2018

Town of Richmond, VT
Facilities Assessment

BreadLoaf
Architects
Planners
Builders

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Executive Summary

During the winter of 2017/2018 Bread Loaf Corporation worked closely with the Town of Richmond to provide conditions assessments for the Richmond Volunteer Fire Station, the Richmond Free Library, and the Richmond Town Center Building. Bread Loaf worked with Geoffrey Urbanik, Richmond Town Manager, Librarian Rebecca Mueller and Assistant Fire Chief Jerry Levesque. The team made several walk-throughs and assessments of the three facilities, evaluating each building for code compliance, accessibility, general building condition, HVAC and electrical system review and an overview of each space and how well they currently function.

This document consists of code analysis and accessibility review for each space and function. Each section provides conditions assessments that will help understand opportunities to improve life safety and code compliance, health and safety of the users, overall short and long term maintenance and identify areas to improve building efficiency. Finally, the report focuses on the potential costs for addressing each building's top priority. These priorities have been categorized in three ways: Code and Life safety issues as the highest priority, Health and Welfare items as the next priority, and General recommendations and function as the third priority in this budgeting exercise.

Note: As projects are undertaken in all of these buildings, changes could invoke a full code review by local or state officials. This analysis could potentially bring about additional issues and added projects. Our analysis is based on the existing conditions and addresses each issue as a separate project, with its own distinct budget.

Richmond Volunteer Fire Department

Richmond Volunteer Fire Department

Site Plan

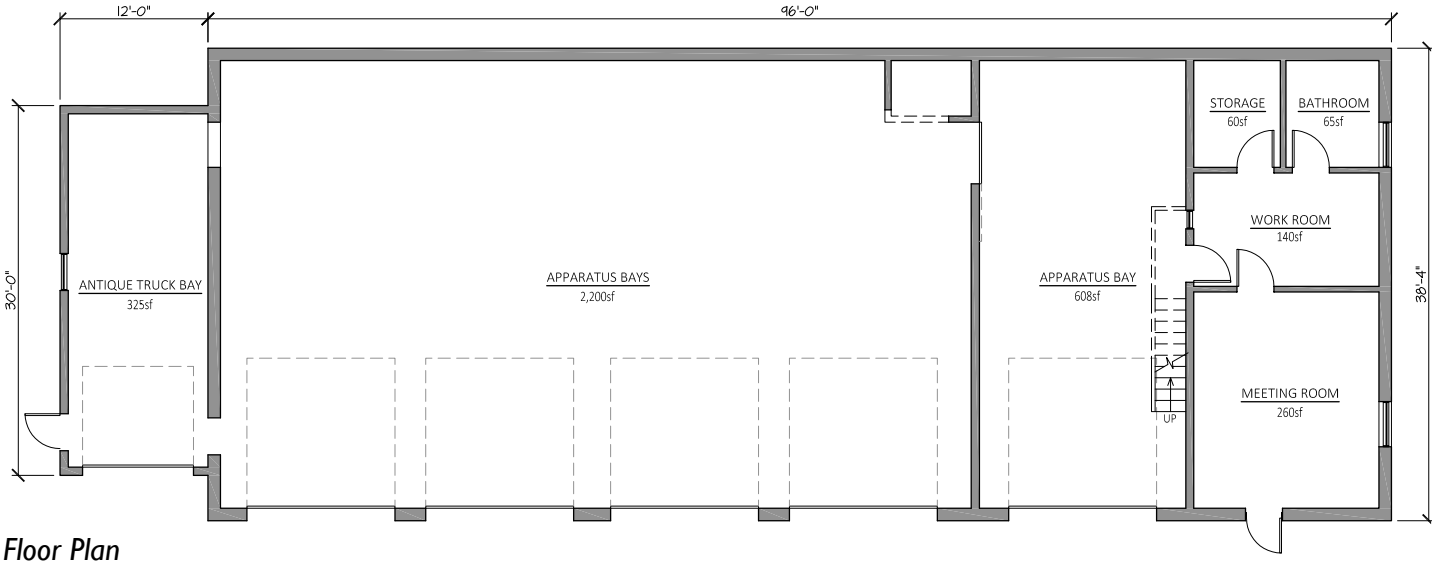
General Information

Richmond Volunteer Fire Department is located at 357 East Main Street in Richmond, Vermont. The station serves an area of approximately 32.3 square miles with 250 average annual calls. There are approximately 18 volunteer fire-fighters serving RVFD.

RVFD has five apparatus located at the station including:

Engine 1 - 2011 HME Ahrens Fox 1250
Engine 2 - 2016 Spartan 1250
Engine 3 - 2001 International 1250
Brush 1 - 2008 Chevy
Rescue 1 - 2006 International Heavy Rescue
Future 2018 - New Pumper Apparatus To Replace Engine 3

The existing station is a 5-bay brick veneer over CMU block building with an asphalt shingle roof over wood trusses. The building was first constructed as a Police Station in the 1970's and consisted of the area that is now the meeting room and the adjacent Apparatus Bay.



Floor Plan

Existing Site Constraints

SITE ACCESS

The town owned, 0.65 acre site is accessed directly off of Route 2. Responders entering the site during an emergency would potentially have to avoid exiting apparatus. Visibility to the east is restricted by trees and Route 2 turning back to the Northeast creating a safety hazard as responding fire apparatus turn on to Route 2. Visibility to the west is adequate.

APRON

The asphalt apron slopes steeply away from the building to its intersection with Route 2. This creates a steep approach angle at the overhead doors and makes it difficult for maneuvering apparatus against the slope. The asphalt is in poor condition and there is an ongoing problem with a section of pavement near the Meeting Room entrance that continually sinks. The absence of a proper swale or drain at the intersection of Route 2 and the apron make it susceptible to icing in the winter.

PARKING

Considering the space necessary to maneuver apparatus into their respective bays, the site appears to have parking spaces for 10 vehicles, however, in responding to a call, the vehicles are double stacked.

SITE LIGHTING

There is minimal existing site lighting. There are two, old building mounted lights. In a modern facility, each overhead door would have a light above it. Also, per code, the door to the meeting room is required to have a light over it to meet egress requirements.

Steep apron approach from Route 2

Patched sink hole

Ice build up at overhead doors

Existing Building Assessment

Wood framed antique truck bay

EXTERIOR WALL

The structure is comprised of CMU block with a brick veneer. Vermiculite cavity insulation could not be verified for this assessment. The brick veneer appears to be in good condition. However, there is a significant amount of mortar damage near the base of the wall from the application of salt to the apron.

