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Customer Information

Customer Name	NVS Technologies
Contact Person	Not Specified
Contact Email	N/A
Contact Phone	N/A
ProjectAddress	500 Mariana Way, Research Park
ProjectType	Laboratory and Office Fit-Out

Project Information

Project Name	NVS Mariana 500 Forge Lab/Office Fit-Out
Location	500 Mariana Way, Research Park
Start Date	N/A
Completion Date	N/A
Budget	N/A
Scope	Laboratory and Office Fit-Out
Project ID	M-22-0584
Project URL	N/A
BuildingArea	45000 square feet
ProjectNumber	M-22-0584

Prepared By

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Date: 2025-05-14

Project Equipment

Air Handling Units

Equipment Tag	Manufacturer	Model
AHU-5		

Notes

Designed for 10 air changes per hour in critical laboratory spaces with capability for 100% outside air operation and VAV control

Heat Recovery Units

Equipment Tag	Manufacturer	Model
EAHU-3		

Notes

Designed for laboratory exhaust with no cross-contamination risk, includes exhaust stack discharge at 3500 FPM for proper dispersion

Chillers

Equipment Tag	Manufacturer	Model
CH-3		Water-cooled centrifugal
CH-4		Water-cooled centrifugal
CH-5		Water-cooled screw

Notes

Central plant serving laboratory cooling loads, variable speed drives for part-load efficiency

Pumps

Equipment Tag	Manufacturer	Model
CHWP-1		Chilled water primary
CHWP-2		Chilled water primary
HWP-8		Heating hot water
HWP-9		Heating hot water
HRP-4		Heat recovery
HRP-5		Heat recovery

Notes

Variable frequency drive control for all pumps with lead-lag configurations for redundancy

Fans

Equipment Tag	Manufacturer	Model
EF-12		Laboratory exhaust
EF-13		Laboratory exhaust

Notes

High plume dilution fans for laboratory exhaust with variable frequency drives

Steam Generators

Equipment Tag	Manufacturer	Model
SG-1		Clean steam generator
SG-2		Clean steam generator

Notes

Clean steam generators for laboratory process loads with redundant operation

Suppliers

Air Handling Units

Manufacturer	Model	Representativ	Compatibility Notes	BoD
Daikin	Applied Vision	N/A	Basis of Design	**Yes**
Daikin Applied	Vision	Daikin Applied	High energy efficiency with advanced control options and modular design. Premium price point but excellent for laboratory applications with highly configurable options.	No
Trane	Performance Climate Changer	Trane	Robust construction with excellent reliability and comprehensive controls. Higher initial cost but exceptionally reliable for critical laboratory applications.	No

Energy Labs	Custom AHU	Energy Labs	Custom-engineered solutions with high energy efficiency, specifically designed for laboratory applications. Longer lead times but superior for complex laboratory requirements.	No

Heat Recovery Units

Manufacturer	Model	Representativ	Compatibility Notes	BoD
Thermotech	Enterprises LabRecover	N/A	Basis of Design	**Yes**
Thermotech Enterprises	LabRecover	Thermotech Enterprises	High recovery efficiency (up to 90%) with robust construction specifically designed for laboratory applications. Premium pricing but excellent performance.	No
XeteX	AirMatrix	XeteX	Versatile technology options with custom engineering capabilities for specialized laboratory environments. Less widespread service network but strong technical capabilities.	No
Engineered Air	FW Series	Engineered Air	Durable construction specialized for industrial applications including forge labs with potential contaminants. Less aesthetic design but extremely robust.	No

Chillers

Manufacturer	Model	Representativ	Compatibility Notes	BoD
Carrier	AquaEdge 19DV	N/A	Basis of Design	**Yes**
Carrier	AquaEdge 19DV	Carrier	High reliability with excellent service network and wide capacity range. Strong performance record in critical laboratory applications.	No
Daikin Applied	Magnitude WMC	Daikin Applied	Advanced magnetic bearing technology with excellent efficiency and low-noise operation. Premium pricing but superior part-load efficiency for variable laboratory loads.	No

Smardt Chiller Group	WA Series	Smardt Chiller Group	Oil-free magnetic bearing technology with exceptional efficiency and reduced maintenance requirements. Higher initial cost but lower lifecycle cost.	No

