☐Consent
☒Action/Discussion
☐Information/Discussion
☐Public Hearing

SUBJECT: ***Walk-On*** Approval of Contract for Service with Inland Mechanical Services, Inc. For Installation of Needlepoint Bipolar Ionization System And Systems Analysis

DATE: March 4, 2021

PERSON(S) RESPONSIBLE: Matt Kelly, Director Facilities and Transportation

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RECOMMENDATION:

The District Business Office recommends that the Board authorize execution of the Contract for Services agreement between Pacific Grove Unified School District and Inland Mechanical Services, Inc. (IMS) for the installation of bipolar ionization systems district wide and a systems analysis.

BACKGROUND:

MERV (Minimum Efficiency Reporting Values) Rating is a HVAC filter's ability to capture particles between .3 and 10 microns. The higher the MERV rating the better the filter is at trapping specific types of particles. The maximum MERV filter rating the District's HVAC units can have is MERV-8 without the possibility of damaging the equipment. ASHRAE's (American Society of Heating, Refrigerating, and Air-Conditioning) recommendation is MERV-13 if it can safely be installed without damaging the equipment. If equipment damage is plausible they recommend putting in the maximum MERV rating for the unit.

INFORMATION:

One effective way to increase MERV rating is by installing a bi-polar ionization system. Studies have shown that bi-polar ionization can increase to MERV-13 from MERV-8.

Bi-polar Ionization (BPI) technology uses electric voltage to convert oxygen molecules to charged atoms that inactivate airborne contaminants. These negatively and positively charged atoms, called ions, are effective against viruses, bacteria, and mold.

These ions also neutralize volatile organic compounds, odors, and allergy-causing dander. Ions are naturally present in pristine air, but pollution and other human activity deplete them. Depending on the contaminant, BPI replaces these charged particles with non-volatile gases such as oxygen, nitrogen, and carbon dioxide.

Ions inactivate airborne pathogens in two main ways. First, the charged particles surround the microbe and break it down. In the case of viruses, the ions induce a chemical reaction on the cell

membrane surface. They envelop the pathogens and puncture the protein spikes on its membrane, neutralizing them.
Second, the ions attach to contaminants and enlarge them enough to be trapped by the HVAC system filters. The ionic load also makes some particles heavy enough to fall to surfaces where they can be cleaned away or further inactivated.

FISCAL IMPACT:

Bi-Polar Ionization Installation Quotes
IMS - $150,400.00
Airtec - $182,500.00

Systems Analysis Quotes
IMS - $49,585.00
Airtec – No bid received

Budgeted Amount - $748,580.29

Amount: $199,985.00
School Funding Source: Fund 21 Measure D (Inter-fund Borrowing from Fund 1)

PACIFIC GROVE UNIFIED SCHOOL DISTRICT

AGREEMENT FOR CONTRACTOR SERVICES

THIS AGREEMENT is hereby entered into by the **Pacific Grove Unified School District**, hereinafter referred to as DISTRICT, and:

Inland Mechanical Services, Inc		#976522	
CONTRACTOR		CONTRACTORS LICENSE #	
1181 California Ave	Corona	Ca	92881
MAILING ADDRESS	CITY	STATE	ZIP

hereinafter referred to as CONTRACTOR.

CONTRACTOR agrees to provide to DISTRICT the services enumerated in Section G of this Agreement under the following terms and conditions:

A. Services shall begin on March 5, 2021 and shall be completed on or before June 30, 2021.

B. CONTRACTOR understands and agrees that CONTRACTOR and CONTRACTOR'S employees are not employees of the DISTRICT and are not entitled to benefits of any kind or nature normally provided employees of the DISTRICT and/or to which DISTRICT employees are normally entitled, including, but not limited to, State Unemployment Compensation or Workers' Compensation. CONTRACTOR shall assume full responsibility for payment of all Federal, State and local taxes or contribution including Unemployment Insurance, Social Security, and Income Taxes with respect to CONTRACTOR'S employees.

C. CONTRACTOR shall furnish, at CONTRACTOR'S own expense, all labor, materials equipment and other items necessary to carry out the terms of this Agreement.

D. In the performance of the work herein contemplated, CONTRACTOR is an independent contractor, with the authority to control and direct the performance of the details of the work, DISTRICT being interested only in the results obtained.

E. CONTRACTOR agrees to defend, indemnify and hold harmless the DISTRICT, its Board of Trustees, employees and agents from any and all liability or loss arising in any way out of CONTRACTOR'S negligence in the performance of this Agreement, including but not limited to any claim due to injury and/or damage sustained by CONTRACTOR, and/or the CONTRACTOR'S employees or agents.

AGREEMENT FOR CONTRACTOR SERVICES (continued)

F. CONTRACTOR shall maintain Insurance with a minimum $1,000,000 combined single limits of general liability and automobile coverage.

G. Services to rendered to the DISTRICT by the CONTRACTOR are as follows:
Provide all labor, equipment and materials for installation of 188 GPS Bi-Polar Ionization and systems analysis at Pacific Grove High School, Pacific Grove Middle School, Robert Down Elementary, Forest Grove Elementary, Pacific Grove Adult School, and David Ave A-Wing.

Neither party shall assign or delegate any part of this Agreement without the written consent of the other party.

I. The work completed herein must meet the approval of the DISTRICT and shall be subject to the DISTRICT'S general right of inspection and supervision to secure the satisfactory completion thereof. CONTRACTOR agrees to comply with all Federal, State, Municipal and District laws, rules and regulations that our now, or may in the future become applicable to CONTRACTOR, CONTRACTOR'S business, equipment, and personnel engaged in operations covered by this Agreement or accruing out of the performance of such operations.

J. CONTRACTOR shall be paid:

$199,9985.00

Source of Funds: Measure D

K. Payments will be made by the District to the Contractor as follows:

1) Monthly Progress Payments

L. This agreement may be terminated by either party notifying the other, in writing, at least 30 days prior to the date of termination.

M. CONTRACTOR shall sign and submit a W-9 to DISTRICT prior to providing service.

AGREEMENT FOR CONTRACTOR SERVICES (continued)

This Agreement is entered into this _____ day of _____, 20 _____.

For the Site/Program:

_____
Site/Program Administrator Date

For the District:

_____
Director of Human Resources Date

_____
Assistant Superintendent Date

For the Contractor:

_____
Name

_____
Title

_____
Date

****

NOTE: PARAGRAPH "F" ABOVE IS HEREBY WAIVED IF SIGNED BELOW.

