ATTACHMENT A: SCOPE OF WORK

Londonderry

The Londonderry Town Office upgrades include:

1. HVAC:
    a. Installation of VRF heat pumps.
    b. Installation of ERVs.
    c. Installation of ductwork for a venting distribution system.
    d. Installation of programmable thermostats.
2. Envelope:
    a. Addition of new insulation and air sealing where new construction is added.
    b. Addition of insulation in foundation and rim joist.
3. Lighting: Upgrade necessary lighting fixtures to LEDs.
4. ADA: Installation of new LULA elevator and shaft, improvements to ramps, building access, bathrooms *ADA improvements must budget to 20% of the entire project construction cost.
5. Solar: Installation of 11.25 kW roof array.
6. SOFT COSTS : The awardee may allocate an amount equivalent to up to 20% of the building grant project's direct construction budget toward sof t costs, such as permitting, legal fees, architectural and engineering expenses, and clerking/project management.
    i. SCOPE AMENDMENT: ADDITION made to 01155_A172_5155_T_LONDONDERR_I Attachment A, Londonderry Town Office, 6. Sof t Cost provisions. (07/10/2025)

The Londonderry Town Hall upgrades include:

1. Envelope:
    a. Installation of vapor barrier in basement. SCOPE AMENDMENT: ADDITION made to 01155_A172_5155_T_LONDONDERR_I Attachment A, Londonderry Town Hall, ***work includes spray foaming the foundation walls, replacing the basement bulkhead door, and infilling basement windows*** (12/11/25)
    b. Replacement of windows.
    c. SCOPE AMENDMENT: ADDITION made to 01155_A172_5155_T_LONDONDERR_I Attachment A, Londonderry Town Hall, ***Insulate and air seal the roof plane and attic floor across building zones*** (12/11/25)
    d. SCOPE AMENDMENT: ADDITION made to 01155_A172_5155_T_LONDONDERR_I Attachment A, Londonderry Town Hall, ***Install insulated and weather-stripped attic hatches*** (12/11/25)
    e. SCOPE AMENDMENT: ADDITION made to 01155_A172_5155_T_LONDONDERR_I Attachment A, Londonderry Town Hall, ***Air seal and insulate walls*** (12/11/25)
2. ADA: ADA improvements with a budget of 20% of total project construction cost.
3. SOFT COSTS : The awardee may allocate an amount equivalent to up to 20% of the building grant project's direct construction budget toward sof t costs, such as permitting, legal fees, architectural and engineering expenses, and clerking/project management.
    i. SCOPE AMENDMENT: ADDITION made to 01155_A172_5155_T_LONDONDERR_I Attachment A, Londonderry Town Hall, 3. Sof t Cost provisions. (07/10/2025)

Scope of work **Duration of Work**

Finish 2nd floor porch
Frame new ceiling
Frame New Gable vent opening
Frame new attic access hatch opening
Install new windows
Provide new outlets and lighting
Drywall ceiling and walls
Paint walls and ceiling
Install Wainscoating Chair Rail
Trim Windows with Salvaged wood from attic
Apply finish to Wainscoating, Trim and Floor

Main Floor
Cover unused attic hatches (finishes to match)
Prep walls for insulation (Behind stage area. May be able to use another form of insulation prior to covering the walls)
Insulate wall cavities (Blown in Cellulose from exterior)

Attic Work
Structural Engineer to assess proposed work
(Based on assesment, additional framing/support may be required)
Re-Frame attic acces points (2)
Install new, Insulated access hatches
Frame in/Finish to match, undesired acces points (2)
Clean out debris in attic
Remediate/Remove old insulation
Install solid blocking in wall cavities for air barrier
Air seal around blocking
Install catwalks through proposed insulated areas
Install12"-15" blown in cellulose insulation

Basement Work
Repair fallen stones (from frost wall)
Repair access panel to finished basement space
Assess what can be done with bulkhead prior to insulating
Remove stairs
Apply vapor barrier, Spray foam existing frost walls
Exterior Perimeter drain

Building Exterior work

Install Gable 2nd floor porch
Cut in/install Soffit venting around 3 sides off building
Replace Main entrry door
Repair Main entry concrete strps
Repair damaged Entry canopy
Replace Canopy at rear exit door
Repair Bulkhead access
Repair any and all damaged siding in preperation for Paint
Caulk/Paint entire exterior of Building

ENGINEERING VENTURES PC

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January 1, 2021
Updated September 22, 2021

Shane O'Keefe
Town of Londonderry, Vermont
100 Old School Street
South Londonderry, VT 05155

Re: Londonderry Old Town Hall Structural Review EV# 20236

Dear Larry:

At your request, a structural review of the Londonderry Old Town Hall has been completed. It is understood that this effort is part of a feasibility study to renovate and restore the building to be used as year-round public space.

This evaluation is based on the following:

- Observations from a site visit on October 30th 2020 and September 9 by Matt Ernst, PE of Engineering Ventures.
- Existing condition drawings of the basement plan and first floor plan dated 4/7/1980 prior to first floor renovations completed at some time after that date.

INTRODUCTION:

The building is a two-story wood-framed structure located at 139 Middletown Rd in Londonderry VT. The original structure was built in 1860 and served as the town hall. Both front and rear additions have been added and renovated over the years to create additional lobby/entry/ticket office space in the front and stage and meeting space in the rear. The building was listed on the National Register of Historic Places in 1983. For the purposes of this report, the side of the building facing the road will be referred to as the "front", the middle original portion of the building will be referred to as the "center", and the side farthest from the road the "rear".

OBSERVATIONS & GENERAL RECOMMENDATIONS:

The following are observations made during the site visit. Recommended work items are in bold. A summary of work items is also included in the Opinion of Probable Cost section of this report.

Foundations:

The perimeter foundation walls of the original building are loose laid stone walls, which have since had a concrete wall poured on the exterior of the stones. The concrete looks to be in fairly good condition.

The walls create about a 4' high crawlspace below the Level 1 framing. **Some zones of the loose laid stonework have lost contact with the ground. Such areas should be infilled with grouted stones to stabilize the walls. Stones supporting the perimeter Level 1 wood framing posts should be grouted solid or replaced with concrete piers to create a more stable bearing condition.**
Water was noted on the gravel floor of the crawlspace and dampness on the interior of the walls. In particular, the access hatch to the exterior on the north side was visibly leaking snow melt at the time of the visit. **The hatch should be replaced, repaired, or removed to stop the water intrusion.**
Concrete piers in the interior of the space supporting wood posts were of more recent construction and appeared in good condition.

The front addition foundation walls are concrete and appeared in fair condition.

The rear addition foundation is concrete walls which create a partial basement. These walls appear in fair condition. Moisture in the space is apparent from pealing paint on the inside face of the concrete walls and surface rust on sheetrock metal corner beads. The slab on grade appeared in good condition.

It is recommended that site drainage be improved to mitigate moisture in the crawlspaces and basement. The following are items should be considered:

- **Excavate perimeter foundation walls around the building, install perforated PVC foundation drain pipes, backfill with crushed stone and re-establish grades that slope away from the building.**
- **Install roof gutters with downspouts that tie into the perimeter foundation system.**
- **Install a vapor barrier in the crawl spaces.**
- **Install waterproofing on outside of concrete fnd walls**
- **Passive or active ventilation of crawl spaces**
- **Include moisture management in the HVAC planning for the basement space**
- **Keep snow piles away from building.**

Floor Framing:

Level 1:
The Level 1 main floor framing and elevated stage floor framing consist of wood joists supported by wood beams. The framing that could be observed was analyzed and the results are summarized in Table 1 below.

Table 1: Floor Framing Capacity Summary

Location	Framing	In-Situ Live Load Capacity	Code Recommended Live Load (Minimum)*
Level 1 Front	3"x6" joists at 16"oc	100psf	100psf
Level 1 Center	2x10 nominal joists at 12"oc	100psf	100psf
Level 1 Center	(5)2x12 nominal beams at 12'oc	100psf	100psf
Level 1 Rear (Stage)	2"x8" joists at 16"oc	120psf	150psf
Level 1 Rear (Stage)(1)	8"x8" beams at 10'oc	40psf	150psf
Level 1 Rear (Stage)(2)	8"x8" beams at 10'oc	80psf	150psf
Level 2 Front	2"x5¼" joists at 14"oc	50psf	100psf
Level 2 Center Floor	2"x4" flat on 2"x8" min (varies) at +/-24"oc	30psf**	60psf (fixed seats)**

*Per State adopted International Building Code (IBC 2015).
**Code recommended live load with fixed seats is 60psf, without fixed seats is 100psf. See further discussion of roof framing that supports the balcony floor.

At the original center portion of the building, the floor framing has been entirely replaced relatively recently (since 1980) with modern preservative treated 2x lumber joists, beams, and posts.

Though not of immediate concern, the metal joist hangers and nails which connect the Level 1 Center joists to the beams show signs of corrosion. Wood rot was noted at the hatch opening on the north side of the building. **Hatch should be replaced, repaired, or removed and rotted wood repaired. Condition of crawlspaces should be monitored to watch for worsening corrosion and rot in wood members. Moisture should be mitigated as discussed in the Foundations section above.**

The connection of the Level 1 Front joists to the interior beam was suspect but difficult to observe. **It is recommended that A34 Simpson angles be placed each side of these joists to reinforce this connection.**

Stage:
The stage floor joists have a capacity of about 120psf, which is substantial, but falls short of the code recommendation of 150psf for stage floors. The ends of the joists appeared to have a half notch bearing into the 8x8 beams, which significantly weakens the shear strength of the joist**. It is recommended that the existing joists are sistered with 2x8's and metal joist hangers used to support both the existing and new joist together at the existing beam.**
The rear zone of the building has undergone renovations and it appeared that some of the 8x8 beams, but not all, had been reinforced with additional 8x8 beams directly below in a stacked configuration. The single and double 8x8 beams have a 40psf and 80psf capacities, respectively. **It is recommended that these beams be reinforced to increase their capacities to 150psf, likely with LVL or steel material below or on the sides of the 8x8 beams.** Further demo of sheetrock ceiling would be required to view the conditions in order to determine a suitable reinforcement scheme

Level 2:
The Level 2 floor framing joists were observed to be 2"x5.25" at about 14"oc, with a live load capacity of 50psf. Significant deflections or deteriorations were not observed (other than around the chimney as discussed below), so augmenting this framing is not mandatory by the existing building, however, **sistering the floor joists should be considered to increase the capacity to the recommended 100psf. During this work, joist end connection conditions should be observed and reported to EV for review.**
The floor boards around an old chimney in the corner closet were significantly rotted and did not appear safe to walk on. The joists exposed did not appear to have been significantly affected by the water damage. **Rotted flooring should be replaced and a header joist should be installed to support the joist that is cut at the chimney.**

Level 2 Balcony:
The beam that supports the edge of the Level 2 balcony was observed to be (3)1.5"x9.75" and is sufficient to support the balcony framing. This beam is supported by iron rods hanging from the roof structure above – this will be discussed more in the roof framing section below. The balcony area is stepped with fixed theater-style seating screwed to the floor. It is understood that the plan for the balcony is to continue to have fixed seats, and therefore the recommended code live load is 60psf. Note that if the space was to be changed such that the seats are removed, then the code live load is 100psf.
The existing framing consists of (2) 2" thick planks of varying widths stacked on top of each other and

hung from the underside of the balcony edge beam at +/-24”oc with ½”diameter bolts and spanning to the wall at the lobby. The ceiling is flat underneath these planks and the floor steps above are made using wood overbuild framing stacked on top the planks. The 2 flat planks have a capacity in the range of 30psf live load. The ceiling below was observed to be visibly sagging under the dead loads. The roof framing that supports the balcony is also under capacity to support the roof and balcony loads. **It is recommended that the balcony framing and the roof framing be augmented to increase the balcony live load capacity to the recommended 60psf. It is recommended that the balcony continue to not be used until the framing capacity is increased.**

Roof Framing:

Front Roof:
The front roof is a hip roof configuration with 2”x6” rafters and 2”x8” hips. These are a little under capacity to meet the balanced snow load plus some drifting from the main high roof, however, the framing appeared in sound condition, and reinforcement is not required unless weight is added to the roof in excess of a lightweight ceiling and insulation as discussed below in the building code review section. **It is recommended that the top ends of the rafter connections to the wall be augmented with face-mount sloped hangers or framing angles on each side.**

The front entry canopy roof appeared in stable condition.

Center Roof:
The center roof of the original building was framed with rafters supported on beams which are supported by large timber frame trusses at about 12’oc. The truss bottom chords are supported by timber columns at the exterior walls. Diagonal knee braces also are present from column to underside of truss bottom chord in the space above the curved ceiling. The 4”x5” rafters and the 8”x8” purlins have adequate capacity for the roof dead and snow loads. Based on a 9.5 on 12 roof pitch and an unobstructed slippery roofing surface the balanced snow load is 34psf. Dead load at the roof surface is estimated to be 15psf. Dead load at the ceiling surface, which loads the bottom chords of the trusses is estimated to be 7psf. The timber trusses have a code capacity in the range of 35psf total.

The first interior truss towards the front of the building supports some additional dead loading of the cupola above, along with the balcony below by way of (3) iron rods going down through the ceiling to Level 2. This truss is more heavily loaded than the others and it appears that the additional load has caused enough deflection to push down and out on the knee braces and columns below, evidenced by visible bowing of the exterior walls at each side of the building at this truss. At some point in time, a horizontal iron rod was installed through the building along the top of the balcony railing presumably to keep the walls from bowing out further. Metal channels on the exterior of the building hold the rod in place. **Given the amount of deformation observed in the truss/column structure here, and the fact that the truss is under code capacity, measures should be taken to remedy the deficiency. Measures could include adding posts under the balcony down to the foundation to unload the balcony weight from the roof truss and/or reinforcing the roof truss system. Roof truss reinforcements would likely include adding diagonal timbers, sistering existing members, and reinforcing timber to timber connections with wood or steel plates. Full span steel beams adjacent to the bottom chord of the truss may also be a simpler option to investigate.**

With the exception of the timber truss supporting the cupula and balcony, significant signs of distress or deformation were not observed in the roof structure. Therefore, reinforcements to increase the capacity of the trusses would not be mandatory by the existing building code (refer to code review section below). Voluntary upgrades to improve the safety would be to replace the slate roofing with metal roofing to reduce the dead loads and/or reinforce the trusses. Roof truss reinforcements would likely include adding diagonal timbers, sistering existing members, and reinforcing timber to timber connections with wood or steel plates. Another option would be to implement a snow removal plan to remove snow from the roof when snow loads are over a certain threshold.

The ceiling/attic floor over the center portion of the building is framed with 2”x8” spanning to the bottom of the timber frame truss. With the exception of lightweight insulation, no weight should be added to the ceiling or roof structure. Access to the attic space should remain very limited, as it is now, and care should be taken during any construction activities to limit the amount of load in the attic to 10psf in a given area. Do not store or stack any materials in the attic space.

Rear Roof:
The rear roof was originally framed with full-size 2x framing and has since been reinforced with modern 2x lumber in a truss configuration. The exact configuration and connections were not able to be measured and analyzed, but the framing is presumed to be sufficient for the roof loads. Further investigation is not warranted unless signs of distress or deterioration is observed, or additional weight is added to the roof (including ceiling) in excess of lightweight insulation as discussed below in the building code review section.

The small canopy roof over the rear door near the parking lot was observed to have significant rot at the junction of the knee brace to the wall. **This should be investigated further to determine extent of rot at this canopy and wall. Repair, replace, or remove the canopy as needed.**

Roof General:
The roof eves in general are fairly short. Dripping rain and snow melt appears to be splashing against the walls after hitting the ground. Roof gutters could be considered to mitigate this issue and decrease the frequency of façade maintenance. The gutters would need to be installed far enough below the drip edge to not interfere with snow sliding off the roof. Downspouts could tie directly into the foundation drains. **Some slate pieces were seen to have fallen off the roof in isolated locations. This should be addressed to keep water from damaging the structure.**

Walls:

Walls are framed with wood studs. Most walls were concealed by finishes and were not observed. Some zones of the exterior siding appeared to be deteriorating due to moisture, particularly at the rear addition of the building. The base of these walls should be investigated to see if rot is present in the wood wall. As noted above, the wall at the junction of the knee braces at the rear entry canopy showed significant signs of rot and should be investigated and repaired. Façade maintenance should be done to keep the structure dry. As noted above, the base of the wall at the access hatch on the north side of the building is rotting and needs to be repaired with the replacement or elimination of the hatch.

BUILDING CODE REVIEW OF RENOVATION ITEMS:

The renovation of this structure would be governed by the 2015 International Existing Building Code (IEBC). The work would be classified as an *Alteration*. EV understands that the following items are the significant items being considered for the renovation project that may have structural implications:

- Insulating the wall, floor and ceiling framing cavities and heating the building for year-round use.
- Reroofing
- ADA Upgrades
- Façade maintenance
- Site drainage

In general, if the alterations do not increase the loading on the building elements by more than 5%, and the structure is not showing signs of distress, and there is no change in use of the spaces that increases live loads, then structural work is not required by the IEBC.

The added insulation would not increase the snow load in this case because the existing conditions are unheated, cold roofs. Adding heat to the building with or without insulation would result in either the same or lower thermal factor for snow loads in accordance with ASCE 7-10. It is assumed that the added insulation would be lightweight and weigh less than or equal to 2 pounds per square foot to stay under the 5% threshold noted above.

If reroofing is completed, it should be done with materials that weigh the same or less than the existing materials (slate), and old materials must be removed prior to new installation to not add weight. In addition, in order to not increase roof snow loads, new roofing should be a slippery and unobstructed surface, such as slate or metal roofing, with no snow guards that would keep the snow from shedding off of the roof. Using asphalt roofing and/or adding snow guards would increase the snow load on the roof and trigger required reinforcements to the structure. Zones of the roof that are currently asphalt shingles could be replaced with new asphalt shingles without code implications.

It is understood that ADA upgrades are being considered, such as a new exterior entry ramp and an interior accessibility lift. It is not expected that the new ramp would have a significant influence on the main building structure. The lift would be in the front addition area from the first floor up to the second floor. It is recommended that the lift be located to the right as you enter the building. Installing the lift to the left near the existing stair would be significantly more complicated in terms of working around the existing framing of the stairs, and therefore is not recommended.

Façade maintenance such as painting and siding work does not have a structural code implication, however, it is needed to keep the structure from deteriorating due to moisture. Specific items are discussed in the observations and recommendations section of this report.

Site drainage work does not have structural code implications; however, it is recommended as discussed in the observations and recommendations section of this report.

