

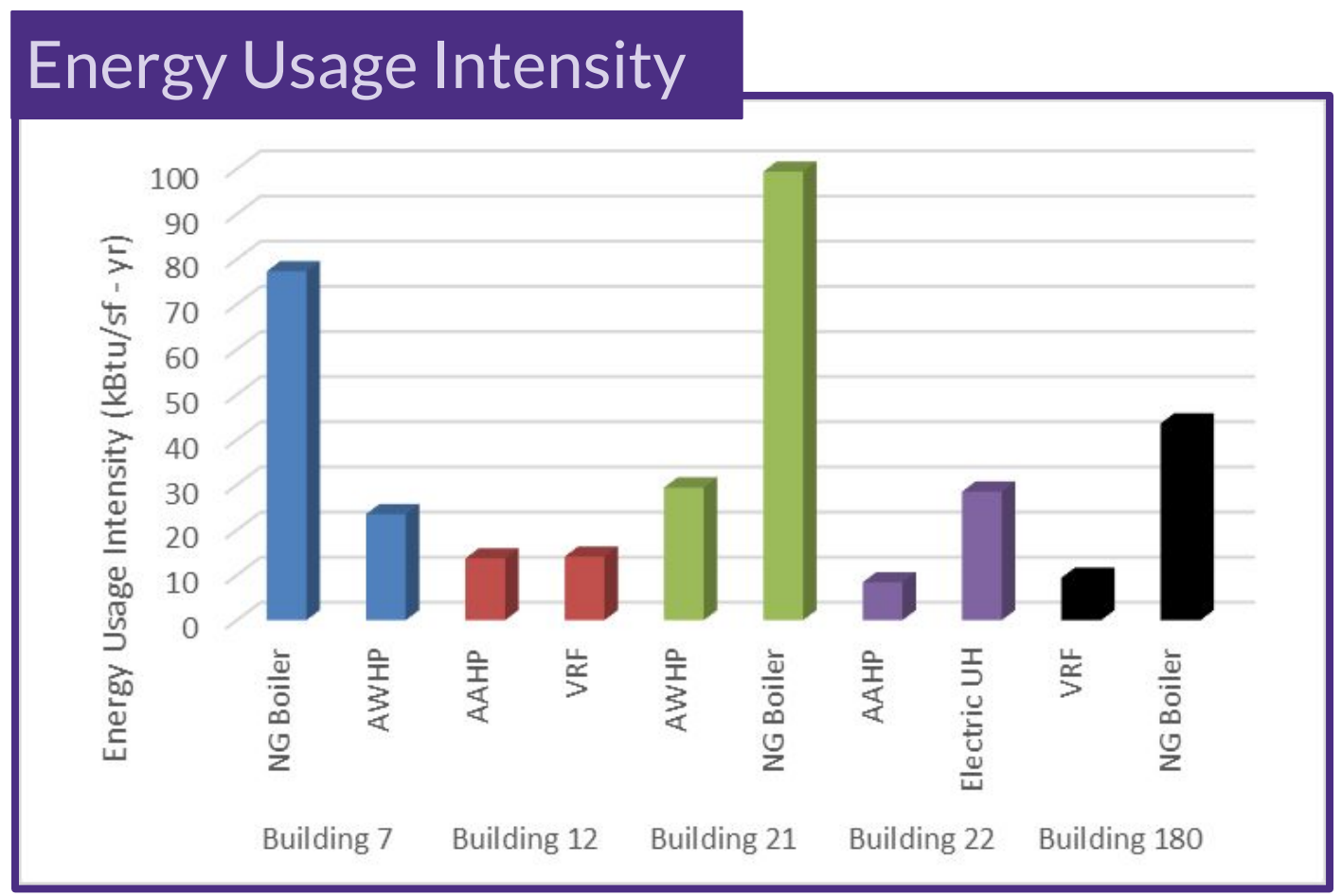
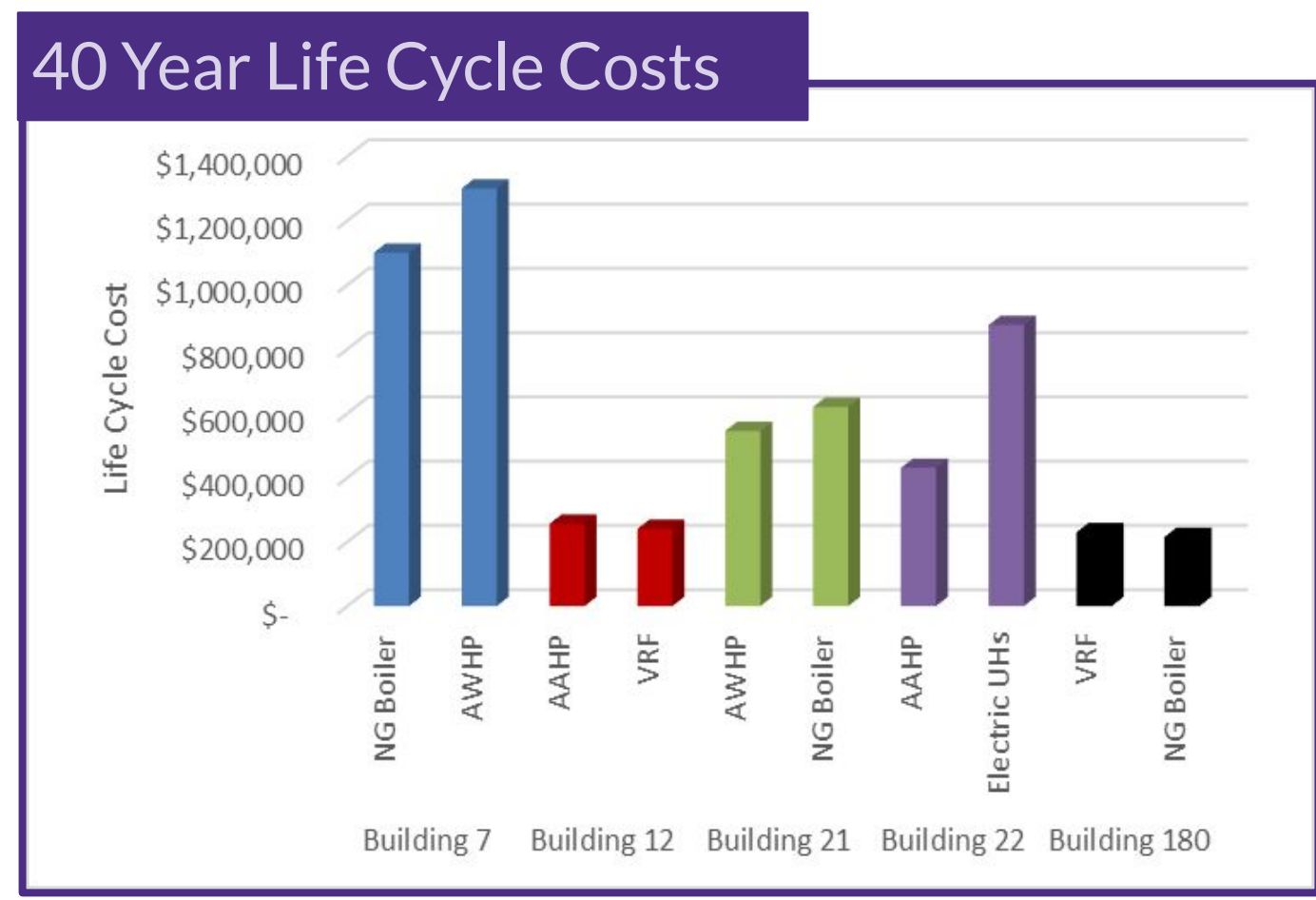
Problem Statement

The centralized steam heating system at Joint Base Lewis-McChord (JBLM) is reaching the end of its lifespan. By implementing decentralized heating systems, energy efficiency can be improved while reducing greenhouse gas emissions, maintenance costs, and operational risks.

Systems	Existing	Considerations	Proposed	Notes
Building 7 Office Building	Hydronic System: <ul style="list-style-type: none"> Steam Heat Exchanger Hot Water → VAV Boxes AHU Handles Ventilation and AC Domestic Electric HW Heater 	<ul style="list-style-type: none"> Preserve Existing Hydronic Piping Minimize First Cost & 40 Year Life Cycle Cost 	Natural Gas Hot Water Boiler (NG Boiler)	<ul style="list-style-type: none"> Reliably meets peak load Uses existing hydronic piping Significantly lower first cost
Building 12 Office Building	Steam-based heating system: <ul style="list-style-type: none"> Steam heating coil inside the AHU Cast-iron radiator on exterior walls for perimeter heating Cooling provided through the A.C cooling coil 	Full Steam Replacement	Variable Refrigerant Flow (VRF)	<ul style="list-style-type: none"> Meets electrification goal High efficiency Great zone control
Building 21 Weapons Storage	Hydronic System: <ul style="list-style-type: none"> Steam Heat Exchanger VAV Boxes AHU Heating Coil Unit Heater (small) 	<ul style="list-style-type: none"> Preserve Existing Hydronic Piping Minimize 40 Year Life Cycle Cost 	Air to Water Heat Pump (AWHP)	<ul style="list-style-type: none"> \$2000 saved per year compared to boiler Meets electrification goal Offers greater efficiency
Building 22 Vehicle Maintenance	Steam-Based Heating and Ventilation: <ul style="list-style-type: none"> Steam makeup air units and unit heaters Vehicle exhaust system Steam FCU in mezzanine 	<ul style="list-style-type: none"> Full Steam Replacement Preserve Existing Ductwork 	Split System serving Mezzanine DOAS serving Bay	<ul style="list-style-type: none"> Uses existing ductwork Lowest electricity use Lowest greenhouse gas emissions
Building 180 Chapel	Hydronic System: <ul style="list-style-type: none"> Steam to hot water converter Blowers and fans for ventilation Additional Considerations: <ul style="list-style-type: none"> Aesthetics preservation 	<ul style="list-style-type: none"> Preserve Existing Hydronics or Full System Replacement Small Size 	Variable Refrigerant Flow (VRF)	<ul style="list-style-type: none"> Offers greater efficiency Meets electrification goal Avoids complicated/expensive aging hydronic system

Key Considerations:

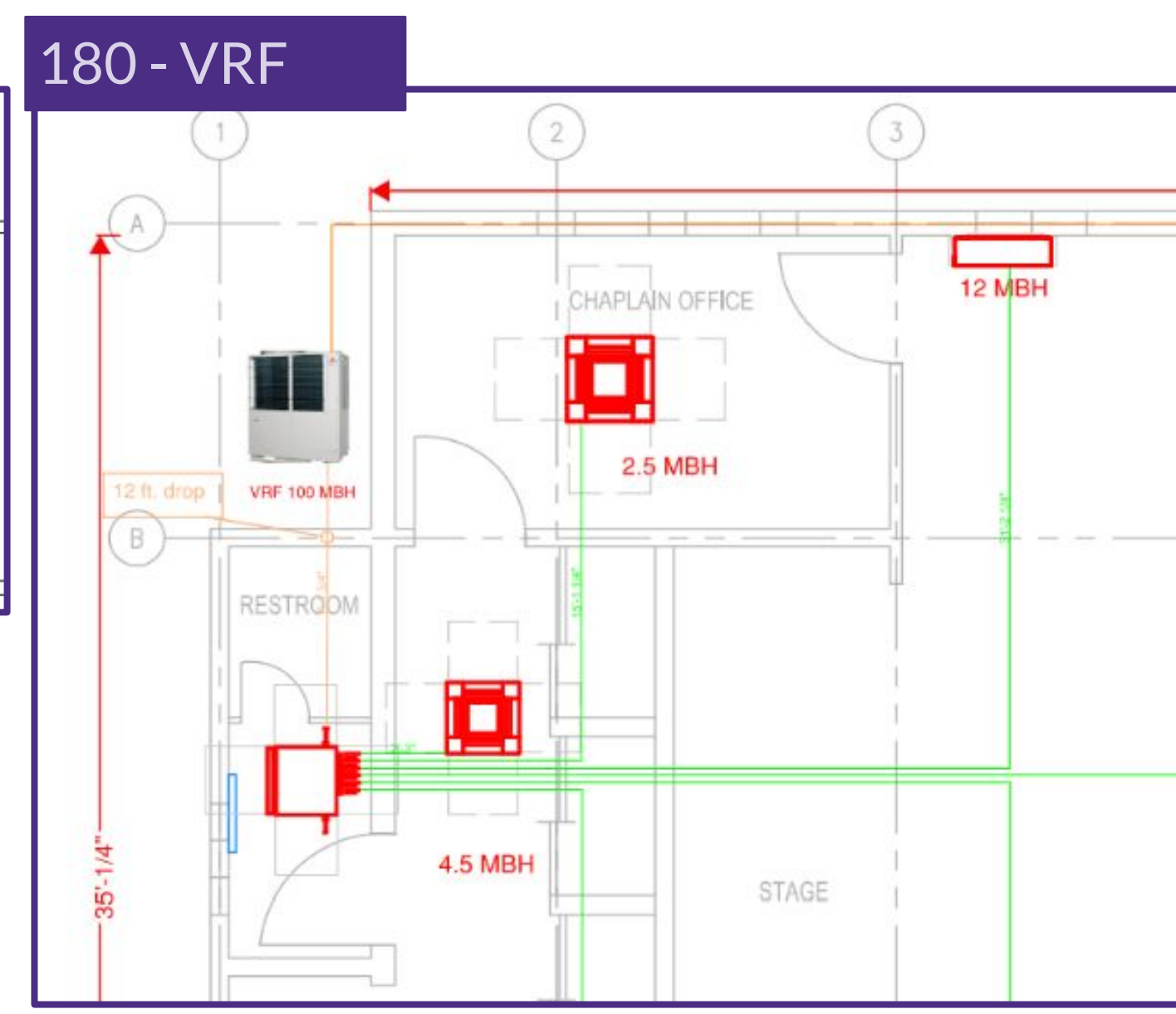
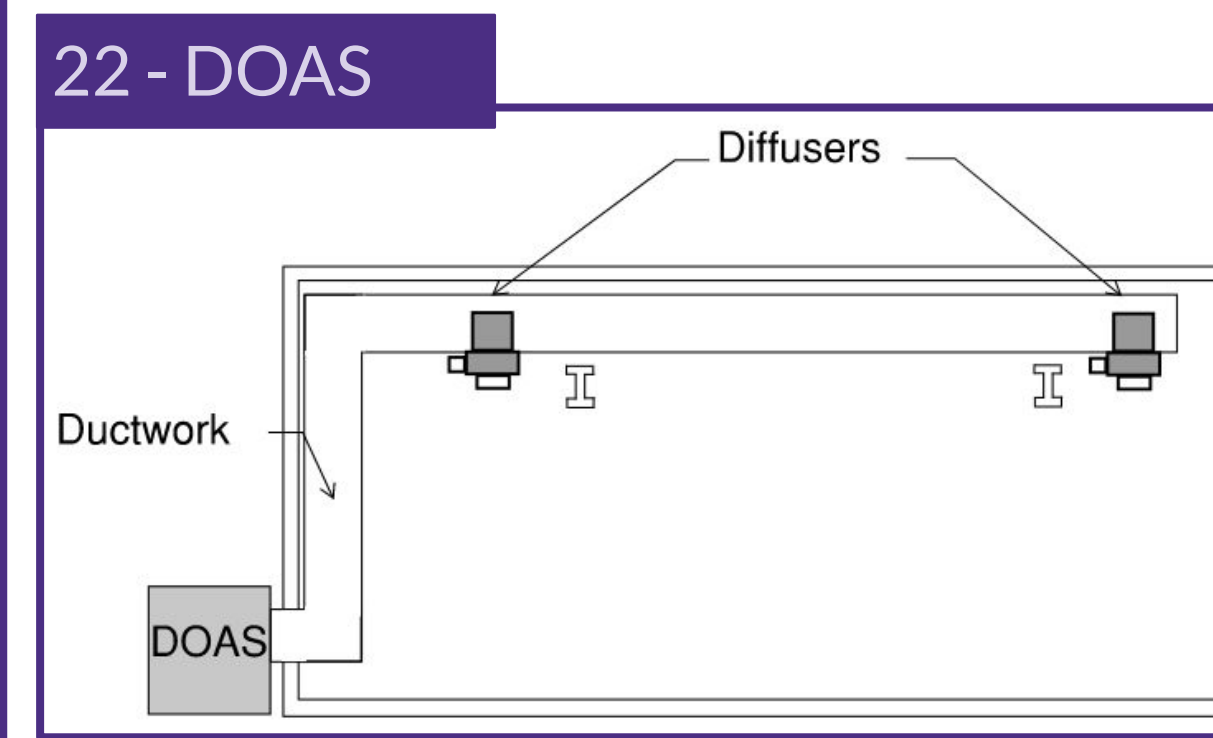
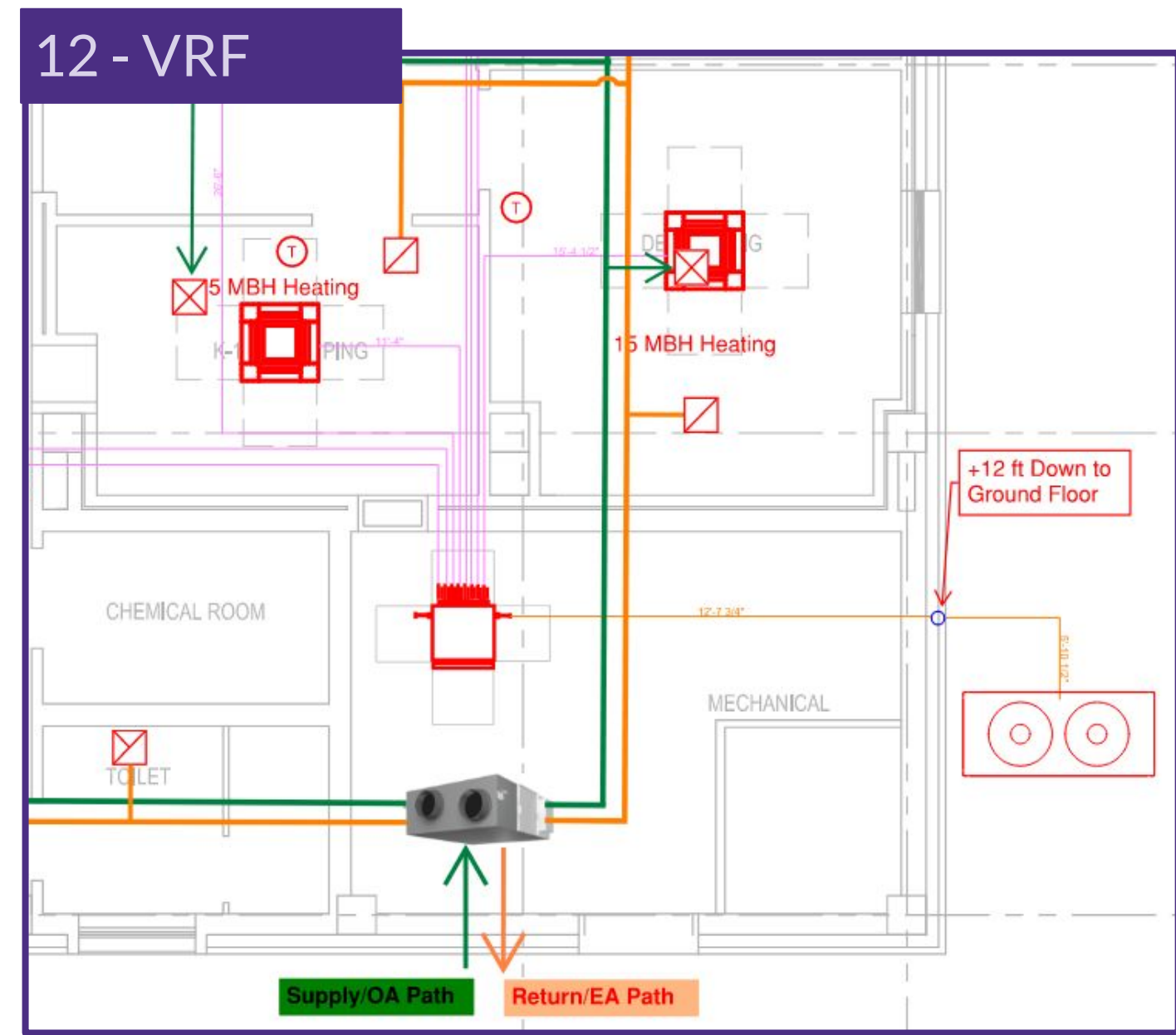
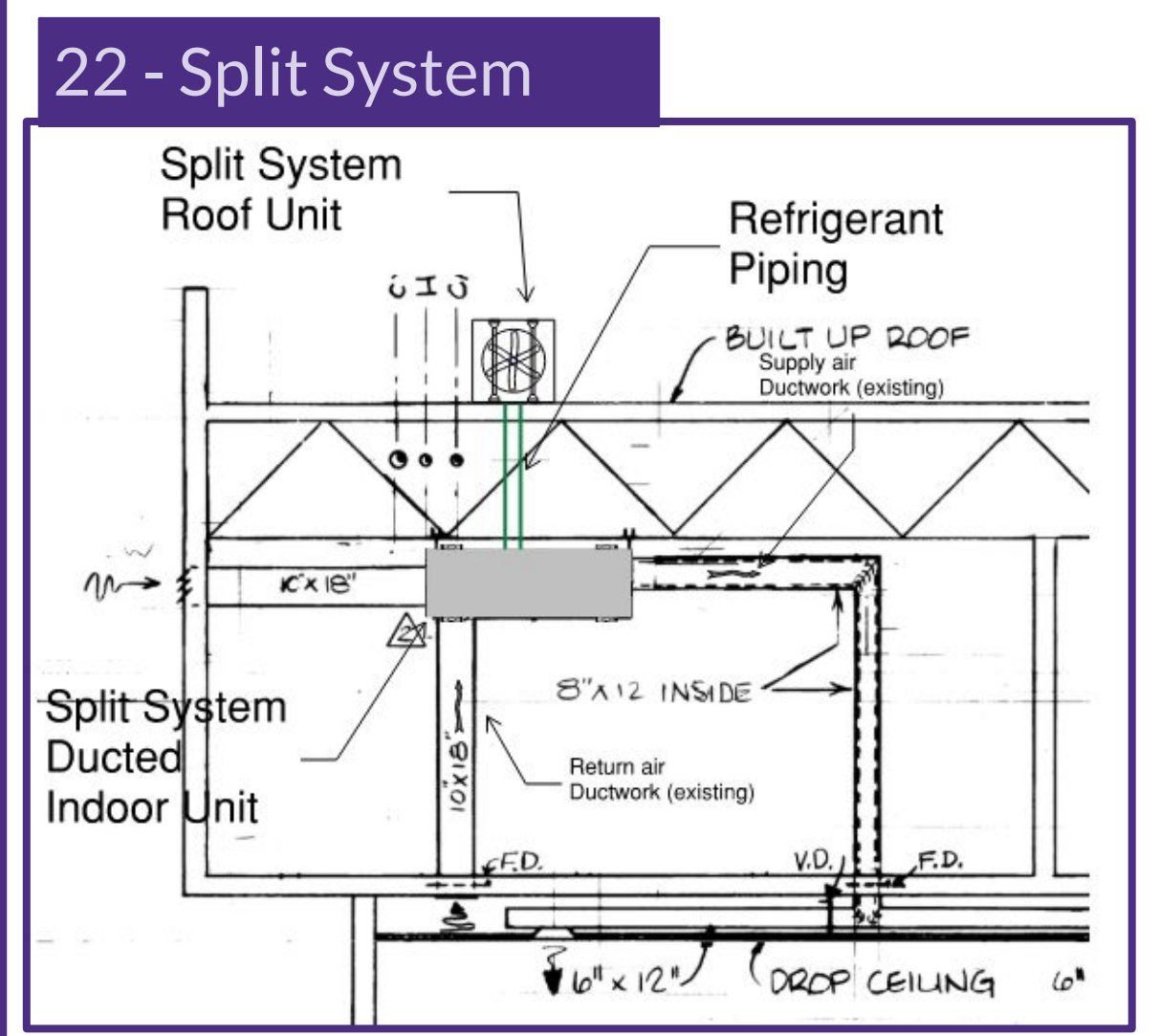
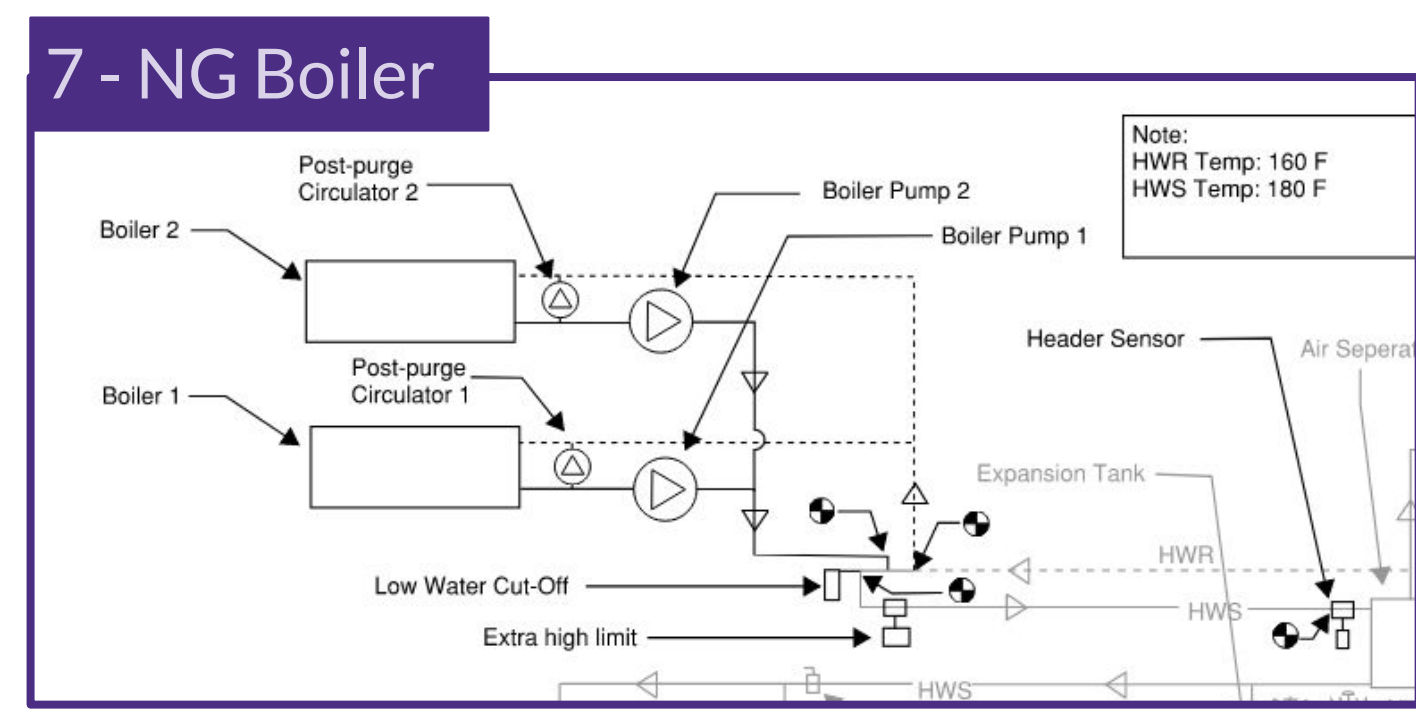
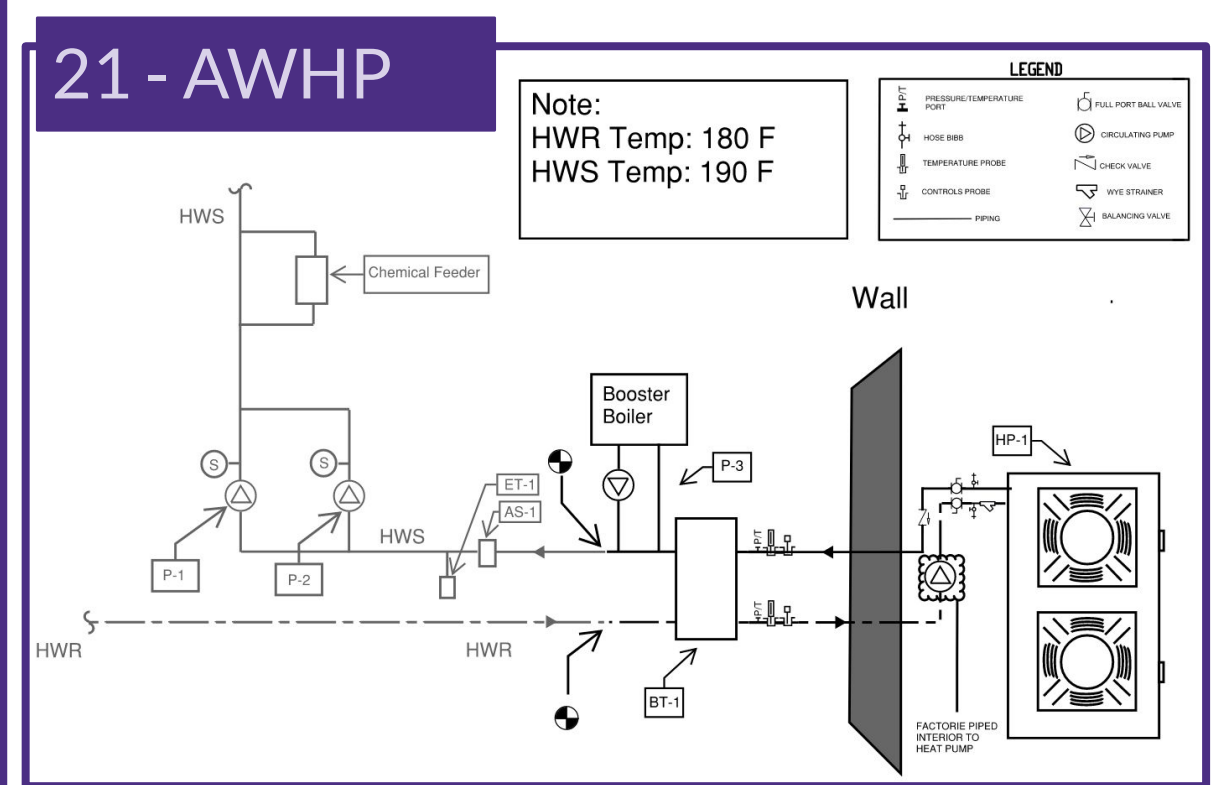
- First Cost
- 40 Year Life Cycle Cost
- Energy Efficiency
- Greenhouse Gas Emissions
- Integration with Existing Equipment
- Structural Impacts
- Code Compliance



Cost estimates and energy analysis based on top 2 leading systems from decision matrix and key considerations.

Proposed System Drawings

One line diagrams & schematic drawings demonstrating how the proposed systems will be installed.



Acknowledgments

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