_____ _____
Assistant Superintendent Date

- All signatures must be obtained before services are provided. -

Inland Mechanical Services, Inc.
1181 California Ave Ste 260
Corona CA 92881
(800) 557-1467,

Proposal # 5091 : Indoor Air Quality

Date	SERVICES PERFORMED BY	SERVICE LOCATION
03/04/2021	Inland Mechanical Services, Inc. 1181 California Ave Ste 260 Corona, CA 92881 (800) 557-1467 Inlandmechanicalservices.com	Pacific Grove Unified 435 Hillcrest Ave. Pacific Grove, CA, (831) 646-6520 Matt Kelly matt.kelly@pgusd.org

Fee Schedule

Inland Mechanical Services, Inc. Proposes to furnish Equipment for the above-mentioned project. This price is based on the outlined scope of work with the following qualifications and exclusions.

Scope of Work	Solution Investment
Indoor Air Quality	**$49,585.00**
	Payment Due
Payment Terms	NET-30

Scope of Work

Inland Mechanical Services Inc. will provide an Indoor Air Quality HVAC System Analysis on (188) HVAC Unit's at all (6) Pacific Grove Unified School District Locations.

	Description	Qty	Rate	Tax	Total
	**HVAC System Analysis** The HVAC System Analysis is a comprehensive test on your HVAC system's. We will provide you a detailed report on the current functionality of your HVAC units. We will be measuring the current output capacity and will address all inconsistency's to make sure your units are running efficiently. We will provide you a detailed analysis and scope of work to address any major issues. We will asses, air exchanges , energy output, functionality, capacity and analyze ductwork efficiency.	188.00	$263.75	$0.00	$49,585.00

Contractor Responsibilities

Inland Mechanical Services Inc. will have all equipment orderd and delviered to the job site.
Inland Mechanical Services Inc. will coordinate delivery and receive.
Inland Mechanical Services, Inc. will provide the client with equipment instruction manuals for all equipment provided

Client Responsibilities

Client provides the contractor necessary access to perform the scope of work

Completion Criteria

Contractor shall have fulfilled its obligations when any one of the following first occurs:
Contractor accomplishes the Contractor activities described within this SOW, including delivery to Client of the materials listed in the Section entitled “Scope of Work,” and Client accepts such activities and materials without unreasonable objections. No response from Client within 2-business days of deliverables being delivered by Contractor is deemed acceptance

Warranty

Inland Mechanical Services, Inc. Provides 1 Year Warranty on Installation Labor. Contractor warranties all craftsmanship furnished for a period of 1 year from the date of completion thereof, excluding defects caused by others, acts of God, or accidents in which the contractor has no control over. If a defect occurs, the owner shall promptly notify the contractor. In the event the problem is due to workmanship; the contractor will repair the defect at no charge to the customer for the duration of the warranty

Manufacture warranty will be in effect from delivary date.

Agreement

This Scope of Work (SOW) is issued pursuant to the Agreement between Pacific Grove Unified (“Client”) and Inland Mechanical Servies, Inc. ("Contractor"), effective 03/04/2021 (the "Agreement"). This SOW is subject to the terms and conditions contained in this agreement between the parties and is made a part thereof. Any term not otherwise defined herein shall have the meaning specified in the Agreement. In the event of any conflict or inconsistency between the terms of this SOW and the terms of this Agreement, the terms of this SOW shall govern and prevail.

This SOW #5091 (herein called the "SOW"), effective 03/04/2021, is entered into by and between Contractor and Client, and is subject to the terms and conditions specified above. The Exhibit(s) to this SOW, if any, shall be deemed to be a part hereof. In the even of any inconsistencies between the terms of the body of this SOW and the terms of the Exhibit(s) hereto, the terms of the body of this SOW shall prevail

The tasks listed in this scope of work are specific to this Scope Of Work. Inland Mechanical Services, Inc, makes every attempt to mitigiate future repairs by fully inspecting the work performed, both on existing equipment and new equipment, and its operational condition, but Inland Mechanical Services, Inc. cannot be held responisble for equipment failures beyond the scope of work outlined in this document

HOLD HARMLESS
To the fullest extent permitted by law, Pacific Grove Unified will indemnify and hold harmless *Inland Mechanical Services, Inc.*, their officers, directors, partners, representatives, agents and employees from and against any and all claims, suits, liens, judgments, damages, losses and expenses, including legal fees and all court costs and liability (including statutory liability) arising in whole or in part and in any manner from injury and/or death of person or damage to or loss of any property resulting from the acts, omissions, breach or default of Pacific Grove Unified, its officers, directors, agents, employees and subcontractors, Pacific Grove Unified will defend and bear all costs of defending any actions or proceedings brought against *Inland Mechanical Services, Inc. a*nd/or, their officers, directors, agents and employees, arising in whole or in part out of any such acts, omission, breach or default. The foregoing indemnity shall include injury or death of any employee of the Inland Mechanical Services, Inc. or Subcontractors and shall not be limited in any way by an amount or type of damage, compensation, or benefits payable under any applicable workers compensation, disability benefits or other similar employees benefit act.

Pacific Grove Unified hereby expressly permits Inland Mechanical Services, Inc. , to pursue and assert claims against Pacific Grove Unified for indemnity, contribution and common law negligence arising out of claims for damages for bodily injury, property damage, death and person injury.

Exclusions

Refrigerant leak repairs.
Permits, Bonds, utility fees, allowances, temporary power, lighting and phone service.
All underground conduit, trenching, encasement and/or backfill between buildings and/or mechanical yards.
All hardware, software, controllers, lighting relays, switches, panels, enclosures, control devices, transformers, or any other misc. control items, and 277/120v wiring.
Furnishing or Installation of Access Doors, and Magnetic Starters.
All dumpster fees, any and all asphalt and concrete cutting, breaking, removal, and patching of same; sealing of roof penetrations and/or repairs to existing roofing systems.

Any and all labor and/or material associated with Layout, coring, X-Ray, cutting, framing, patching, painting, removal/repair of existing ceilings, walls, floors, as required for electrical installations.
Lighting control, Security Access, Process Controls and/or Alarms, Utility Meters and/or Integration of any systems not specifically listed in the above proposal.
Duct smoke detectors, AHU/Equipment shutdown, smoke/fire dampers, end switch monitoring, and any fire life safety.
Any and all Structural engineering, seismic bracing, load calculations and engineered designs.
Any and all 3D BIM/Revit Modeling and/or ACAD design and/or services.
Any and all labor and/or material associated with Fiber Optic Cabling unless specifically listed above.
Any and all labor and/or material for Ethernet TCP/IP Cabling for intranet and extranet network connection to Network Area / Building Controller(s).
Any and all labor and/or material associated with Smoke Exhaust Control unless specifically listed above.
Any and all labor and/or material for tamper proof thermostats, and/or security hardware.
Accelerated construction schedule
Any and all work not specifically listed in the above proposal.

