Farnsworth GROUP

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IGNACIO SCHOOLS ADMINISTRATION BUILDING

Retro-Commissioning Report_DRAFT

September 2024

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Scope of Effort and Methodology

The purpose of this study is to evaluate the facility to:

1. Assess the condition of the major systems in this building.
2. Identify key issues contributing to de-rate and required maintenance of the facility with recommended corrective action.
3. Support Ignacio School District in documenting present and future needs regarding maintenance, repair, capital improvements, and energy conservation opportunities.

Component Priority

1. **SAFETY –** Situations or conditions which pose an immediate danger to life, limb, or property, if the deficiency is not corrected. Matches the Health and Safety Hazard operational criteria used in the CM evaluation scoring process.
2. **DAMAGE/WEAR OUT –** Potential for serious damage to the building or the building components if the deficiency is not corrected. Matches the Disruption Operations (Agency Programs) operational criteria used in the CM evaluation scoring process.
3. **CODES/STANDARDS –** Building codes and/or institutional standards were not met during construction or renovation. Condition may or may not represent an urgent situation if deficiency is not corrected.
4. **ENVIRONMENTAL IMPROVEMENTS –** Correctable deficiencies that will improve system operations and increase the comfort level of the building occupants. Matches the causing damage or deterioration operational criteria used in the CM evaluation scoring process.
5. **ENERGY CONSERVATION –** Amelioration or upgrading of the operating systems to reduce energy consumption or increase energy efficiency in the building.

SYSTEM CONDITION RATING	CONDITION RATING
Acceptable or Needs maintenance: No deficiencies noted or additional routine or minor maintenance needed.	A
Major Maintenance: The recurring need to keep in good repair building systems or components which have known maintenance cycles of greater than one year.	B
Remodel: Reworking of components in a system.	C
Extensive Renovation: Major replacement, alteration, or upgrading of building systems or components that is necessitated by facility obsolescence.	D
Demolition: Unsatisfactory and cannot be renovated; replace system.	F

Executive Summary

Building Condition Assessment (C+)

Overall, the facility appears to be in fair condition and well maintained. However, the HVAC systems are inefficient from an energy standpoint. This is in part due to the nature of natural gas heating and DX cooling systems, and multiple energy conservation opportunities were noted during the assessment that may be implemented. Individual components of these systems for which repairs or replacements have been recommended are recorded in greater detail in this report.

Each component of the major MEP systems in the Administration building was assessed and given an observed condition rating between "A" and "F". The main concern of Ignacio School District was the disproportional number of repairs required at the water source heat pumps, given the relatively recent installation of the heat pumps. The power distribution, domestic hot water, interior lighting, and snow melt systems were given overall observed condition ratings.

The table below reflects the system conditions observed during the assessment.

BUILDING	SYSTEM NAME	DISCIPLINE	OBSERVED CONDITION	SYSTEM CONDITION GRADE
Administration Building	Interior Lighting	Electrical	Good	A-
Administration Building	Power Distribution	Electrical	Good	A-
Administration Building	Heat Furnaces and A/C units	Mechanical	Poor	D-
Administration Building	Snow Melt	Mechanical	Good	A
Administration Building	Domestic Hot Water	Plumbing	Good	A
Administration Building	DDC_Direct Digital Controls	Controls	Good	B