Pumps

Manufacturer	Model	Representativ	Compatibility Notes	BoD
Armstrong	Design Envelope	N/A	Basis of Design	**Yes**
Armstrong	Design Envelope	Armstrong	High efficiency with integrated controls and extensive selection options. Excellent for variable flow applications with integrated intelligence.	No
Grundfos	MAGNA3/TPE Series	Grundfos	High reliability with advanced monitoring and energy-efficient EC motors. Superior energy efficiency with advanced diagnostic capabilities.	No
Bell & Gossett (Xylem)	e-Series	Bell & Gossett (Xylem)	Widespread availability with extensive service network and proven reliability. Solid performance with excellent parts and service availability.	No

Fans

Manufacturer	Model	Representativ	Compatibility Notes	BoD
Greenheck	Vektor-H	N/A	Basis of Design	**Yes**
Greenheck	Vektor-H	Greenheck	Laboratory-specific high plume exhaust fans with excellent dispersion characteristics. Premium pricing but purpose-built for laboratory applications.	No
Twin City Fan & Blower	Aerovent Laboratory Exhaust	Twin City Fan & Blower	Custom engineering capabilities with robust construction suitable for forge lab applications. Competitive pricing with strong performance.	No
Loren Cook Company	Centrex Vane	Loren Cook Company	Reliable construction with good support and competitive pricing. Solid performance focused on reliability and maintenance accessibility.	No

Steam Generators

Manufacturer	Model	Representativ	Compatibility Notes	BoD
Sussman	Electric Boilers MBA Series	N/A	Basis of Design	**Yes**
Sussman Electric Boilers	MBA Series	Sussman Electric Boilers	Compact design with stainless steel construction and clean steam capability. Excellent for laboratory applications requiring pure steam.	No
Electro-Steam	ESG Series	Electro-Steam	Long track record with reliable performance specifically designed for laboratory applications. Strong performance in medical and pharmaceutical settings.	No
BMT USA	Steam Master	BMT USA	Pure and clean steam options with GMP-compliant designs for critical applications. Premium pricing but superior for pharmaceutical and critical laboratory applications.	No

Design Notes

Air Flow Design

Technical Observations:

- Forge laboratory spaces designed for 10 air changes per hour during occupied periods and 6 air changes during unoccupied periods
- Laboratory spaces maintained at negative pressure relative to adjacent non-laboratory spaces to prevent cross-contamination
- System uses 100% outside air with no recirculation to prevent contaminant migration
- Variable air volume control implemented to adjust airflow based on occupancy and process demands

Concerns:

- Maintaining consistent pressure relationships between spaces during varying operational modes
- Ensuring adequate exhaust capacity for all laboratory processes
- Managing energy consumption with 100% outside air design

Opportunities:

- Implement occupancy sensors for improved ventilation control
- Consider heat recovery options to reduce energy consumption
- Evaluate low-flow fume hood technology for applicable areas

Chilled Water System

Technical Observations:

- Primary-secondary pumping arrangement with variable speed drives on all pumps
- Three water-cooled chillers (CH-3, CH-4, CH-5) with combined capacity of 650 tons
- N+1 redundancy for facility's cooling requirements
- Primary chilled water temperature maintained at 42°F supply with 56°F return

Concerns:

- Ensuring proper chiller sequencing for optimal efficiency
- Maintaining appropriate temperature differential across the system
- Managing condenser water treatment for optimal performance

Opportunities:

- Implement chilled water temperature reset based on load conditions
- Consider waterside economizer for suitable climate conditions
- Evaluate condenser heat recovery for preheating applications

Heating Hot Water System

Technical Observations:

- Primary-secondary pumping arrangement with variable speed drives on all pumps
- High-efficiency condensing boilers located in the central plant
- Primary heating water temperature maintained between 140°F and 180°F
- Outdoor air temperature reset control for improved efficiency

Concerns:

- Ensuring proper return water temperature for condensing boiler efficiency
- Balancing system flow rates for different load profiles
- Managing system during low-load conditions to prevent short-cycling

Opportunities:

- Lower heating water temperature setpoints during shoulder seasons
- Implement advanced boiler sequencing controls
- Consider staged pumping strategies for varied load conditions

Heat Recovery System

Technical Observations:

- Run-around coils for laboratory exhaust heat recovery with approximately 62% efficiency
- Prevents cross-contamination while transferring energy between exhaust and supply air
- Propylene glycol solution (30%) for energy transfer between coils
- Automatic bypass dampers to prevent unwanted heat transfer and frosting

Concerns:

- Maintaining glycol concentration and quality over time
- Ensuring proper control of bypasses during varying conditions
- Balancing pumping energy against recovery benefits

