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Customer Information

Customer Name	Hensel Phelps
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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	Construction of an integrated training center for the Ground Based Strategic Deterrent (GBSD) program including mechanical systems, air handling units, and related infrastructure
Project ID	d9ccf49d-0eba-4852-8c17-c04b44d3fe4a
Project URL	BuildVision Project Link
Contract Type	N/A
Bid Status	BuildingConnected Lead
Project Size	N/A
Request Type	Proposal
RFIs Due	6/19/2025
Job Walk	N/A
Date Invited	5/27/2025
Contract Number	W9128F21D0024
Solicitation Number	W9128F25RA015

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Project Equipment

Air Handling Units

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

Notes

Performance based on design altitude of 6,115 ft. Units require 6 inch equipment pad extending 6 inches beyond edges of equipment. Units include variable frequency drives.

Energy Wheels

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

Notes

Energy recovery units shall be certified per AHRI 1060. Motors powered through single point connection. Performance based on design altitude of 6,115 ft.

Water Cooling Coils

Equipment Tag	Manufacturer	Model
WCC-1		
WCC-2		

Notes

Coil shall be selected based on entering and leaving air temperatures. Performance based on design altitude of 6,115 ft. Route 3/4” condensate drain to nearest floor drain.

Heating Water Coils

Equipment Tag	Manufacturer	Model
HC-01		
HC-02		

HC-03		
HC-04		

Notes

Coil shall be selected based on entering and leaving air temperatures. Heating capacity provided for reference only. Capacity based on 40% propylene glycol. Performance based on design altitude of 6,115 ft.

Gas Heating Coil

Equipment Tag	Manufacturer	Model
HC-G-01		

Notes

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

Fan Coil Units

Equipment Tag	Manufacturer	Model
Type 1		
Type 2		
Type 3		

Notes

Provide lockable, fusible disconnect. External static pressure includes filter and ductwork not in casing. Cooling coil performance based on 100% water. Heating coil performance based on 40% propylene glycol mixture.

Blower Coil Units

Equipment Tag	Manufacturer	Model
Type 1		
Type 2		
Type 3		

Notes

External static pressure includes filter and ductwork not in casing. Cooling coil performance based on 100% water. Heating coil performance based on 40% propylene glycol mixture. Provide lockable disconnect.

Air Cooled Chillers

Equipment Tag	Manufacturer	Model
CH-1	Trane	
CH-2	Trane	

Notes

Provide Trane water chiller product with single point connection and lockable unit mounted disconnect. Capacity based on 40% propylene glycol/water solution in evaporator. Unit suitable for low ambient operation to 0°F. Performance based on design altitude of 6,115 ft.

Four Pipe Heat Pump

Equipment Tag	Manufacturer	Model
AWHP-1		

Notes

Provide single point connection and lockable unit mounted disconnect. Capacity based on 40% propylene glycol/water solution in evaporator and condenser. Performance based on design altitude of 6,115 ft.

Expansion Tanks

Equipment Tag	Manufacturer	Model
ET-CHW-01		
ET-CHW-02		

Notes

Constructed in accordance with ASME Section VIII Division 1. Route drains to nearest floor drain. Provide 6” concrete equipment pad extending 6 inches beyond edges of equipment. Tank size based on 40% propylene glycol.

Suppliers

Air Handling Units

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Climate Changer	N/A	Air Handling Units AHU-1, AHU-2, and AHU-3 with energy recovery wheels EW-1, EW-2, and EW-3. Basis of design with features including variable frequency drives, MERV 8/13 filtration, and components sized for the specified altitude of 6,115 ft.	**Yes**
Daikin	Vision	N/A	Compatible alternative with equivalent energy recovery wheel performance. May require minor modifications to ductwork connections.	Listed
Carrier	AirStream	N/A	Good compatibility with specified heating and cooling coil requirements. Offers similar energy recovery performance.	Listed
York	Solution	N/A	Potential alternative with good high-altitude performance. May offer cost savings but requires verification of energy recovery wheel specifications.	No
Greenheck	Energypack	N/A	Specialized in energy recovery systems with good performance at high altitudes. Would need verification of heating/cooling coil performance to match specifications.	No

Energy Wheels

Manufacturer	Model	Representative	Compatibility Notes	BoD
Semco	Total Energy Wheel	Mountain Mechanical	Basis of design for energy recovery wheels. AHRI 1060 certified with superior OACF and EATR performance.	**Yes**
Thermowheel	TW Series	Rocky Mountain HVAC	Listed alternate. Compatible with AHUs, meets specified efficiency requirements.	Listed