Acknowledgement

I acknowledge that I have received, read, and understand the scope of work, provided by Inland Mechanical Services, Inc. I agree to the price and terms provided, including to the terms of payment stated in the Fee Schedule.

Pacific Grove Unified	Inland Mechanical Services, Inc.
Approval Signature	Approval Signature

Thank you for the opportunity to provide you with this proposal. Please call or email if you have any questions regarding this proposal.

Regards,

Chad Chandall

Inland Mechanical Service, Inc.
(800) 557-1467
Ccrandall@inlandmechanicalservices.com
www.inlandmechanicalservices.com

Inland Mechanical Services, Inc.
1181 California Ave Ste 260
Corona CA 92881
(800) 557-1467,

Proposal # 5096 : Indoor Air Quality

Date	SERVICES PERFORMED BY	SERVICE LOCATION
03/04/2021	Inland Mechanical Services, Inc. 1181 California Ave Ste 260 Corona, CA 92881 (800) 557-1467 Inlandmechanicalservices.com	Pacific Grove Unified 435 Hillcrest Ave. Pacific Grove, CA, (831) 646-6520 Matt Kelly matt.kelly@pgusd.org

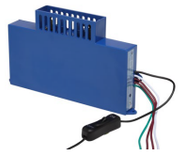
Fee Schedule

Inland Mechanical Services, Inc. Proposes to furnish Equipment for the above-mentioned project. This price is based on the outlined scope of work with the following qualifications and exclusions.

Scope of Work	Solution Investment
Indoor Air Quality	**$150,400.00**
	Payment Due
Payment Terms	NET-30

Scope of Work

Inland Mechanical Services Inc. will Install GPS Ionization technology on (188) HVAC Unit's at all (6) Pacific Grove Unified School District Locations.

	Description	Qty	Rate	Tax	Total
	**GPS-FC24-AC** The GPS-FC24-AC is an auto-cleaning, no maintenance, needlepoint bipolar ionization system designed to handle up to 2,400 CFM. The unit is designed for multiple mounting options including fan inlet, interior duct wall or interior duct floor. •Particle Reduction and Smoke Control • Odors Neutralized by destroying VOCs • Pathogens Killed (Bacteria, Viruses, Mold), Helps to Control Allergens/ Asthma*, Prevents Dirty Sock Syndrome • Energy Savings of up to 30% by Reducing Outdoor Air Intake, reduces pressure loss by keeping coils clean	188.00	$800.00	$0.00	$150,400.00

Contractor Responsibilities

Inland Mechanical Services Inc. will have all equipment orderd and delviered to the job site.
Inland Mechanical Services Inc. will coordinate delivery and receive.
Inland Mechanical Services, Inc. will provide the client with equipment instruction manuals for all equipment provided

Client Responsibilities

Client provides the contractor necessary access to perform the scope of work

Completion Criteria

Contractor shall have fulfilled its obligations when any one of the following first occurs:
Contractor accomplishes the Contractor activities described within this SOW, including delivery to Client of the materials listed in the Section entitled “Scope of Work,” and Client accepts such activities and materials without unreasonable objections. No response from Client within 2-business days of deliverables being delivered by Contractor is deemed acceptance

Warranty

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Manufacture warranty will be in effect from delivary date.

Agreement

This Scope of Work (SOW) is issued pursuant to the Agreement between Pacific Grove Unified (“Client”) and Inland Mechanical Servies, Inc. ("Contractor"), effective 03/04/2021 (the "Agreement"). This SOW is subject to the terms and conditions contained in this agreement between the parties and is made a part thereof. Any term not otherwise defined herein shall have the meaning specified in the Agreement. In the event of any conflict or inconsistency between the terms of this SOW and the terms of this Agreement, the terms of this SOW shall govern and prevail.

This SOW #5096 (herein called the "SOW"), effective 03/04/2021, is entered into by and between Contractor and Client, and is subject to the terms and conditions specified above. The Exhibit(s) to this SOW, if any, shall be deemed to be a part hereof. In the even of any inconsistencies between the terms of the body of this SOW and the terms of the Exhibit(s) hereto, the terms of the body of this SOW shall prevail

The tasks listed in this scope of work are specific to this Scope Of Work. Inland Mechanical Services, Inc, makes every attempt to mitigiate future repairs by fully inspecting the work performed, both on existing equipment and new equipment, and its operational condition, but Inland Mechanical Services, Inc. cannot be held responisble for equipment failures beyond the scope of work outlined in this document

HOLD HARMLESS
To the fullest extent permitted by law, Pacific Grove Unified will indemnify and hold harmless *Inland Mechanical Services, Inc.*, their officers, directors, partners, representatives, agents and employees from and against any and all claims, suits, liens, judgments, damages, losses and expenses, including legal fees and all court costs and liability (including statutory liability) arising in whole or in part and in any manner from injury and/or death of person or damage to or loss of any property resulting from the acts, omissions, breach or default of Pacific Grove Unified, its officers, directors, agents, employees and subcontractors, Pacific Grove Unified will defend and bear all costs of defending any actions or proceedings brought against *Inland Mechanical Services, Inc. a*nd/or, their officers, directors, agents and employees, arising in whole or in part out of any such acts, omission, breach or default. The foregoing indemnity shall include injury or death of any employee of the Inland Mechanical Services, Inc. or Subcontractors and shall not be limited in any way by an amount or type of damage, compensation, or benefits payable under any applicable workers compensation, disability benefits or other similar employees benefit act.

Pacific Grove Unified hereby expressly permits Inland Mechanical Services, Inc. , to pursue and assert claims against Pacific Grove Unified for indemnity, contribution and common law negligence arising out of claims for damages for bodily injury, property damage, death and person injury.

Exclusions

Refrigerant leak repairs.
Permits, Bonds, utility fees, allowances, temporary power, lighting and phone service.
All underground conduit, trenching, encasement and/or backfill between buildings and/or mechanical yards.

All hardware, software, controllers, lighting relays, switches, panels, enclosures, control devices, transformers, or any other misc. control items, and 277/120v wiring.
Furnishing or Installation of Access Doors, and Magnetic Starters.
All dumpster fees, any and all asphalt and concrete cutting, breaking, removal, and patching of same; sealing of roof penetrations and/or repairs to existing roofing systems.
Any and all labor and/or material associated with Layout, coring, X-Ray, cutting, framing, patching, painting, removal/repair of existing ceilings, walls, floors, as required for electrical installations.
Lighting control, Security Access, Process Controls and/or Alarms, Utility Meters and/or Integration of any systems not specifically listed in the above proposal.
Duct smoke detectors, AHU/Equipment shutdown, smoke/fire dampers, end switch monitoring, and any fire life safety.
Any and all Structural engineering, seismic bracing, load calculations and engineered designs.
Any and all 3D BIM/Revit Modeling and/or ACAD design and/or services.
Any and all labor and/or material associated with Fiber Optic Cabling unless specifically listed above.
Any and all labor and/or material for Ethernet TCP/IP Cabling for intranet and extranet network connection to Network Area / Building Controller(s).
Any and all labor and/or material associated with Smoke Exhaust Control unless specifically listed above.
Any and all labor and/or material for tamper proof thermostats, and/or security hardware.
Accelerated construction schedule
Any and all work not specifically listed in the above proposal.

