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Customer Information

Customer Name	Hensel Phelps
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Contact Phone	N/A
Project Status	N/A
Contract Type	N/A
Bid Status	BuildingConnected Lead
Request Type	Proposal

Project Information

Project Name	GBSD Integrated Training Center (ITC)
Location	F.E. Warren AFB, Wyoming
Start Date	5/27/2025
Completion Date	6/30/2025
Budget	N/A
Scope	N/A
Project ID	d9ccf49d-0eba-4852-8c17-c04b44d3fe4a
Project URL	BuildVision Project Link
Expected Start	–
Date Invited	5/27/2025
Job Walk	–
Project Size	–
Rfis Due	6/19/2025
Date Due	6/30/2025

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Project Equipment

Air Handling Units

Equipment Tag	Manufacturer	Model
AHU-1	Trane	
AHU-2	Trane	
AHU-3	Trane	

Notes

AHUs are designed with capacities ranging from 4,830 to 10,300 CFM. Units include supply/return fans, filters, and various coils. Performance based on design altitude of 6,115 ft.

Energy Recovery Wheels

Equipment Tag	Manufacturer	Model
EW-1		
EW-2		
EW-3		

Notes

Energy wheels provide heat recovery with minimum sensible efficiency of 71.5% and total efficiency of 68.4-76.6%.

Water Cooling Coils

Equipment Tag	Manufacturer	Model
WCC-1		
WCC-2		

Notes

Cooling coils are sized based on entering and leaving air temperatures with capacity provided for reference. Performance based on design altitude of 6,115 ft.

Heating Water Coils

Equipment Tag	Manufacturer	Model
HC-01		
HC-02		

HC-03		
HC-04		

Notes

Heating coils sized based on entering and leaving air temperatures with capacity provided for reference. Capacity based on 40% propylene glycol. Performance based on design altitude of 6,115 ft.

Gas Heating Coils

Equipment Tag	Manufacturer	Model
HC-G-01		

Notes

Gas heating coils with minimum burner turndown ratio of 10:1. Performance based on design altitude of 6,115 ft. Gas input based on 1,000 BTU/ft³.

Suppliers

Air Handling Units

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Various	N/A	Specified as basis of design for air-cooled chillers (CH-1 and CH-2) with modular scroll compressors.	**Yes**
York	Scroll	N/A	Compatible with specified controls and piping connections. Provides similar energy efficiency ratings.	Listed
Carrier	AquaSnap	N/A	Compatible with project requirements and control systems. Offers comparable efficiency ratings.	Listed
Daikin	Air-Cooled Scroll	N/A	Good alternative with high efficiency ratings. Would require minor adjustments to piping connections.	No

Energy Recovery Wheels

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Energy Recovery Wheel	N/A	Specified for the project as the basis of design. The energy recovery wheels (EW-1, EW-2, EW-3) must meet the minimum performance requirements including sensible efficiency of 71.5% and total efficiency of 70.8%.	**Yes**
Semco	Energy Recovery Wheel	N/A	Compatible with the specified requirements for energy recovery wheels. Provides AHRI 1060 certification and meets minimum efficiency requirements.	Listed
Greenheck	Energy Recovery Wheel	N/A	Can be provided as an alternate with AHRI certification. Compatible with the project requirements for energy recovery wheels.	No
Munters	Total Energy Recovery Wheel	N/A	Premium option with high durability. Compatible with the specified performance requirements and AHRI certified.	No

Water Cooling Coils

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	WCC-1, WCC-2	N/A	Basis of design for Water Cooling Coils in Air Handling Units. Coil requirements include minimum 6 rows, minimum coil area of 20.2 ft² for WCC-1 and 12.9 ft² for WCC-2, with max face velocity of 315-374 FPM and specific performance requirements for cooling capacity.	**Yes**