Building Description

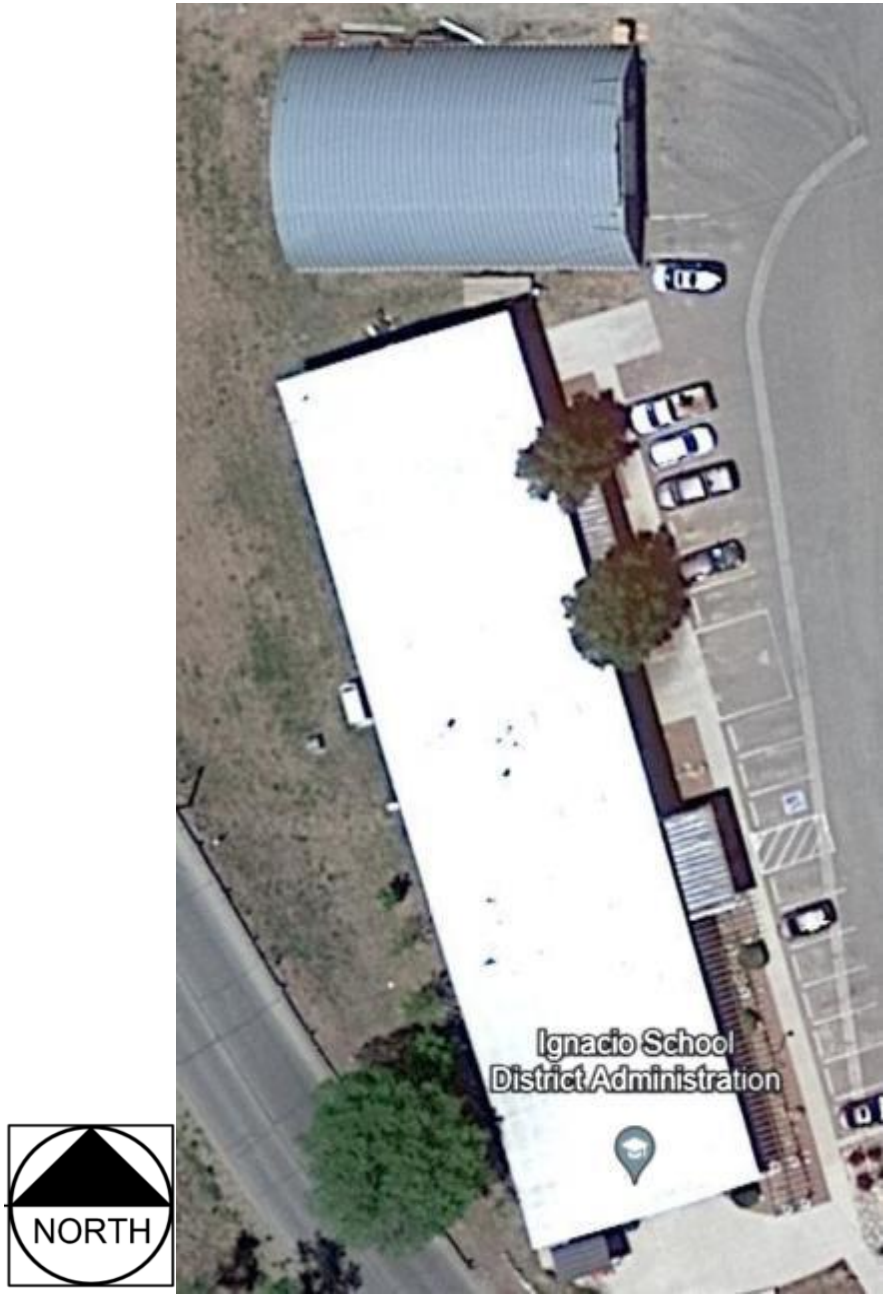
Building Overview

The assessed building is a school district administration building with office space, conference spaces, and restrooms. The building is approximately 9,500 square feet. The building was constructed originally in 1978 and renovated most recently in 2012.

The HVAC system is a series of gas-fired furnaces with A/C evaporator coils and condensing units.

The electrical distribution system has a utility transformer, disconnect and multiple interior panels. Power is transferred to a Quonset Hut Building (Woodshop) to the north using an overhead power line. A 35kW generator serves as a backup to those electrical systems.