Please note that this code review is for structural items only. Additional modifications for Life Safety, egress, electrical and other Code issues are beyond the scope of this report.

OPINION OF PROBABLE COST OF RECOMMENDED STRUCTURAL ITEMS:

Foundations:

- Some zones of the loose laid stonework foundation have lost contact with the ground. Such areas should be infilled with grouted stones to stabilize the walls. Stones supporting the perimeter Level 1 wood framing posts should be grouted solid or replaced with concrete piers to create a more stable bearing condition….$8,000
- The leaking exterior hatch access to the crawl space at the north side of the building should be replaced, repaired, or removed, and wood rot at base of wall repaired….$2,000 to $4,000
- New foundations for access lift….$3,000
- Moisture mitigation for basement/crawlspaces:
    - Excavate perimeter foundation walls around the building, install perforated PVC foundation drain pipes, backfill with crushed stone and re-establish grades that slope away from the building….$12,000
    - Install a vapor barrier in the crawl spaces….$2,000
    - Install waterproofing on outside of concrete fnd walls…$6,000
    - Passive or active ventilation of crawl spaces….consult MEP professional and/or contractor
    - Include moisture management in the HVAC planning for the basement space….consult MEP professional and/or contractor
    - Keep snow piles away from building.

Floor Framing:

- Condition of crawlspaces should be monitored to watch for worsening corrosion of metal hangers and fasteners and rot in wood members.
- A34 Simpson angles placed each side of these Level 1 Front joists to beam connection….$250
- Sister existing stage floor joists with 2x8's and install metal joist hangers to support both the existing and new joist together at the existing beam….$3,000
- Reinforce stage floor beams, likely with LVL or steel material below the original 8x8 beams….$5,000
- Potential Level 2 Front and Balcony framing reinforcement, if necessary, pending further investigation….TBD.
- Added posts and foundations to support Level 2 balcony with rods above removed….$4,000.
- Replace/repair rotted floor framing and floor boards at Level 2 Front around old chimney….$800
- Frame out openings in Level 1 and Level 2 Front floors for access lift….$2,000

Roofs:

- Front roof rafter conn hangers….$250
- Center roof timber frame truss reinforcements (1 truss required, 3 optional)….$8,000 to $12,000 per truss.
- Remove iron rods supporting balcony….$500
- Repair or replace rear canopy over door….$1,000 to $2,000
- Gutters and downspouts….$3,000

Limitations of this report:

This investigation was not intended to be an exhaustive search to find all issues that may be present, but rather to identify the major areas of structural work and facilitate steps toward financial planning for restoration. This report is not intended to be used as a construction document for implementation of specific work. Additional design, drawings, specifications and integration of project steps will be required to finalize recommendations and provide more direction to contractors. Not all the of the structure was able to be observed. If renovation work goes forward, it should be anticipated that issues will be uncovered along the way that may require repair.

Opinions of Construction Cost provided herein are to be considered preliminary for planning purposes only. Since a final design has not been developed and we have no control over the costs or price of labor, equipment or materials, or over the selected contractor's method of pricing, it is understood that the opinions of cost provided are made based on experience and may differ from bid or actual costs.

No attempt has been made to identify hazardous materials as this is beyond the scope of this report and outside of the expertise of the EV team. The owner is advised to employ an independent agency to test and address lead, asbestos, subsurface contaminants or other hazardous materials.

Please let us know if there are further questions or if you would like us to assist in planning & implementation of the next steps.

We are pleased to be of service.

Best Regards,

Bob Needld, PE – President
Engineering Ventures, PC

Matthew Ernst, PE – Project Engineer, Principal
Engineering Ventures, PC

Field Report

206 West Newberry Road
Bloomfield, CT 06002
Tel: (860) 286-9171
Fax: (860) 242-0236
www.bvhis.com

Report Date	July 31, 2020
Project Name	Londonderry Town Hall
Project Number	21-20-112
Date of Visit	July 23, 2020
Purpose	Blower Door Test/Envelope Study

Thank you for using BVH Integrated Services for your envelope study testing.

Ambient Conditions 7-23-2020:
Outside Temperature: 75 °F
Inside Temperature: 75 °F
Wind Conditions: 5-10mph
Time of Day: 10:00 am

Test Conditions:

1. All exterior doors were closed.
2. All interior doors were propped open.
3. All plumbing traps were filled.
4. No masking of any HVAC openings or open attic hatches were completed. The building was tested under its normal operating conditions.
5. A three fan blower door setup was installed at the front entrance.

Blower Door Test Results:

The whole building leakage rate was 2.41 cubic feet per minute (CFM) at 50 Pascals of pressure (1.04 lbs./sq. ft) per sf of exterior shell. This is an extremely high air leakage. Adjusted CFM50 accounts for the lack of power required to reach 50 Pascals. Three fans were used, but the building would have needed approximately four fans to reach pressure. Adjusted CFM50 is a more accurate measure of air flow under test conditions.

Field Measured CFM @ 32 Pascals	Pressure Adjusted CFM @ 50 Pascals	Square Feet of Building Shell	CFM50/SF
16,518	22,077	9,159	2.41

The table below is used to compare the results of this building.

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	CFM50/sf of shell
Londonderry Town Hall	**2.41**
Ultra-Tight Air Barriers	<0.15
High Performance Air barriers	<0.25
Typical Modern Construction	0.60 to 0.90
Leaky Construction	>0.60

This result indicates that the building's air barrier is in the realm of leaky construction as compared to whole-building air tightness benchmarks. In fact, this is the leakiest building I have ever tested. findings and recommendations are provided below.

R-Values:

Windows: The vast majority of the windows are single pane, wood framed with spring assisted sashes for an approximate R-value of 1. It should be noted that the windows leak excessively. The windows on the back of the building do have exterior storms, which are also single pane, wood framed. These windows have an approximate R-value of 1.5.

Foundation: The exact thickness of the foundation could not be determined. It is a combination of stacked stone, topped with what appears to be large granite blocks. From outside concrete is visible, it appears that the concrete was used to reinforce the existing stone foundation. The approximate R-value is R-3.5.

Front Zone:
Walls 1st floor: ½" shiplap boards on 2x4 studs 16" o.c., the sheathing is estimated to be ½" thick, Tar paper, then wood siding for an approximate R-value of 2.6.

Walls 2nd floor: The studs are visible on the 2nd floor, consisting of 2x4 studs 16" O.C., the sheathing is estimated to be ½" thick, tar paper, then wood siding for an approximate R-value of 2.1.

Roof: 2"x6" rafters 16" o.c. with ½" thick wood sheathing, tar paper, and asphalt shingles for an approximate R-value of 1.8.

Middle Zone:
Roof: 4" wide by 5" thick rafters approximately 30" o.c., ½" wood sheathing, tar paper, slate roof for an approximate R-value of 1.5.

Attic Floor: Shiplap boards on 2x4 studs, 16" o.c. with 3-4" of cellulose insulation for an approximate R-value of 10.

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Walls: ½" shiplap boards on 2x4 studs 16" o.c., the sheathing is estimated to be ½" thick, Tar paper, then wood siding for an approximate R-value of 2.6. However, some of the cellulose insulation has fallen down the wall bays from the attic, so it may be slightly higher in some areas.

Back Zone:
Basement Walls: The basement walls consist of concrete, fiberglass insulation, and drywall. The type of studs could not be determined, and the thickness of the fiberglass insulation appeared to be 4". The thickness of the concrete was found to vary, likely due to reinforcing the foundation wall. The approximate R-value is R-11.

Walls 1st floor: The studs are visible on the 1st floor, consisting of 2x4 studs 16" O.C., the sheathing is estimated to be ½" thick, plastic weather barrier, then wood siding for an approximate R-value of 2.1.

Attic Floor: ½" shiplap boards, 2x8 joists 16" o.c. with 2-3" of chopped fiberglass spread sporadically for an approximate R-value of R-8.

Roof: 2x10 rafters 16" o.c. with ½" thick plywood sheathing, plastic ice and water shield, and asphalt shingles for an approximate R-value of 2.1.

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Context Photos-Present Construction

Roof-With Zones Called Out

Back

Middle

Front

Main Entrance

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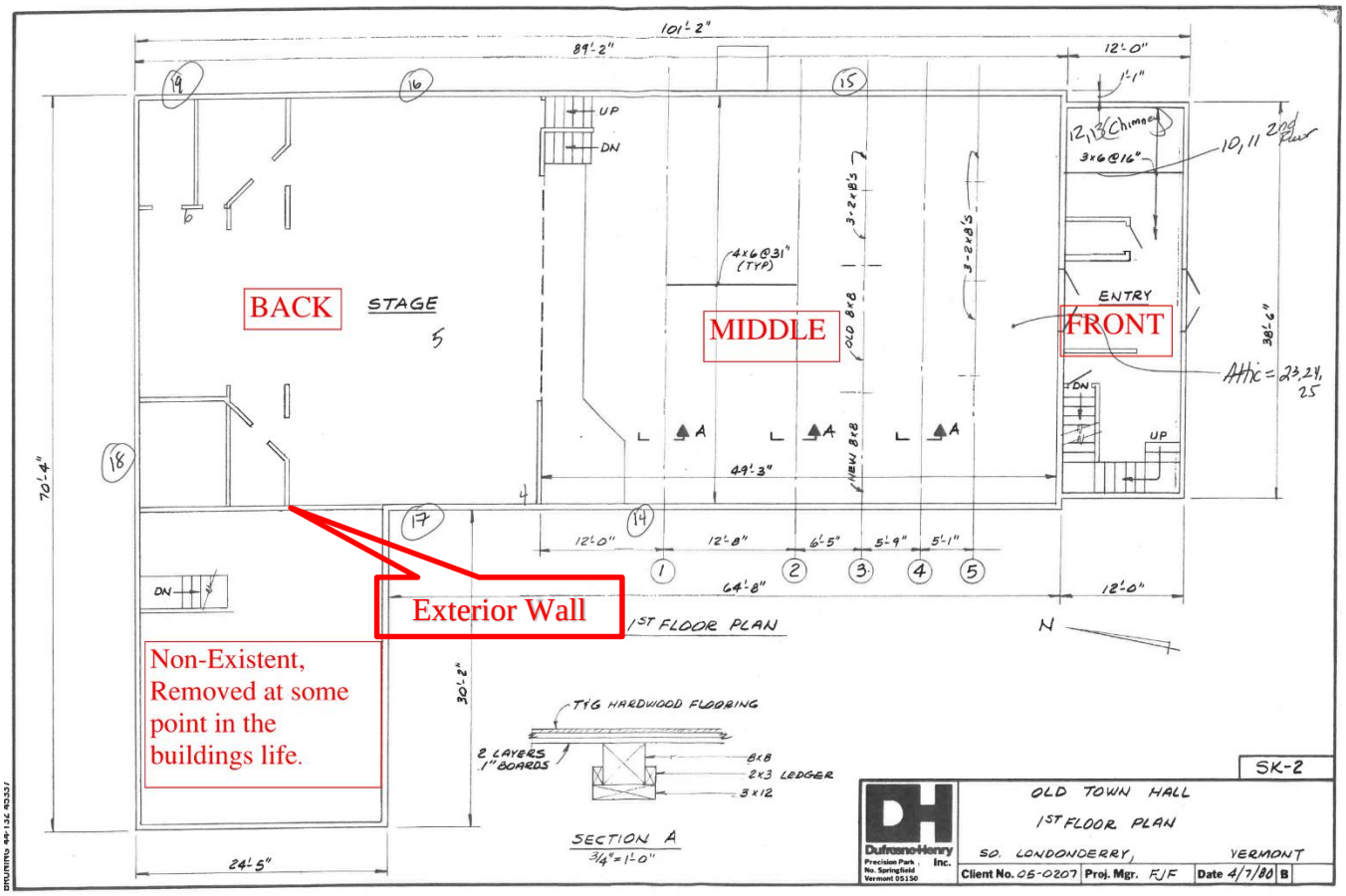
Existing Drawings Provided-1980



1st Floor

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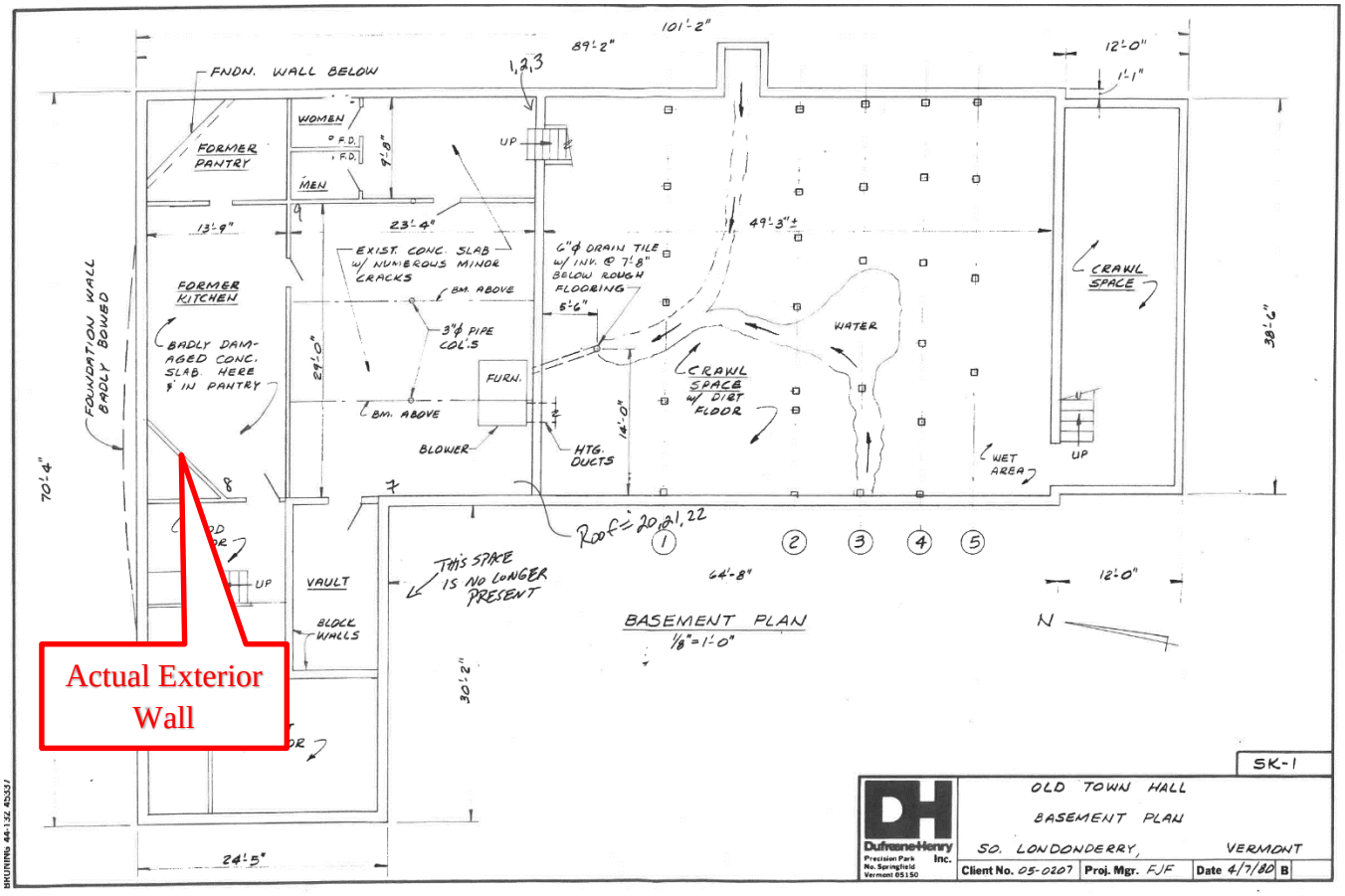

Basement

Findings and Recommendations

1. Building History

From information provided by Mary Lines, the existing drawings, and inspecting the building, the following assumptions can be made. The building appears to have multiple additions/renovations made throughout the years. The building has been separated into three different zones in terms of construction, the Front, Middle, and Back. The floor plan above from 1980 shows a wing of the building which was removed at some point in the buildings life. The shared wall between the Non-Existent and the Back zone has since been turned into an exterior wall. This leads us to believe the exterior siding is not original. Additionally, the siding between the Front and Middle are definitely different sizes. The siding on the Back matches the Middle. On parts of the building, primarily the back, a plastic weather barrier is visible behind the siding. Plastic weather barriers weren't in existence in 1859, which is the date posted on the front of the building. Because of this, we believe the siding can be removed and replaced, since it does not appear to be original, hence doesn't have a significant historic value.

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The foundation also appears to have had work done over the years. Looking at the building from inside and outside, it appears that the foundation has been reinforced with concrete. It does not appear that the building was lifted, as the existing stone foundation is visible from inside. This can be assumed because no evidence of the removed wing was found. The wing is only known about from the drawings. Along with this, the basement drawing shows the back of the building having a bowed wall, however this was not witnessed during the visit. Either this wall was replaced or concrete was added hiding the bowing.

The construction of the walls is different for each zone and do not fully match the floor plans. The Back zone is not square as is shown in the drawings. Looking at the building you can see that the back corners are not 90 degree angles, instead there are corner walls, pointed to in the basement drawing. Along with this, there is a 2nd floor above the Front Zone, but no drawings exist of this.

The three zones have different attic/roof conditions, which are as follows. The Front zone has no attic, instead it has a 2nd floor to access the mezzanine in the Middle zone. The underside of the roof is visible from inside the building for the Front zone. The Middle zone has a curved ceiling, which has some cellulose insulation applied on the ceiling. Above the ceiling here the cupola is partially visible along with the underside of the roof. The Back zone has an attic with only 3" of chopped fiberglass insulation along the attic floor. Looking at the underside of the roof, the rafters are newer, and the roof sheathing is plywood. It's likely when the wing was removed that the roof was replaced here.

The floor joists of the Middle zone are constructed of newer lumber, potentially done when the wing was removed. The basement is lined with gravel and is sloped leading to a PVC drain for when water enters the basement.

The roofs appear to need work. We suggest having a qualified roof installer inspect the roofs to determine if they need to be replaced. A structural engineer should also be brought out to inspect the building. From inside the attic, daylight is visible through parts of the roof, and in many areas through the exterior walls. The shingles are not original to the building and the slate doesn't appear to be as well. This can be assumed because inside the building there is a chimney between the Front and Middle zones. However, this chimney is not visible from outside, so the roof and slate was adjusted at some point in the buildings life to cover up this change. Along with this, slate roofs have a life expectancy of roughly 75-125 years, so it is possible that it has been replaced once already.