ROOF

The asphalt shingles appear to be in fair condition. Existing gutters are falling off of fascia board causing water to fall in front of overhead doors causing ice build up during winter months.

OVERHEAD DOORS

The overhead doors are in poor condition. There is rotting wood visible at all of the jambs where they meet the concrete slab. The panels on the doors are warping. Vinyl weather-stripping has hardened and chipped in multiple locations. The overhead door remote operators will not close the doors once a truck has exited a bay, causing the firefighters to exit the truck, re-enter the building and close the doors from inside.

Apparatus Bay overhead doors with inadequate lighting

Existing Building Assessment

INTERIOR CONDITIONS

APPARATUS BAY

The apparatus bay is just deep enough to fit the trucks that RVFD currently has in service. Circulation space in front of and behind the trucks is very tight and this is a limiting factor when it comes time to upgrade to newer fire apparatus, which average 38 feet long. Space between the trucks is also tight, resulting in insufficient space to lay out and dry the hoses. The concrete slab is in fair condition but there is some damage around the floor drains. The existing truck fill system is comprised of a plastic 1,000 gallon tank which feeds into an overhead PVC pipe with a small diameter soft hose above each truck. This results in a very long fill time per truck.

TRAINING ROOM

The training room is approximately 260sf and is used for department meetings and training. The space is too small to adequately hold 18 firefighters in a meeting or training setting. The wood paneling on the walls is in poor condition. The floor is painted concrete and is in fair condition.

OFFICE / WORKROOM

There is a very small workroom located adjacent to the training room. It has a small workbench to service SCBA equipment and a workstation for the department radio. There are no exterior windows in the space. The overall quality of the space is poor.

BATHROOM

There is one small bathroom in the building. It does not meet ADA requirements for accessibility and would be required to be updated and enlarged during a renovation. There is a small free standing, fiberglass shower that is not used by department personnel due to its small size and poor condition.

Tight space at hose storage and back of trucks

Undersized training room

Existing Building Assessment

Non compliant bathroom layout

Existing, undersized truck fill tank

LIFE SAFETY & ADA ASSESSMENT

- No existing exhaust containment system.*
- No existing carbon monoxide or nitrogen dioxide detection systems.*
- No existing decontamination room.
- No existing washer and dryer for turnout gear.
- No exit signs or emergency lights within the building.
- No exterior horn strobe.
- No egress light over exterior meeting room door.
- Building generator is stand-by only, not life safety and therefore the building is lacking required emergency lighting.
- Bathroom does not meet ADA requirements for clearances around fixtures and lack of grab bars.
- The apparatus bays are required to have two egress doors. Currently, there is only one in the antique truck bay.

*These systems are used to meet emission-reduction goals set forth in the applicable laws, regulations, and standards including Environmental Protection Agency 2007 Highway Diesel Rule (EPA07); NFPA 1500 (Section 9); OSHA; the International Code Council (Building Code); and United States Fire Administration's Assistance to Firefighters Grant Program Guidelines.

Existing Building Assessment

MECHANICAL SYSTEMS

As listed under the Code Assessment portion of the survey, this building is lacking in code required systems related to vehicle exhaust containment and carbon monoxide and nitrogen dioxide detection. Applicable systems include but are not limited to direct-source capture using hoses; direct-source capture using filtration; general filtration and exhaust systems for the apparatus bays. Ventilation air is not provided per current codes. A small energy recovery unit should be provided for the meeting and office areas at a minimum. The building is heated with a Weil-McLain GV-90+ 91% efficient natural gas boiler installed less than one year ago. The heating system has a median service life of 25 years. The system has for zones as follows:

1. Large Apparatus Bay
2. Small Apparatus Bay
3. Meeting and Office Area
4. Domestic Hot Water

The building is heated via:

1. Six (6) Hot water Modine type unit heaters for apparatus bays.
2. Hot water fin tube radiation in Meeting and Office area.
3. The equipment has a service life of 25 plus years and appears to have been replaced within the last 10 years.
4. Controls of unit heaters and fin tube is via manual thermostats.

None of the heating hot water copper piping distribution system is insulated and should be a future consideration. The piping system is in fair condition but will require repairs over the next 10 years due to corrosion of pipes and fittings. The building has a toilet exhaust fan venting to the outside. No outside air or ventilation air is provided. Four ceiling de-stratification fans serve the apparatus bays. Fans are on manual control. Compressed air is provided by a portable air compressor and tied into a copper compressed air distribution system via a flexible air hose.

Two-bulb T8 fluorescent light fixtures

Boiler in apparatus bay

Air and power supply from apparatus bay ceiling

Existing Building Assessment

Corrosion of water service pipe

Modine heater in antique truck bay

Floor drain in apparatus bay

PLUMBING SYSTEMS

The building is fed via a ¾" town water service to a 1,000 gallon plastic storage tank. The fill system is 1.5" PVC and is failing. The PVC line should be replaced in the near future. Upon discussion with the Town of Richmond water authority, it was determined that the water service is protected by a backflow preventer in the exterior meter pit. Domestic hot water is provided by a SuperStor SSU-30 indirect water heater fed from the building boiler zone #4. The indirect heater is less than one year old and has an anticipated service life of 20 plus years. The system has a code compliant mixing valve. The domestic hot water piping however is uninsulated and should be insulated to meet current energy codes.
The piping system is in fair condition but will require repairs over the next 10 years due to corrosion of pipe and fitting.

ELECTRICAL SYSTEMS

The building generator is a stand by generator, not a life safety generator and consequently the building is lacking code compliment emergency lights. The building is served by a 200 amp main service Panel A with a main breaker. Panel A serves two sub panels (B&C). The distribution system is primarily conduit and wire. An older GFI system is in place but it is unclear if it is functional. Lighting fixtures are a combination of T-8 32 watt and 40 watt T-12. There are no motion or automatic lighting controls with the exception of a time clock.

FIRE PROTECTION SYSTEMS

There is a Fire-Lite MS-10UD Fire Alarm Control panel and System. We anticipate the system will be serviceable for ten plus years. The fire alarm system incudes smoke detectors, pull stations, and horn strobes throughout the facility and appears to be code compliant with the exception of the lack of an exterior strobe.

Summary & Recommendations

RICHMOND VOLUNTEER FIRE DEPARTMENT

In summary, this building requires immediate work to bring it up to all 3 areas of priority- code compliance, health and welfare, and proper building function. While a new fire station in a new location would be the best option, there are options presented in this report that could upgrade the existing facility to greatly improve conditions there.

