

LIVONIA PUBLIC SCHOOLS

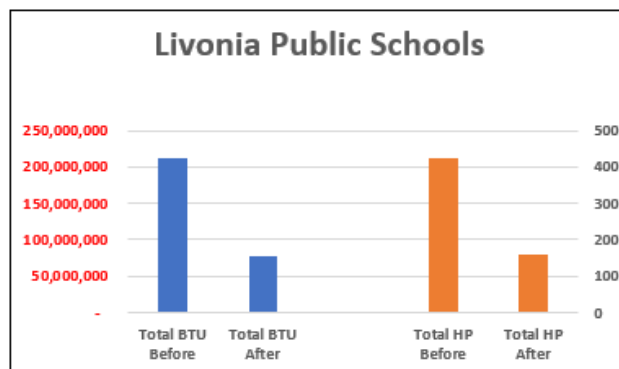
In preparation for the 2013 bond request to the City of Livonia citizens, Livonia Public School administrators made the decision to decline a proposed plan for the replacement of major mechanical system components throughout the district. Instead, the first step they took was to automate all viable buildings, including the HVAC systems and air quality. They determined their greatest needs for a positive impact on the comfort and safety of students and staff, included lighting, flooring, entrances, and windows.

Automation with Building Management Systems (BMS) would measure the actual mechanical system usage and determine the requirements at each location. BMS would also report any potential problems with existing equipment while allowing personnel to observe their large district remotely.

The district began monitoring, and, with the data gathered, knew with confidence **what was and was not** required for their schools and other buildings.

When they were ready, Livonia Public Schools was able to upgrade the aging building systems by using their existing maintenance/sinking fund. They did not need to request any new bonds from the Livonia voters!

They also realized significant energy rebates from both Consumers Power and DTE Energy.



Total BTU was reduced by 63%. Total HP was reduced by 64%, while the kW consumed was reduced by 90%.

Please see the chart on the back of this page for the heating system makeovers done at Livonia Public Schools over the past five years.



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Livonia Public Schools - Heating System Make-Overs 2018-2023

School	Boiler Quantity	Existing BTU (each)	Existing Total BTU	BTU/sf Before	Replaced Quantity	Replaced BTU (each)	Replaced Total BTU	BTU/sf After	BTU Reduction	% BTU Reduction	Existing Pump HP	Replaced Pump HP	Total HP Reduction (%)
Buchanan	3	1,440,000	4,320,000	76	3	599,000	1,797,000	32	-2,523,000	58%	7.5 (2)	1.5 (2)	80%
Career Ctr CTC-1 and CTC-2)	4	1,260,000	5,040,000	99	5	498,000	2,490,000	49	-2,550,000	51%	7.5 (2)	1.5 (2)	80%
Cass	3	990,000	2,970,000	56	3	599,000	1,797,000	34	-1,173,000	39%	3.0 (2)	1.0 (2)	67%
Churchill	12	2,070,000	24,840,000	66	6	2,000,000	12,000,000	32	-12,840,000	52%	25.0 (2)	7.5 (2)	70%
Cleveland	3	1,800,000	5,400,000	109	3	599,000	1,797,000	36	-3,603,000	67%	5.0 (2)	1.5 (2)	70%
Coolidge	4	1,800,000	7,200,000	114	3	599,000	1,797,000	29	-5,403,000	75%	7.5 (3)	1.5 (2)	87%
Cooper	2	3,000,000	6,000,000	63	2	2,000,000	4,000,000	42	-2,000,000	33%	3.0 (2)	2.0 (2)	33%
Emerson	2	6,000,000	12,000,000	92	4	1,000,000	4,000,000	31	-8,000,000	67%	15.0 (2)	3.0 (2)	80%
Franklin (Steam > Hydronic)	2	9,750,000	19,500,000	56	12	599,000	7,188,000	21	-12,312,000	63%	-	7.5 (2)	-
Frost	8	2,070,000	16,560,000	116	4	1,000,000	4,000,000	28	-12,560,000	76%	10.0 (2)	3.0 (2)	70%
Garfield	2	3,000,000	6,000,000	97	3	599,000	1,797,000	29	-4,203,000	70%	3.0 (2)	1.0 (2)	67%
Grant	2	3,000,000	6,000,000	103	3	599,000	1,797,000	31	-4,203,000	70%	7.5 (2)	1.0 (2)	87%
Hayes	2	1,795,000	3,590,000	68	2	1,000,000	2,000,000	38	-1,590,000	44%	5.0 (2)	5.0 (2)	0%
Holmes	8	2,070,000	16,560,000	134	4	1,000,000	4,000,000	32	-12,560,000	76%	10.0 (2)	3.0 (2)	70%
Hoover	4	1,260,000	5,040,000	94	2	1,000,000	2,000,000	37	-3,040,000	60%	5.0 (2)	5.0 (2)	0%
Jackson Early Childhood	3	990,000	2,970,000	74	3	599,000	1,797,000	45	-1,173,000	39%	10.0 (2)	1.5 (2)	85%
Johnson Upper Elementary	7	2,070,000	14,490,000	151	3	1,000,000	3,000,000	31	-11,490,000	79%	7.5 (2)	1.5 (2)	80%
Kennedy	4	1,260,000	5,040,000	99	2	1,000,000	2,000,000	39	-3,040,000	60%	5.0 (2)	5.0 (2)	0%
Randolph	4	1,440,000	5,760,000	97	3	599,000	1,797,000	30	-3,963,000	69%	7.5 (2)	1.5 (2)	80%
Riley	2	6,000,000	12,000,000	87	6	599,000	3,594,000	26	-8,406,000	70%	10.0 (4)	10.0 (2)	50%
Roosevelt	2	3,000,000	6,000,000	89	3	599,000	1,797,000	27	-4,203,000	70%	5.0 (2)	5.0 (2)	0%
Rosedale	2	1,500,000	3,000,000	72	3	599,000	1,797,000	43	-1,203,000	40%	3.0 (2)	1.0 (2)	67%
Stevenson	10	2,070,000	20,700,000	61	4	2,000,000	8,000,000	24	-12,700,000	61%	25.0 (2)	7.5 (2)	70%
Niji Iro/Taylor	3	1,440,000	4,320,000	93	3	599,000	1,797,000	39	-2,523,000	58%	3.0 (2)	1.0 (2)	67%
Webster/Tyler	4	1,800,000	7,200,000	115	3	599,000	1,797,000	29	-5,403,000	75%	7.5 (3)	1.0 (2)	92%
	100		222,500,000	91	92		79,836,000	33	-142,664,000	64%	437	158.8	64%
			Existing District Total BTU Load (As of 12/05/2013)				Replaced District Total BTU Load (As of 12/31/2023)		Total District BTU Reduced as of 12/31/23	District Total BTU Reduction Percentage	Existing Total District Boiler System Pumping HP (As of 12/31/2023)	Total District HP Reduced (As of 12/31/2023)	District Total HP Reduction Percentage (As of 12/31/2023)