The windows are all old single pane windows with some having springs instead of weighted pulleys. Some of the Back zone windows have an exterior storm over them. Looking at the windows they do not appear to be from the 1800's, as springs were used in the 20th century. Because of this, we believe the windows are not original which reduces their historical value.

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Based on the information above, we have determined that a number of the buildings features do not appear to be original, including the siding, windows, some walls, and roofs. With this in mind, the question of what should remain comes up. For this building, we believe that to be the interior wood trim around the theater and the Middle zone. Along with the look of the building from outside. Our recommendation involves replacing the windows, removing siding which can either be refurbished or replaced, and most importantly air sealing/insulating. The goal of our recommendations is to have the building renovated so that it can be used throughout the year instead of once a year. The recommendations will help to maintain the building for many years to come and will help with heating and cooling costs. Our recommendations are described further below.

2. Walls

The studs and sheathing of the exterior walls is visible from inside the building for the Back zone and 2nd floor of the Front zone. We recommend fully exposing the studs and the back of the sheathing for the Front and Back zones so that 3" of closed-cell spray foam can be added between the studs. Closed-cell spray foam has an R-value of approximately R-6/inch and is an air and vapor barrier. The building is constructed of balloon framing, which means there is no top plate along the walls between the 1st floor and the attic. Blocking should be added between studs, where the wall meets the ceiling, to act as a backer/end of the spray foam.

The recommendation for the Middle zone is similar but involves insulating from outside instead. This is because the interior wood which lines the walls and ceiling of the Middle zone is likely historic, and would be costly to remove and reinstall/replace. For the Middle zone we recommend removing the exterior siding and sheathing to the height of the ceiling. This will expose the back side of the interior wood trim. At this point, 3" of closed cell spray foam can be added to the exterior walls of the Middle zone up the wall and stop where the wall becomes the ceiling. The sheathing and siding can then be reinstalled or replaced. This will effectively insulate and air seal the exterior walls.

3. Insulate the Roof or Attic?

For parts of the building, we believe the roof should be insulated and other parts the attic. The Front zone should be insulated and air sealed along the plane of the roof. This can be done from inside with 5" of closed cell spray foam since the rafters are 2x6. The rafter tails/soffit area should be sealed off with wood blocking so that the spray foam can effectively seal the wall to roof transition. Along with this, the shared wall between the Front and Middle zones should be insulated with 3" of closed cell spray foam. The foam should transition from the attic floor to where the Front zone roof meets the shared wall. This is because the attic above the Middle zone will not be heated, which leads us to how to treat the attic for the Middle zone.

For the Middle zone, we recommend removing the existing cellulose insulation along the attic floor. The cellulose is compressed, dirty, and full of contaminants. The cellulose is not doing an effective job of insulating the ceiling, especially along the exterior walls, where the cellulose has started to fall down the wall bays. With the old cellulose insulation removed, the attic floor/ceiling can now be insulated

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and air sealed. This can be done in several ways. The cheapest would be to add 10" of new cellulose insulation along the attic floor. For this to be effective, the wall bays would need to be dammed/ blocked off so that the cellulose won't fall down the wall bays again. This will fully insulate the ceiling/attic floor but would not take care of any air leaks which may exist here. 5" of closed cell spray foam could be used instead which would have the same R-value and would fully air seal the attic, but at a higher expense.

As for the Back zone, we recommend insulating along the plane of the attic floor. Inside the attic for this zone there is existing chopped fiberglass insulation which should be removed, along with the subfloor to fully expose the ceiling joists. This will allow the attic floor to be insulated and air sealed. Again this can be done in several ways. The cheapest would be to add 10" of new cellulose insulation along the attic floor. For this to be effective, the wall bays would need to be dammed/ blocked off so that the cellulose won't fall down the wall bays again. This will fully insulate the ceiling/attic floor but would not take care of any air leaks which may exist here. 5" of closed cell spray foam could be used instead which would have the same R-value and would fully air seal the attic, but at a higher expense.

It should be noted that the shiplap ceiling likely isn't air tight, which is why spray foam is recommend/preferred over cellulose. For the Back zone the shiplap ceiling could be replaced with drywall, which would likely be tighter. It would also match the walls if drywall is added.

4. Attic Hatches

During the visit there were at least 4 large openings leading to the attic, a few are shown below. These openings do not have any doors/hatches to seal them off. A large portion of the buildings air leakage can be accounted to these openings. Because of this we recommend the following:

Seal off some of the openings or install a new attic hatch with weather-stripping and at least 6" of rigid polyisocyanurate (foil faced foam board) insulation attached to every opening. Use ¾" plywood and sheetrock for strength and weight so the hatch presses down on the weather-stripping when closed. Use wide foil tape to cover and protect the edges of the insulation and then glue or screw the rigid foam insulation to the plywood so it remains affixed to the hatch indefinitely. At the hatch opening install a 16" tall, 4 sided end dam to keep cellulose insulation from covering the hatch.

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5. Basement/Crawlspace

The foundation is uninsulated and shows signs of water entry. Along with this, there is no air sealing present in the basement. Dampness/humidity from the basement was apparent during the visit, and could be made even more apparent when the building is tightened up and insulated. A dehumidifier was also found in the basement adjacent to the furnace room. The basement room for the Back Zone had mold growing on the drywall from the humidity. For these reasons, we recommend that the foundation walls are insulated, air sealed, and a vapor barrier is installed along the basement floor. To do so, the following steps should be done:

1. First, manage the water that enters the basement by installing a sump pump at a low point in the basement and then digging/cutting channels in the floor at the perimeter of the basement to catch and divert water to a sump pump. A PVC drain already exists in the basement, so it is possible that a sump pump isn't necessary.
2. Install a Tu-Tuff vapor barrier across the dirt/gravel floor and lap it up onto the granite foundation walls, not the stacked stone. Tu-Tuff is recommended because it seals relatively well to foam and it is more durable than 6 mil poly to occasional foot traffic. For regular foot traffic you can install a poured slab, a layer of pea stone, or at minimum, install plank walkways in heavy traffic areas to protect the vapor barrier.
3. Lap Tu-Tuff seams at least 6" and seal with manufacturers recommended tape.
4. Finally, install 3" of closed cell foam at the perimeter of the original basement starting at the underside of the floor and down to 1' below the outside grade or stop at the inside grade if it the same as, or higher, than outside. Foam should lap over Tu-Tuff on the walls.
5. The foam will need an approved 15 minute thermal barrier for fire protection, foam installers can make recommendations for the barrier to use but it should be approved beforehand by a local code official.
6. Foam over basement windows:

   The basement windows can be permanently covered over with spray foam or covered in rigid foam plugs wrapped in polyethylene sheeting like a present that are then foamed in place as shown below. This allows the windows, which have negligible R-value, to act like insulated walls. If the window ever needs to be accessed simply trim the perimeter of the rigid foam plug with a knife and slide the plug out. If you prefer the basement windows to remain uncovered then a wooden frame should be built around each window so foam can be installed to the full thickness right up to the window. Otherwise the foam can be tapered as it approaches the window.

Examples of this recommendation:

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Tu-tuff lapped up onto walls prior to spray foam install.

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Fully installed Tu-Tuff and spray foam.

6. Crawlspace Access

The crawlspace does have a hatch to outside. During the visit, the hatch was found to have no insulation, is not air tight, and leaked water heavily during a small rain storm that came through. Along with this, it is constructed of plywood and wood lumber which is severely water logged. The hatch ways easily over 100 pounds.

I imagine the hatch is necessary in the event that equipment must be moved in or out of the basement. If so, then it should be framed square, weather-stripped, and insulated with at least 2" of polyiso fastened to a new hatch panel. If the door is not necessary, then ideally it would be removed and an infill panel (consider structural requirements) be installed and foamed over so that it becomes a continuous part of the proposed foundation thermal barrier system.

7. Windows

The windows are old, impossible to open, have a low R-value, and leak significantly. Many of the windows were found to not fully shut. Because of this, we recommend that the windows are replaced with current windows. As mentioned previously, the windows do not appear to be original, which lowers their historic value.

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When replacing the windows keep the following considerations in mind:

1. Are there any oversized window areas that are no longer necessary? Most buildings that predate electricity had large windows for day lighting. Can parts of the window area be in filled with insulated wall? Walls always outperform even the best windows at a fraction of the cost. If aesthetics is a concern can part of the window area be in filled with translucent panels such as Kal wall?
2. If the new windows are inserts remove window weights and fill in the weight pockets with injected foam. Air seal the original window opening as much as possible before the window insert is installed.
3. Consider installing single hung units so the top sash is sealed in place. This reduces air leakage overall and makes them easier to close and latch.
4. Specify that new windows are to be foam sealed into the rough opening or to the original frame to make an airtight connection to the wall.
5. Buy windows with low conduction frames like fiberglass and warm edge spacers between the glazing.
6. Get as high an R-value and as low a U-value as possible. New windows with suspended films can perform on par with triple pane windows at a much lower weight. Target R4 (U=0.25) or better.
7. If installing aluminum framed windows get windows with thermally broken frames to separate the interior aluminum from the exterior aluminum.
8. Finally, identify any windows that are no longer in use and infill them with insulated wall panels.

	
Window along the front of the building.	Large gap between sash and sill.

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Please review and let me know if there are any questions.

Respectfully Submitted by,

BVH Integrated Services, P.C

Quinn Treadgold

Quinn Treadgold
Building Envelope Services Provider

7-23-2020 Londonderry Town Hall Blower Door Test Report.docx

Appendix A - Foam Notes

Polyurethane foam or foam plastic is an extremely useful tool in air sealing when used correctly. In this report I may refer to various types of foam as part of an insulation or air sealing strategy. The following brief guide will help the reader understand, and anticipate requirements, for foam. Please contact BVH if you would like assistance writing foam or air barrier specifications.

1. Foam and fire protection: The foam system or foam coating must be an approved 15-minute thermal barrier or ignition barrier. Occupied spaces require a 15-minute thermal barrier, which has to be shown through one of the following tests: NFPA 286, FM4880, UL1040, or UL1715, to be an approved equal to ½" thick gypsum board. The less stringent ignition barrier is only allowed for unoccupied attics or crawlspaces "where entry is made only for the service of utilities". An ignition barrier is one of six permissible materials (per IRC 314.5.3 and IRC 314.5.4) 1½ " mineral fiber insulation, ¼"thick hardboard, 3/8" particle board, ¼" thick wood structural panels, 3/8" thick gypsum board, or corrosion resistant steel having a base metal thickness of 0.016 inch. Other materials may qualify as ignition barriers but they must be shown to meet the criteria for an ignition barrier as described in IRC 314.6 through one of the following tests: NFPA 286, FM4880, UL1040, or UL1715.

2. Types of Foam:
   - Open-cell: Good air barrier, crushable, about R3.5/inch, NOT a vapor barrier
   - Closed-cell: Good air and vapor barrier, dense, about R6/inch

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- Kit foam: Closed-cell foam in small propane-like cylinders for "do-it-yourself" applications. Prone to misuse because it is not intuitive. READ ALL instructions and cautions if using kit foam and practice with it before starting. Plan on changing gun tips often and making test shots into a trash bag to ensure the foam is mixing properly. Installing bad kit foam results in a sticky, impossible mess.
- Can foam: Also called one-part foam, hardware store foam and gun foam. Closed-cell foam that is very intuitive to use especially if one buys the reusable gun.

Can-foam is great for sealing and filling gaps larger than 1/8" and up to about 1-1/2" wide but not for filling voids or cavities or for bulk insulation. Can-foam does not apply well in multiple layers. For gaps 1/8" and smaller silicone or urethane caulk is recommended, foam will not seal a gap 1/8" or less, it will just cover and hide the gap.

Kit foam is good for voids and cavities but not for narrow gaps. Kit foam can be used as bulk spray insulation for small areas (< 100 sf) and to fill a small number if closed cavity wall or roof bays if done by a professional. Kit foam is also good for sealing joints on a surface like sheetrock or plywood seams and for making "fillet" type seals around a large pipe or duct.

Open-cell foam can be sprayed but is not a good fit when tolerances are tight because it expands 100X its wet volume. Open cell foam can be applied in thick layers. It can be injected and is a good option for air sealing closed cavities. Open-cell foam is vapor permeable so it may be the better choice when applied to old masonry but consult a building scientist for any foam over existing masonry applications. Open-cell foam is not a good choice in locations that are likely to be damp with no drying potential - i.e. basements and crawlspaces - closed cell foam is the better choice.

Closed-cell foam is good for bulk insulation where tight tolerances are required, it only expands 30-40X its wet volume. Closed-cell foam can be injected into closed cavities but requires an *experienced* professional for application. Closed cell foam has to be applied in layers or lifts 3" or less. Closed-cell foam is more technical and less forgiving to the installer than open-cell foam.

3. <u>Cautions with foam:</u>
    - Temperature and humidity: Foam arrives at the site as unmixed chemicals. Making foam is a chemical reaction that is sensitive to temperature and humidity. Read the tech data sheet for the foam being installed to know the proper equipment and environmental conditions for installation.
    - Experienced installers: Experience matters. Knowing how the foam will react under all conditions is critical to a good installation. Experienced foamers often cost more because it really does take longer to do the job correctly, the new guys think they can cut this corner until they get called back.

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- Building Science: A new branch of science has emerged to help us understand how parts of a building interact. As a building gets air and vapor tight, understanding those interactions becomes more critical. Consider hiring a building science expert when contemplating the extensive use of foam, the use of foam over surfaces like brick and stone that are vapor permeable or in the use of foam on rubble foundations.
- Each type of foam listed above has its advantages and limitations. Consider carefully what you are trying to do and pick the appropriate foam.
- Foam also does not span large holes or gaps (wider than about 2") on its own, it usually needs a dam to be sprayed against.
- Because foam expands, fills, and adheres to surfaces people tend to think it will fill and seal everywhere we want it to on its own. It will not. Foam will not make up for poor installation technique. Pockets, corner bays, or blind cavities are properly filled by putting the gun deep into the pocket and "backing out" while spraying. Cavities over 10" deep may be too deep for traditional spray foam, injection foam may be needed. Blind pockets should be pointed out to the installer before they start.
- Overspray: spray applied foam insulations are prone to overspray. Therefore, appropriate measures should be taken to ensure that any finishes and furniture are protected so as not to cause permanent damage. This is particularly important in existing buildings.
- Closed-cell foam insulation installed too thick at once can fail and it is difficult repair if it does. How thick is too thick? It varies by manufacturer and environmental conditions at the time of install but the safe approach is install in lifts of not more than 2" at a time with full cure time between lifts. Ask the foam installer to provide technical data sheets with the information on appropriate lift thickness and environmental conditions.

Test Equipment

<u>Minneapolis Blower Door Model 3 Fan Specifications:</u>
Maximum Flow:
6,300 CFM at free air (2,973 l/s, 10,700 m3/h).
5,350 CFM at 50 Pa (2,524 l/s, 9,090 m3/h).
5,000 CFM at 75 Pa (2,360 l/s, 8.495 m3/h).
Minimum Flow:
300 CFM with Ring B (141 l/s, 510 m3/h).
85 CFM with Ring C (40 l/s, 144m3/h).
30 CFM with Ring D (14 l/s, 51 m3/h).

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11 CFM with Ring E (5 l/s, 18 m3/h).
Dimensions: 20 in. (50 cm) inlet diameter, 10.25 in (26 cm) length.
Weight: 33 lbs. (15 kg) with Flow Rings A & B.
Flow Accuracy: +/- 3% with DG-700, Rings D & E +/- 4% or 1 CFM.
Calibration: Meets ASTM Standard E779-03, E1554-07, CGSB-149.10-M86, EN 13829,ATTMA Technical Standard 1 and NFPA 2001.
Power: 3/4 hp motor in 110V.

DG-700 Micromanometer Specifications:
Number of Independent Pressure Channels: 2
Pressure Range: –1,250 to +1,250 Pascals (-5 to +5 in. H20)
Display Resolution: 0.1 Pa (0.0001 in H20)
Accuracy: 1% of pressure reading or .15 Pa, whichever is greater.
Calibration date: 10-31-17

Analysis Software:
TECTITE software version 4.0 by the Energy Conservatory

MUNICIPAL ENERGY RESILIENCE PROGRAM
LEVEL II ENERGY ASSESSMENT

prepared for

Town of Londonderry, VT
139 Middletown Rd.
Londonderry, VT 05155

Town Hall
139 Middletown Rd.
Londonderry, VT 05155

March 12, 2024

DuBois & King inc.

Mechanical, Electrical, Plumbing

6 Green Tree Dr.

S. Burlington, VT 05403

Salas O'Brien

Building Enclosure

206 W. Newberry Rd.

Bloomfield, CT 06002

TABLE OF CONTENTS

1. Executive Summary

The purpose of this Level II Energy Assessment is to provide the building Owner (Town/City) and the State of Vermont - Building and General Services with specific recommendations for building Energy Conservation Measures (ECMs) and Renewable and Resilient Energy Measures (RREMs). These measures will reduce electric and fossil fuel consumption and associated costs, and potentially provide resilience against cost fluctuations and interruptions in the supply of purchased energy. The assessment includes a review of the building's historical energy consumption and costs, exterior enclosure, mechanical and plumbing systems, and lighting.

The costs and savings for each measure are calculated using industry standard engineering methods. ECMs with a payback period greater than the Expected Useful Life (EUL) of the equipment are not typically recommended, as the cost of the measure will not be recovered during the lifespan of the equipment. These ECMs are recommended for implementation at the time of future system replacement, where it would be appropriate to evaluate based on the premium cost of installing energy efficient equipment rather than the full cost of the measure.

1.1. Building General Data

General Building Data			
Name / Type	# Stories	Year Built/ Renovated	Floor Area (sq. ft.)
Town Hall	2	1859	7,775

Building Occupancy		Building Conditioning	
		Conditioning Type	Percent of Floor Area
Occupied Hours/Week	1	Heated	100%
Occupied Weeks/Year	12	Cooled	0%
Occupant Quantity	2	Unconditioned	0%

Facility Contact	
Name	Shane O'Keefe
Title	Town Administrator
Phone Number	(802) 824-3356

1.2. Energy Conservation Measures

No measures are recommended for this building.

1.3. Renewable & Resilient Energy Measures

The following tables summarize the recommended RREMs in terms of investment cost and benefits provided.

Battery Electric Storage Summary	
Equipment Quantity / Capacity	1 / 13.5 kWh
Investment Cost After Incentives	$6,675

Note: Information on this measure is provided for informational purposes only; The Owner needs to consider if the value of backup power to the building, and the value of electric storage vs. a fuel-fired electric generator is worth the investment.

