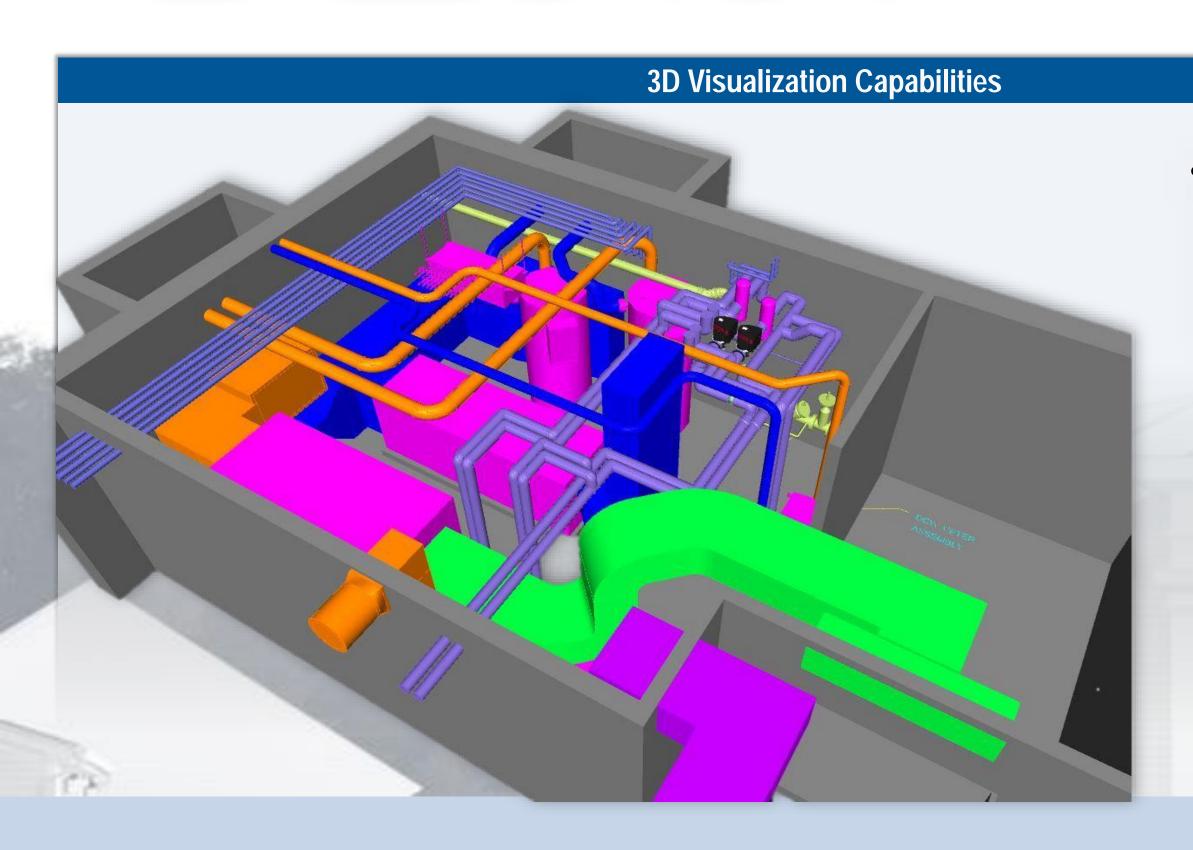
## HEN.



 Navisworks was used to ensure a clash-free fit of all mechanical, plumbing and fire protection services prior to construction.

# **Load Calculations & Energy Modeling**

 HVAC load calculations were performed utilizing Trane Trace modeling software.

 Energy modeling was performed utilizing eQUEST to analyze economic impact between the based case and proposed HVAC systems.



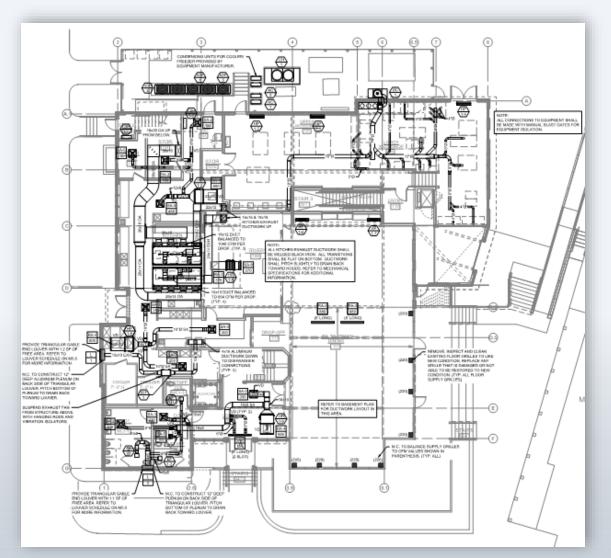
## **Project Challenges**

- ü Low structure and high ceilings left little room for conventional style HVAC systems making VRF a natural fit.
- **ü** Very limited room for exterior mounted equipment making space utilization and coordination with existing equipment a necessity
- The combination of the project being in a flood plain combined with a low basement slab elevation was mitigated due to the close coordination between the plumbing and civil engineers.

## **Project Background**

V New physical science labs, classrooms and expanded woodshop will be built around the existing dining hall. Many HVAC systems were considered such as geothermal heat pumps and chilled beams. Due to the budget and space constraints, a highly efficient VRF heat recovery heating and cooling system was designed along with a high efficiency gas fired hot water boiler and an air cooled chiller.