1. Remove all existing fixtures and finishes in bathroom and install new fixtures to comply with ADA clearances and heights. *American Disabilities Act (ADA) 2019 BUDGET: $9,400*

2. Install new code required egress door in north wall of apparatus bay. *Life Safety & Code (LSC) 2019 BUDGET: $3,500*

3. Install code required interior and exterior exit and emergency light fixtures. *(LSC) 2019 BUDGET: $3,600*

4. Install code required exterior horn strobe over existing meeting room door. *(LSC) 2019 BUDGET: $700*

5. Construct a new decontamination room with a shower, sink and commercial grade washer and dryer to clean equipment after a fire. *Health & Welfare (HW) 2019 BUDGET: $41,000*

6a. Install AIRVAC vehicle exhaust removal system in apparatus bays. *(HW) 2019 BUDGET: $38,000*

6b. Install Magnagrip vehicle exhaust removal system in apparatus bays. *(HW) 2019 BUDGET: $57,000*

7. Replace all windows. *(HW) 2019 BUDGET: $2,500*

8. Demolish wood-framed antique truck bay and construct a new bay to house recently purchased truck. *Functionality Recommendation (FR) 2019 BUDGET: $193,000*

9 Replace asphalt shingle roof and gutters. *(HW) 2019 BUDGET: $30,000*

10. Remove existing apron paving, compact soil at sewage pump station and repave. *(FR) 2019 BUDGET: $9,000*

Summary & Recommendations

11. Increase size of water service line to the building TO 4" with new STORZ connection. for truck fill. *(FR) 2019 BUDGET: $16,200*

12. Replace all interior lighting with LED fixtures. (FR) *2019 BUDGET: $6,500*

13. Install new automatic lighting controls. *(FR) 2019 BUDGET: $2,600*

14. Install new Energy Recovery Unit for Meeting Room and Office Area. *(LSC) 2019 BUDGET: $9,600*

15 Replace and insulate domestic water distribution piping. *(HW) 2019 BUDGET: $5,400*

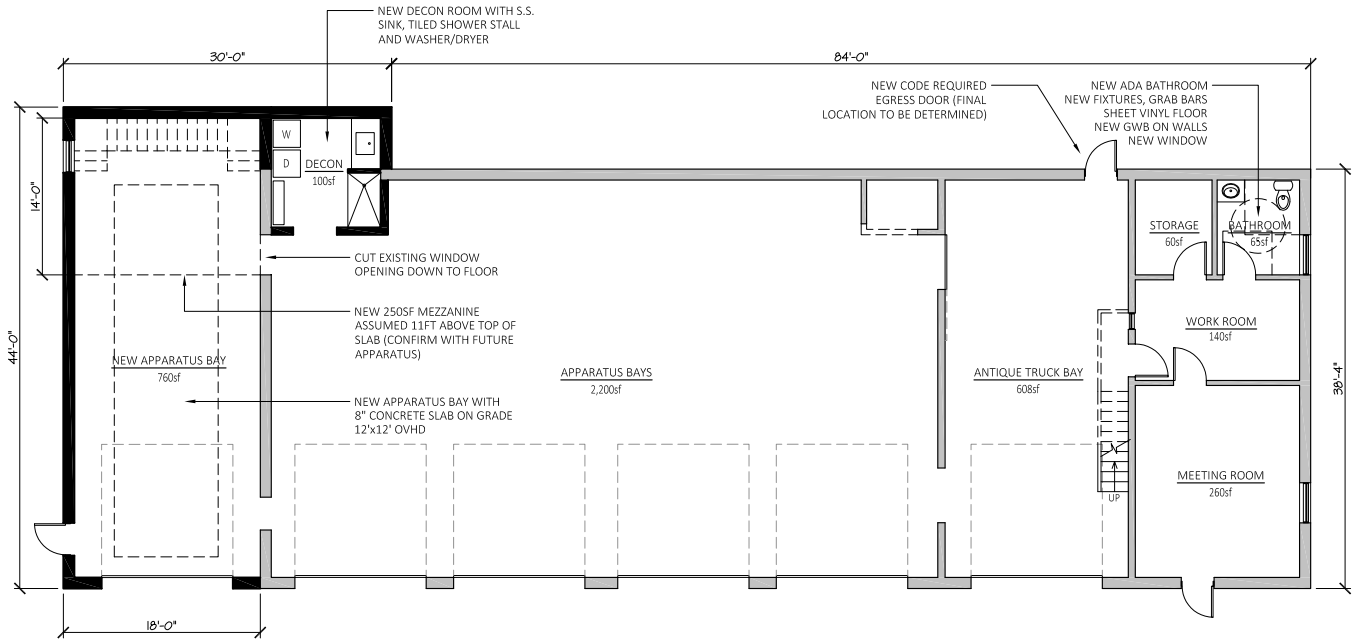
16 Insulate heating hot water distribution piping. *(HW) 2019 BUDGET: $1,800*