Solar Photovoltaic Summary	
Annual Electrical Energy Generated (kWh)	3,000 kWh
Annual Building Electrical Consumption Offset (%)	90%
Investment Cost After Incentives	$4,750
Annual Energy Cost Savings	$490
Simple Payback	9.7 Years

1.4. Building Durability Measures

The following table summarizes the recommended building durability measures.

Occupant Health & Comfort Summary	
Measure	Benefit
Repair Foundation Water Leak	Improve Building Durability
Air/Vapor Seal, Insulation Crawlspace	Improve Building Durability
Repair/Replace Crawlspace Hatch	Improve Building Durability

2. Introduction

The purpose of this Energy Assessment is to provide the building Owner (Town/City) and the State of Vermont - Building and General Services (VT BGS) with a baseline of energy usage, the relative energy efficiency of the facility, and specific recommendations for Energy Conservation and Renewable and Resilient Energy Measures. Information obtained from these analyses may be used to support a future application for a Municipal Energy Resilience Implementation Grant, any other State or Federal Energy Conservation Program, as well as support performance contracting, justify a municipal bond-funded improvement program, or as a basis for replacement of equipment or systems.

The energy assessment consisted of an onsite visual assessment to determine current conditions, itemize the energy consuming equipment (mechanical, electrical, plumbing); The study also included interviews and consultation with operational and maintenance personnel. The following is a summary of the tasks and reporting that make up the Energy Assessment report.

Utilities

A review of the existing energy types supplied to the building, historical consumption, and associates costs and required on-site storage.

Building Enclosure

A survey and assessment of the characteristics and conditions of the building enclosure including walls, windows, doors, and roofs.

Whole building air leakage testing utilizing a blower door tool.

Energy Consuming Equipment & Systems

A survey of building spaces to document and assess utility-related equipment, including heating, cooling, ventilation, domestic hot water and lighting systems.

Measurement of illumination levels in each space and comparison to recommended levels.

Recommendations for Energy Savings Opportunities

Based on the information gathered during the on-site assessment, the utility rates, as well as recent consumption data and engineering analysis, identification of opportunities to save energy and associated probable construction costs, projected energy/utility savings and resulting simple payback analysis.

Clarifications

This Assessment has been completed in accordance with the State of Vermont ACT 172 and is based primarily on Salas O'Brien's / DuBois & King's ("Assessor") site visit conducted on 12/12/2023.

This report has been prepared for and is exclusively for the use and benefit of the Town / City and VT BGS ("Client"). The purpose for which this report shall be used shall be limited to the use as stated in the contract between the Client and Assessor. This report, or any of the information contained therein, is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance written consent of the Assessor. Any reuse or distribution without such consent shall be at the Client's sole risk, without liability to the Assessor.

The Assessor has no control over the cost of labor, material, and equipment, or over competitive bidding or market conditions. Therefore, the accuracy of project construction cost estimates included in this Assessment as compared to actual contractor bids or the actual cost to the Client are not guaranteed. Construction costs estimates are understood to be an opinion of a probable budget for construction costs. If a more accurate budget is required, we recommend enlisting the services of a professional estimating agency.

This Assessment is not intended to be or should be construed as any type of design for construction which a licensed Architect or Engineer is required for.

3. Utilities

3.1. Historical Energy Consumption & Cost by Type

Energy can be calculated and reported in multiple different ways, each with their advantages and disadvantages. Generally, this report uses Site Energy and Energy Cost, but also reports on Emissions.

- **Site Energy** – Amount of energy consumed by a building as measured by site utility meters. Typically, electricity and one or multiple fuels.
- **Source Energy** – Accounts for the additional energy consumed in the extraction, processing, and transport of primary fuels such as coal, oil, gas, the energy losses in thermal combustion in power generation plants, and the energy losses in transmission and distribution to a building. Site/source conversions are typically national averages.
- **Energy Cost** – The monetary value for energy which serves a building.
- **Energy Emissions** – Amount of CO_{2e} source emissions. Rates are from regional grid annual averages for electric and national averages for fuel.

Utility Summary			
Utility Type	Utility Provider	Meter Quantity	Energy Uses
Electric	Green Mountain Power	1	Space heating, lighting, equipment, fans
No. 2 Oil	Not able to verify	-	Space heating

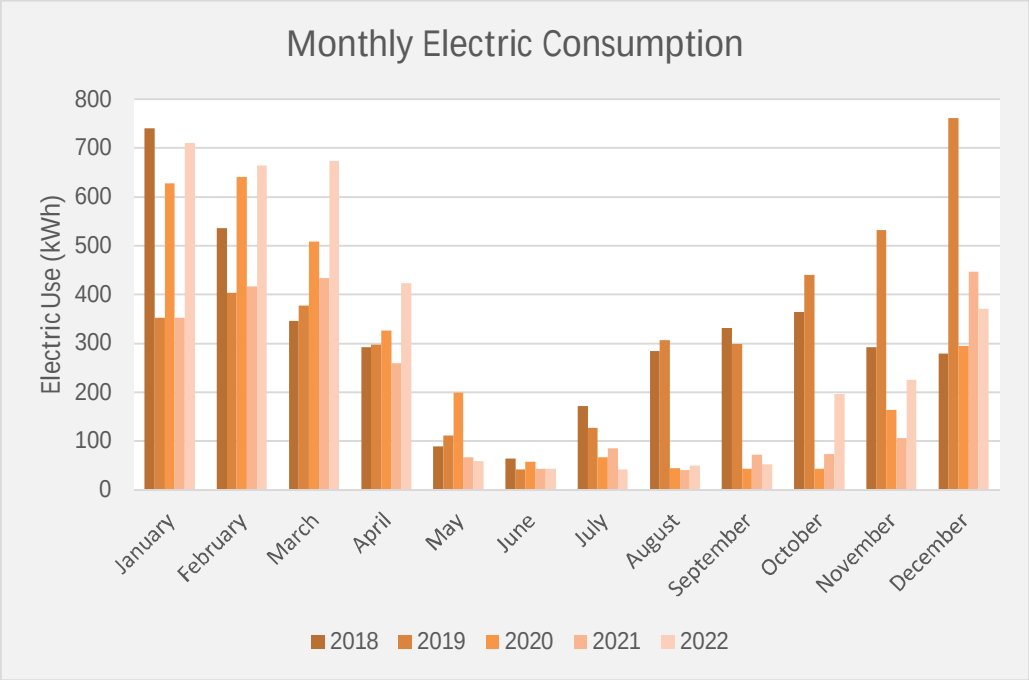
Utility Analysis						
Utility Type	Annual Consumption	Annual Cost	Energy Cost Rate	Annual Site Consumption (mmbtu)	Annual Source Consumption (mmbtu)	Annual Emissions (Mt CO2e)
Electric	3,350 kWh	$875	$0.261/kWh	11.5	33	1.6
No. 2 Oil	250 Gal	Not provided		33.5	40	3.3
TOTAL	-			45	75	5.0

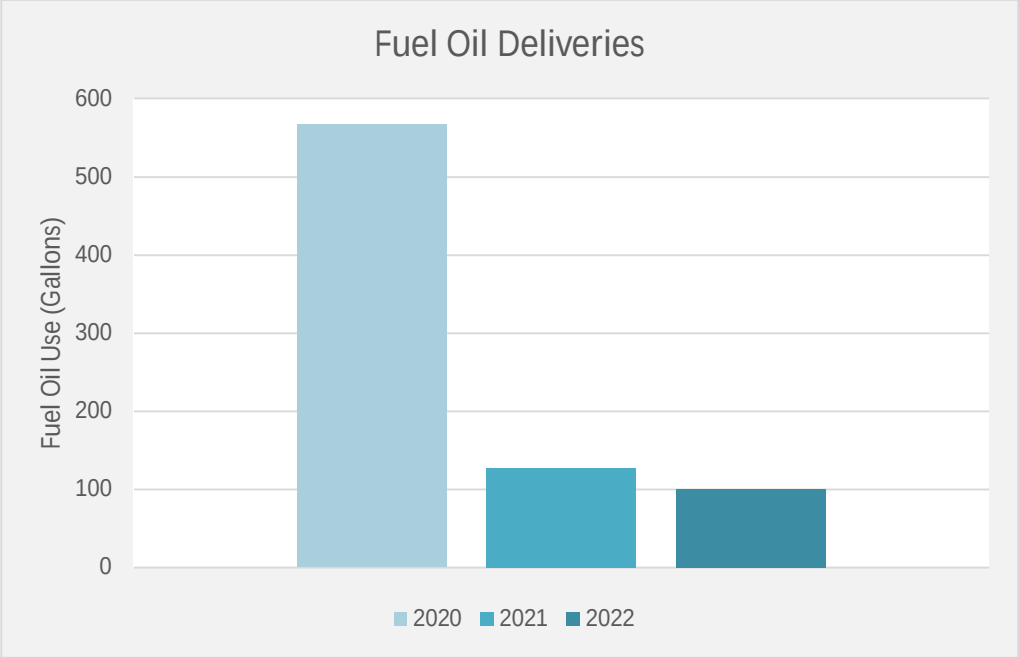
Data presented here is based on actual annual historical consumption from **Jan. 2018 through Dec. 2022** with estimates where data was not provided. Monthly electrical usage cost and individual fuel delivery cost could not be obtained.

Assessment/Recommendations:

- Electric use is similar from month-to-month, somewhat correlated with seasonal building space heating demand. In some years, monthly use is significantly different than other years, however this is likely due to the fact that usage generally is very low and a single occupancy event could drive the majority of the use for an entire month.
- Fuel use is strongly correlated with seasonal building space heating demand. Use is generally very low due to the minimal occupancy and heating of the building.
- Fuel use represents roughly 65% of total energy emissions vs. electric use.

- Electric cost rate (blended) is relatively high, primarily due to relatively low usage resulting in fixed costs representing an unusually large portion of the total cost versus variable costs.





The following utility rates were used for the purposes of savings analysis. The electrical savings rate is lower than the blended electrical rate ($0.26/kWh) as only variable usage costs are able to be offset; fixed costs are not.

Average Utility Rates			
Electricity	No.2 Oil	Propane	Wood Pellets
$0.190 /kWh	$3.00/Gal	$2.50/Gal	$300/Ton

3.2. Fuel Storage

Fuel Storage - Existing	
Type	No.2 Oil
Quantity / Capacity	1 / 266 Gal
Location	Interior, Crawlspace

Figure 1 – Existing Oil Tank

3.3. Electric Service

Electrical Service - Existing	
Capacity	200A, 1 Phase, 120/240V, 60 Hz
Electric Meter Location	Exterior Wall Mount

Assessment/Recommendations:

The existing electrical service does not appear to have the capacity to support the addition of electric heat pumps. A licensed electrical engineer should be consulted to verify if any modifications are required.

3.4. Electric Storage

The existing building/site has no battery electric storage.

Assessment/Recommendations:

An electric lithium battery storage system could be added to increase building resiliency. The value of this system is primarily the ability to continue to utilize the building in the case of a loss of electrical power from the utility, similar to that provided by a traditional fuel-fired electric generator. The benefit is it does not consume fuel or produce the associated on-site emissions. The battery system may provide additional utility cost savings; however, these are relatively minor or nonexistent based on current rates. The system proposed is selected to provide the capacity to power the building for approximately one average 24-hour period based on historical consumption data. It's not clear the value of resiliency is high for this building, somewhat demonstrated by the fact that no back-up electric system currently exists (fossil fuel powered or battery).

Electric Battery Storage - Proposed	
Quantity / Capacity	1 / 13.5 kWh
Location	Interior Electrical Room / Exterior Ground Mounted
Space Served	Entire Building
Investment Cost	$15,000
Potential Incentives	$3,825 (GMP) + $4,500 (Federal IRS)

3.5. Electric Generation

The existing building/site has no fuel fired generators or solar PV system.

Assessment/Recommendations:

The addition of a new solar PV system appears to not be feasible on the existing roof due to the slate construction, but could be located on a different building within the town and still offset the majority of the building's annual electric consumption. The system is assumed to be a grid-tied, net metered account. A licensed structural engineer should be consulted on the capacity of the existing roof structure, and an electrical engineer on the system design.

Solar Photovoltaic System - Proposed	
Capacity	2.75 kW
Location	Roof / Ground Mounted
Annual Electrical Energy Generated (kWh)	3,000 kWh
Annual Building Electrical Consumption Offset (%)	90%
Investment Cost	$6,750
Potential Incentives, Tax Credits	$2,000 (Federal IRS)
Annual Energy Cost Savings	$490
Simple Payback	9.7 Years

Note: System is sized based on current facility electrical use. Implementing ECMs would reduce electric use and result in a smaller PV system being required. Implementing RREMs including EV chargers or heat pumps would increase electric use and result in a larger PV system being required. System costs and annual energy costs savings would be proportionally smaller or larger, but result in a similar payback.

3.6. Electric Vehicle Chargers

No EV chargers currently exist at the building/site.

Assessment/Recommendations:

The addition of new Level 1 or Level 2 chargers appear to be technically feasible for the building, however due to minimal building occupancy and the resulting minimal impact, EV chargers are not recommended.

4. Building Enclosure

The building envelope consists of the exterior shell, made up of the walls, windows, roof, and floor. The envelope provides building integrity and separates the exterior from the interior conditioned space. The building envelope was audited by the same building envelope commissioning agent in 2020, the company was then called BVH Integrated Services. Use that report when considering envelope improvements to the building. Since the building isn't used in winter and there is no air conditioning, at the moment there are not any cost effecting envelope recommendations in terms of lowering the fuel consumption. In order for envelope repairs to be effective, the building would need to be used throughout the winter. Otherwise, the only other envelope items that should be improved relate to durability and safety.

Notes for Understanding the Building Envelope:

1. All building systems interrelate and occasionally improvements to one building system can create problems in another. This is particularly true of envelope and HVAC improvements. Measures to improve energy efficiency should be regarded in the context of the health and safety of occupants and in the long-term durability of the building. Careful consideration of the following and testing before and after efficiency improvements will help to prevent conditions that could have a negative impact on the building.
2. When viewing thermographs, lighter colors indicate higher surface temperatures than darker colors. What is considered "heat loss" is dependent upon the perspective from which it is viewed, inside or outside.
3. Some infrared images are taken under depressurization. Depressurization causes all outdoor air to flow inward and is not the normal operating state of the building. It is done to reveal conditions that would not normally be detected or to enhance thermographic images. Depressurization is also used to mimic the environment a building would be under in conditions of high wind or very cold temperatures. The building was depressurized to about –30 Pascals during the last part of the imaging from the 2020 visit.
4. Air leaks are detected by the infrared camera when cooler air "washes" across a surface. The pattern of air leakage is typically wispy lines emanating from the air leakage site.
5. One measure used to determine if an improvement is warranted is comparison to the current 2020 Vermont Commercial Building Energy Standards (CBES). Though code minimum might be considered a low bar it is important to understand that the code minimums have progressed significantly in recent years. They are far more stringent than they were even 20 years ago. Today, a code minimum envelope is quite robust from an energy perspective. In addition, the energy savings from increased insulation thickness (R-value) is not linear, it is geometric. So, the energy savings for doubling the insulation thickness is high for areas with low or missing insulation but low for areas with code minimum insulation. While the CBES is used as a reference, the requirements are applicable only to new buildings and to existing buildings when renovation occur; existing buildings which are not modified are not required to comply with the requirements.
6. Estimated costs include only the costs that relate to energy improvements. For example, if the recommendation is to add more insulation when the roof membrane is replaced, only the cost of the additional insulation is included in the simple payback calculation since the roof membrane replacement would have to be done regardless.

4.1. Foundation

Building Foundation - Existing	
Foundation	Masonry foundation walls
Basement and Crawl Space	Crawl space, dirt floor
Basement Wall Insulation Type	None
Basement Wall R-value	R-3.5

Assessment/Recommendations:

The foundation is in ok condition and performing below a code compliant (R15 continuous insulation) foundation. Adding additional insulation is not recommended at this time because it would not be cost effective. If the building was occupied and heated to a greater extent, it may be a worthwhile investment.

There is a durability/safety concern however. At one of the bathrooms, there appears to be a water leak. This leak is damaging the bathroom and there already appears to be black mold. The exact source of the leak is unknown. Could be from the foundation, the slab, the framed wall to foundation transition, or even a frozen pipe. Because the cause is unknown, the solution is unknown. However, the first step is to clean the debris, mold, etc. and expose the wall layers so that the source can be found. Once the source is known a repair can be implemented.

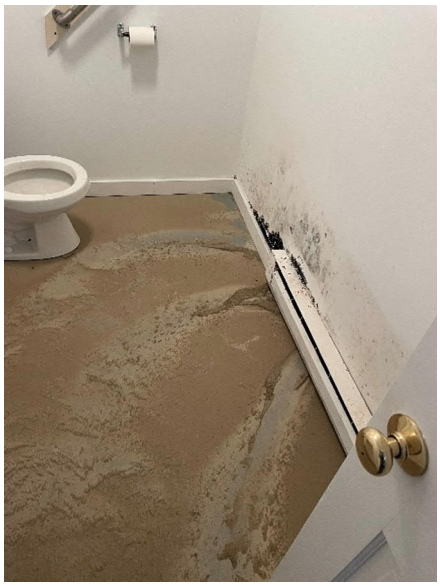


Figure 2 – Bathroom leak causing dirt and mold on the sheetrock

Figure 3 – The stone foundation is visible from within the crawlspace.

The foundation is uninsulated and shows signs of water entry. Along with this, there is no air sealing present in the basement. Dampness/humidity from the basement was apparent during the visit, and could be made even more apparent if the building is tightened up and insulated. A dehumidifier was also found in the basement adjacent to the furnace room. The basement room for the Back Zone had mold growing on the drywall from the humidity. For these reasons, we recommend that the foundation walls are insulated, air sealed, and a vapor barrier is installed along the basement floor. To do so, the following steps should be done:

1. First, manage the water that enters the basement by installing a sump pump at a low point in the basement and then digging/cutting channels in the floor at the perimeter of the basement to catch and divert water to a sump pump. A PVC drain already exists in the basement, so it is possible that a sump pump isn't necessary.
2. Install a Tu-Tuff vapor barrier across the dirt/gravel floor and lap it up onto the granite foundation walls, not the stacked stone. Tu-Tuff is recommended because it seals relatively well to foam and it is more durable than 6 mil poly to occasional foot traffic. For regular foot traffic you can install a poured slab, a layer of pea stone, or at minimum, install plank walkways in heavy traffic areas to protect the vapor barrier.
3. Lap Tu-Tuff seams at least 6" and seal with manufacturers recommended tape.
4. Finally, install 3" of closed cell foam at the perimeter of the original basement starting at the underside of the floor and down to 1' below the outside grade or stop at the inside grade if it the same as, or higher, than outside. Foam should lap over Tu-Tuff on the walls.
5. The foam will need an approved 15 minute thermal barrier for fire protection, foam installers can make recommendations for the barrier to use but it should be approved beforehand by a local code official.
6. Foam over basement windows:

The basement windows can be permanently covered over with spray foam or covered in rigid foam plugs wrapped in polyethylene sheeting like a present that are then foamed in place as shown below. This allows the windows, which have negligible R-value, to act like insulated walls. If the window ever needs to be accessed simply trim the perimeter of the rigid foam plug with a knife and slide the plug out. If you prefer the basement windows to remain uncovered then a wooden frame should be built around each window so foam can be installed to the full thickness right up to the window. Otherwise the foam can be tapered as it approaches the window.