Acknowledgement

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Pacific Grove Unified	Inland Mechanical Services, Inc.
Approval Signature	Approval Signature

Thank you for the opportunity to provide you with this proposal. Please call or email if you have any questions regarding this proposal.

Regards,

Chad Chandall

Inland Mechanical Service, Inc.
(800) 557-1467
Ccrandall@inlandmechanicalservices.com
www.inlandmechanicalservices.com

Sensitivity Testing

A petri dish containing a pathogen is placed underneath a laboratory hood, then monitored to assess the pathogen's reactivity to NPBI over time. This controlled environment allows for comparison across different types of pathogens. Sensitivity Testing is not a measure of pathogen inactivation in the air.

View Disclaimers

Pathogen	Time in Chamber	Rate of Reduction	Test Agency
Norovirus†	30 minutes	**93.5%**	ATS Labs
Human Coronavirus 229E*	60 minutes	**99.0%**	Analytical Lab Group
Legionella	30 minutes	**99.7%**	EMSL
Clostridium Difficile	30 minutes	**88.9%**	EMSL

†Surrogate for Norovirus; actual strain tested was Feline Calicivirus, ATCC VR-782, Strain F-9

*Human Coronavirus 229 is not SARS-CoV-2

Simulation Testing

Simulation testing measures in-air inactivation of pathogens. Counts of an airborne pathogen are taken before and after aerosolizing that pathogen into a sealed, unoccupied laboratory environmental room

View Disclaimers

Pathogen	Time in Chamber	Rate of Reduction	Test Agency
Tuberculosis	60 minutes	**69.1%**	EMSL
MRSA	30 minutes	**96.2%**	EMSL
Staphylococcus	30 minutes	**96.2%**	EMSL
E.coli	15 minutes	**99.7%**	EMSL

Specialty Testing

Unoccupied laboratory test environments are designed to evaluate NPBI performance in conditions unique to particular industries or customers and may include special circumstances such as higher-than-average ion concentrations. Review individual test results for details.

The 2020 SARS-CoV-2 specialty testing conducted by Innovative Bioanalysis is not a measure of pathogen inactivation in the air.

View Disclaimers

Pathogen	Time in Chamber	Rate of Reduction	Test Agency
SARS-CoV-2**	30 minutes	**99.8%** Inactivation rate measured on aluminum and other surfaces	Innovative Bioanaylsis

Please note that testing the reduction rate of SARS-Cov-2 with the GPS NPBI product is an evolving process and additional testing is anticipated to be conducted in the future. While this is not a surface disinfectant, this testing demonstrates a decrease in active virus on surfaces through particle aggregation.

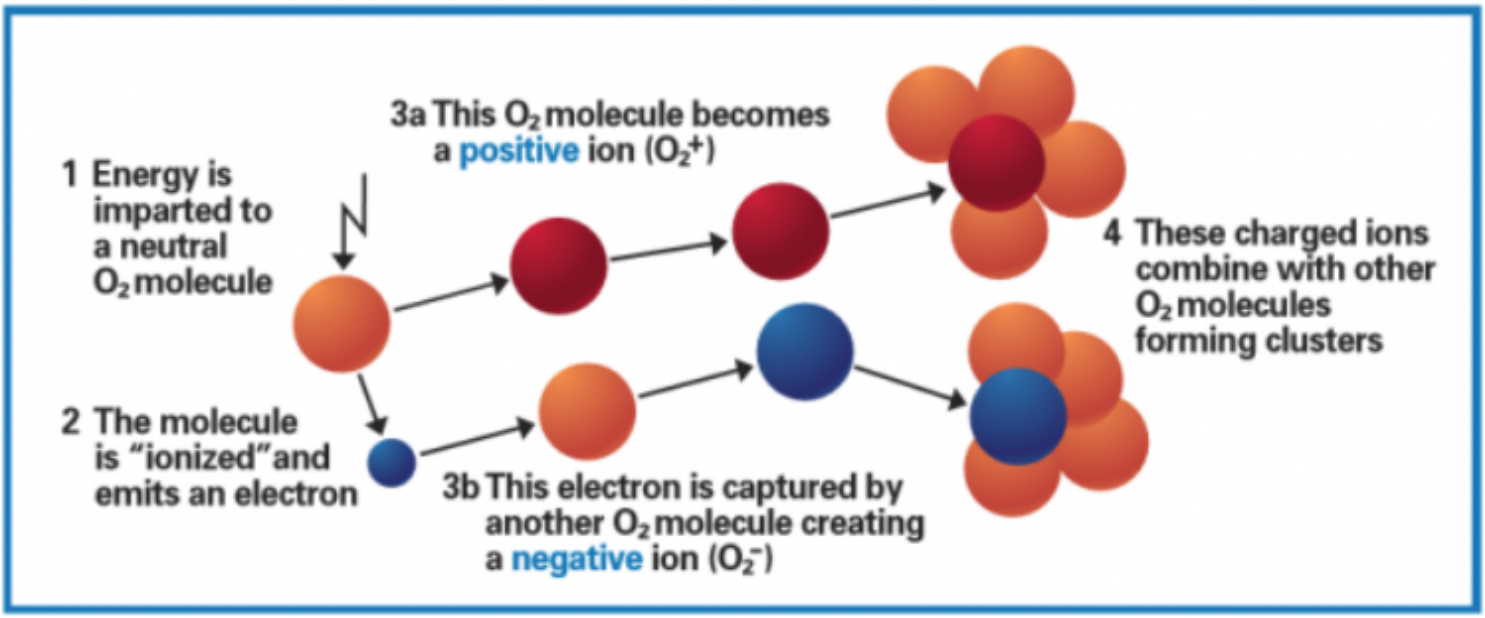
**Not an FDA Cleared Air Purification System

Field Testing

Measurement at actual customer locations can be compared in rooms with and without NPBI, or the same room before versus after NPBI. Measurement variables and test criteria are determined by the customer. Pathogen findings occur as part of the customers' normal course of business and are not introduced specifically for testing purposes.