17a. Replace PVC fill piping with schedule 80 PVC. *(HW) 2019 BUDGET: $4,000*

17b. Replace PVC fill piping with copper piping. *(HW) 2019 BUDGET: $6,000*

18. Replace jamb trim at existing overhead doors. *(FR) 2019 BUDGET: $2,000*

19. Add mezzanine above new apparatus bay. *(FR) 2019 BUDGET: $27,000*



Proposed floor plan

Richmond Free Library

Richmond Free Library

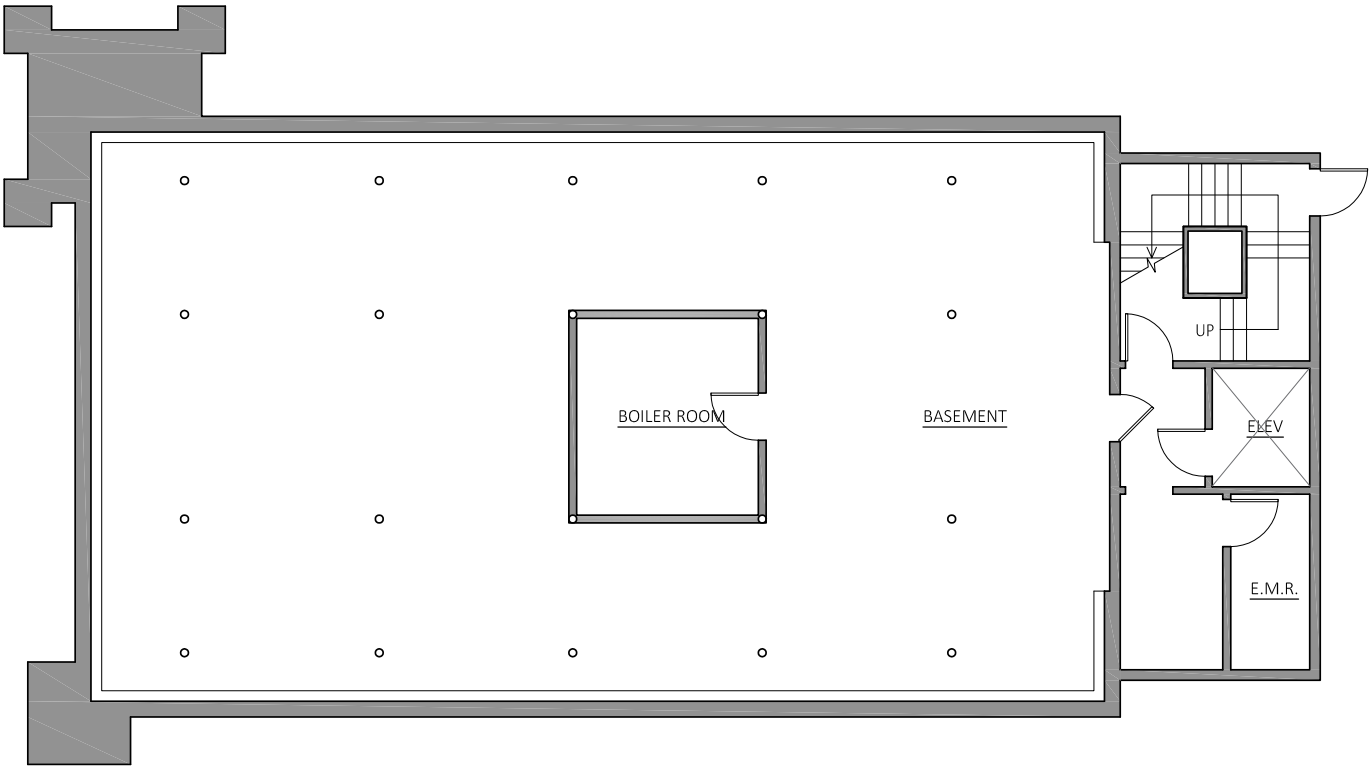
General Information

Site Plan

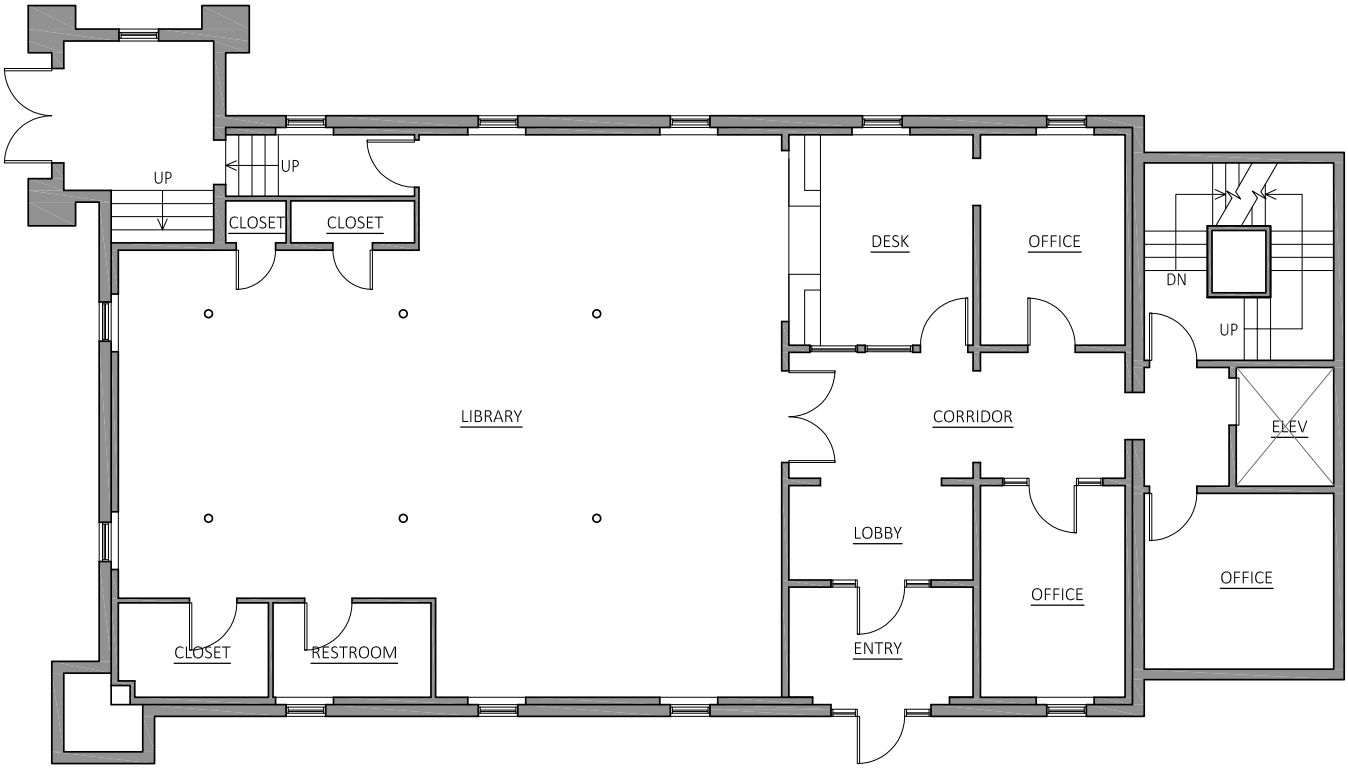
West Elevation

Richmond Free Library is located at 201 Bridge Street just east of the Town Center Building. The building was originally built in 1897 as a Universalist Unitarian Church. In 1991, the building was renovated for use by the Town's Library. In 2003, the second floor and mezzanine levels were renovated to include two youth libraries, lounge and study/practice rooms. The various programs offered through the Library average approximately 15,000 visitors per year.