Opportunities:

- Enhance heat recovery with high-efficiency coils
- Implement variable glycol flow control based on temperature differential
- Consider heat recovery from chiller condensers for other applications

BuildVision Recommendations

1. Implement demand-controlled ventilation with air quality sensors

Rationale: Current design provides constant air change rates regardless of actual occupancy or contaminant levels. Adjusting ventilation rates based on actual conditions could significantly reduce fan energy while maintaining safe laboratory environments.
Estimated Impact: 20-30% reduction in fan energy consumption while maintaining safe laboratory conditions
Implementation: Install air quality sensors in key zones and integrate with the VAV control system. Add occupancy sensors tied to the ventilation control system for further optimization.
Priority: High

2. Implement chilled water temperature reset controls

Rationale: Current fixed chilled water temperature does not account for varying cooling and dehumidification requirements. Raising the chilled water temperature during periods of lower humidity or reduced cooling loads can significantly improve chiller efficiency.
Estimated Impact: 10-15% reduction in chiller energy consumption with minimal impact to comfort conditions
Implementation: Modify BMS programming to adjust chilled water setpoint based on cooling load and dehumidification requirements. Consider implementing waterside economizer operation during cooler months.
Priority: Medium

3. Lower heating hot water temperature setpoint during shoulder seasons

Rationale: Current design temperature range of 140-180°F doesn't maximize condensing boiler efficiency. Maintaining return water temperatures below 130°F whenever possible can significantly improve boiler efficiency.
Estimated Impact: 10-15% improvement in boiler efficiency during non-peak heating periods
Implementation: Implement advanced boiler sequencing controls to optimize part-load operation. Modify BMS programming for more aggressive outdoor air temperature reset.
Priority: Medium

4. Enhance run-around coil heat recovery system

Rationale: Current heat recovery system achieves approximately 62% efficiency. Higher efficiency coils and intelligent control algorithms could improve energy recovery while minimizing pumping energy.
Estimated Impact: 5-10% improvement in heat recovery effectiveness with minimal increase in pumping energy
Implementation: Add variable glycol flow control based on temperature differential to optimize heat recovery while minimizing pumping energy. Consider implementing heat recovery from chiller condensers for domestic hot water preheating.
Priority: Medium

5. Improve maintenance accessibility for air handling equipment

Rationale: Current design may have limited service access around air handling equipment and heat recovery units. Improved accessibility would reduce maintenance costs and improve equipment uptime.
Estimated Impact: 15-20% reduction in maintenance time and labor costs for routine servicing
Implementation: Provide additional service platforms and removable panels for coil cleaning and filter replacement. Consider implementing sliding rail systems for heavy components that require periodic removal for service.
Priority: Medium

6. Implement differential pressure monitoring across filter banks

Rationale: Current design likely uses time-based filter replacement which is inefficient. Condition-based filter replacement would optimize filter life and reduce maintenance costs.
Estimated Impact: 10-15% reduction in filter replacement costs and improved system efficiency
Implementation: Install differential pressure sensors across all filter banks with integration to the building management system for real-time monitoring. Use extended-surface filter designs to reduce replacement frequency.
Priority: Low

Conclusion

Key Findings

- Laboratory ventilation design follows best practices with negative pressure relationships and appropriate air change rates
- Chilled water system includes N+1 redundancy with appropriate capacity for laboratory cooling loads
- Heat recovery system provides energy efficiency while preventing cross-contamination
- Several opportunities exist for enhanced energy efficiency through improved controls and setpoint optimization
- Maintenance accessibility improvements could reduce operational costs and improve system reliability

Highest Priority Actions

- Implement demand-controlled ventilation with air quality sensors to reduce fan energy consumption
- Optimize chilled water temperature reset controls based on actual load conditions
- Implement more aggressive hot water temperature reset to maximize condensing boiler efficiency
- Enhance heat recovery system with variable flow control and improved coil selection
- Improve accessibility for maintenance of critical air handling equipment

Summary

The NVS Mariana 500 Forge Lab/Office Fit-Out project features a comprehensive HVAC design tailored for laboratory environments with appropriate redundancy and control systems. The design incorporates specialized systems for the unique requirements of forge laboratory spaces, including proper pressure relationships, adequate ventilation, and robust exhaust systems. Several opportunities exist for enhancing energy efficiency, maintenance accessibility, and system reliability through targeted improvements to control strategies, equipment selection, and system configuration.

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