View Disclaimers

Location	Comparison	Results
Major Medical Center	6 Test Rooms vs. 6 Control Rooms	Gram negative rods reduced to 0 Isolated pathogens 64–99% less per day Lower average CFU throughout test period
Air Travel Command Center	Before vs. After	1 month of particle reduction 0.3um – 87.2% 0.5um – 95.4% 1.0um – 95.8%



E X A M P L E

Corona, CA 92881 (800)-557-1467
License #976522

Proposal		**Contact**	
Date	March 31,	**Mobile**	
Address		**Office**	
Job Site		**Email**	

The following analysis is based on the Full HVAC System Performance Analysis performed on February 13 – February 15, 2017, on (10) roof top package units that currently serve Building 1

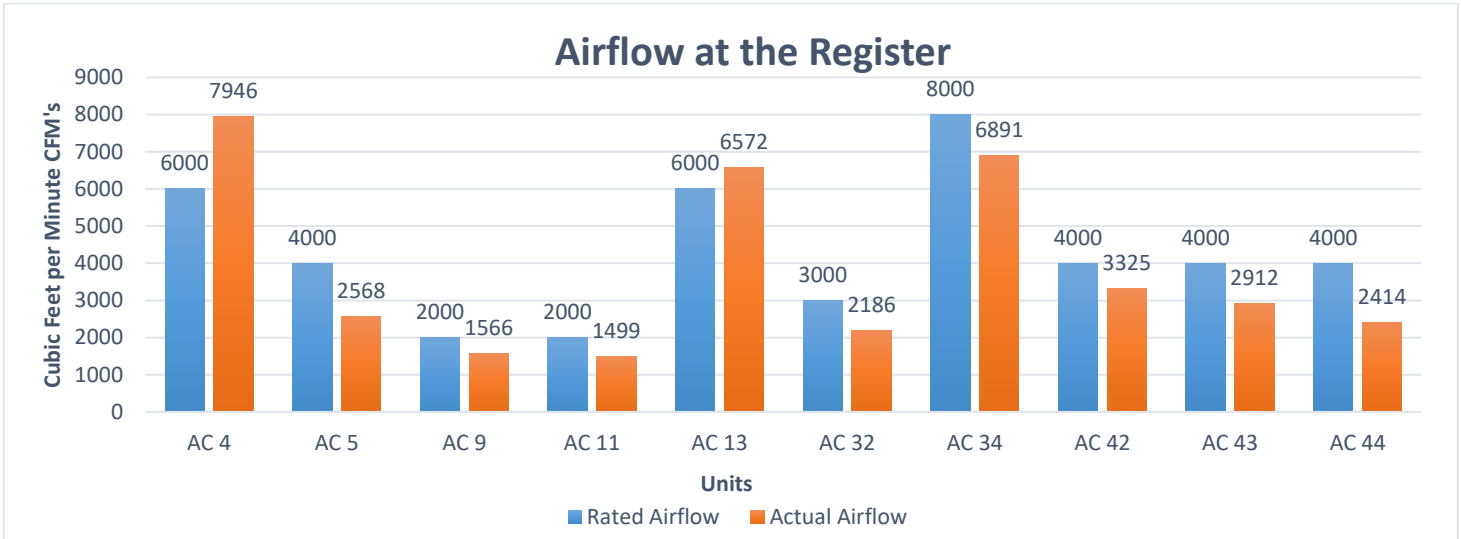
Unit Number	Unit Size	Area Served	Square Footage
AC 4	15 Tons	Laminating Area	2,000 sq. ft.
AC 5	10 Tons	EHS Stewardship	1,275
AC 9	5 Tons	Human Resources	800
AC 11	5 Tons	Forming Inspection	1,000
AC 13	15 Tons	Machine Shop	2,000
AC 32	7.5 Tons	SEMCO	2,050
AC 34	20 Tons	GF Assembly	5,000
AC 42	10 Tons	Building 1 Conference Room	1,600
AC 43	10 Tons	Corporate Conference Room	1,600
AC 44	10 Tons	Cafeteria	2,000

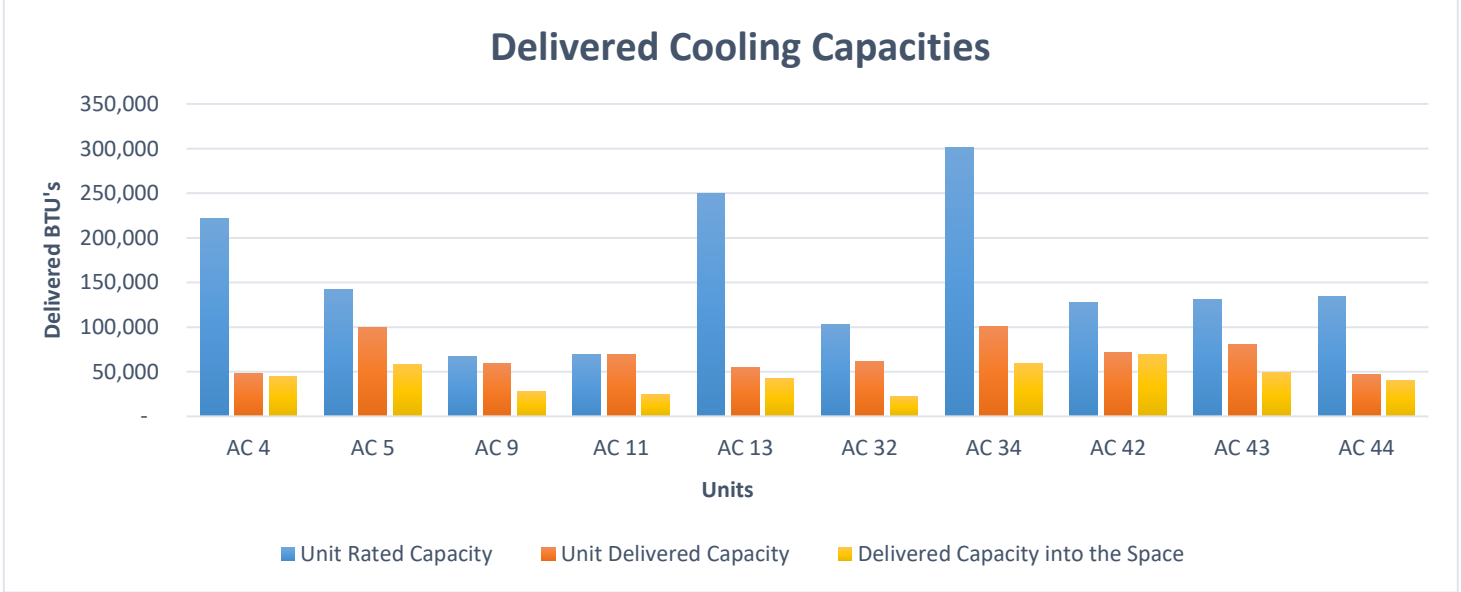
Inland Mechanical Services, Inc. utilized the following tools and equipment to perform the HVAC Performance Analysis