Examples of this recommendation:

Figure 4 – Spray foam and window infill

Figure 5 - Tu-tuff lapped up onto walls prior to spray foam install.

Figure 6 – Fully installed Tu-Tuff and spray foam.

The crawlspace does have a hatch to outside. During the visit, the hatch was found to have no insulation, not be air tight, and leaked water heavily during a small rain storm that came through. Along with this, it is constructed of plywood and wood lumber which is severely water logged. The hatch weighs easily over 100 pounds.

The hatch is assumed to be necessary in the event that equipment must be moved in or out of the basement. If so, then it should be framed square, weather-stripped, and insulated with at least 2" of polyiso fastened to a new hatch panel. If the door is not necessary, then ideally it would be removed and an infill panel (consider structural requirements) be installed and foamed over so that it becomes a continuous part of the proposed foundation thermal barrier system.

4.2. Roof

Primary Roof - Existing			
Finish	Slate	Main Ventilation Source	NA
Type / Geometry	Gable	Roof Drains	Edge drainage to ground
Insulation	None	Roof / Attic Insulation	R-10

Assessment/Recommendations:

The roof is in ok condition and the attic is performing below as a code compliant (R49) attic. Adding additional insulation is not recommended at this time because it would not be cost effective. If the building was occupied and heated to a greater extent, it may be a worthwhile investment, and the following would be recommended.

For parts of the building, we believe the roof should be insulated and other parts the attic insulated.

- The Front Zone should be insulated and air sealed along the plane of the roof. This can be done from inside with 5" of closed cell spray foam since the rafters are 2x6. The rafter tails/soffit area should be sealed off with wood blocking so that the spray foam can effectively seal the wall to roof transition. Along with this, the shared wall between the Front and Middle Zones should be insulated with 3" of closed cell spray foam. The foam should transition from the attic floor to where the Front zone roof meets the shared wall. This is because the attic above the Middle zone will not be heated, which leads us to how to treat the attic for the Middle zone.
- For the Middle zone, we recommend removing the existing cellulose insulation along the attic floor. The cellulose is compressed, dirty, and full of contaminants. The cellulose is not doing an effective job of insulating the ceiling, especially along the exterior walls, where the cellulose has started to fall down the wall bays. With the old cellulose insulation removed, the attic floor/ceiling can now be insulated and air sealed. This can be done in several ways. The cheapest would be to add 10" of new cellulose insulation along the attic floor. For this to be effective, the wall bays would need to be dammed/ blocked off so that the cellulose won't fall down the wall bays again. This will fully insulate the ceiling/attic floor but would not take care of any air leaks which may exist here. 5" of closed cell spray foam could be used instead which would have the same R-value and would fully air seal the attic, but at a higher expense.
- As for the Back zone, we recommend insulating along the plane of the attic floor. Inside the attic for this zone there is existing chopped fiberglass insulation which should be removed, along with the subfloor to fully expose the ceiling joists. This will allow the attic floor to be insulated and air sealed. Again this can be done in several ways. The cheapest would be to add 10" of new cellulose insulation along the attic floor. For this to be effective, the wall bays would need to be dammed/ blocked off so that the cellulose won't fall down the wall bays again. This will fully insulate the ceiling/attic floor but would not take care of any air leaks which may exist here. 5" of closed cell spray foam could be used instead which would have the same R-value and would fully air seal the attic, but at a higher expense.

It should be noted that the shiplap ceiling likely isn't air tight, which is why spray foam is recommend/preferred over cellulose. For the Back zone the shiplap ceiling could be replaced with drywall, which would likely be tighter. It would also match the walls if drywall is added.

During the visit there were at least four large openings leading to the attic. These openings do not have any doors/hatches to seal them off. A large portion of the buildings air leakage can be accounted to these openings. Because of this we recommend the following:

- Seal off some of the openings or install a new attic hatch with weather-stripping and at least 6" of rigid polyisocyanurate (foil faced foam board) insulation attached to every opening.
- Use ¾" plywood and sheetrock for strength and weight so the hatch presses down on the weather-stripping when closed.
- Use wide foil tape to cover and protect the edges of the insulation and then glue or screw the rigid foam insulation to the plywood so it remains affixed to the hatch indefinitely.
- At the hatch opening install a 16" tall, 4 sided end dam to keep cellulose insulation from covering the hatch.

Figure 7 – One of the many hatches open to the attic

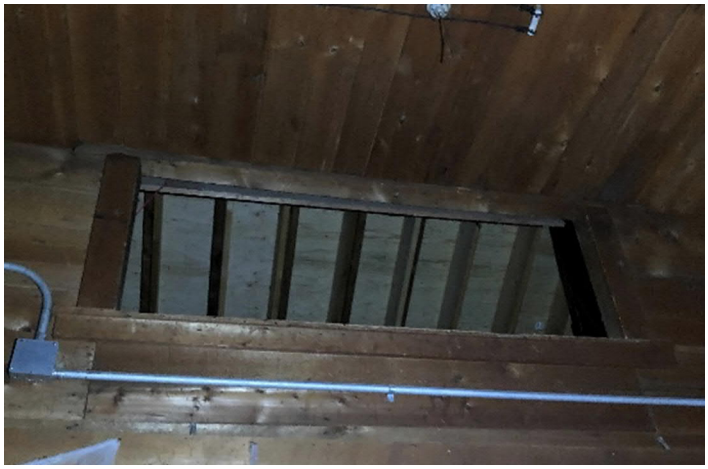


Figure 8 – One of the many hatches open to the attic

4.3. Walls

Exterior Walls - Existing	
Primary Finish	Wood siding
Wall Insulation Type	None
Back Lower Level Walls Insulation Type	Fiberglass batts
Wall Framing Type	Wood framed
Wall Thickness	2x4, 16” On Center
R-value Non-Insulated Walls	R-1.5
R-value Insulated Walls	R-2.1

Assessment/Recommendations:

The walls are in ok condition and performing below a code compliant (R19+R20 ci) wood framed wall. Adding additional insulation is not recommended at this time because it would not be cost effective. If the building was occupied and heated to a greater extent, it may be a worthwhile investment, and the following would be recommended.

The studs and sheathing of the exterior walls is visible from inside the building for the Back zone and 2nd floor of the Front zone. We recommend fully exposing the studs and the back of the sheathing for the Front and Back zones so that 3” of closed-cell spray foam can be added between the studs. Closed-cell spray foam has an R-value of approximately R-6/inch and is an air and vapor barrier. The building is constructed of balloon framing, which means there is no top plate along the walls between the 1st floor and the attic. Blocking should be added between studs, where the wall meets the ceiling, to act as a backer/end of the spray foam.

The recommendation for the Middle zone is similar but involves insulating from outside instead. This is because the interior wood which lines the walls and ceiling of the Middle zone is likely historic and would be costly to remove and reinstall/replace. For the Middle zone we recommend removing the exterior siding and sheathing to the height of the ceiling. This will expose the back side of the interior wood trim. At this point, 3" of closed cell spray foam can be added to the exterior walls of the Middle zone up the wall and stop where the wall becomes the ceiling. The sheathing and siding can then be reinstalled or replaced. This will effectively insulate and air seal the exterior walls.

Figure 9 – The middle of the building as viewed from inside.

Figure 10 – The walls as viewed from outside.

4.4. Windows

Exterior Windows - Existing					
Location	Window Framing	Glazing	Storm Windows	Air tightness	R-Value
Building	Wood-framed, operable	Single glaze	None	Poor	R-1

Assessment/Recommendations:

The windows are in poor condition and performing below a code compliant (R2.7) operable window. Replacing the windows is not recommended at this time because it would not be cost effective. If the building was occupied and heated to a greater extent, it may be a worthwhile investment, and the following would be recommended.

The windows are old, difficult to open, have a low R-value, and leak significantly. Many of the windows were found to not fully shut. Because of this, we recommend that the windows are replaced with modern windows. As mentioned previously, the windows do not appear to be original, which lowers their historic value.

When replacing the windows keep the following considerations in mind:

1. Are there any oversized window areas that are no longer necessary? Most buildings that predate electricity had large windows for day lighting. Can parts of the window area be in filled with insulated wall? Walls always outperform even the best windows at a fraction of the cost. If aesthetics is a concern can part of the window area be in filled with translucent panels such as Kalwall?
2. If the new windows are inserts remove window weights and fill in the weight pockets with injected foam. Air seal the original window opening as much as possible before the window insert is installed.

3. Consider installing single hung units so the top sash is sealed in place. This reduces air leakage overall and makes them easier to close and latch.
4. Specify that new windows are to be foam sealed into the rough opening or to the original frame to make an airtight connection to the wall.
5. Buy windows with low conduction frames like fiberglass and warm edge spacers between the glazing.
6. Get as high an R-value and as low a U-value as possible. New windows with suspended films can perform on par with triple pane windows at a much lower weight. Target R4 (U=0.25) or better.
7. If installing aluminum framed windows get windows with thermally broken frames to separate the interior aluminum from the exterior aluminum.
8. Finally, identify any windows that are no longer in use and infill them with insulated wall panels.

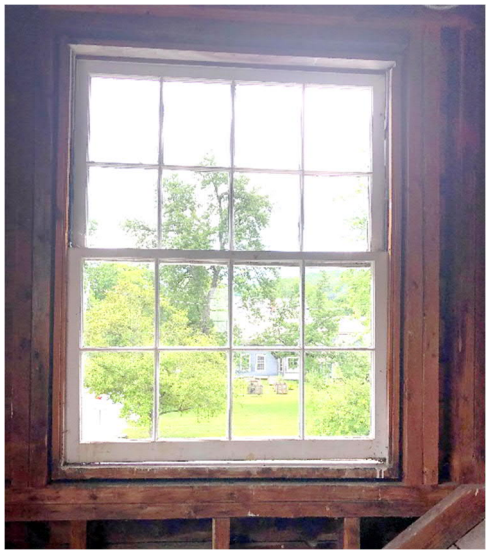


Figure 11 – Window along the front of the building.

Figure 12 – Large gap between sash and sill.

4.5. Doors

Exterior Doors - Existing			
Building Doors		R-Value	Weather-stripping
Main Entrance Doors	Solid core wood	2	Effective

Assessment/Recommendations:

The doors are in ok condition and performing below a code compliant (R4.75) insulated door. Improving the doors is not recommended at this time because it would not be cost effective.

4.6. Air Tightness

Blower Door Test Results			
Indoor Temperature	75	CFM/sf at 75 Pa.	2.20
Outside Temperature	75	Test Notes	Note, a blower door test was not performed during this visit as there were concerns about causing the pipes to freeze in the bathrooms. The building temperature was 35^0 F. These results are from prior testing on 7/23/2020 by the same auditor. No changes appear to have been made to the envelope since then.
Total Surface Area	13,140		
CFM at 32 Pa.	16,518		

Building Air Tightness Comparison	
Type	CFM/sf at 75 Pa.
This Building	2.20
Leaky Construction	> 0.50
Average Construction	0.21 to 0.50
High Performance Construction	< 0.20
Ultra Tight Construction	< 0.08
Overall Assessment	The building is extremely leaky

Assessment/Recommendations:

The building air tightness is performing far above (worse than) a code compliant (0.30 CFM/sf at 75 Pascals) building. Reducing the building's air leakage is not recommended at this time because it would not be cost effective. If the building was occupied and heated to a greater extent, it may be a worthwhile investment, and the following would be recommended.

Please note: Reducing air leakage can be a significant opportunity to save energy but it can conflict with adequate ventilation for building occupants and the intake air for atmospherically vented combustion appliances. If air tightening measures are implemented without consideration of other systems, stale air, excess humidity, back-drafting, or carbon monoxide poisoning could result. We recommend switching to sealed combustion appliances and consulting with an HVAC engineer to review the mechanical ventilation when planning improvements that will improve the air tightness of the building.

The cost for the building envelope measures is provided if the Town wants to consider use and heating of the building more often in the future. No measures are cost effective based on the current use and heating of the building.

Building Envelope – Recommended ECMs				
Type	Foundation/crawl	Roof/ attic	Walls	Windows
Investment Cost	$20,000	$50,000	$75,000	$35,000

5. Building Heating, Ventilating, and Air-Conditioning (HVAC)

The building is heated with a hot air system consisting of a single oil-fired furnace and associated ductwork. There is no mechanical cooling or ventilation besides manually controlled bathroom exhaust fans.

HVAC Central Equipment - Existing	
Type	Oil-Fired Hot Air Furnace, Non Condensing, Single Stage, Vented Through Chimney, Combustion Air Ducted to Burner
Quantity	1
Make / Model	Thermo-Pride / OL 33 – 200R
Capacity	Heating – 200 MBh
Rated Efficiency	Heating – 83.5% AFUE
Electrical Power	120V, 60Hz, 1-PH, 13.8A, ½ hp fan motor
Year Installed / Age	2014 / 9 Years
Location / Spaces Served	Basement / Entire Building
Control	Non-Programmable, set to “off” at time of site visit

Figure 14 – Existing Oil-Fired Furnace

Figure 13 – Existing Non-Programmable Thermostat

HVAC Insulation - Existing	
Duct Insulation	There is no duct insulation on the existing system ductwork, typical and appropriate for a single-zone system with no cooling capability.

HVAC Terminal Equipment - Existing	
Type	Electric Baseboard Radiators
Quantity	2
Make / Model	Not Verified
Location / Spaces Served	Bathrooms
Control	Non-programmable thermostat, set to 50°F

Figure 15 – Existing Electric Baseboard Radiator

Assessment:

1. **Ventilation** – The addition of a new mechanical ventilation system would increase heating demand and energy use, but would be improve indoor air quality for occupants, particularly if the building envelope air leakage is reduced. An energy recovery ventilation unit could be used to minimize the impact on heating demand / energy use. Based on current building use (minimal), the benefit of a ventilation system would be minimal.
2. **Thermostats** - When the entire building or individual spaces within the building are unoccupied, thermostat temperature setpoints should be reset, and set to the same temperatures to minimize energy use. This does appear to be effectively done manually with the existing non-programmable thermostats. Replacing the existing thermostats with new, programmable ones would have little impact on energy use if this is continued to be done.
3. **Motor Efficiency** - The PSC-type furnace fan motor is relatively inefficient versus a modern EC-type motor.

4. **Heating Capacity vs. Demand** – The existing furnace capacity appears to be less than half as much as required for the maximum building heating demand based on its size and construction. If building envelope insulation and air sealing measures were implemented, the furnace capacity may be close to the maximum building heating demand.
5. **Air Filter** – The existing furnace air filter is a low-efficiency 1" thick type. This provides minimal protection to the equipment heat exchanger, and minimal benefit to indoor air quality.
6. **Heating System** - The existing mid-efficiency furnace appears to be in good condition, and has an expected RUL of 15 years. Replacing the existing oil-fired furnace with a new high efficiency gas-fired model, or replacing or using it in conjunction with a renewable heating source - wood pellets or electric heat pumps – are possible options. These options are not recommended at this time because it would not be cost effective. If the building was occupied and heated to a greater extent, it may be a worthwhile investment.
    - **Option 1 - High Efficiency Gas-Fired Furnace:** A new high efficiency, condensing, direct-vent, gas-fired furnace with a modulating output burner, stainless steel heat exchanger, EC fan mtor, and an efficiency rating of 95%+ AFUE could be installed to completely replace the existing oil-fired one.
    - **Option 2 - Wood Pellet-Fired Furnace:** A new wood pellet-fired furnace could be installed to completely replace the existing oil-fired one. Equipment selection would be challenging due to limited amount of equipment manufacturers and capacities available; currently there is only a single capacity furnace (96 MBh) from a single manufacturer (MESYS) which qualifies for incentives. A new wood pellet storage bin would need to be located inside the building, or a more expensive silo would need to be located outside of the building.
    - **Option 3 – Electric Heat Pump Air-to-Air, Ducted:** A new heat pump system could be installed and utilized in conjunction with the existing oil-fired furnace. The heat pump could heat the building for the majority of the year while the oil-fired furnace would operate only on the coldest days. The heat pump system would consist of an exterior unit and a single interior ducted coil attached to the furnace with refrigerant piping in between. Heat pump controls would be integrated with the furnace. The indoor unit would require condensate drain piping. The heat pump system could provide cooling/dehumidification in addition to heating. The relatively low indoor air temperature setpoint during unoccupied periods – 55F - is close to the minimum air temperature rating of different heat pumps – usually either 50F or 59F. Technical specifications of a specific heat pump would need to be confirmed before purchasing.

The following should be considered when evaluating new systems:

- **Building Envelope Improvements** – This analysis assumes that building envelope insulation and air sealing ECMs identified in this assessment report are pursued and the maximum building heating demand is reduced due to their impact. If these ECMs were not pursued, the heating system costs and energy savings would be greater.
- **Replacement Cost** – The existing furnace has many years of RUL, but will require an investment in a replacement unit in the future. The cost difference between a similar new furnace and a new high efficiency / renewable energy system is always less than the full cost.
- **Energy Cost Volatility** – Fossil fuel prices typically vary over time by +/- 50%, depending on a variety of factors. Wood and electricity costs are relatively stable over time.
- **Energy Source –** Fossil fuels originate from outside the local geographical region whereas electricity is sourced locally and regionally, and wood is sourced locally. Purchasing electricity and even more so wood significantly contributes to the local economy whereas purchasing fossil fuels has relatively low benefit to the local economy. Propane is widely available through bulk delivery from many local distributors. Wood pellets are available through bulk delivery from a few regional suppliers. Electric power already exists and is used at the building. It appears the existing 200A electrical service does not have the capacity to support a new heat pump system and would need to be upgraded to a 300A service, but an electrical engineer should be consulted to confirm.