Daikin	Custom Water Cooling Coils	N/A	Compatible with specified parameters for water cooling coils. Can meet the specified performance requirements including flow rates, temperature differentials, and pressure drops.	Listed
Carrier	Custom Water Cooling Coils	N/A	Compatible with specified performance requirements. Can meet the specified cooling capacity, flow rates, and temperature differentials.	Listed
York	Custom Water Cooling Coils	N/A	Can be configured to meet the specified design parameters. Compatible with AHU-1 and AHU-2 requirements.	No
Heatcraft	Custom Water Cooling Coils	N/A	Specializes in custom coil manufacturing and can meet the specified performance requirements. Would require verification of complete compatibility with the AHU design.	No

Heating Water Coils

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Series HC Heating Coil	N/A	Specified for heating water coils HC-01 through HC-04. Compatible with AHU-1 and AHU-2 equipment.	**Yes**
Carrier	Hydronic Heat Coils	N/A	Compatible with AHU requirements, can be dimensioned to fit existing parameters.	Listed
Daikin	Heating Coil Series	N/A	Offers slightly higher efficiency rating but at premium cost.	Listed
York	Hot Water Coils	N/A	Compatible with specifications, may require custom sizing to match exact dimensions.	No

Johnson Controls	HW Series Heating Coils	N/A	High quality alternative with good corrosion resistance and performance similar to basis of design.	No

Gas Heating Coils

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	HC-G-01	N/A	Gas heating coil for AHU-3. Provides 584.8 MBH output with 731 CFH gas input. Requires 10:1 minimum turndown ratio.	**Yes**
Reznor	UDAS	N/A	Compatible with specifications, provides similar capacity range with required turndown ratio.	Listed
Modine	Hot Dawg	N/A	Alternative option for gas heating applications, may require modifications to meet exact specifications.	No
Sterling	TF Series	N/A	Higher-end alternative with enhanced control features, suitable for high-altitude applications.	No

BuildVision Recommendations

1. High-Efficiency Condensing Boilers

Rationale: The project specifications call for two 1600 MBH gas-fired condensing boilers (BLR-1 and BLR-2). Condensing boilers are already an efficient choice, but selecting models with the highest possible efficiency ratings (96%+) will maximize long-term operational savings. The specifications indicate a minimum efficiency of 96.1%, which is good, but premium models with up to 98% efficiency are available.
Estimated Impact: Upgrading to the highest efficiency models could reduce gas consumption by approximately 2-3% compared to standard condensing boilers, potentially saving $1,500-2,500 annually in utility costs depending on facility usage patterns and local gas rates.
Implementation: 1. Evaluate premium condensing boiler models from manufacturers like Lochinvar, Viessmann, or AERCO that exceed 97% efficiency. 2. Compare initial cost premium against lifecycle cost savings. 3. Ensure selected models maintain high efficiency across their modulation range, not just at peak load. 4. Verify compatibility with specified control systems.
Priority: Medium

2. Variable Frequency Drives for All Pumps

Rationale: The mechanical schedules show multiple pumps throughout the hydronic systems. While some pumps already specify VFDs, ensuring all major circulation pumps have VFDs would provide significant energy savings through reduced pump speed during partial load conditions. The specification already indicates provision for VFDs in Section 23 21 23 (Hydronic Pumps), but this should be emphasized as a priority procurement decision.
Estimated Impact: VFDs on all major pumps could reduce pumping energy consumption by 30-50% compared to constant speed operation, with potential electrical savings of $2,000-3,000 annually depending on system usage patterns.
Implementation: 1. Review pump schedule to ensure VFDs are specified for all pumps over 1 HP. 2. Prioritize premium efficiency motors with inverter duty rating for all pump selections. 3. Specify VFDs with BACnet communication capability for integration with building automation system. 4. Ensure proper harmonic mitigation measures are included in VFD specifications.
Priority: High

3. High-Efficiency Air-Cooled Chillers with Free Cooling

Rationale: The specifications call for two modular scroll air-cooled chillers (CH-1 and CH-2). The schedule indicates CH-2 includes integral free cooling capability. For a Wyoming installation, where many hours of the year have ambient temperatures below chilled water supply temperatures, expanding free cooling capability to both chillers could provide substantial energy savings.
Estimated Impact: Adding free cooling to both chillers could eliminate compressor operation for 20-30% of the cooling season, potentially saving $3,000-5,000 in annual energy costs while extending compressor life through reduced run hours.
Implementation: 1. Confirm both chillers will be equipped with free cooling capability. 2. Specify high-efficiency models with EER ratings exceeding 11.0 at AHRI conditions. 3. Select units with robust low-ambient controls for reliable operation in Wyoming's climate. 4. Ensure proper glycol concentration (40% as specified) to prevent freezing during free cooling operation.
Priority: High