Instrument	Model	Function
Alnor Electronic Balancing Hood	Model EBT731 Balometer	Measures airflow entering and exiting ceiling registers in cubic feet per minute, CFM
Fieldpiece In-Duct Hot Wire Anemometer	Model STA2	Measures airflow inside ductwork, economizers, outside air hoods, and tight spaces in cubic feet per minute, CFM
Fieldpiece Dual In-Duct Psychrometer	Model SDP2	Measures temperature of airflow, in dry bulb and wet bulb, of air entering and exiting the unit
Fieldpiece In-Duct Psychrometer	Model ET2W	Measures temperature of airflow, in dry bulb and wet bulb, of air entering and exiting the ceiling registers
Fieldpiece Dual Port Manometer	Model SDMN5	Measures static pressure of the airflow inside the ductwork
Extech Tachometer Counter	Model 461920	Measures revolutions per minute of the indoor blower motor and indoor fan

Summation of data gathered through the analysis

Unit ID	Tonnage	Rated CFM	Actual Sup Airflow	Actual Ret Airflow	Rated Capacity	Actual Tonnage	Unit Capacity	Actual Delivered Unit Capacity	%	Ductwork Capacity	Actual Delivered Ductwork Cap	%
AC 4	15	6,000	7,946	4,084	221,850	18.49	48,006	4.00	22%	44,696	3.72	20%
AC 5	10	4,000	2,568	2,820	141,765	11.81	99,072	8.26	70%	58,358	4.86	41%
AC 9	5	2,000	1,566	1,172	67,200	5.60	59,768	4.98	89%	27,695	2.31	41%
AC 11	5	2,000	1,499	1,903	69,800	5.82	69,575	5.80	100%	24,351	2.03	35%
AC 13	15	6,000	6,572	5,588	249,650	20.80	55,296	4.61	22%	42,882	3.57	17%
AC 32	7.5	3,000	2,186	1,640	102,350	8.53	61,811	5.15	60%	22,428	1.87	22%
AC 34	20	8,000	6,891	7,165	301,700	25.14	100,620	8.39	33%	59,228	4.94	20%
AC 42	10	4,000	3,325	3,032	127,950	10.66	71,539	5.96	56%	69,426	5.79	54%
AC 43	10	4,000	2,912	2,918	131,400	10.95	80,222	6.69	61%	49,009	4.08	37%
AC 44	10	4,000	2,414	2,417	134,439	11.20	46,368	3.86	34%	40,084	3.34	30%
	Tonnage	**Rated CFM**	**Actual Sup CFM**	**Actual Ret CFM**	**Rated Capacity**	**Actual Tonnage**	**Unit Capacity**	**Actual Delivered Unit Capacity**	**%**	**Ductwork Capacity**	**Actual Delivered Ductwork Cap**	**%**
	107.5	43,000	37,879	32,739	1,548,104	129.01	692,277	57.69	45%	438,157	36.51	28%





Renovation Summary

Unit / Area Served	Renovation Description	Renovation Total
AC 4: Laminating	Repair or replace compressor, insulate external ductwork, add VFD, thorough maintenance	
AC 5: EHS Stewardship	Replace with 5-ton unit with VFD, replace external ductwork, add mini split to conference room	
AC 9: Human Resources	Renovate ductwork, add Variable Frequency Drive, air balance, thorough maintenance	
AC 11: Forming Inspection	Insulate external ductwork, seal duct leaks, add VFD, air balance, thorough maintenance	
AC 13: Machine Shop	Replace with a 12.5-ton unit with VFD, replace external ductwork, repair return plenum	
AC 32: SEMCO	Renovate ductwork, insulate external ductwork, add VFD, air balance, thorough maintenance	
AC 34: GF Assembly	Repair or replace compressor, add VFD, thorough maintenance	
AC 42: Conference Room	Replace with 5-ton unit with VFD, completely renovate existing ductwork	
AC 43: Corporate Conf. Rm	Install mini split serve conference room, install split system to feed remaining space	
AC 44: Cafeteria	Replace with 7.5-ton unit with VFD, replace external duct work, duct renovation	
Controls	Add Pelican Wireless System to each unit	
10 Unit Renovation Total		

The pricing shown assumes that all work will be performed dung normal business hours. Additional cost will apply to work performed outside of normal business hours.
The pricing shown does not account for any additional engineering or engineered drawings costs associated with the scope of work. Engineering would be performed and billed for by a third party

Renovation Detail

AC 4: Laminating Area

Manufacturer	York
Model Number	DH180N24P4AAAZA
Serial Number	NHNM110117
Capacity	15 Tons
Manufacture Date	2004
Delivered Capacity of Unit	4.00 Tons – 22%
Delivered Capacity into the Space	3.72 Tons – 20%

This unit has a compressor that is not functioning properly.

- Repair the 2nd stage of cooling
  - Determine why the second compressor is not functioning properly
  - Replace the compressor and starting components if necessary
- Insulate the external ductwork on the roof
- Perform full maintenance on the unit, including refrigerant service, and coil cleaning

AC 5: EHS Stewardship

Manufacturer	RUUD
Model Number	RKKB-A120DM15E
Serial Number	2A6336ADAAF049911247
Capacity	10 Tons
Manufacture Date	1999
Delivered Capacity of Unit	8.25 Tons – 70%
Delivered Capacity into the Space	4.86 Tons – 41%

This unit is too large for the space It serves the conference room in addition to the Stewardship office, but the conference room is not occupied more than a few hours a week

- Replace the existing 10-ton unit with a 5-ton unit
- Replace the external ductwork on the roof, and replace it with properly sized, insulated ductwork
- Add 2-ton mini split to serve only the conference room
- Renovate the ductwork in the existing space to allow for the smaller unit

AC 9: Human Resources

Manufacturer	York
Model Number	D4NZ060N06525NXA
Serial Number	NIE0914022
Capacity	5 Tons
Manufacture Date	2014
Delivered Capacity of Unit	4.98 Tons – 89%
Delivered Capacity into the Space	2.31 Tons – 41%

This unit is in good working order, but the ductwork has significant issues

- Renovate the existing ductwork
  - Add return
- Perform full test and air balance in the space
- Perform full maintenance on the unit, including refrigerant service, and coil cleaning

AC 11: Forming Inspection

Manufacturer	RUUD
Model Number	RKNL-A060DL10E
Serial Number	2G7507ADAAF021305710
Capacity	5 Tons
Manufacture Date	2013
Delivered Capacity of Unit	5.8 Tons – 100%
Delivered Capacity into the Space	2.03 Tons – 35%

The unit is performing very well, but the ductwork has significant issues

- Renovate ductwork
  - Identify and seal duct leakage
- Insulate the external ductwork on the roof
- Perform full test and air balance in the space
- Perform full maintenance on the unit, including refrigerant service, and coil cleaning

