02-01-2024

Two-apartment Residence at 358 High Street, Belfast, ME

Issues

1. The crawl space floods periodically

The site's water management is poor. At its rear, standing water is at grade level. Roof rain run-off is unmanaged. As a result, the crawl space appears to flood after each major rain.

For example, the 2.5" (est.) of rain during a day of a week ago (12-10-2023) resulted in an inch of standing water in the crawl space. Much of the water had drained out (through a floor drain, discharge point TBD) within about 24 hours; however, low area puddles remained, which require many days to evaporate. This water contributes to the building's ongoing elevated humidity, which is roughly 20% higher than outdoor air. Elevated living space humidity is okay in winter, but terrible in summer and shoulder seasons. Chronic elevated crawl space humidity risks mold.

2. Boiler Plant, Fuel System and Storage

The oil-fired boiler plant is functioning adequately while at the end of its economic life. It's located in the crawl space beneath Unit 1 and includes a 16 foot, induced-draft, flue discharge adjacent to the crawl space access bulkhead. Burner combustion air is leaked through the bulkhead, and products of combustion are brought into the crawl space. And the crawl space air migrates into the apartments. The result is that the apartments' indoor air quality is poor: both have elevated relative humidity and carbon dioxide. Also, boiler plant operation produces considerate noise.

The boiler and its burner are elevated an inch and three inches, respectively, above the crawl space floor – above the apparent, usual flood level. However, the fuel oil tubing (approx. 20 feet) from the tank to the burner lies on the crawl space floor. A fuel leak would likely be unnoticed until it became significant. A fuel leak in combination with a crawl space flood presents the risk of site contamination at the point of floor drain discharge.

3. Base building electric consumption is allocated unevenly

The building has two electric services. The building's lack of a "landlord" meter means that any shared electric loads are split between the tenant services. It is impossible to share them equally. For example, the clothes dryer is included on the Unit 1 service: unless each tenant's dryer use is equal, tenant 1 will be subsidizing tenant 2. Similarly, for the boiler plant (Unit 1 service) and the washing machine. The washing machine's cold and hot water services is provided by one of the units. (which, TBD).

4. *Only the kitchens, bathrooms and halls have built-in lighting*

   The bedrooms and living rooms were not provided with built-in lighting, apparently to avoid original construction cost. Switched receptacles were provided, instead, which required plug-in light fixtures to provide lighting.

5. *The building's air quality is poor; its air exchange is insufficient*

   There is not enough outdoor air in either of the apartments, and their resulting air quality is poor. As indicated by the Airthings sensors/monitors, infiltrated air is insufficient to provide acceptable ventilation. The results of the air leakage test (single-point) confirmed the lack of infiltration: 3.68 ACH50, or about one air change for every five hours under "natural" conditions.

6. *Air leakage and noise transmission is excessive between the apartments.*

   The recently installed Airthing Wave+ in Unit 1 shows elevated CO2 despite no occupancy in the unit. Similarly, odors from ceiling painting in Unit 1 entered Unit 2..

Other Limitations

1. There's one bathroom per apartment, only;
2. Base building electric consumption is split unevenly between tenants;
3. Kitchens range hoods are recirculation, not exhaust;
4. Unit 2 lacks a dishwasher;
5. The rear of the building functions as main entry for Unit 1;
6. There's very little transition space, i.e., mud-rooms, storage.

Goals for 2024 Construction

1. Good indoor air quality at all times, and kitchen exhaust;
2. Reduction in heating demand by increased insulation and leakage elimination;
3. Heat pump domestic water heater for each apartment;
4. Dedicated heat pump heating and cooling for each apartment;
5. One and a half bathrooms per apartment;
6. Dedicated laundry appliances and space for each apartment;
7. Mudroom space for each apartment;
8. Solar PV generation to offset consumption: net-zero operation.