4. Premium Fan Arrays for Air Handling Units

Rationale: The specifications call for three air handling units (AHU-1, AHU-2, and AHU-3) with various airflow requirements. Selecting AHUs with multiple smaller fans arranged in arrays rather than single large fans would provide redundancy, improved efficiency at partial loads, and quieter operation.
Estimated Impact: Fan arrays can improve energy efficiency by 10-15% compared to single-fan designs, particularly at partial load conditions. This could save $2,000-3,000 annually in fan energy costs while providing N+1 redundancy that prevents total system failure if a single fan fails.
Implementation: 1. Specify AHUs with multiple EC (electronically commutated) motor-driven fans in array configurations. 2. Ensure fan array controllers provide proper staging and modulation. 3. Verify that selected fan arrays meet the sound criteria specified for the project. 4. Confirm BACnet integration with building automation system for monitoring individual fan status.
Priority: Medium

5. High-Efficiency Energy Recovery Wheels

Rationale: The project includes energy recovery wheels (EW-1, EW-2, and EW-3) with minimum total efficiency requirements of 76%, 76.6%, and 68.4% respectively. Selecting premium energy recovery wheels with higher effectiveness (80%+) would maximize energy savings from the recovery process and reduce heating/cooling loads.
Estimated Impact: Upgrading to higher efficiency energy recovery wheels could provide an additional 5-10% energy recovery, potentially saving $1,500-2,500 annually in heating and cooling energy costs based on the outdoor air volumes specified.
Implementation: 1. Specify energy recovery wheels with total effectiveness ratings of 80% or higher. 2. Ensure selected wheels maintain high effectiveness across variable airflow rates. 3. Verify proper purge section design to minimize cross-contamination. 4. Select wheel construction materials appropriate for the temperature extremes expected in Wyoming.
Priority: Medium

6. Invest in Advanced Digital Scroll Compressors for Chillers

Rationale: The specifications call for scroll compressors in the chillers. Selecting chillers with digital scroll compressors would provide superior part-load efficiency compared to standard scrolls. Digital scrolls can modulate capacity between 10-100% rather than cycling on/off, resulting in better temperature control and energy efficiency.
Estimated Impact: Digital scroll compressors typically improve seasonal energy efficiency by 15-20% compared to standard scroll compressors, potentially saving $2,000-3,000 annually in electricity costs while providing better temperature stability.
Implementation: 1. Specify chillers with digital scroll compressor technology. 2. Verify IPLV (Integrated Part Load Value) ratings to ensure good part-load performance. 3. Ensure proper controls integration to maximize the benefits of the modulation capability. 4. Consider compressor sound packages to minimize noise impact.
Priority: High

7. High-Turndown Condensing Boiler Burners

Rationale: The specifications mention a minimum 10:1 turndown ratio for the boiler burners. Selecting boilers with even higher turndown ratios (20:1 or more) would provide better load matching during shoulder seasons and reduce cycling, improving efficiency and extending equipment life.
Estimated Impact: Higher turndown burners can reduce cycling by 30-50% during low-load conditions, potentially saving $1,000-1,500 annually in gas consumption while extending boiler life by reducing thermal stress.
Implementation: 1. Specify boilers with minimum 20:1 turndown ratio. 2. Ensure boiler efficiency remains high across the entire modulation range. 3. Verify proper venting design to accommodate the full turndown range. 4. Consider cascade controls to sequence multiple boilers for optimal efficiency.
Priority: Medium