General Information

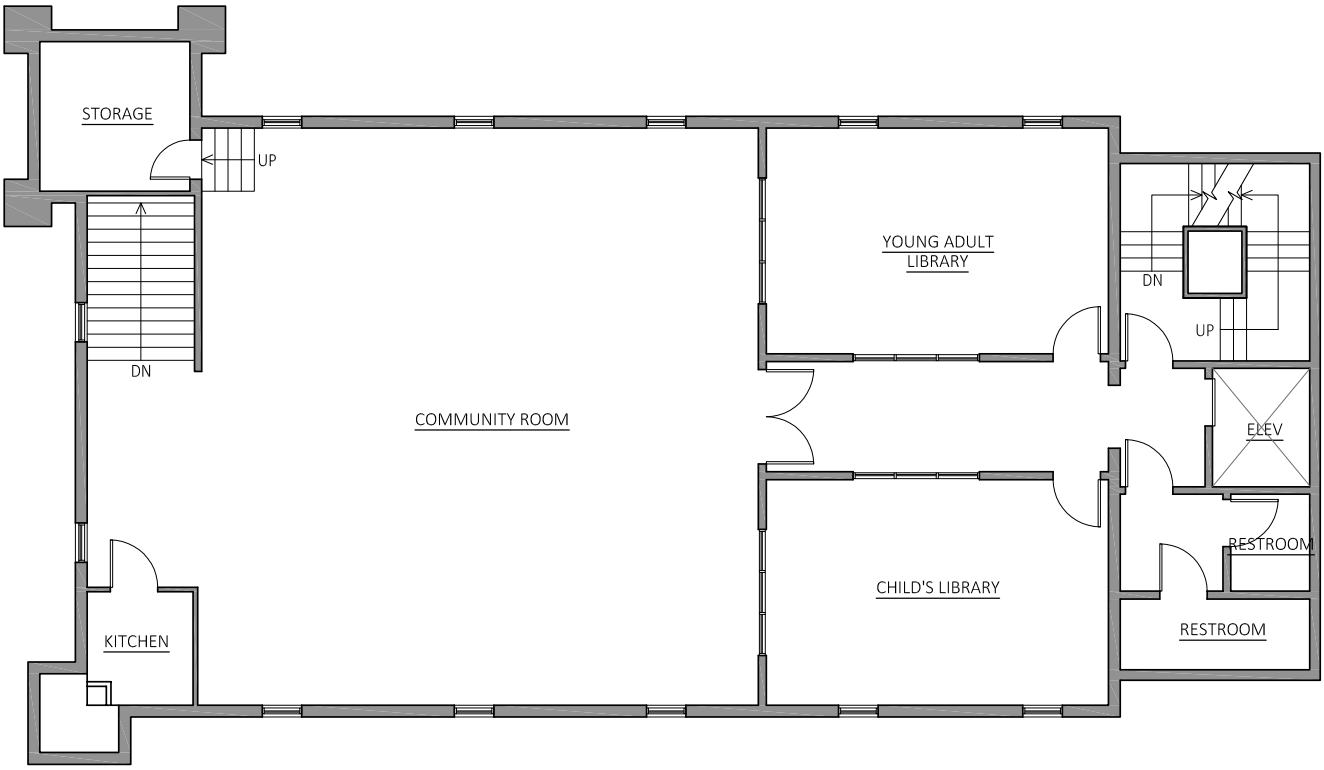


Basement Level Floor Plan

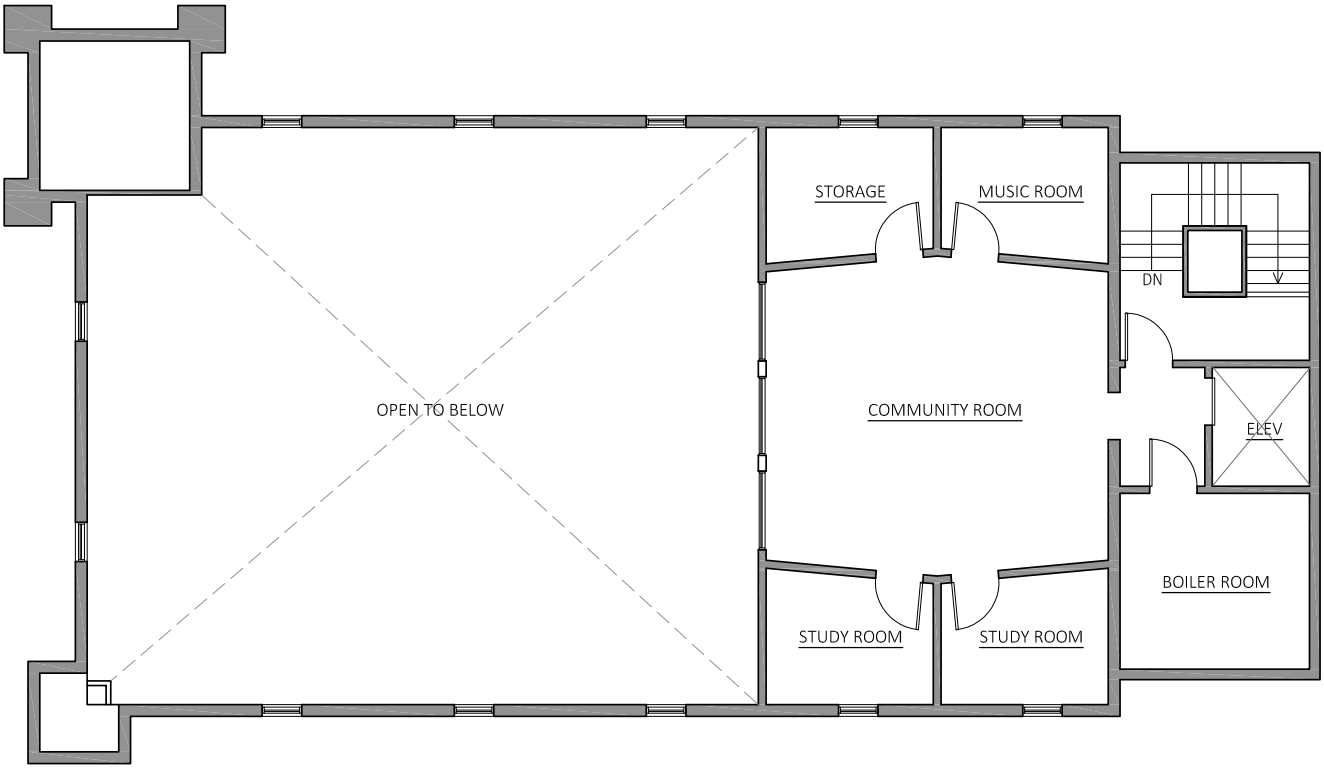


First Floor Plan

General Information



Second Floor Plan



Third Floor Plan

Existing Site Constraints

SITE ACCESS

The Richmond Free Library is located on the same site as the Town Center Building. There is shared parking for both buildings. There are two handicap parking spaces provided off Bridge Street. A concrete sidewalk and ramp provides ADA access to the building. There are metal handrails provided and the slope appears to be compliant. The overall condition of the sidewalk is good, however, there are a few sections of the sidewalk that have heaved.