- **Environmental Impact** – The oil use of the existing furnace represents the majority of the building's environmental impact (vs. electricity use). Annual CO_2e emissions after recommended building enclosure ECMs have been implemented can be reduced further by different amounts depending on the option, from 35% up to 70%.
- **Equipment Life -** For the primary heating equipment, high efficiency gas-fired furnaces are expected to have 20 year useful services lives, 25 years for standard efficiency gas- and wood pellet-fired furnaces, 15 years for heat pumps.

Heating System ECMs and RREMs				
Type	Mid Eff. Oil-Fired Furnace (Ref. Only)	High Eff. Gas-Fired Furnace	Wood Pellet – Fired Furnace	Heat Pump, Air-to-Air / Gas Hybrid
Estimated Heating Capacity (MBh)	200	200	200	Heat Pump: 80 Furnace: 200
Annual CO_2e Emissions Eliminated (%)	0%	35%	70%	65%
Investment Cost	$10,000	$16,000	$70,000	$35,000
Potential Incentives	$0	$0	$6,000 (Eff. VT, RERC)	$3,000 (Efficiency VT)

Recommendations:

1. **Motor Efficiency** – When a new, replacement furnace is purchased/installed, it should include an EC-type fan motor.
2. **Heating Capacity vs. Demand** - New heating equipment should be selected with a capacity to match the actual maximum building heating demand, or only a portion of it for hybrid systems. A licensed mechanical engineer should be consulted to determine this.
3. **Air Filter** – When a new, replacement furnace is purchased/installed, it should include a higher performance filter – MERV-8 minimum, MERV-13 ideally - to provide better indoor air quality for occupants, and protect the equipment heat exchangers, particularly if a heat pump is used.

Figure 17 - Example York Brand Gas-Fired Furnace

Figure 16 – Example Mitsubishi Brand Air-to-Air Ducted Heat Pump, For Use With Gas-Fired Furnace

Figure 19 - Example MESYS Brand Wood Pellet-Fired Furnace

Figure 18 – Example FleXILO Brand Wood Pellet Indoor Storage Bag

6. Building Lighting

Lighting - Existing	
Interior Illumination	Bathroom: Measured at levels between 1 and 14 foot-candles. Hall: Measured at levels between 5 and 65 foot-candles.
Interior Light Fixtures	Basement: Ceiling mounted wrap with HPT8 fluorescent bulbs and ballasts Bathroom: Ceiling mounted wrap with compact fluorescent bulbs Hall: Ceiling mounted panel LED's. Hall: Ceiling mounted pendant fixtures with compact fluorescent bulbs.
Interior Lighting Controls	Manual wall mounted switches.
Interior Exit Light Fixtures	LED-type
Exterior Light Fixtures	Ceiling mounted fixture with compact fluorescent bulbs
Exterior Lighting Controls	Manual wall mounted switches

Figure 21 – Existing CFL Bulbs

Figure 20 – Existing LED Panel Fixture

Figure 22 – Existing Ceiling Mounted Wrap

Assessment/Recommendations:

1. All interior and exterior light fixtures are either high efficiency, or operate few hours per year and replacing with more efficient fixtures would result in minimal energy savings and not be cost effective.
2. While many interior and exterior lighting controls are manual rather than automatic, building occupants appear to use lights only when needed; the use of automated controls is possible but would result in minimal energy savings and not be cost effective.

JASW

updated 11/19 1:30pm

Nov 19, 2024

Town of Londonderry
Attn: Shane O'Keefe, Town Administrator
100 Old School Street
Londonderry, VT 05155

RE: Londonderry Town Hall - Accessibility Assessment

Shane:

This Accessibility Assessment was performed by Jon Saccoccio of JA Saccoccio Architectural Workshop, PLLC for the **Londonderry Town Hall.**

The purpose of this report is to assess the existing building for compliance with the Americans with Disabilities Act (ADA). The goal of this report is to inform the building owner of the building's conditions as they relate to accessibility so that they can make an informed decision and investment regarding the repair and/or improvement of the structure.

Executive Summary

We understand that the Londonderry Town Hall is primarily used for annual Town Meeting and voting. The Town is exploring improving Accessible access for all events offered at this building. This assessment finds that:

1. The building lacks an interior accessible connection between the main level and the basement. Rough-sketch concepts are provided in this document. The intent of these sketches is to roughly lay-out potential solutions for access.
    a. The change in elevation between the main level and basement is approximately 5'. We've assumed the stage and balcony do not need to be accessed.
    b. The selected product is Savaria V1504 Vertical Platform Lift. This lift can be used when travel does not exceed 6'. Travel up to 14' can be granted with a variance, but we don't believe that is necessary. https://www.savaria.com/products/v-1504-unenclosed-vpl
2. The bathrooms are not compliant. Reconfiguration and reconstruction of the basement bathrooms is most likely. Sketches have not been provided for this scope.
3. Historic buildings are not exempt from ADA requirements, but they may be allowed fewer requirements. It's our opinion that historic buildings shall maintain their character and achieve accessibility. By providing compliant bathrooms and vertical access, we believe that the building will meet the intent of the regulation while maintaining its character.

a. The Londonderry Town Hall is listed on the National Register of Historic Places. https://accdservices.vermont.gov/ORCDocs/Londonderry_NationalRegister__NominationForm_00000001.pdf
b. Further reading can be found in the National Park Service's Preservation Brief #32 "Making Historic Properties Accessible". https://www.nps.gov/orgs/1739/upload/preservation-brief-32-accessibility.pdf

4. A drinking fountain is required by the International Plumbing Code for this building type. If provided, it shall be accessible.

5. A Rough Order-of-Magnitude to make these improvements may be approximately $94,500 in construction cost.

Attachments

Attached to this cover letter:

1. Field Survey of Accessible Elements. This survey enumerates each item reviewed for compliance with ADA.
2. A property map, from online-available data is provided, showing the northerly property line.
3. Sketches are included depicting potential vertical conveyance solutions. Product information for the lift is also included.

Rough Order-of-Magnitude (ROM)

The following Rough-Order-of-Magnitude (ROM) is provided for the potential work. Cost projections are made based on preliminary visual inspections and are intended to provide a reasonable baseline for planning. Upon more detailed inspections, additional items and costs may be incurred and it is strongly recommended that a 20% contingency (in addition to the Estimate Contingency) be set aside to cover costs for conditions that cannot be seen in a preliminary, non-destructive investigation such as this one. Architectural and/or engineering fees, and other soft costs, are not included.

Rough Order-of-Magnitude	
1. Reconfigure Bathrooms	$15,000
2. New Vertical Conveyance, including small addition	$65,000
3. Move Light Fixture Controls	$2,500
4.	$0
5.	$0
6.	$0
7.	$0
Subtotal	**$82,500**

Estimate Contingency (15%)	**$12,000**
Total	**$94,500**

Conclusion

With the assessment, ROM, and intervention outlined below, the Londonderry Town Hall has the potential to maintain its historic character and internal program while updating the accessibility of its entry and bathrooms.

Sincerely,

Jon Saccoccio, AIA

Field Survey of Accessible Elements

Notes:

1. This assessment is based on visual observations and data collected by manual and digital measurement.
2. This field survey report is formatted to follow the Americans with Disabilities Standards for Accessible Design. The numbers shown below correspond to the ADA. Criteria may be omitted based on the particulars of the assessed building.

Priority 1: Approach and Entrance

	Accessible Route	
1.1	Is there at least one route from site arrival points (parking, passenger loading zones, public sidewalks and public transportation stops) that does not require the use of stairs? [206.2.1] ☑ **Yes** ☐ **No** **Comment:** An informal parking area is provided on the north side of the building. See Parcel Viewer, attached at end of this report, for approximate location of property line. Property line appears to approximately at the bottom of the slope up to the neighbor's property.	

	Parking	
1.2	If parking is provided for the public, are an adequate number of accessible spaces provided? [208.2] ☑ **Yes** ☐ **No** **Comment:** Gravel parking area on south side of building is provided; assume less than 25 spaces are provided, therefore one required ADA space is provided.	
1.4	Are accessible spaces at least 8 feet wide with an access aisle at least 5 feet wide? [505.2, 502.3] ☐ **Yes** ☑ **No**	

Comment: The dedicated gravel driveway is 12’-6” in width.

1.9 Does the access aisles adjoin an accessible route width of 36 inches minimum?

☑ **Yes**
☐ **No**

Comment: A gravel area connects the parking space to the ramp.

1.10 Are accessible spaces identified with a sign that includes the International Symbol of Accessibility?

Is the bottom of the sign at least 60 inches above the ground? [502.6]

☐ **Yes**
☑ **No**

Accessible Route to the Building

1.12 Of the total parking spaces, are the accessible spaces located on the closest accessible route to the accessible entrance(s)? [208.3.1]

☑ **Yes**
☐ **No**

Comment:

1.14 Is the route at least 36 inches wide? [403.5.1]

☑ **Yes**
☐ **No**

Comment: The route consists of the previously described parking, and a wood ramp. The route will navigate around the outswing doors at the main entrance.

1.17 Is the running slope no steeper than 1:20, i.e. for every inch of height change there are at least 20

inches of route run? [403.3]

If the running slope is steeper than 1:20, treat as a ramp and add features such as edge protection and handrails.

☐ **Yes**
☑ **No**

Comment: The slope is ±1:14, which is steeper than 1:20. It should be considered a ramp (and is).

1.18 Is the cross slope no steeper than 1:48? [403.3]

☑ **Yes**
☐ **No**

Comment: The cross slope does not exceed 1:48.

Ramps & Handrails

1.25 If there is a ramp is it at least 36 inches wide? [405.5]

Note: If there are handrails, measure between the handrails.

☑ **Yes**
☐ **No**

Comment: The dimension is 43” between handrails.

1.26 Is the surface stable, firm and slip resistant [405.4]

☑ **Yes**
☐ **No**

Comment: In it’s current state, the ramp conforms to this criterion. However, over time, it may be that the pressure treated decking becomes more slippery. Anti-slip tape could be added here.

1.27 For each section of the ramp, is the running slope no greater than 1:12, i.e. for every inch of height change there are at least 12 inches of ramp run?

[405.2]

Note: Rises no greater than 3 inches with a slope no steeper than 1:8 and rises no greater than 6 inches with a slope no steeper than 1:10 are permitted when such slopes are necessary due to space limitations.

☑ **Yes**
☐ **No**

Comment: Slope is ±1:14, which is shallower than 1:12.

1.28 Is there a level landing that is at least 60 inches long and at least as wide as a ramp:

At the top of the ramp?

At the bottom of the ramp?

[405.7.2, 405.7.3]

☑ **Yes**
☐ **No**

Comment: There is a concrete landing at the, top, 60” long, and as wide as the ramp.

1.30 If the ramp has a rise higher than 6 inches, are there handrails on both sides? [405.8]

Note: Curb ramps are not required to have handrails

☑ **Yes**
☐ **No**

Comment: There are handrails on both sides.

1.30.1 Does any run of the ramp exceed 30” in vertical change? [405.6]

☐ **Yes**
☑ **No**

Comment:

1.31 Is the top of the handrail gripping surface no less than 34 inches and no greater than 38 inches above the ramp surface? [505.4]

- ☑ **Yes**
- ☐ **No**

Comment:

1.32 Is the handrail gripping surface continuous and not obstructed along the top or sides? [505.3]

If there are obstructions, is the bottom of the gripping surface obstructed no greater than 20% [505.6]

- ☑ **Yes**
- ☐ **No**

Comment:

1.33 If the handrail gripping surface is circular, is it no less than 1 1/4 inches and no greater than 2 inches in diameter? [505.7.1]

- ☑ **Yes**
- ☐ **No**

Comment:

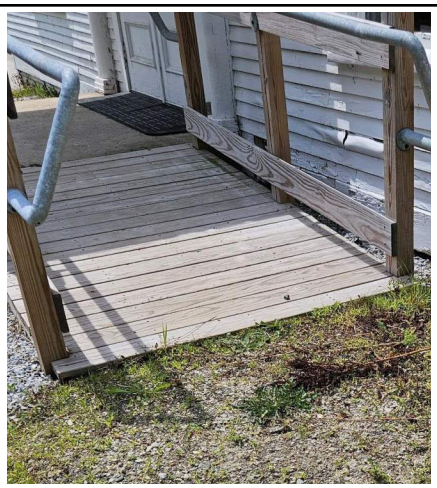
1.35 Does the handrail: Extend at least 12 inches horizontally beyond the top and bottom of the ramp and return to a wall, guard, or landing surface? [505.10.1]

- ☐ **Yes**
- ☑ **No**

Comment: The handrails return to the post, which is allowed. They do not extend 12”.

1.36 To Prevent wheelchair casters and crutch tips from falling off: Does the surface of the ramp extend at least 12 inches beyond the inside face of the handrail?

Or is there a curb or barrier that prevents the passage of a 4-inch diameter sphere? [405.9.1, 405.9.2]

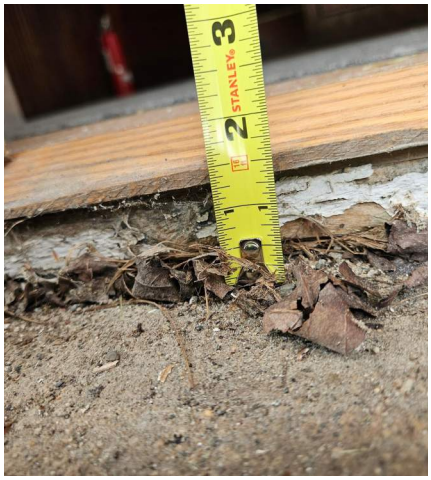


☑ **Yes**
☐ **No**

Comment: Barrier can be seen on each side.

Entrance

1.37 Is the main entrance accessible?



☐ **Yes**
☑ **No**

Comment: Door threshold exceeds maximum. Rubber mats are not securely fastened to the concrete. Their presence also creates potential cross slope issue at the top of the ramp.

1.38 If the main entrance is not accessible, is there an alternative accessible entrance?

☐ **Yes**
☑ **No**

Comment: There is a secondary entrance to the basement, but is not connected/accessible to the main level.

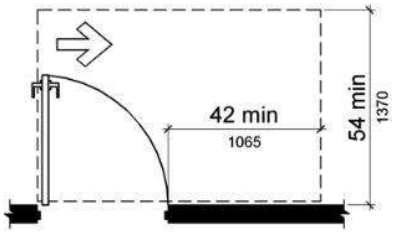
1.41 Is the clear opening width of the accessible entrance door at least 32 inches, between the face of the door and the stop, when the door is open 90 degrees? [404.2.3]

☐ **Yes**
☑ **No**

Comment: The primary (active) panel of the main entry door is 31 ½” in width.

1.42 If there is a side approach to the pull side of the door, is there maneuvering clearance as shown in the diagrams?

On both sides of the door, is the ground or floor surface of the maneuvering clearance level (no steeper than 1:48)? [404.2.4]



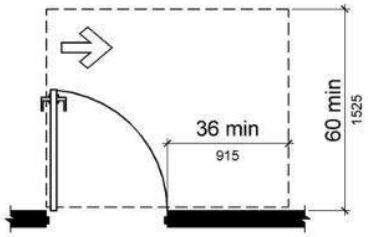
(e)
hinge approach, pull side

☑ **Yes**
☐ **No**

Comment: Ground surface is not steeper than 1:48.

The depth of the concrete landing is 70”, which exceeds 54” and 60” as shown.

Given the double door configuration, there is 54” measured from the latch side of the active door (in the closed position) southward to the edge of the concrete landing (as measured in front of the passive door).



(d)
hinge approach, pull side

1.43 Is the door threshold no more than 1/2 inch high? [404.2.5, 303.2]

Existing thresholds may be 3/4 inch high with a beveled edge.

Note: The first 1/4 inches of the 1/2 or 3/4 inch threshold may be vertical; the rest must be

beveled.

☐ **Yes**
☑ **No**

Comment: The door threshold is ± 1 ½” in height.

1.44 Is the door equipped with hardware that is operable with one hand and does not require tight grasping, pinching or twisting of the wrist? [404.2.7]

☐ **Yes**
☑ **No**

Comment: Knobs are not compliant.

1.45 Are the operable parts of the door hardware no less than 34 inches and 48 inches above the floor or ground surface? [404.2.7]

☐ **Yes**
☑ **No**

Comment: The bottom of the knob is less than 34” above the floor.

Priority 2: Access to Goods and Services

2.1 Does the accessible entrance provide direct access to main floor, lobby and elevator? [206.4]

☑ **Yes**
☐ **No**

Comment: There is a level floor/transition from the lobby to the main room.

	Interior Accessible Route
2.2	Are all public spaces on at least one accessible

route? [206.2.4]

☐ **Yes**
☑ **No**

Comment: There is not an interior accessible route to all usable areas.

2.9 Are there elevators or platform lifts to all public stories?

☐ **Yes**
☑ **No**

Comment: The basement, approximately ½ story below the main level is not served by an elevator.

Signage

2.38 If there are signs designated permanent rooms and spaces not likely to change over time, e.g. room numbers and letters, room names, and exit signs: [216.2]

Do text characters contrast with their backgrounds? [703.5]

Are text characters raised? [703.2]

Is there Braille? [703.3]

Is the sign mounted:

On the wall on the latch side of the door? [703.4.2]

Note: Signs are permitted on the push side of doors with closers and without hold-open devices.

Does the sign have clear floor space beyond the arc of the door swing between the closed position and 45-degree open position, at least 18 x 18 inches centered on the tactile characters?*

**Note: If constructed before 3/15/2012 and a person may approach within 3 inches of the sign without encountering protruding objects or standing within the door swing, relocation not required*

So the baseline of the lowest character is at least 48 inches above the floor and the baseline of the highest character is no more than 60 inches above the floor?**

***Note: If constructed before 3/15/2012 and mounted no higher than 60 inches to the centerline of the sign, relocation not required.*

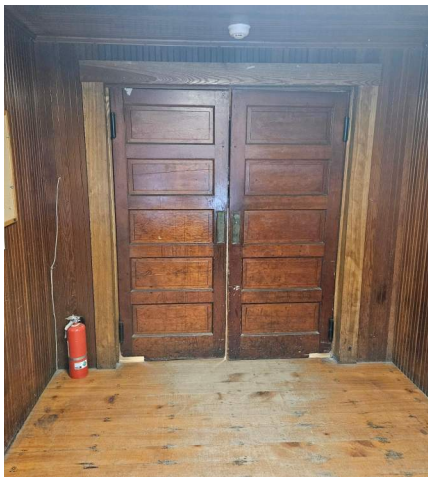
Note: If the sign is at double doors with one active leaf, the sign should be on the inactive leaf; if both leaves are active, the sign should be on the wall to the right of the right leaf.