Livonia Public Schools - Heating System Make-Overs 2018-2023

<u>School</u>	<u>Project year</u>	<u>Savings years</u>	<u>Pumps kWh saved/yr</u>	<u>Boiler MCF Saved/yr</u>	<u>Gas (MCF) base</u>	<u>year</u>	<u>Pumping (kWh) base</u>	<u>Accumulated savings MCF of Gas</u>	<u>kWh</u>
Buchanan	2022	2	3,871	429	2,146	2019	9,202	858	7,742
Career Center CTC-1 and CTC-2)	2021	3	19,133	508	2,538	2020	26,515	1,523	57,399
Cass Elementary	2023	1	19,133	508	2,538	2023	26,515	508	19,133
Churchill	2022	2	37,346	4,665	18,659	2020	66,511	9,330	74,692
Cleveland	2022	2	21,183	583	2,330	2020	73,824	1,165	42,366
Coolidge	2020	4	19,133	795	2,271	2020	26,515	3,179	76,532
Cooper	2021	3	1,753	1,097	3,133	2021	19,315	3,290	5,259
Emerson	2020	4	12,003	1,988	5,681	2015	18,898	7,953	48,012
Franklin (Steam > Hydronic)	2020	4	20,085	3,203	16,015	2018	24,307	12,812	80,340
Frost	2017	7	31,805	1,318	5,273	2015	37,332	9,226	222,635
Garfield	2021	3	7,118	1,318	2,592	2016	8,969	3,954	21,354
Grant	2021	3	7,118	1,318	2,592	2015	8,969	3,954	21,354
Hayes	2020	4	6,663	566	2,266	2015	7,488	2,264	26,652
Holmes	2018	6	31,805	1,319	4,624	2015	42,211	7,914	190,830
Hoover	2018	6	11,760	535	2,142	2015	13,926	3,210	70,560
Jackson Early Childhood	2022	2	5,509	482	2,412	2020	11,268	965	11,018
Johnson Upper Elementary	2018	6	38,085	1,053	4,054	2015	42,978	6,318	228,510
Kennedy	2018	6	7,014	505	2,020	2015	8,046	3,030	42,084
Randolph	2022	2	13,090	330	1,651	2019	18,422	660	26,180
Riley	2020	4	26,347	1,649	4,710	2016	34,738	6,594	105,388
Roosevelt	2020	4	22,214	330	1,651	2019	26,596	1,321	88,856
Rosedale	2021	3	10,071	755	2,157	2014	14,099	2,265	30,213
Stevenson	2022	2	25,156	3,567	14,269	2019	28,025	7,135	50,312
Niji Iro/Taylor	2023	1	10,071	755	2,157	2023	14,099	755	10,071
Webster/Tyler	2021	3	22,214	330	1,651	2019	26,596	991	66,642
Project Totals			429,680	29,905				101,173	1,624,134
Tons of CO₂ Emissions avoided			304	158				536	1,148
Schools in blue were steel water- and fire-tube boilers with standard efficiency.			CO₂ conversion factors:			2012 Original Proposed Mechanical Bond		\$	35,516,163
All other schools were low mass copper-fin boilers with mid-range efficiency.			0.000707 CO ₂ metric tons/ kWh			Total Costs for all Boiler Projects		\$	5,978,784
			0.0053 CO ₂ metric tons/ MCF			Total Rebates for all Projects		\$	211,977