8. Smart Glycol Feed Systems with Monitoring

Rationale: The specifications call for glycol feed systems (GMU-1, GMU-2, GMU-3) with basic controls. Upgrading to smart glycol feed systems with digital monitoring capabilities would provide alerts for leaks, enable remote monitoring, and ensure proper glycol concentration is maintained.
Estimated Impact: Smart glycol feed systems can reduce maintenance costs by $1,000-2,000 annually through early leak detection and prevention of glycol loss. They also help maintain optimal system performance by ensuring proper glycol concentration.
Implementation: 1. Specify glycol feed systems with digital pressure monitoring and BACnet communication. 2. Include capability for remote alerts when makeup levels exceed normal patterns. 3. Consider systems with built-in glycol concentration monitoring. 4. Ensure integration with building automation system for centralized monitoring.
Priority: Low

9. Premium Efficiency Motors for All HVAC Equipment

Rationale: While the specifications already call for premium efficiency motors in some equipment, ensuring all motors across the project (fans, pumps, etc.) are premium efficiency or better would maximize electrical savings. For smaller motors, EC (electronically commutated) motors offer superior efficiency compared to traditional PSC (permanent split capacitor) motors.
Estimated Impact: Upgrading to premium efficiency motors for all HVAC equipment could reduce motor energy consumption by 5-10% compared to standard efficiency motors, potentially saving $2,000-3,000 annually in electricity costs.
Implementation: 1. Specify premium efficiency motors meeting NEMA Premium standards for all equipment. 2. For fractional horsepower applications, specify EC motors where available. 3. Verify that all fan coil units use EC motors rather than PSC motors. 4. Ensure proper motor sizing to avoid oversized motors operating at low load factors.
Priority: Medium

10. Advanced Ultrasonic Flow Meters for Hydronic Balancing

Rationale: Traditional balancing valves specified in the project require manual adjustment and don't provide continuous flow monitoring. Investing in ultrasonic flow meters for key hydronic circuits would enable more precise balancing, ongoing monitoring, and faster commissioning.
Estimated Impact: Advanced flow metering can improve system efficiency by 5-10% through more precise balancing, potentially saving $1,000-2,000 annually in energy costs while reducing commissioning time by 20-30%.
Implementation: 1. Specify ultrasonic flow meters for main hydronic circuits (chilled water, heating water). 2. Ensure meters have BACnet integration capability for monitoring through the BAS. 3. Locate meters in accessible locations with appropriate straight pipe runs. 4. Provide training for facilities staff on using flow data for system optimization.
Priority: Low

Conclusion

Key Findings

- The mechanical systems are designed for high-altitude operation (6,115 ft) requiring equipment rated for these conditions and proper sizing of motors, fans, and heat transfer components
- A 40% propylene glycol solution is specified for chilled water systems, requiring compatible pumps, heat exchangers, and proper sizing of equipment to account for the glycol's thermal properties
- Energy recovery systems are emphasized with total energy wheels required to achieve minimum 68.4-76.6% efficiency, providing significant operational savings
- Digital scroll compressors with free cooling capability are recommended for the chillers to optimize performance in Wyoming's climate and reduce operating costs
- High-turndown condensing boilers (minimum 10:1 ratio) are specified for heating, but premium models with up to 20:1 turndown would provide better load matching and efficiency

Highest Priority Actions

- Verify all equipment selections meet high-altitude performance requirements (6,115 ft) with appropriate derating factors applied to capacity and motor selections
- Procure chillers with free cooling capability and digital scroll compressors to maximize energy efficiency in Wyoming's climate
- Implement variable frequency drives for all pumps over 1 HP to optimize system efficiency and reduce energy consumption
- Schedule long-lead items (chillers, boilers, AHUs) immediately with careful coordination of delivery timelines to ensure project completion by June 2025

Summary

The GBSD Integrated Training Center (ITC) at F.E. Warren AFB requires a comprehensive HVAC system featuring air-cooled chillers, condensing boilers, air handling units with energy recovery, and various hydronic components designed for Wyoming's climate. The procurement strategy should focus on high-efficiency equipment that can withstand high-altitude operation (6,115 ft elevation) while utilizing a 40% propylene glycol solution for freeze protection. Key considerations include proper vendor selection, equipment performance verification, lead time management, and coordination of interdependent systems to ensure on-time project completion.

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