☐ **Yes**
☑ **No**

Comment: Signage is not provided throughout the building.

Interior Doors

2.40 Is the door opening at least 32 inches clear, between the face of the door and stop, when the door is open 90 degrees? [405.2.3]



☑ **Yes**
☐ **No**

Comment: Each leaf in the double door is 31" wide. With both doors open, this requirement is met.

2.43 Is the door equipped with hardware that is operable with one hand and does not require tight grasping, pinching or twisting of the wrist? [404.27]

☑ **Yes**
☐ **No**

Comment: The door can be pushed open from either side.

2.45 Can the door be opened easily (5 pounds maximum force)? [404.2.9]

Note: You can use a pressure gauge or fish scale to measure force. If you do not have one you will need to judge whether the door is easy to open.

☑ **Yes**
☐ **No**

Comment:

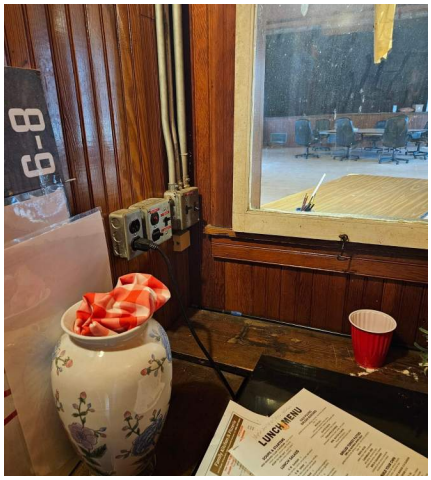
Controls

2.5 Is there clear floor space at least 30 inches wide by at least 48 inches long for a forward or parallel approach? [305.3]

Are the operable parts no higher than 48 inches above the floor? [309.3, 308]

☐ **Yes**
☑ **No**

Comment: The lighting controls for the main room are located in the office, which is not accessible.



Priority 3: Toilet Rooms

3.1 If toilet rooms are available to the public, is at least one toilet room accessible? (Either one for each sex, or one unisex.)

☑ **Yes**
☐ **No**

Comment: Both are designated gender neutral.

Note that the existing toilet rooms are not accessible.

Signs at Toilet Rooms

3.5 Do text characters contrast with their backgrounds? [703.5]

Are text characters raised? [703.2]

Is there Braille? [703.3]

Is the sign mounted:

On the wall on the latch side of the door? [703.4.2]

Note: Signs are permitted on the push side of doors with closers and without hold-open devices.

Does the sign have clear floor space beyond the arc of the door swing between the closed position and 45-degree open position, at least 18 x 18 inches centered on the tactile characters?*

**Note: If constructed before 3/15/2012 and a person may approach within 3 inches of the sign without encountering protruding objects or standing within the door swing, relocation not required. [703.4.2]*

Is the baseline of the lowest character at least 48 inches above the floor and the baseline of the highest character is no more than 60 inches above the floor?**

***Note: If constructed before 3/15/2012 and mounted no higher than 60 inches to the centerline of the sign, relocation is not required.* [703.4.1]

Note: If the sign is at double doors with one active leaf, the sign should be on the inactive leaf; if both leaves are active, the sign should be on the wall to the right of the right leaf.

☐ **Yes**
☑ **No**

Comment: Braille is not provide. Signage cannot be provided on the door itself. ADA conformance is not indicated.

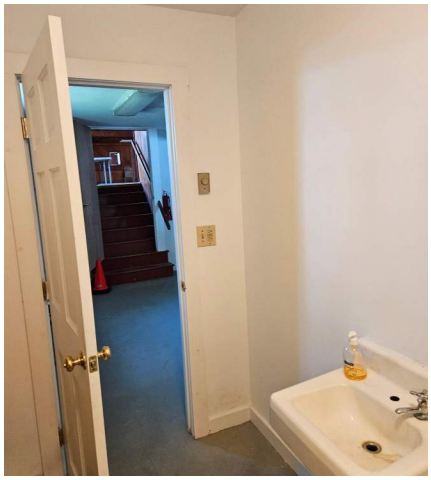
Entrance (to Toilet Rooms)

3.6 Is the door opening width at least 32 inches clear, between the face of the door and the stop, when the door is open 90 degrees? [404.2.3]

☐ **Yes**
☑ **No**

Comment: The door is 30”.

3.7 If there is a front approach to the pull side of the door is there at least 18 inches of maneuvering clearance beyond the latch side plus 60 inches clear depth?



Note: See 2010 Standards 404.2.4 for maneuvering clearance requirements on the push side of the door and side approaches to the pull side of the door.

On both sides of the door, is the floor surface of the maneuvering clearance level (no steeper than 1:48)? [404.2.4]

☐ **Yes**
☑ **No**

Comment: 18” is not provided on the pull side.

3.8 If the threshold is vertical Is is it no more than ¼ inch high?

OR

No more than ½ inch high with a sloped section beveled no steeper than 1:2?

OR

No more than ¾ inch high with a sloped section beveled no steeper than 1:2 (If installed since 1/26/93)?

[404.2.5, 303.2]

Note: The first ¼ inch of the ½ or ¾ inch threshold may be vertical; the rest must be beveled.

☑ **Yes**
☐ **No**

Comment: Flooring is at the same height throughout basement.

3.9 Is the door equipped with hardware that is operable with one hand and does not require tight grasping, pinching or twisting of the wrist?

Door handle?

Lock (if provided)?

[404.2.7]

☐ **Yes**
☑ **No**

Comment: Knob is provided, which is non-compliant.

3.10 Are the operable parts of the door hardware mounted no less than 34 inches and no greater than 48 inches above the floor? [404.2.7]

☑ **Yes**
☐ **No**

Comment:

3.11 Can the door be opened easily (5 pounds maximum force)? [404.2.9]

Note: You can use a pressure gauge or fish scale to measure force. If you do not have one you will need to judge whether the door is easy to open.

☑ **Yes**
☐ **No**

Comment:

Toilet Room

3.16 Is there a clear path to at least one of each type of fixture, e.g. lavatory, hand dryer, etc., that is at least 36 inches wide? [403.5.1]

☑ **Yes**
☐ **No**

Comment:

3.17 Is there clear floor space available for a person in a wheelchair to turn around, i.e. a circle at least 60 inches in diameter or a T-shaped space within a 60-inch square? [603.2.1]

Note: The door to the toilet room may swing into the required turning space

☐ **Yes**
☑ **No**

Comment: The width of the bathrooms is 56”.

Lavatories

3.21 Does at least one lavatory have a clear floor space for a forward approach at least 30 inches wide and 48 inches long? [606.2]

☑ **Yes**
☐ **No**

Comment:

3.23 Is the front of the lavatory or counter surface, whichever is higher, no more than 34 inches above the floor? [606.3]

☑ **Yes**
☐ **No**

Comment:

3.24 Is there at least 27 inches clearance from the floor to the bottom of the lavatory that extends at least 8 inches under the lavatory for knee clearance? [396.3.3]

☐ **Yes**
☑ **No**

Comment: The lavatory installed height is not compliant.

3.25 Is there toe clearance at least 9 inches high? [306.3.3]

☑ **Yes**
☐ **No**

Comment:

3.26 Are pipes below the lavatory insulated or otherwise configured to protect against contact? [606.5]

☐ **Yes**
☑ **No**

Comment:

3.27 Can the faucet be operated without tight grasping, pinching, or twisting of the wrist?

Is the force required to activate the faucet no greater than 5 pounds? [606.4]

☐ **Yes**
☑ **No**

Comment: description

Water Closets

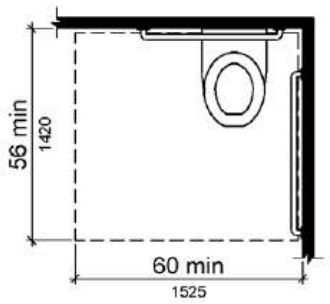
3.30 Is the centerline of the water closet no less than 16 inches and no greater than 18 inches from the side wall or partition? [604.2]

☑ **Yes**
☐ **No**

Comment: Centerline of the fixture is 16”.

3.31 Is clearance provided around the water closet measuring at least 60 inches from the side wall and at least 56 inches from the rear wall?

[604.3.1]



☑ **Yes**
☐ **No**

Comment: The depth of the bathroom is compliant at 56”. Although the baseboard heater encroaches on this dimension. There is not 60” clearance measured from the side wall, the lavatory interferes.

3.32 Is the height of the water closet no less than 17 inches and no greater than 19 inches above the floor measured to the top of the seat? [604.4]

☐ **Yes**
☑ **No**

Comment: Appears to be a residential style toilet, seat is 15” above the floor.

3.33 Is there a grab bar at least 42 inches long on the side wall?

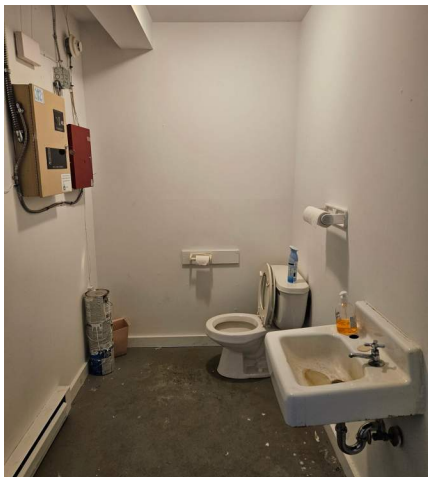
Is it located no more than 12 inches from the rear wall?

Does it extend at least 54 inches from the rear wall? [604.5.1]

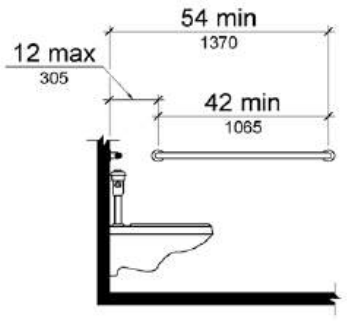
Is it mounted no less than 33 inches and no greater than 36 inches above the floor to the top of the gripping surface? [609.4]

Is there at least 12 inches clearance between the grab bar and projecting objects above?*

Is there at least 1½ inches clearance between the grab bar and projecting objects below?*



**Note: If constructed before 3/15/2012 grab bars do not need to be relocated; there are no space requirements above and below grab bars in the 1991 Standards.*



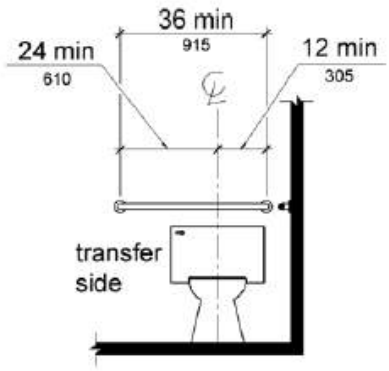
Is the space between the wall and the grab bar 1 ½ inches?

[609.3]

☐ **Yes**
☑ **No**

Comment:

3.34 Is there a grab bar at least 36 inches long on the rear wall?



Does it extend at least 12 inches from the centerline of the water closet on one side (side wall)?

Does it extend at least 24 inches on the other (open) side?

[604.5.2]

Is it mounted no less than 33 inches and no greater than 36 inches above the floor to the top of the gripping surface? [609.4]

Are there at least 12 inches clearance between the grab bar and protruding objects above?*

Are there at least 1 ½ inches clearance between the grab bar and projecting objects below?*

**Note: If constructed before 3/15/2012 grab bars do not need to be relocated; there are no space requirements above and below grab bars in the 1991 Standards.*

Is the space between the wall and the grab bar 1 ½ inches? [609.3]

☐ **Yes**
☑ **No**

Comment:

3.35 If the flush control is hand operated, is the operable part located no higher than 48 inches above the floor? [604.6]

☑ **Yes**
☐ **No**

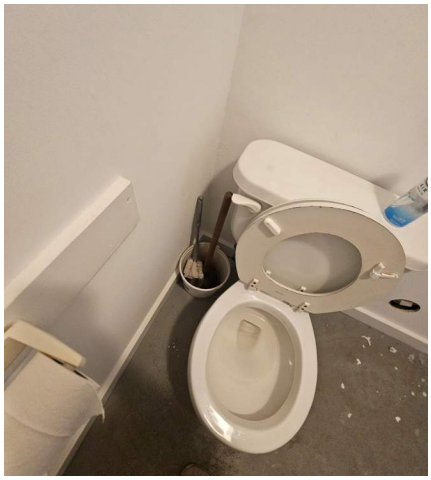
Comment:

3.36 If the flush control is hand operated, can it be operated with one hand and without tight grasping, pinching, or twisting of the wrist? [605.4]

☑ **Yes**
☐ **No**

Comment:

3.37 Is the flush control on the open side of the water closet? [604.6]

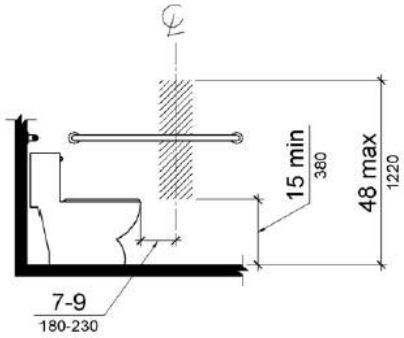


☐ **Yes**
☑ **No**

Comment: The flush control is inaccessible.

3.38 Is the toilet paper dispenser located no less than 7 inches and no greater than 9 inches from the front of the water closet to the centerline of the dispenser?

Note: If constructed before 3/15/2012 dispenser does not need to be relocated if it is within reach from the water closet seat; the 1991 Standards do not specify distance from the front of the water closet. [604.7]



☐ **Yes**
☑ **No**

Comment: Horizontal centerline is ~10”.

3.39 Is the outlet of the dispenser:

Located no less than 15 inches and no greater than 48 inches above the floor?

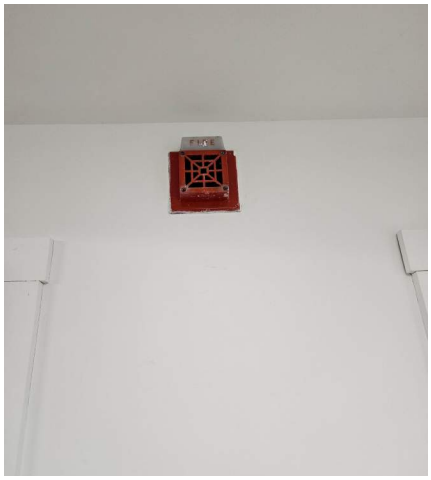
Not located behind grab bars? [604.7]