PEDESTRIAN ACCESS

Pedestrian access is provided by a concrete sidewalk and ramp from Bridge Street. On-site access is provided by a concrete stair case on the west side of the building, facing parking and the Town Center Building

PARKING

Parking appears to be adequate and is shared between the Library and tenants of the Town Center Building and Post Office.

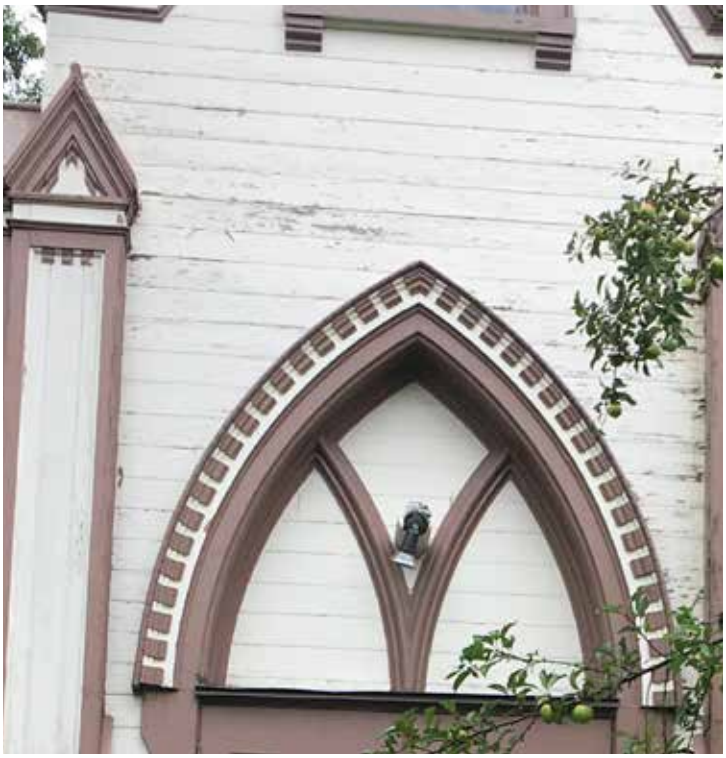
SOUTH LAWN

There is a lawn area on the south side of the building that is greatly under-utilized. There is one picnic table in the area but there is nothing leading pedestrians to the space either from parking or the building. This could be an area to develop into a nice space for some outdoor program for the Library.

Stairs at main entrance

South lawn space

Existing Building Assessment



Paint peel and rot at northeast steeple above door

EXTERIOR WALLS

The majority of the exterior wood siding is in fair condition. The paint has started to crack and peel in certain locations and needs to be scraped. There are some areas where the siding is cracked and will need to be replaced. There is some significant rot and paint peel visible on the northwest steeple. This location appears to be in the worst condition compared to the rest of the building. The northeast steeple has some significant paint peel above the doors. The east side of the building is heavily shaded by adjacent trees which are causing some moisture related damage on the siding and window trim. There is a lot of paint damage along this elevation.

North gable end rot

East elevation paint damage

Existing Site Constraints

ROOF

The roof of the Richmond Free Library is an historic slate tile roof. There have been past estimates done for the town to replace the slate shingles but no work has been done to date. Multiple tiles are cracked and have had the corneres broken off, however there are no signs of failure. A survey done in 2015 indicated no visible signs of leakage in the main roof system and none were noted in this survey.

FENESTRATION

The first floor windows are from the 1991 renovation. The second floor windows are from the 2003 renovation. Excluding the custom built windows in the comunity room, the windows of the are all Marvin units. Even though the newest windows are from 2003, all units are experiencing some degree of air infiltration. Specifically, there are two windows on the Bridge Street side of the Library where daylight is visible between the window frame and jamb framing. The exterior door on the northeast steeple leaks air along the threshold. On the south side of the building, the exit door on the stair tower has visible daylight along the entire bottom of the door.

Daylight at stair tower door

Damaged wood trim

Existing Building Assessment

Wood trim rot and peeling paint

Daylight at window frame

Community Room window exterior

Existing Building Assessment

INTERIOR CONDITIONS

BASEMENT LEVEL

The basement level includes a small storage closet, elevator machine room and access into the elevator shaft, all on a concrete slab. The remainder of the space is on a dirt floor with heights to underside of structure ranging from three feet to six feet. There is a small enclosed room within this area that includes the boiler as well as manifolds for the first floor radiant heat system. There are multiple unsealed penetrations in the foundation wall resulting in air & moisture infiltration. There are fiberglass insulation batts installed between the floor joists, some of which have fallen over time. A blown-in type of insulation was installed along the perimeter foundation wall and has collapsed or is in the process of collapsing in multiple locations. Mouse traps were observed during the survey and staff reported that there is a rodent problem in the basement. At the time of survey, there was a musty smell present in the elevator cab and hoistway. An air and mold testing assessment is recommended for this area of the building.

Dirt floor at basement level

Insulation collapsing at interior of foundation wall

FIRST FLOOR

The first floor is exclusively Richmond Free Library space. Public community spaces on the floors above are only accessed by circulating through the Library space to get to the stair tower. Library staff mentioned that this creates a potential security issue since these spaces are accessible during hours when the Library is closed. Select renovations around the main desk of the Library would help to create sight lines back to the main entrance, therefore providing an easily monitored flow into the building. In general, interior conditions on this level are good. All exterior windows have a certain degree of noticeable air infiltration present. Two windows on the north wall have significant air infiltration underneath the sill. The south egress stair is in compliance with Life Safety Code requirements. Stair width, railing height and continuity, and fire rated doors and frames were all verified and are code compliant.