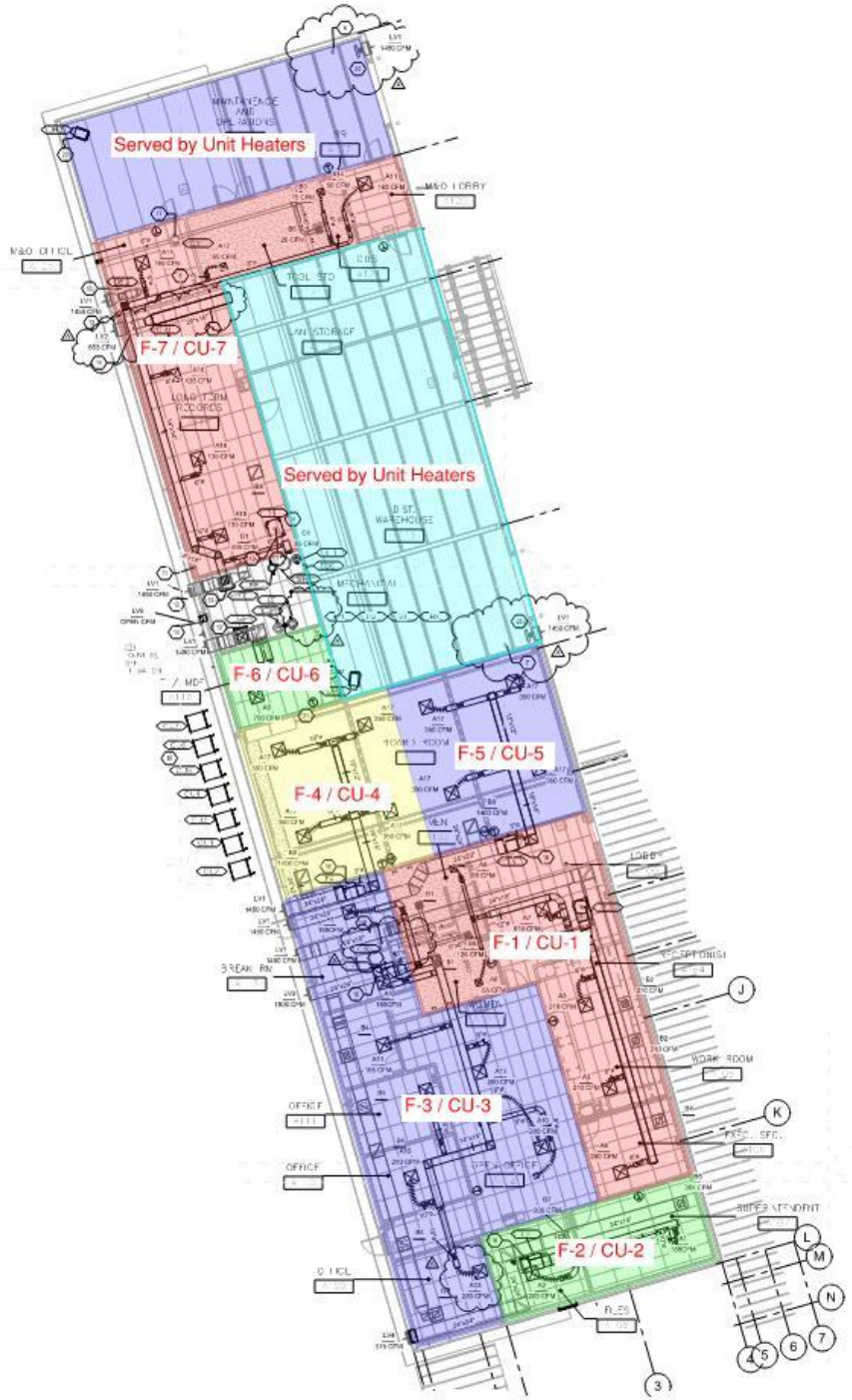
The domestic hot water system is served by a gas-fired hot water heater and circulating pump.



HVAC Zoning Plans

Zoning Plans

The following plans reflect the existing HVAC zones labelled with the heating equipment serving each zone. These plans are intended to be a reference for the maintenance team. This zoning plan reflects the entirety of the administration building.



HVAC DDC System Assessment

Overall Condition: Good (B)

The DDC system reflects the furnaces and exhaust fans. The DDC system is dated, but functional. The control points are linked and operational. Trend and energy data is not accessible from the BAS. CO2 levels are reflected for the furnaces that serve the conference space on the north side of the building. The BAS does not reflect data from electrical or plumbing systems.

System Expandability:

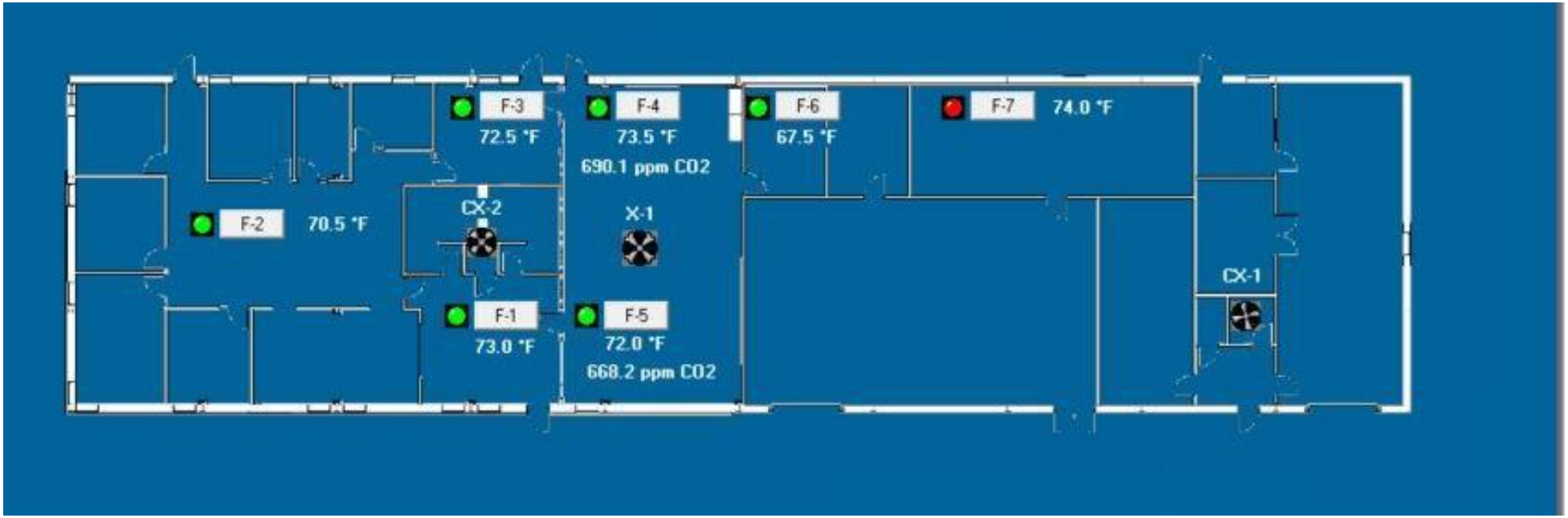
The snow melt boilers are not reflected on the administration building pages of the BAS. The boilers have been reported to be enabled during the summer .

The furnaces and A/C coils are listed in the BAS, but individual graphics do not exist in the system. Recommend adding individual furnace graphics to simplify diagnosing issues during operation.

Energy Conservation Opportunity:

It is suspected that no occupancy schedule is functional within the building with respect to the furnaces and A/C units. It is recommended that an occupancy schedule be implemented to reduce gas and electrical consumption.

Maintenance team is not notified of the snow melt boilers enabling or disabling. As a result, gas is consumed year-round. Adding snow melt boiler plants to the BAS will allow for diagnostics and repairs by the maintenance team to reduce gas usage.



Heating and A/C systems

Overall Condition: Poor (D-)

The HVAC system for the Administration building is a series of gas-fired furnaces with DX A/C coils served by individual, air-cooled condensing units. The furnaces are controlled by individual thermostats wall-mounted in their respective zones. F-4 and F-5 monitor CO2 levels in the main conference room, but implementation of demand control ventilation is unclear.

Energy Conservation Opportunity:

High mixed air temperatures during the summer indicate that a larger-than-normal rate of outside air is mixed with the return air of the system. This may be the reason for the inordinately high gas consumption of the building, as mixed air temperatures during the winter would be lower-than-normal. Recommend re-balancing of the outside air dampers, confirmation of motorized damper operability, and closure of dampers during unoccupied hours.

Insulation of the outside air ductwork was not observed. Recommend installing duct insulation with a minimum rating of R-12 on all outside air ductwork.

Implement demand control ventilation sequence and confirm outside air and return air dampers operate inversely with each other.

Domestic Hot Water System Assessment

Overall Condition: Good (A)

The domestic hot water (DHW) system consists of a 200 btu/h 96% efficient gas fired water heater with 100 gallons of storage. It is in mechanical room A117 and was installed in 2013. The DHW has Point-Of-Use thermostatic mixing valves set at 105 deg F for non-kitchen plumbing fixtures, cold water 50 deg F and hot water at 120 deg F. Recirculation of the 120 deg F and 105 deg F system is accomplished through DHW circulators controlled by aquastats.