☑ **Yes**
☐ **No**

Comment: description

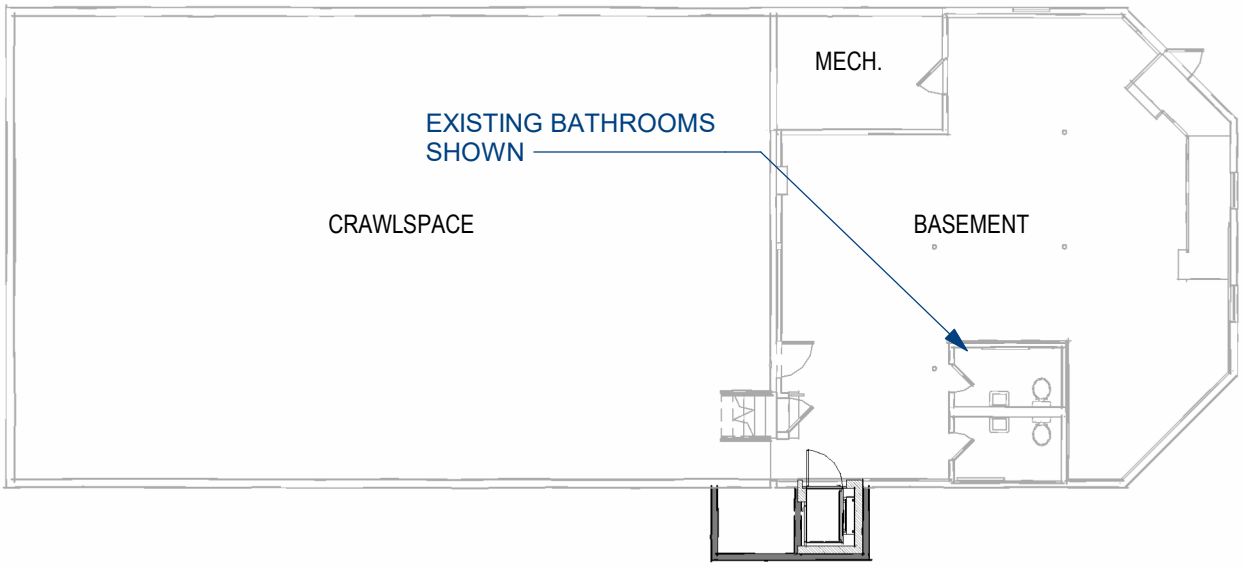
Priority 4: Additional Access

4.20 If there are fire alarm systems, do they have both flashing lights and audible signals? [702.1]

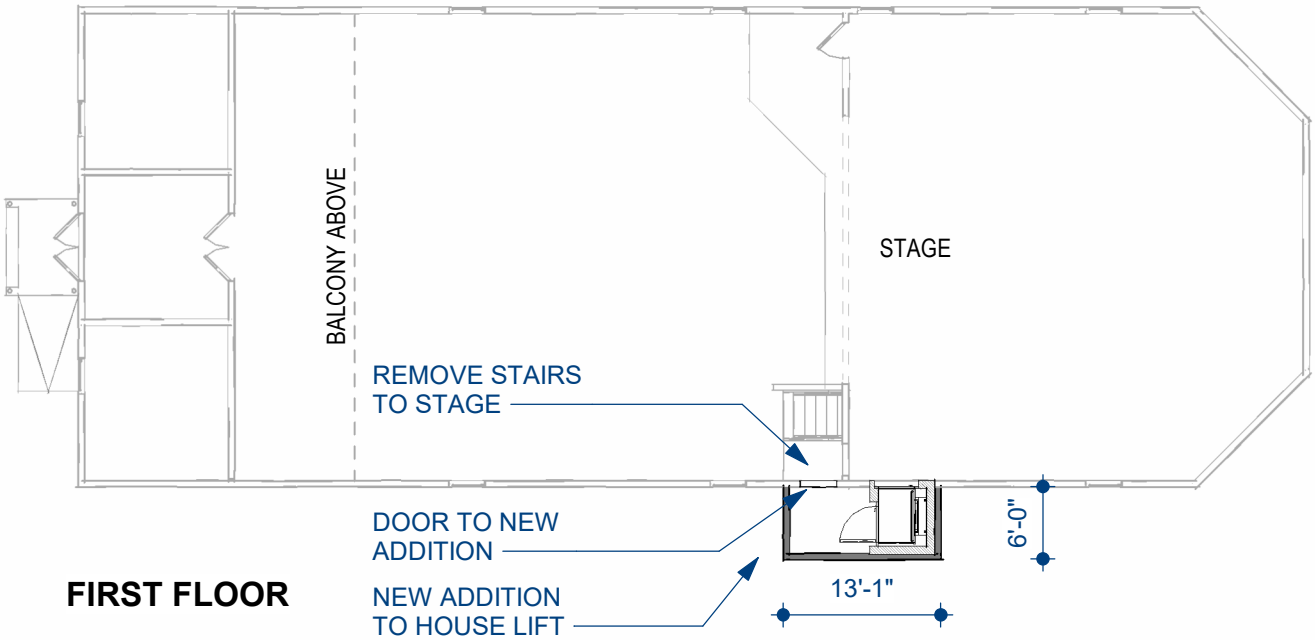


☑ **Yes**
☐ **No**

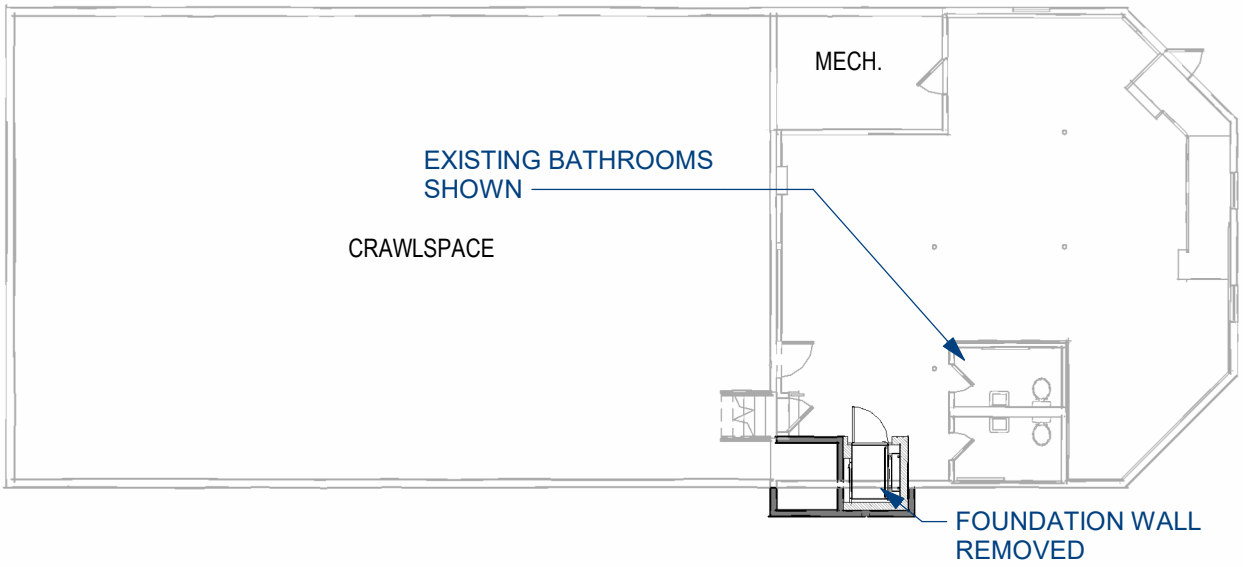
Comment:



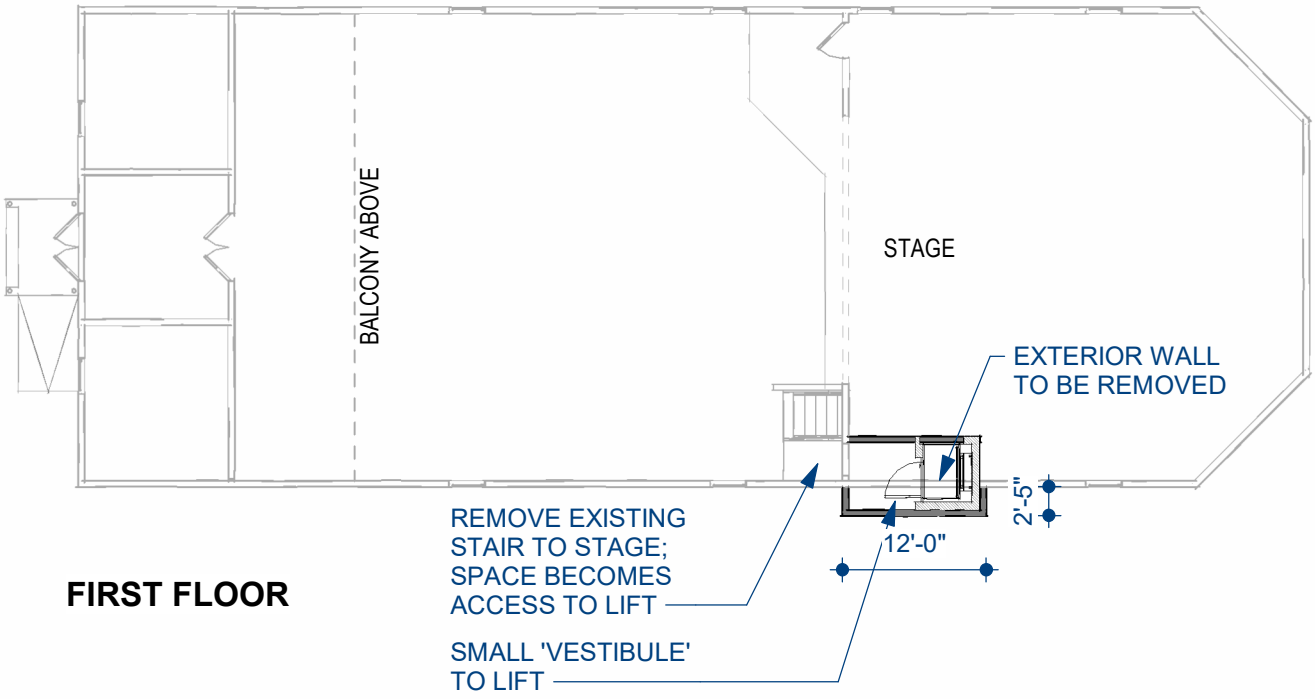
BASEMENT



FIRST FLOOR



BASEMENT



FIRST FLOOR

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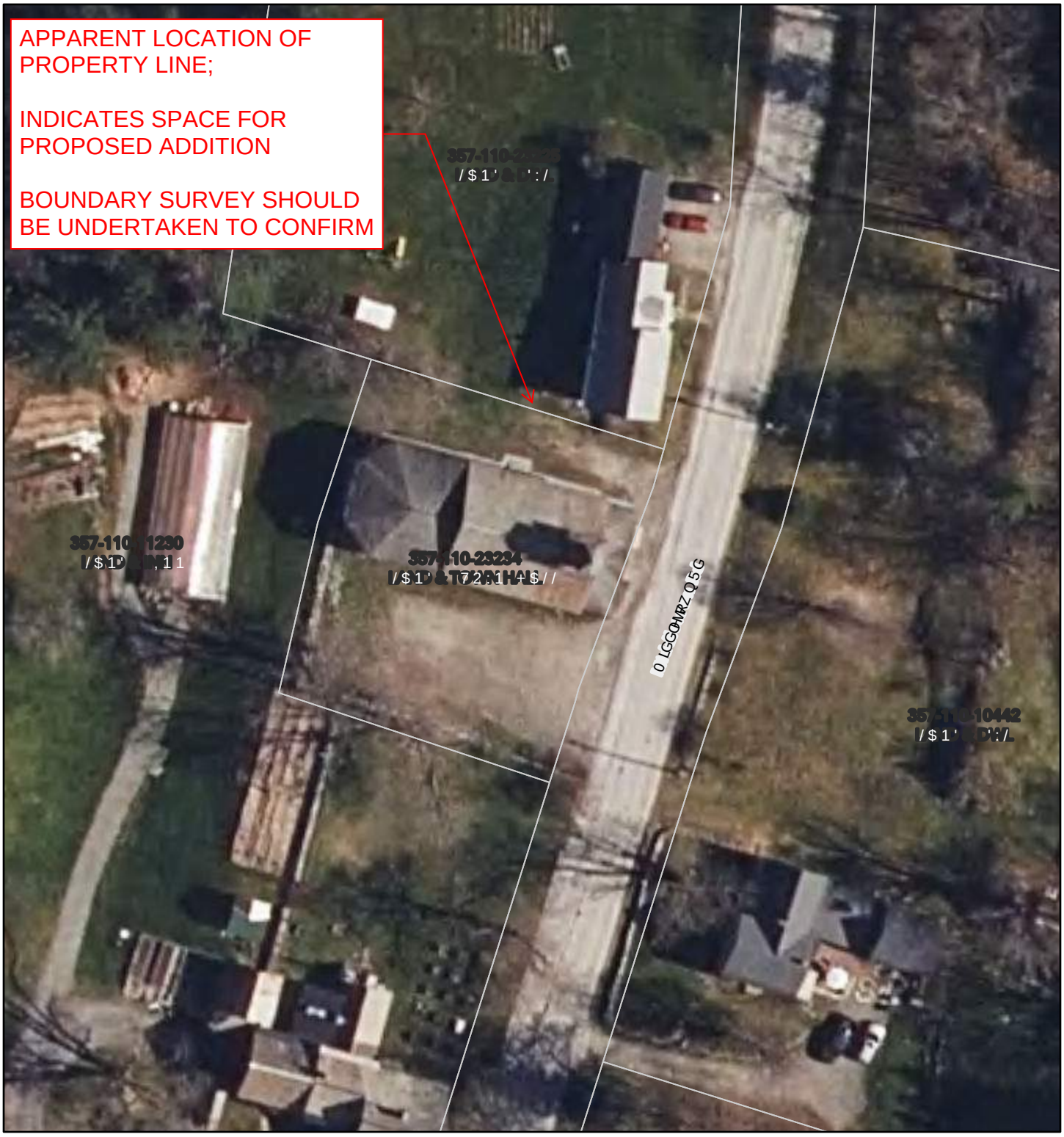

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PL

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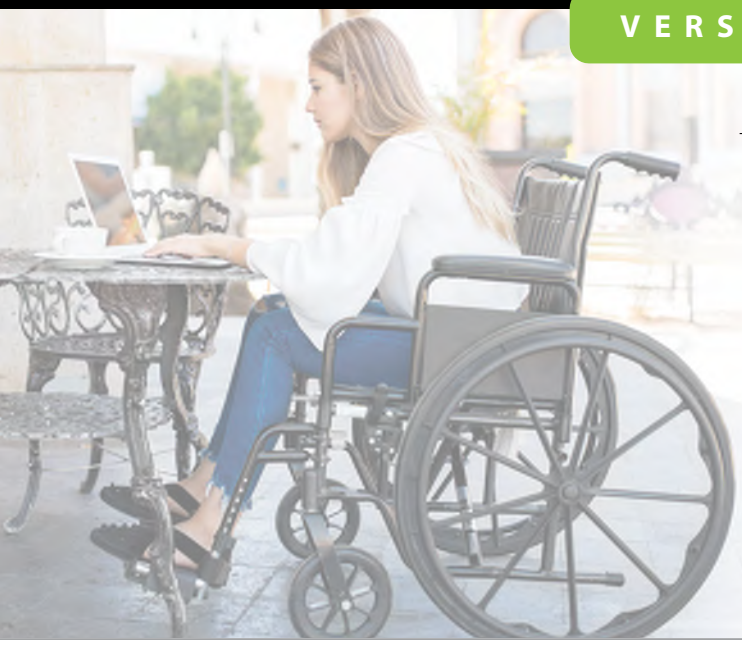
9&*, (VUL &RPPXQLW\ 0DSV &RQWULEXWRUV 9&*, 0LFURVRIW (VUL 7RP7RP *DUDLQ 6DIH*UDSK *HR7H 1$6$ 86*6 (3$ 136 86 &HQVXV %XUHDX 86'$ 86):6

Suitable for virtually any architectural requirements including public spaces and home use

Ideal for indoor or outdoor applications from basic installations to large-scale, complex projects

Finish options including frameless glass for the ultimate in luxury for upscale commercial applications

Savaria® V-1504 Vertical Platform Lift



VERSATILITY FOR ANY APPLICATION

The Savaria V-1504 vertical platform lift is built to carry a wheelchair and passenger safely up and down one or more levels.

Suitable for installations in public and commercial buildings, as well as private homes, this Savaria lift features an extremely versatile design that can be configured and customized to suit virtually any project requirements and aesthetic needs. From the rugged outdoors, to the most luxurious office tower lobbies, the Savaria V-1504 lift is ready to serve with its reliable performance, ease of use and range of finish options.

savaria®

SAVARIA® V-1504 VERTICAL PLATFORM LIFT

The Savaria V-1504 vertical platform lift is available in a range of base models, all with options and configurations for customization to your needs. Please consult your local skilled Savaria dealer for complete details and local requirements for installation compliance.

STANDARD (V-1504 STD)

Ideal for basic commercial applications and home use, this lift can be used indoors and outdoors to travel a standard 48" with 2 stops or optionally more distance and stops. The standard unit can be custom enclosed on site by your local installer, or built inside a hoistway.

Order the V-1504 in standard beige powder-coated finish, or choose an optional custom color. Popular for use in schools, places of worship and other public spaces, the standard model can be outfitted with a range of options to suit the installation need.

Installation notes:

1. *Custom brown paint, gate with glass inserts (photo courtesy of Transitions Mobility & Elevator)*
2. *Hoistway application*
3. *Unenclosed outdoor residential (photo courtesy of Elevators of Texas)*
4. *Tall enclosure with acrylic inserts (photo courtesy of Florida Lifts)*
5. *Enclosure with aluminum inserts (photo courtesy of Access Lifts & Service)*
6. *Prestige frameless glass with custom red tower*

ALUMINUM/ACRYLIC MODEL (V-1504 ALPE)

This enclosed model uses aluminum and acrylic inserts and top dome with corrosion-resistant steel components, making it ideal for outdoor applications. Optionally, this model can be ordered with tempered* or laminated glass panels. The active ventilation system keeps the inside comfortable and the gates and door can be motorized.

LUXURY FRAMED (V-1504 LUX)

Framed in 316 stainless steel finish No. 4, with tempered or laminated glass inserts, this lift is a beautiful complement for lobby areas, offices and public buildings.

PRESTIGE FRAMELESS (V-1504 PRESTIGE)

With half-inch structural tempered or tempered laminated glass and no visible frame, this lift is the ultimate statement for creating barrier-free access in commercial applications.

Every Savaria V-1504 model is driven by our reliable hydraulic system and can be configured specifically for your needs. The lift travels up and down a rail system enclosed in the lift tower. The tower is supported with attachment to an existing wall or through a constructed hoistway. Because the drive system is contained within the lift tower, no additional machine room is required for installation.

SMOOTH HYDRAULIC 2:1 CHAIN DRIVE SYSTEM

The lift provides a high efficiency, reliable and comfortable ride.

LARGE PLATFORM FOR EASY ACCESS

The standard platform is 36" by 54" (ADA compliant), and custom platform sizes are also available. The non-skid surface provides added safety.

FLEXIBLE DESIGN

Configure up to 23' of travel distance* with up to four stops, with a full range of entrance and exit configurations available.

EXTENSIVE FINISH OPTIONS

Choose standard beige powder coat, select from the optional color finishes, or even request your own custom color. Enclose your lift with acrylic or glass panels.

EMERGENCY BACK-UP SYSTEMS

In addition to a manual lowering system, the lift features a DC battery powered lowering system for use in the event of a power failure. Optionally, a battery back-up operating system can be added to allow full functionality of the lift for emergencies.

EASY OPERATION

On-board controls operate the lift easily with constant pressure. Optional call/send stations can be added with or without key access. Add an optional joystick, 60 mm buttons, or additional operating panel to add even more flexibility for user needs.

MACHINE ROOMLESS

The Savaria V-1504 does not require a machine room to house the drive component, simplifying the installation process. Alternatively, the drive system can be located in a remote machine room for ultra-quiet operation.

** consult your authorized Savaria dealer for complete specifications applicable to your local code requirements*

Savaria® V-1504 Vertical Platform Lift

VERSATILITY FOR ANY APPLICATION

OPTIONS

Platform gate, top landing gate, upper/lower landing door, emergency light and alarm, motorized door, frame-mounted, wall-mounted, recessed or free-standing call stations, public building package, outdoor package, battery back-up system for up/down operation, fire-rated doors, wooden door, automatic swing door operator, doors with glass or acrylic inserts, interlock, weather resistant lock, telephone, ADA-hands free phone, folding seat, automatic safety ramp, fixed access ramp, Savaria Link wifi diagnostics and more.

SPECIFICATIONS

Applications	Residential (indoor/outdoor), Commercial (indoor/outdoor), consult local dealer for details
Capacity	750 lb (340 kg)
Maximum travel distance	23' (7 m), 12' to 14' (3.65 to 4.26 m) in some jurisdictions
Platform sizes	36" x 54" (914 mm x 1371 mm) ADA-compliant, (customize up to 17.5 sq.ft./1.63 sq. m)
Nominal speed	20 ft/min (0.1 m/s)
Levels/stops	2 to 4 stops
Car access/configurations	Enter/exit same side, 90 degree exit, straight through enter/exit
Power supply	110 volt, 20 amp, single phase, 60 Hz
Drive system	2:1 roller chain, hydraulic
Motor pump	3 hp, gear-type
Controller	Relay logic
Emergency operation	Battery-operated lowering with automatic recharging system, plus remote access manual lowering valve optional battery backup
Rail construction	8' modular guide rail assembly with roller guide shoes
Side guards	42 1/8" (1070 mm), 80" (2032 mm) optional
Finish	Powder coated steel beige, optional and custom colors available
Warranty	36 months parts, ask for details

For drawings, detailed specifications and a complete list of options for your Savaria V-1504 vertical platform lift, consult your local authorized Savaria dealer. To locate a dealer near you, visit savaria.com, or call us.

Talk to a Savaria dealer about how the V-1504 vertical platform lift can give you the access you need.

Authorized Savaria dealer:

savaria®

savaria.com

2 Walker Drive Brampton ON L6T 5E1 Canada

tel: 800.661.5112 **fax:** 905.791.2222