Insulation falling from floor joist cavity

Existing Building Assessment

First floor corridor adjacent to Library desk

First floor library stacks

Existing Building Assessment

SECOND FLOOR

The second floor features a two-story high community room which used to be sanctuary space when the building was previously a church. The windows were replaced in 1991 during the renovation and currently are experiencing significant air infiltration. There is an open stair within the space that leads down to the old "front door" in the northeast steeple. The double doors at the bottom of the stairs leak a significant amount of cold air which then is leaked into the community room. It is our interpretation through reviewing NFPA egress requirements that this stair, unless previously permitted or through variance, is required to be enclosed in a one hour fire-rated enclosure as a code required means of egress. Per NFPA 101, chapter 7, this space has a maximum occupant load of 199 people, therefore requiring (2) one hour fire-rated means of egress directly from the space. The south end of the second floor was renovated in the early 2000's to include a Children's Library and Young Adult Library. Interior finishes in these spaces are in excellent condition.

Second floor corridor to community room

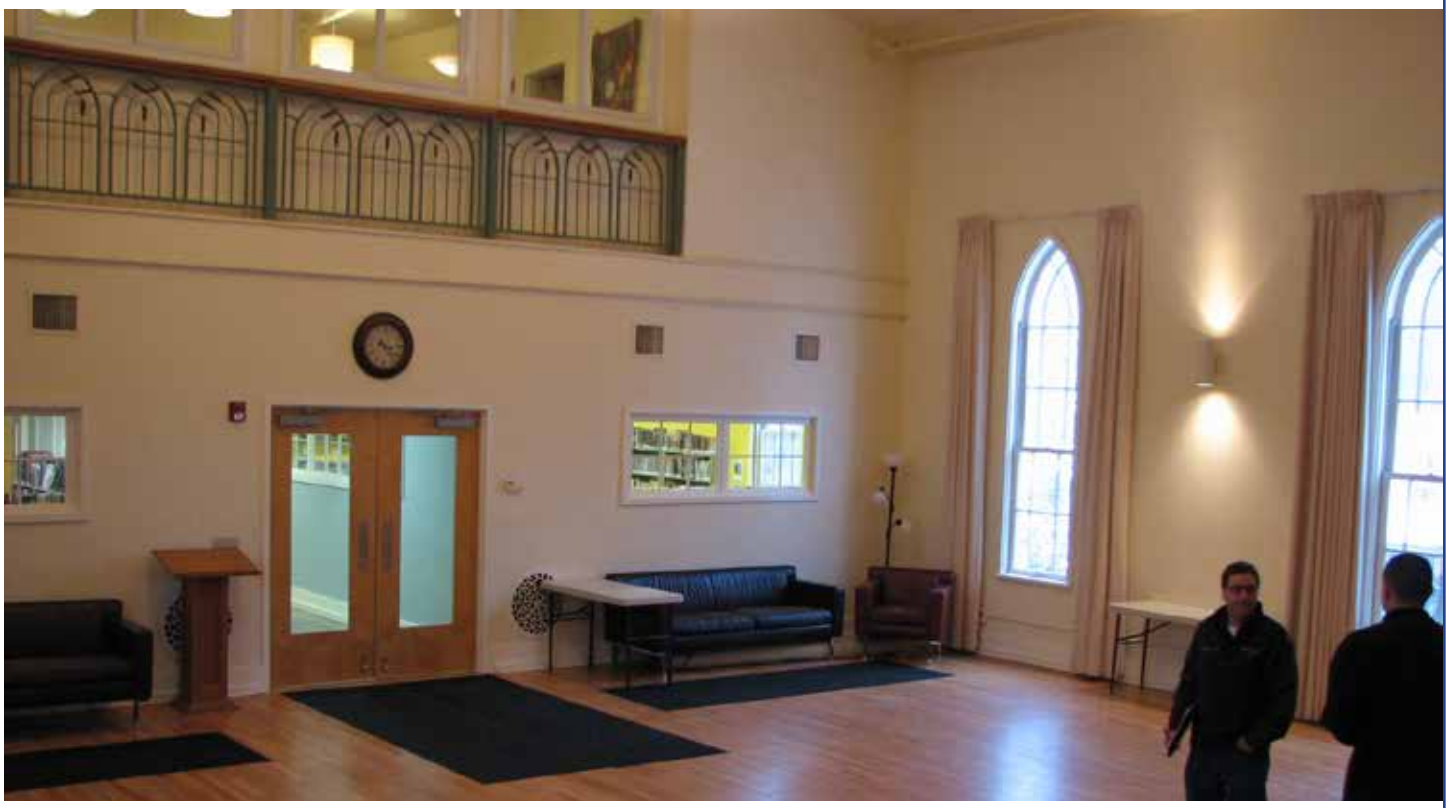
Second floor children's library

Second floor young adult library

THIRD FLOOR

The third floor was renovated in 2003 along with the second floor. It currently consists of an open community room that overlooks the large community room on the second floor. There are (2) private study rooms and a music practice room as well as the boiler room, which serves the entire building. This level is exclusively public program space and is available to rent.

Existing Building Assessment



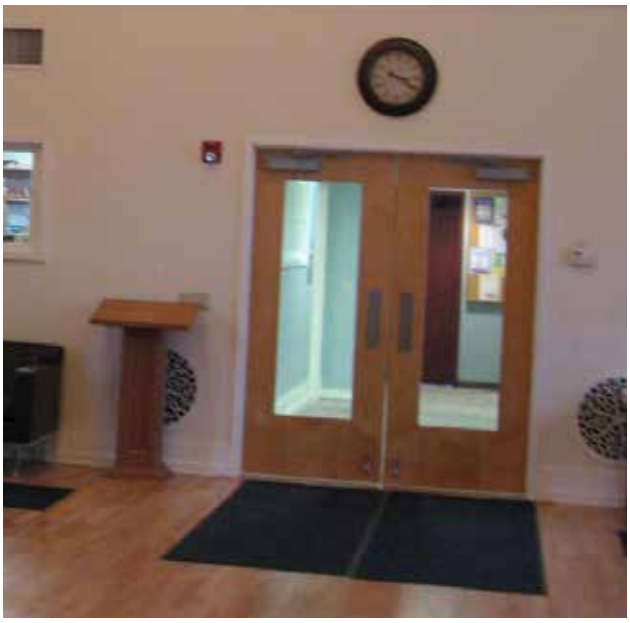
Second floor community room

Third floor community room

Existing Building Assessment

LIFE SAFETY & ADA ASSESSMENT

- Sections of exterior sidewalk leading from handicap parking spaces have heaved, creating a difference in height of walking surface over 1/2".
- Double doors at south end of Community Room do not have required exit signage.
- Open exit stair at north side of Community Room needs to be enclosed with a one-hour fire rated barrier per NFPA to meet requirements as the second means of egress from the Community Room, which has a design occupant load of 199 people.
- Additional emergency light fixtures required in second floor corridor and egress stair.