AC 13: Machine Shop

Manufacturer	York
Model Number	DJ180N24P4AAAZA
Serial Number	NOL6090464
Capacity	15 Tons
Manufacture Date	2004
Delivered Capacity of Unit	4.61 Tons – 22%
Delivered Capacity into the Space	3.57 Tons – 17%

This unit is performing very poorly

- Replace 15-ton unit with a 12.5-ton unit with variable frequency drive
- Replace the external ductwork on the roof, and replace it with properly sized, insulated ductwork
- Extend return plenum, add grilles

AC 32: SEMCO

Manufacturer	RUUD
Model Number	RKNL-B090DL15E
Serial Number	2N7868ADAAF451205583
Capacity	7.5 Tons
Manufacture Date	2012
Delivered Capacity of Unit	5.15 Tons – 60%
Delivered Capacity into the Space	1.87 Tons – 22%

This unit is in good working order, but the ductwork has significant issues

- Renovate ductwork
  - Identify and seal duct leakage
- Insulate the external ductwork on the roof
- Perform full test and air balance in the space
- Perform full maintenance on the unit, including refrigerant service, and coil cleaning

AC 34: GF Assembly

Manufacturer	York
Model Number	DJ240N24A4AAA2A
Serial Number	NOH6767757
Capacity	20 Tons
Manufacture Date	2004
Delivered Capacity of Unit	8.38 Tons – 33%
Delivered Capacity into the Space	4.94 Tons – 20%

This unit has a compressor that is not functioning properly.

- Repair the 2nd stage of cooling
  - Determine why the second compressor is not functioning properly
  - Replace the compressor and starting components if necessary
- Perform full maintenance on the unit, including refrigerant service, and coil cleaning

AC 42: Building 1 Conference Room

Manufacturer	RUUD
Model Number	RKKB-A120DM15E
Serial Number	2b6336adaaf190015387
Capacity	10 Tons
Manufacture Date	2000
Delivered Capacity of Unit	5.96 Tons – 56%
Delivered Capacity into the Space	5.79 Tons – 54%

This unit is serves multiple areas that are also served by other units

- Replace the existing 10-ton unit with a 5-ton unit
- Re-duct area to be served by new smaller unit
- Replace the external ductwork on the roof, and replace it with properly sized, insulated ductwork

AC 43: Corporate Conference Room

Manufacturer	RUUD
Model Number	RKKB-A120DM15E
Serial Number	2B6336ADAAF190015384
Capacity	10 Tons
Manufacture Date	2000
Delivered Capacity of Unit	6.69 Tons – 61%
Delivered Capacity into the Space	4.08 Tons – 37%

This unit is serves multiple areas that are not occupied but a few hours a week

- Eliminate the 10-ton package unit
- Install mini split system to serve the corporate conference room and kitchen only
- Install split system heat pump to serve rest of area served by existing unit
- Renovate ductwork to allow for new system

AC 44: Cafeteria

Manufacturer	RUUD
Model Number	RKKB-A120DM15E
Serial Number	2A6336ADAAF140015713
Capacity	10 Tons
Manufacture Date	2000
Delivered Capacity of Unit	3.86 Tons – 34%
Delivered Capacity into the Space	3.34 Tons – 30%

This unit is oversized for the area it serves

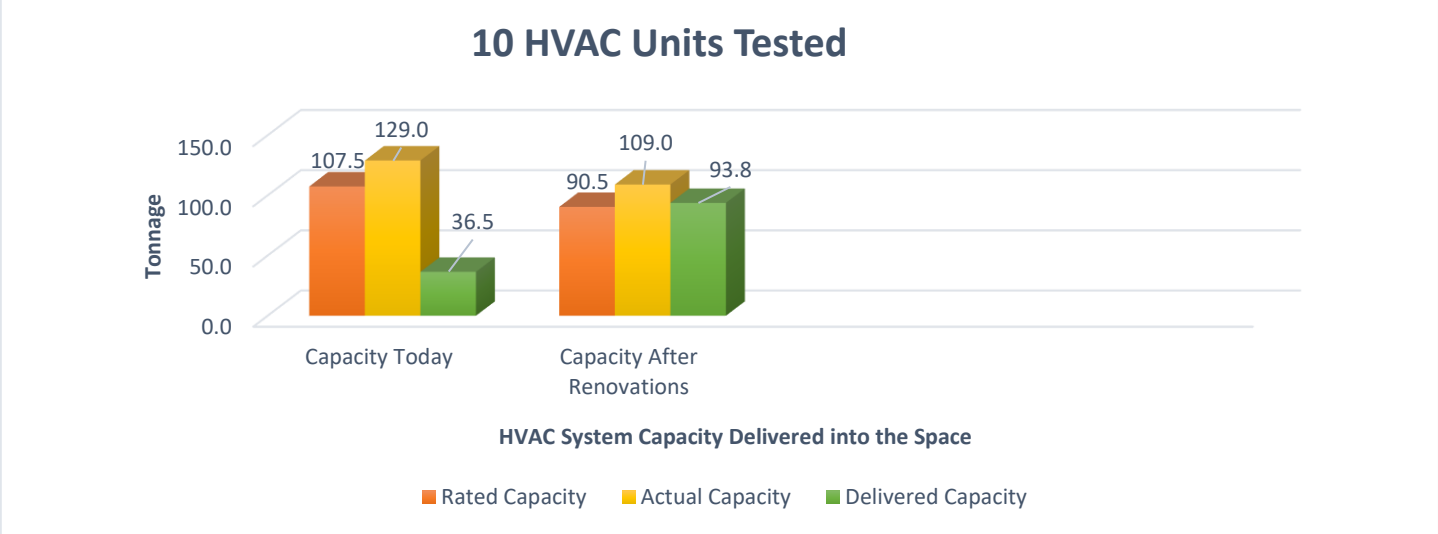
- Replace 10-ton unit with a 7.5-ton unit with variable frequency drive
- Replace the external ductwork on the roof, and replace it with properly sized, insulated ductwork
- Replace all of the ductwork that is not exposed in the café dining room
- Add a return

Recommendations

10 Unit Renovation Project

The initial analysis gathered data from 10 different roof top package units serving Building 1 of the facility. The areas served by these 10 units included occupied office space, unoccupied conference rooms, wide open manufacturing space, and process cooling. The diversity of the units was intended to create a well-represented cross section of the facility as a whole.

Based on the findings, Inland Mechanical Services, Inc. is proposing to reduce the tonnage of the 10 units tested from 107.5 tons to 90.5 tons. That is a 17-ton decrease, or 16% reduction in tonnage. Reducing the tonnage, and increasing the delivered capacity will improve overall comfort, efficiency, and ultimately reduce the energy consumed by each unit.