Recommended Repair:

N/A

EQUIPMENT NAME	SYSTEM	DISCIPLINE	OBSERVED CONDITION	YEAR INSTALLED
ES-WH1	Domestic Hot Water	Plumbing	Good	2013
ES-RP	Domestic Hot Water	Plumbing	Good	2013

Electrical Distribution and Lighting System Assessment

Overall Condition: Good (A-)

The electrical distribution system has 1 utility transformer feeding into an 800 Amp Disconnect which serves multiple interior panels. Those 208V panels are used for the small mechanical and plumbing loads, task lighting and receptacle loads. Panel A, a 600 Amp MLO transfers power to an overhead line, serves a Quonset Hut Building (Woodshop) to the north of the main building. There is a 240V, 35kW generator that backups the electrical systems for these facility's served by a 200 Amp Automatic Transfer Switch. According to the maintenance team, the generator is tested monthly for functionality.

System expandability:

N/A

Recommended Maintenance:

We recommend that the electrical panels be thermally scanned and that all feeders be re-torqued.

Perform routine electrical maintenance on all disconnects check movement of disconnects as lubricate/exercise as needed, tighten all conductors which land on lugs - entering and exiting the disconnects.

Test batteries of all interior and exterior emergency fixtures.

It is recommended that the ATS be thoroughly tested to comply with all operating requirements. At a minimum, test the switch under load for proper operation, check all connections and remove all dust and debris. Inspect or test for evidence of overheating and excessive contact erosion. Verify system controls will operate as intended.
It is recommended that the generator is tested to comply with all operating requirements. At a minimum, test the generator under load for proper operation, checking all connections. Test the on-board circuit breaker and the EPO button. It is also recommended that the load bank be tested at 25% of total KW load for 30 minutes, 50% KW load for 30 minutes, and at 75% of nameplate KW for 1-hour.

Recommended Replacement/Capital Improvement:

Add a surge protection device to protect the building from outages during severe lighting storms.

Recommended Repair:

N/A

Energy Consumption Summary

Energy Consumption Grade: F

Overall energy consumption at the Administration building has, by a significant margin, the campus worst EUI of 130 kbtu/sf/yr. This facility is occupied 12 months a year and traditionally we'd expect it to operate closer to 62 kbtu/sf/yr according to the Energy Star Target finder. With reported data averaging $21,000/yr for energy consumption ($2.22/sf/yr) we'd anticipate this facility has lots of opportunity to drastically reduce energy consumption and cost.

The average electric purchase rate over the last three years is $0.109/kWh, which meets expectations. Electricity is steadily trending more expensive with the last 12 months: averaging $0.115/kWh. We recommend projecting a blended rate of $0.115/kWh, with a 3% per year escalation. Electricity consumption peaks in the winter and is lower in the summer months when school is not in session. This is a typical trend for electricity consumption within a school. Electric consumption overall at 41 kbtu/sf/yr is in line with expectations.

The average gas rate over the last three years is $1.03/therm, though natural gas costs peaked in 20223 and 2023 and are trending downward. Since September of last year, the cost of natural gas has averaged $0.42/therm. Our observations have been that gas prices have been falling precipitously across multiple markets. Conservatively, we recommend projecting a natural gas purchase rate of $0.925/therm. Natural gas only consists of approximately 70% of the annual energy consumption and 42% of the annual energy cost, this is way out of line with expectations. Your summer use does dip to meet expectations removing the worry of a leak. Follow up review with how ventilation and outdoor air and equipment schedules are handled is the primary suspect.

	Ignacio Admin Building	Benchmark Facility
Natural Gas Usage (kBtu/Year)	838,539	153,925
Natural Gas Cost ($/Year)	$8,673	$1,592
Natural Gas EUI (kBtu/SF/Year)	89	16
Natural Gas ECI ($/SF/Year)	$0.92	$0.17
Natural Gas blended rate ($/therm)	$1.0343	-
Electric Usage (kBtu/Year)	387,558	431,340
Electric Cost ($/Year)	$12,358	$13,750
Electrical EUI (kBtu/SF/Year)	41	45.6
Electrical ECI ($/SF/Year)	$1.31	$1.45
Electrical blended rate ($/kwh)	$0.1088	-
Combined EUI (kBtu/SF/Year)	130	62
Combined Energy Cost	$21,031	$15,342
Combined ECI ($/SF/Year)	$2.22	$1.62