No exit sign at community room doors

Open exit stair from community room

ADA accessible sidewalk to main entrance

Existing Building Assessment

Sprinkler service entrance

Unsealed pipe penetration through foundation

Corrosion of copper piping in radiant floor system

MECHANICAL SYSTEMS

In general, the building appears to meet all current standards for life safety systems with respect to fire alarm, emergency lighting and exit signage with a few minor exceptions.

No code compliance issues were observed with the building's plumbing systems. The building is served via a 3/4" city water line complete with a water meter, backflow preventer and a pressure-reducing valve. Domestic hot water is served by a two small electric tank type point of use water heaters. Each water heater was observed to have a hot water mixing valve. Water coolers should be provided in any future major renovations. The sump pump in basement should have a high water alarm

The building is served by three sealed combustion natural gas furnace split systems with DX cooling. The units are York Diamond 90 high efficient furnaces with a useful service life of 15 to 20 years. The units are approximately six years old. Starting on January 1, 2020, U.S. production and import of HCFC-22 will end, but systems can continue to use HCFC-22 in existing system for as long as necessary. HCFC-22 supply will decline over the next few years, and prices are expected to rise considerably. With these units being less than 25 % of their useful service life, we recommend that the systems are serviced by a qualified technician on a semi-annual bases to maximize the life and reduce the potential for a loss of a refrigerant charge. The units serve the following areas:

Unit 1 – 120,000 Btuh serves the 2nd floor community room

Unit 2 – 60,000 Btuh serves the 3rd floor

Unit 3 – 120,000 Btuh serves the kids library area(s)

Existing Building Assessment

A Weil McLain natural gas CGS sealed combustion 167,000 bTUH boiler serves the serves radiant floor, perimeter baseboard and unit heaters heat in the basement and lower level of the building. The boiler appears in good condition and has a useful service life of 15 plus years. The hot water heat distribution piping throughout building is uninsulated. The radiant floor system appears to be a Bio Energy Radiant Roll 2-tube EPDM system. The system manufacturer is no longer in business and the system is at or near the end of its life expectancy. Other installed systems have reports of numerous failures and class action suits. The primary issue is that the black EPDM radiant tubing does not have an oxygen barrier. Consequently, ferrous components within the heating system corrode leading to premature failure of the ferrous boiler and boiler system components. This corrosion often results in plugging or flow restriction in the less than .25" ID tubing and there are numerous reports of the tubes having a no flow condition. In addition, the oxygen entering the system through the tubing results in a low PH (acidic) condition of the water causing the EPDM tubing to dry rot and fail. Per the adjacent picture, it is apparent that tubing failures have occurred, (see corrosion of header pipes). While there are still installed systems such as this that have not had reported major issues, it appears that a system replacement should be planned for in the near future.

Outside air is provided to the three furnaces serving the 2nd and 3rd levels. The first floor or main level does not have ventilation air. A future retrofit project should include ventilation air for the first floor with an associated energy recovery unit to serve the building. Existing HVAC Controls are T-87 non-programmable thermostats. Thermostats should be changed out to 7 day or Smart programmable type thermostats for energy savings.

First floor radiant heat piping

Third floor hot water heater

Third Floor Sprinkler system pump

Existing Building Assessment

Intake & Exhaust ducts from Outdoor Air Furnaces

ELECTRICAL SYSTEMS

The building is served by a 400 amp 208/120 volt 3 Ph 4 wire service. The MDP has 42 poles. The largest load is the elevator, which is fed by a 125 amp breaker.

There are fluorescent light fixtures throughout the building. Lighting levels are adequate in most locations. All future renovations should utilize LED lighting and occupancy sensor controls. A lighting retrofit to LED fixtures should be considered in the near future to take advantage of LED fixture rebates and energy savings. Manual switches are prevalent thought the building. Occupancy sensors and current technology lighting controls are not prevalent in the building and should be considered for energy saving. Battery pack emergency egress lighting units where noted below. Exit signage throughout the building appears adequate. Additional life-safety devices are required at:

- Emergency light at second level corridor between large room and stair
- Emergency light at egress stair to rear exit at exit door level
- Exit sign is required above door in community room to corridor

GFI Outlets were observed in appropriate locations.

FIRE PROTECTION SYSTEMS

The building is protected by a dry type fire protection automatic sprinkler system. The system appears to be code compliant and in good condition. The building is also served by a Silent Knight Model SK-5208 fire alarm panel. The panel is a zone type panel and parts should be readily available for the foreseeable future. Smoke detectors, pull stations, and horn strobes were noted throughout the building. CO detection was noted in the boiler room.

Summary & Recommendations

RICHMOND FREE LIBRARY

In summary, the library has been renovated several times over the years, and the latest renovation improved comfort and code compliance. There are some areas where code compliance is not met, which are noted in the report. The main concern for the this historic building is with the exterior siding, which is in poor conditions in areas, the roof, which requires replacement, and the windows, which need some work to improve building efficiency and comfort. The radiant floor heating system is also failing and will need to be addressed.

1. Install code required exit sign in second floor community room. *(LSC) 2019 BUDGET: $800*

2. Install additional code required emergency lighitng in stair tower. *(LSC) 2019 BUDGET: $1,600*

3. Enclose north stair in community room with code required one hour fire-rated walls, ceiling and new door with closer. *(LSC) 2019 BUDGET: $23,000*

4. Install new weatherstripping and door bottom at exit door in stair tower. *(HW) 2019 BUDGET: $700*

5a. Replace radiant floor heat system at first floor. *(HW) 2019 BUDGET: $32,000*

5b. Hire ATC to perform air/mold test around the elevator shaft. *(HW) 2019 BUDGET: $2,800*

5c. Install new ERV for ventilation air on first floor. *(HW) 2019 BUDGET: $22,000*

5d. Replace existing thermostats with smart thermostats. *(HW) 2019 BUDGET: $1,600*

6a, Add weatherstripping to windows to close major gaps. *(HW) 2019 BUDGET: $8,100*

6b, Add interior storm panels to windows. *(HW) 2019 BUDGET: $27,000*

6c. Paint exterior surfaces of windows. *(HW) 2019 BUDGET: $24,000*

Summary & