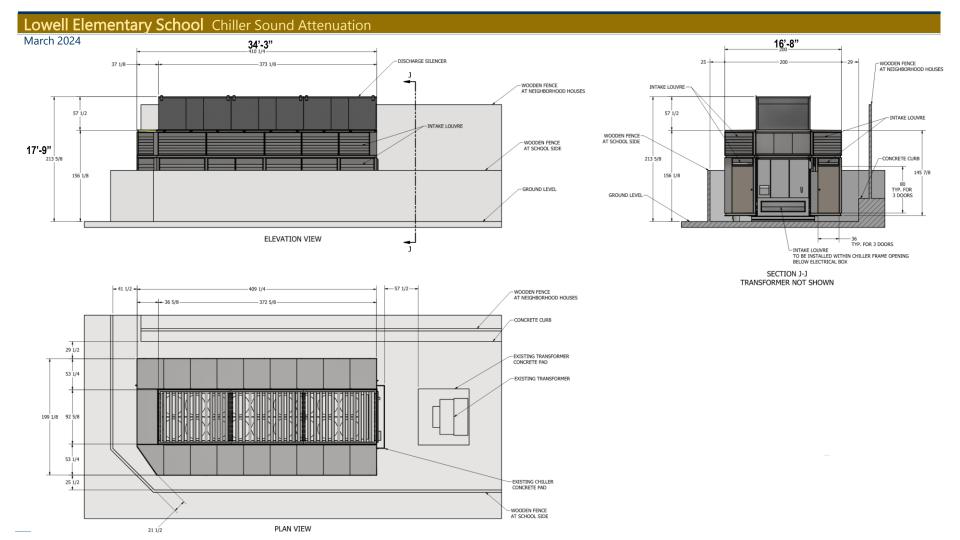
Lowell Elementary Sch	ool			
Parklane Noise Control:	Chiller Custo	om Sound	Enc	closure
Dimensions				
Silencer Height				4'-6"
Overall Height Above Ch	iller			8'-0"
Overall chiller width incr		5'-0"		
Overall Pressure Drop				
Max by MFG	0.10 PD			14dBA
BRD Recommended	0.20 PD			16dBA
Detailed Engineering			\$	31,405
System Supply			\$	254,269
Shipping & Installation			\$	60,176
Cost			\$	345,850
Not Included in Price Pro	<u>oposal:</u> Applic	cable taxes	s no	ot
included; Permits if requ	iired, All pricii	ng reflects	reg	ular
working hours; Removal	of existing bo	llards		

Previous Estimate \$262,350 (with 10% Contingency)

### Recommendation

### Parklane full acoustical sound enclosure





### **Next Steps**

- Field Measurements
- ✓ Final Engineering for Review
- Acoustical Engineer Review & Approval
- Structural Engineer Review and Approval
- Color Selection for Enclosure

Remove Bollards by DPW

Installation April Vacation

**Final Acoustical Testing** 

Watertown Public Schools Building Committee

### **Lowell Elementary School Updates**

## **Executive Summary**

	Town of Water Three Elem Project Dashbo	entary Schoo	) March 1	.5, 2024		EXECUTIVE S	UMMARY				International
	Proie	ected Tasks This Sprin	g 2024				Hosmer - Pro	gress Photos		C	unniff - Progress Photos
Lowell Elementary School Remaining Interior and Exterior Punchlist scheduled for the week of April 15th (Misc. interior items, GFRP repairs and Grass area repairs)						A A					
	Proje	ected Tasks This Sprin	g 2024								
Hosmer Elementary School Installation of an additional swing (Includes repairs to the new playgr Loam and Seed is scheduled for Ma	ound surface unde ay/June 2024	er warranty)		/lay 2024						4/Abrahas	
Schedule Summary - Upcoming Milestones						Scope changes from the Original Scope				1	owell - Progress Photos
Description Scheduled Start Scheduled Finish Staus Comments Hosmer Elementary School						CUNNIFF & HOSMER ELEMENTARY SCHOOLS Brait Builders - CO #1 - #17 - \$6,519,607.59					
PV's - Ready for Eversource Electric 5/16/22 2/29/24 Scheduled Bollards							#1 - #17 - \$0,515	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Allow a start	A CONTRACTOR OF A CONTRACTOR OFTA CONTRACTOR O
Lowell Elementary S Monetized Punchlist 3/1/2024			5/1/2024	Scheduled	Punch List	LOWELL ELEMENTARY SCHOOL CTA - CO#1 - CO #13 -Approved \$4,327,495.82 CTA Change Order #14 - \$45,920.23 Pending Approval					
Description	Baseline Budget	BUDGET Authorized Changes	Approved Budget	Committed Costs	CC Uncommitted Costs	OST Forecast Costs T	otal Project Costs	CASH Expenditures to Date	FLOW Balance To Spend	\$180.0 \$160.0 \$140.0	and the second
Construction	\$ 136,000,000	\$ 7,604,656	\$ 143,604,656	\$ 143,604,656	\$ -	\$ - \$	143,604,656	\$ 143,061,866	\$ 542,790	\$120.0	and the second se
Design Services	\$ 13,819,615	\$ 477,522	\$ 14,297,137	\$ 14,297,137	\$ 0	\$ - \$	14,297,137	\$ 14,306,719			and the second sec
Administrative	\$ 7,530,385			\$ 5,603,005		\$ 546,390 \$	, , -	\$ 5,550,504		\$100.0	and the second s
FF&E	\$ 4,150,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		\$ 1,925,001	<u>\$ - </u>	4,883,099	· · · · · · · · · · · · · · · · · · ·	\$ 1,950,536	.eiii \$80.0	1
SUBTOTAL	\$ 161,500,000	\$ 7,952,914	\$ 169,452,915	\$ 166,462,896	\$ 2,990,019	\$ 546,390 \$	169,999,305	\$ 165,851,652	\$ 4,147,653	₹ <sub>\$60.0</sub>	
Construction Contingency (Hard Cost) Owner's Contingency - COVID-19	\$ 7,400,000 \$ -	,	,	\$ - \$ -	,	\$ - \$ \$ - \$	,	\$ - \$ -	,	\$40.0	Estimated Expenditure     Actual Expenditure
Owner's Contingency (Soft Cost)	\$ 1,100,000				\$ 555,927	\$ (546,390)			\$ 9,537		and the second se
SUBTOTAL	\$ 8,500,000	\$ (7,952,914)	\$ 547,086	\$ -	\$ 547,086	\$ (546,390) \$	696	\$ -	\$ 696	\$0.0 \$0.0 \$0.0 \$0.0 \$0.0	

PROJECT TOTAL \$ 170,000,000 \$ - \$ 170,000,000 \$ 166,462,896 \$ 3,537,105 \$ - \$ 170,000,000 \$ 165,851,652 \$ 4,148,349

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Watertown Public Schools Building Committee

# **Executive Summary**

#### **Lowell Elementary School**

- Remaining interior and exterior Punchlist Scheduled for the week of April 15<sup>th</sup> (Interior items, GFRP repairs and Grass Area repairs)
- Approximately \$240k being held in retainage of which \$180k is for GFRP repair

#### **Hosmer Elementary School**

- Installation of new Swing Set and poured in place surface is scheduled for April/May (Includes repair to playground area under warranty)
- Loam and seed is scheduled for May/June

# Watertown Public Schools Building Committee Questions / Comments

Those members of the public joining via Zoom, please use the Q&A button at this time to ask questions or email questions to: <u>buildingforfuture@watertown-ma.gov</u>



www.hillintl.com