Innergytech	XeteX Series	Western Mechanical	Listed alternate. Slightly lower initial cost but meets all performance criteria.	Listed
RotorSource	RS Energy Recovery	High Plains Mechanical	Not listed but compatible. Meets efficiency and AHRI certification requirements.	No
Greenheck	ERW Series	Front Range Representatives	Not listed but compatible with specified AHUs. Higher premium but includes enhanced controls.	No

Water Cooling Coils

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Water Cooling Coil	N/A	Basis of design for AHU-1, AHU-2 coils WCC-1 and WCC-2	**Yes**
Daikin	Water Cooling Coils	N/A	Compatible with specified AHUs. Performance meets specified requirements for cooling capacity and pressure drop.	Listed
Carrier	Water Cooling Coils	N/A	Compatible with AHU systems. Meets cooling capacity and row count requirements.	Listed
York/Johnson Controls	Water Cooling Coils	N/A	Suitable for high-altitude installations. Can meet specified performance at 6,115 ft elevation.	No
USA Coil & Air	Custom Water Cooling Coils	N/A	Custom coil manufacturer that can meet exact specifications. Good for retrofit applications.	No

Heating Water Coils

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	HC Series	N/A	Hot water coil designed for AHUs with capacities ranging from 79.4 to 283.9 MBh	**Yes**
Carrier	39M Series	N/A	Compatible with all specified heating water coil requirements, drop-in replacement option	Listed

Daikin	DWUD Series	N/A	Compatible with all specified heating water coil requirements with similar pressure drop	Listed
York/JCI	Hot Water Coils	N/A	Comparable performance with slightly lower first cost, suitable for military applications	No
Heatcraft	HW Series	N/A	Good performance with glycol solutions, suitable for the specified 40% propylene glycol	No

Fan Coil Units

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	FCAH Series	N/A	Four-pipe fan coil units for heating and cooling applications in horizontal concealed arrangement with ECM motors	**Yes**
Daikin	FH/FHB Series	N/A	Compatible four-pipe fan coil units, supports specified CFM ranges and heating/cooling capacities	Listed
JCI/York	Horizontal Fan Coil Units	N/A	Direct replacement for basis of design, matches performance specifications	Listed
Carrier	Horizontal FCU Series	N/A	Compatible with project requirements, may require minor ductwork modifications	No
IEC (International Environmental)	Hi-Rise Series	N/A	Premium construction quality, good compatibility with project specifications	No

Blower Coil Units

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Blower Coil Unit	N/A	Specified as basis of design for Blower Coil Units (BCAH) in the project specifications. Designed for horizontal concealed installation with various airflow ranges from 700-2650 CFM.	**Yes**
Daikin	Blower Coil Unit	N/A	Compatible with project requirements for horizontal concealed blower coil units. Offers equivalent performance specifications with similar airflow ranges and static pressure capabilities.	Listed
Carrier	Blower Coil Unit	N/A	Compatible with the project requirements for horizontal blower coil units with ECM fan motors. Can meet the specified airflow and static pressure requirements.	Listed
Johnson Controls/York	Blower Coil Unit	N/A	Compatible alternative with similar specifications and construction. Offers units with comparable airflow ranges from 700-3000 CFM with factory programmed ECM fan motors.	No
Greenheck	Blower Coil Unit	N/A	Suitable alternative with high-quality construction. Can meet the performance specifications for the horizontal concealed blower coil units with similar water coil capabilities.	No

Air Cooled Chillers

Manufacturer	Model	Representative	Compatibility Notes	BoD
Trane	Air-Cooled Scroll Chiller	N/A	Specified in notes for CH-1 and CH-2. R-454B refrigerant. Modular design with multiple circuits.	**Yes**

Daikin Applied	AGZ-E Series	N/A	Compatible with R-454B refrigerant requirements. Supports free cooling option needed for CH-2.	Listed
Carrier	AquaForce 30XA	N/A	Compatible with performance requirements. Supports operation down to 0°F ambient temperature.	Listed
York	YVAA	N/A	Variable speed drives standard. Compatible with glycol solutions and low ambient operation.	No
McQuay/Daikin	WMC	N/A	Premium efficiency. Supports 40% propylene glycol and altitude adjustments for 6,115 ft installation.	No

Four Pipe Heat Pump

Manufacturer	Model	Representative	Compatibility Notes	BoD
Modular Four Pipe Scroll	AWHP-1	N/A	Basis of design four pipe heat pump. Capacity: 92.3 GPM, EER: 9.828, COP: 2.966. Uses R-454B refrigerant.	**Yes**
Trane	Four Pipe Heat Pump	N/A	Specifically mentioned in chiller schedule note. Compatible with existing systems.	Listed
Daikin	AWH Series	N/A	Industry leader in four-pipe heat pump technology. Compatible with 40% propylene glycol solution.	No
Carrier	AquaForce 30XV	N/A	Compatible with specified glycol solution and altitude requirements.	No

BuildVision Recommendations

1. Purchase High-Efficiency Air Handling Units with Heat Recovery

Rationale: The specifications call for multiple air handling units (AHUs) with energy recovery capabilities. The mechanical schedules show AHU-1, AHU-2, and AHU-3 all utilize energy recovery wheels (EW-1, EW-2, EW-3) with minimum sensible efficiency requirements of 71.5%. Selecting units that exceed these minimums would provide significant energy savings over the life of the equipment, especially given the project's location in Wyoming with extreme temperature differentials.
Estimated Impact: Selecting units with 80%+ efficiency could reduce heating and cooling costs by approximately 10-15% compared to minimum-efficiency units, resulting in $15,000-25,000 annual energy savings based on typical HVAC operating costs for a facility of this size.
Implementation: 1. Request energy recovery efficiency data from multiple manufacturers (Trane, Daikin, Carrier, York)
2. Perform life-cycle cost analysis comparing higher initial cost against projected energy savings
3. Specify units with highest sensible and total efficiencies that meet the budget constraints
4. Ensure selected units maintain the specified airflow and static pressure requirements
Priority: High

2. Implement Competitive Bidding for HVAC Water Chillers

Rationale: The specifications indicate Trane products are required for water chillers CH-1 and CH-2. While this ensures compatibility with existing systems, it eliminates competitive bidding that could yield cost savings. Consider requesting an 'or equal' provision to allow alternative manufacturers that meet the same performance specifications, particularly if the chiller is a standalone system without integration requirements to existing Trane building management systems.
Estimated Impact: Opening to competitive bidding could yield 5-15% savings on chiller procurement costs. For the specified modular scroll chillers with capacities indicated, this could represent $10,000-30,000 in direct equipment savings.
Implementation: 1. Request modification to allow 'or equal' manufacturers that meet all performance criteria
2. Develop detailed performance specifications including capacity, EER/IPLV, and control integration requirements
3. Solicit bids from multiple qualified manufacturers (Carrier, York, Daikin)
4. Evaluate proposals based on initial cost, efficiency, and lifecycle costs
Priority: Medium

3. Bundle Vehicle Exhaust Fan Procurement

Rationale: The mechanical schedules show eight identical vehicle exhaust fans (EF-01 through EF-08) with the same specifications (240 CFM, 5.0" w.g. ESP, 0.75 HP motors, 460V/3-phase power). Purchasing these as a bundled package from a single supplier would likely yield quantity discounts and streamline installation and maintenance.
Estimated Impact: Quantity discounting could provide 8-12% savings compared to individual purchases, estimated at $2,000-3,000 total savings. Additional savings in maintenance costs would accrue from standardized parts inventory and servicing procedures.
Implementation: 1. Identify all identical equipment in the specifications

2. Request volume pricing from manufacturers or distributors
3. Ensure procurement specifications allow for batch ordering
4. Coordinate delivery scheduling to match construction timeline
5. Maintain consistent model numbers for future maintenance simplification

Priority: Medium

4. Optimize Glycol Feed System Procurement

Rationale: The specifications call for three identical glycol feed systems (GMU-1, GMU-2, GMU-3) for different water systems. These systems have identical technical specifications (1.70 GPM flow rate, same pressure settings, 50-gallon tanks, 0.33 HP motors). Purchasing these as a package from a single supplier would likely yield cost savings and ensure consistent operation and maintenance procedures.

Estimated Impact: Volume purchasing could save approximately 10% on equipment costs, resulting in approximately $1,500-2,500 in direct procurement savings. Standardization would also reduce maintenance costs by approximately $500 annually through consistent parts inventory and maintenance procedures.

Implementation: 1. Verify that all three systems can indeed be identical
2. Request package pricing from manufacturers
3. Ensure specifications call for identical models from the same manufacturer
4. Order systems together to minimize shipping costs
5. Coordinate installation timing with mechanical contractor

Priority: Medium

5. Standardize Fan Coil Units to Reduce Cost and Simplify Maintenance

Rationale: The mechanical schedules indicate numerous fan coil units of different types and capacities. Where possible, standardizing to fewer models would increase procurement efficiency and reduce maintenance complexity. For example, the schedules show 15 different types of four-pipe fan coil units with capacities ranging from 200-1200 CFM that could potentially be consolidated into fewer standard sizes.

Estimated Impact: Standardizing to 4-5 models instead of 15 could yield 5-8% savings on equipment costs through volume purchasing, representing approximately $10,000-15,000 in savings on a project of this scale. Maintenance savings over a 10-year period could amount to $25,000-40,000 due to simplified parts inventory and maintenance procedures.