### **Complete Design Documentation**



- Complete constant volume energy recovery system design for code ventilation requirements.
- Complete hot water boiler and air cooled chiller hydronic system design.
- Ultra efficient VRF heat recovery system design.

B	2 <b>C</b>	)													
						Th	e Fenn S	School F	IVAC - EF	RU-1 - Poi	nts Lis	t			
Prepared By Checked by															Date 06/23/1 Issue for Construction 06/23/1
Control Point No.			Unit	Description	Point Type	Control Platform	Equipment Furnished by	Equipment Installed By	Wired By	Wiring Requirements	Make	Model	Rev	Settings	Notes
		ERU-1 FAI	T	ERU-1 FAI						Shielded					2-Position fail closed fail safe control damper complete
0101	CD	Damper	2-position	damper position	BacNet	Trane	Trane	Trane	Trane	Twisted Pair	Belimo	NKQB24-SR	0	0-10 V	with DPDT open and close position switches
0102	DS	Damper	0% Open	FAI damper closed switch FAI damper	BacNet	Trane	Trane	Trane	Trane	Shielded Twisted Pair Shielded	Belimo	see above	0	0-10 V	DPDT close position switch
0103	DS	Damper	100% Open	open switch	BacNet	Trane	Trane	Trane	Trane	Twisted Pair Shielded	Belimo	see above	0	0-10 V	DPDT open position switch
0104	TT HT	Inlet	7	Temperature	BacNet BacNet	Trane	Trane Trane	Trane Trane	Trane	Twisted Pair Shielded	Vaisala Vaisala	HMD70Y RH+T HMD70Y RH+T	0	2-10 V 2-10 V	9" 10K Thermistor type 2 & RH sensor in (1) module 9" 10K Thermistor type 2 & RH sensor in (1) module
0105	DT	Inlet ERU-1 FAI	inches WC	FAI % RH ERU-1 FAI	BacNet	Trane	Trane	Trane	Trane	Twisted Pair Shielded	Dwyer	605-6	0	2-10 V	9" 10K Thermistor type 2 & RM sensor in (1) module  Filter dP sensor 0 to 6" range alarm set at 2.0"
0107	CD	Heat Whee	Position %	Filter dP Supply Side Heat Wheel	BacNet	Trane	Trane	Trane	Trane	Twisted Pair Shielded	Belimo	NKQB24-SR	0	2-10 V	Modulating Electronic fail safe control damper
0107	CD	damper	Open	Bypass Supply side heat	Bacnet	Trane	Trane	Irane	Trane	Twisted Pair	Belimo	NKUB24-SR	U	2-10 V	Modulating Electronic fail safe control damper
0108	DS	Heat Whee bypass damper	0% Open	wheel bypass damper closed	BacNet	Trane	Trane	Trane	Trane	Shielded Twisted Pair	Belimo	see above	0	0-10 V	DPDT close position switch
		Heat Whee	+	switch Supply side heat			-								
0109	DS		100% Open	wheel bypass damper open switch	BacNet	Trane	Trane	Trane	Trane	Shielded Twisted Pair	Belimo	see above	0	0-10 V	DPDT open position switch
0110	ss	Heat Whee Belt Drive	Start/Stop	Heat Wheel	BacNet	Trane	Trane	Trane	Trane	Shielded	NA	NA.	0	0-10 V	Start/stop command for heat wheel motor
		Motor S/S Heat Whee		Motor S/S Heat Wheel			110110			Twisted Pair Shielded					Kele ACTA series 0 to 5A Current Transducer. Coordinate
0111	СТ	Motor CT	Current	Motor Status	BacNet	Trane	Trane	Trane	Trane	Twisted Pair	Kele	A/CTA-5	0	0-5 V	amperage setpoint with Trane
0112	DT	Heat Whee Discharge	**	Supply side heat wheel dewpoint	BacNet	Trane	Trane	Trane	Trane	Shielded Twisted Pair	Vaisala	HMD82TD	0	0-10V	
		Dewpoint (Supply) Heat Whee	_	sensor						Twisted Pair					
0113	TT	Discharge Temp (Supp	~	Heat Wheel Discharge Temp	BacNet	Trane	Trane	Trane	Trane	Shielded Twisted Pair	Precon	025-35807-012	0	2-10 V	9" 10K Thermistor type 2 complete with transmitter module
L	+	Side)		(Supply Side) ERU-1 Reheat		_	_	-	_	Shielded	_		_		9" 10K Thermistor type 2 complete with transmitter
0114	TT	Coll Discharg		Coil discharge air temp	BacNet	Trane	Trane	Trane	Trane	Twisted Pair	Precon	025-35807-012	0	2-10 V	module
0115	TS		F 'F	ERU-1 Cooling Coil Freezestat	BacNet	Trane	Trane	Trane	Trane	Shielded Twisted Pair	JCI	A72AA2 DPST	0	0-10 V	15 to 55°range, set to 36°F
0116	тт	ERU-1 Chille Water Coll		ERU-1 Chilled Water discharge	BacNet	Trane	Trane	Trane	Trane	Shielded	Precon	025-35807-012	0	2-10 V	9" 10K Thermistor type 2 complete with transmitter
		Discharge		air temp						Twisted Pair			-		module
															<b>(</b>

**Complete Control Diagrams & Points Lists** 

 Complete piping and instrumentation diagrams along with control points lists were created for all major HVAC equipment.

> Dining hall and physical science lab & classroom addition for prestigious private boys school.







100 Burtt Road Suite 212 Andover, MA 01810 (978) 447-5601 www.b2qassociates.com