	Currently	After Renovations
Number of Units	10 Units	12 Units
Total Tonnage	107.5 Tons	90.5 Tons
Cooling Capacity Available at 76°	129 Tons	109 Tons
% Delivered Capacity into the Space	28% Delivered Capacity	85% Delivered Capacity
Actual Delivered Tonnage into the Space	36.5 Tons of into the Space	93.8 Tons of into the Space

- An ambient temperature of 75° is the ideal operating temperature for HVAC units

Energy Expense

There are a total of 74 units, totaling 553 tons, that serve Building 1. The HVAC represents 27% of the energy consumed by Building 1. The Total electricity consumption for Building 1 in 2016 was $1,091,041.

Annual Electricity Expense for Building 1 in 2016	$1,091,041
HVAC % of Total Electricity Expense is Space Cooling	27%
Estimated Annual HVAC Electricity Expense	$294,581
Annual Cost per Ton to Operate HVAC	$1,091,041 / 553 Tons = $533 per Ton

Estimated Savings for Renovation of 10 Units Analyzed	Currently	After Renovations

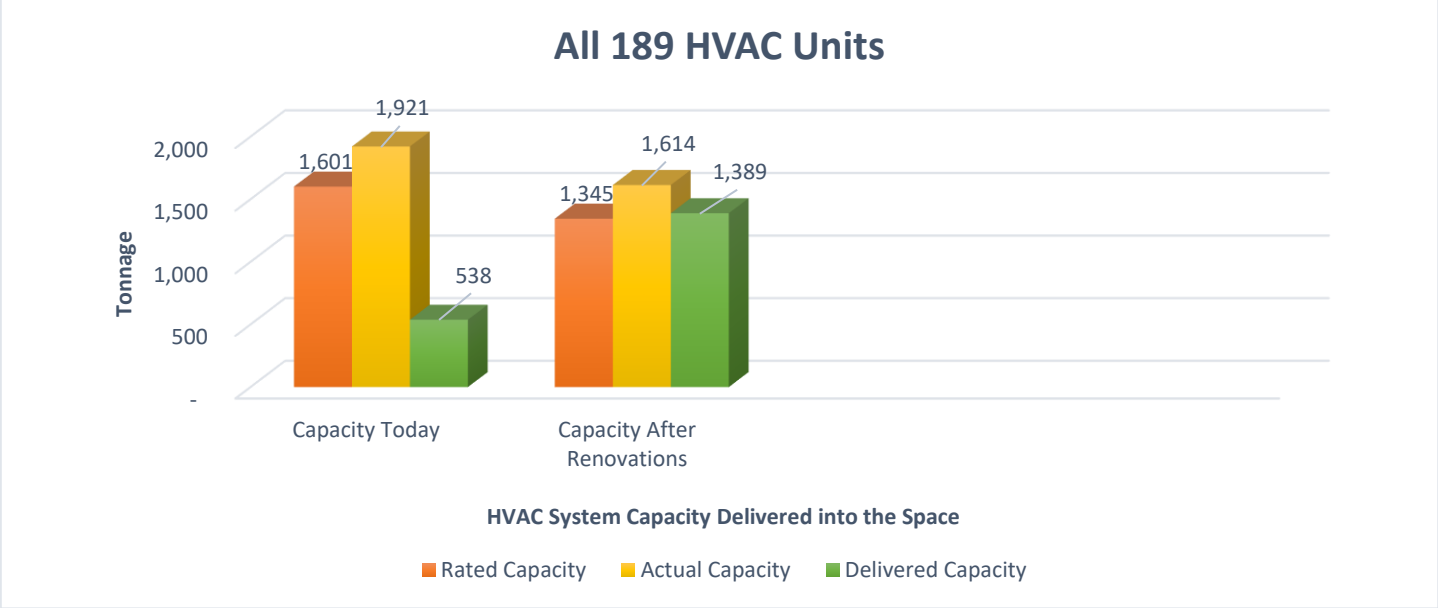
Total Tonnage	107.5 Tons	90.5 Tons
$672 per Ton Annually	$57,265 Annually	$48,209 Annually
Total Annual Savings by Reducing Tonnage	$0 Annually	$9,056 Annually
Estimated 40% Savings Annually by Increasing Delivered Capacity to 85%	$0 Annually	$22,905 Annually
Total Estimated Annual Savings	$0 Annually	$31,962 in Annual Savings

Return On Investment

Reducing the tonnage from 107.5 to 90.5 tons will immediately reduce the energy consumption by an estimated $9,056 annually. Improving the delivered capacity from 28% to 85% will drop the overall energy consumption by an estimated 40% annually, or $22,905 for these 10 units. The estimated savings of the reduction of the tonnage, in addition to the consumption, should provide an estimated $31,962 in savings annually.

Assumptions

The initial analysis took data from 10 different roof top package units serving Building 1 of the facility. The areas served by these 10 units included occupied office space, unoccupied conference rooms, wide open manufacturing space, and process cooling. The diversity of the units was to create a well-represented cross section of the facility as a whole. If it can be assumed that the 10 units initially analyzed, is representative of the 189 HVAC units currently serving the entire facility, here are some assumptions that can be made.



	Currently	After Renovations
Number of Units	189 Units	189 Units
Total Tonnage	1,601 Tons	1,345 Tons
Cooling Capacity Available at 76°	1,921 Tons	1,614 Tons
% Delivered Capacity into the Space	28% Delivered Capacity	85% Delivered Capacity
Actual Delivered Tonnage into the Space	538 Tons of into the Space	1,389 Tons of into the Space

Energy Expense

There are a total of 189 units that serve the facility as a whole. The HVAC represents 30.75% of the energy consumed by the plant. It was explained that the total electricity cost of the facility is between $3,500,000 and $4,000,000 annually.

Estimated Annual Electricity Expense	$3,500,000
Weighted Average % of Total Electricity Expense is Space Cooling	30.75% Weighted Average
Estimated Annual HVAC Electricity Expense	$1,076,250 Annually
Annual Cost per Ton to Operate HVAC	$1,076,250 / 1,601 Tons = $672 per Ton Annually

Estimated Savings for Renovation of 189 Units Serving Entire Facility	Currently	After Renovations
Total Tonnage	1,601 Tons	1,345 Tons

$672 per Ton Annually	$1,076,250 Annually	$903,840 Annually
Total Annual Savings by Reducing Tonnage	$0 Annually	$172,410 Annually
Estimated 40% Savings Annually by Increasing Delivered Capacity to 85%	$0 Annually	$430,500 Annually
Total Estimated Annual Savings	$0 Annually	$602,910 in Annual Savings

Thank you for the opportunity to provide you with this HVAC System Performance Analysis.

Regards,

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