Implementation: 1. Review the load calculations for each space
2. Identify opportunities to standardize on fewer models
3. Select standard capacities that can be used across multiple spaces
4. Request volume pricing from manufacturers
5. Ensure maintenance staff receives training on the standardized equipment

Priority: High

6. Source High-Efficiency Condensing Boilers with Advanced Controls

Rationale: The specifications call for gas-fired condensing boilers (BLR-1 and BLR-2) with 96.1% minimum efficiency. The high-altitude location (6,115 ft) makes efficiency particularly important. Procuring boilers with enhanced turndown ratios (beyond the specified 10:1) and advanced oxygen trim controls would improve seasonal efficiency by optimizing combustion across varying loads and conditions.
Estimated Impact: Advanced controls and higher turndown could improve seasonal efficiency by 2-4%, saving approximately $2,000-4,000 annually in gas costs. Additionally, better load matching would reduce cycling, potentially extending equipment life by 2-3 years and saving $10,000-15,000 in replacement costs.
Implementation: 1. Specify boilers with 20:1 or higher turndown ratio
2. Request oxygen trim control systems as part of the boiler package
3. Evaluate proposals based on efficiency at part-load conditions
4. Ensure the altitude-specific requirements are explicitly addressed by manufacturers
5. Request factory testing data for high-altitude performance
Priority: High

7. Utilize Integrated Procurement for Air-Cooled Heat Pump and Chiller

Rationale: The specifications indicate both an air-cooled water chiller (CH-2) and a four-pipe heat pump (AWHP-1) are required. These systems have similar components and may be available from the same manufacturer as an integrated solution. This could reduce total cost and improve system integration compared to purchasing from separate vendors.
Estimated Impact: An integrated procurement approach could yield 5-10% savings on equipment costs, representing approximately $15,000-30,000 for systems of this size. Additional savings would come from reduced design coordination, simplified controls integration, and streamlined maintenance, estimated at $5,000-10,000 over the first five years of operation.
Implementation: 1. Request proposals for both systems from the same manufacturers
2. Evaluate the benefits of integrated controls and single-source responsibility
3. Consider shared refrigerant circuits or heat recovery options between systems
4. Assess maintenance advantages of standardized components
5. Ensure design coordination between the two systems is optimized
Priority: High

8. Optimize Radiant Floor Heating System Components

Rationale: The specifications include three identical radiant floor heating zones (RAD-1, RAD-2, RAD-3) for the high bay areas, each with identical flow rates, temperatures, and control requirements. Purchasing these components as a package, including manifolds, pumps, and controls, would likely yield better pricing and ensure system compatibility.
Estimated Impact: Package pricing could save 8-12% on component costs, estimated at $3,000-5,000. System optimization from matched components could improve efficiency by 5-7%, saving approximately $1,000-1,500 annually in operating costs.
Implementation: 1. Specify a complete packaged system from a single manufacturer
2. Request integrated controls that optimize the operation of all three zones
3. Ensure all components are rated for the specified glycol concentration
4. Verify compatibility with the building automation system
5. Require comprehensive documentation and training for maintenance staff

Priority: Medium

Conclusion

Key Findings

- Trane is specified as the required manufacturer for water chillers, limiting competitive bidding but ensuring system compatibility
- Equipment must be rated for high-altitude operation (6,115 ft) with appropriate performance adjustments
- Glycol systems are extensively used (40% propylene glycol in multiple water systems) requiring compatible components throughout
- Numerous fan coil and blower coil units could be standardized to fewer models for procurement efficiency and maintenance simplification
- Energy recovery is a key design feature with minimum efficiency requirements that should be prioritized in equipment selection

Highest Priority Actions

- Purchase high-efficiency air handling units with energy recovery that exceed minimum efficiency requirements to maximize energy savings in Wyoming's climate
- Standardize fan coil units to reduce procurement costs and simplify maintenance by consolidating to 4-5 models instead of 15 different types
- Source high-efficiency condensing boilers with enhanced turndown ratios and advanced oxygen trim controls to optimize performance at high altitude
- Pursue integrated procurement for the air-cooled heat pump and chiller systems to reduce costs and improve system integration

Summary

The GBSD Integrated Training Center (ITC) at F.E. Warren AFB requires sophisticated HVAC systems designed for Wyoming's high-altitude environment (6,115 ft). The procurement strategy should focus on equipment compatibility, standardization, and energy efficiency while addressing the unique requirements of the facility. Significant equipment includes air handling units with energy recovery, modular scroll chillers, a four-pipe heat pump system, numerous fan coil units, condensing boilers, and vehicle exhaust systems—all requiring careful coordination in procurement to ensure operational efficiency and maintenance simplicity.

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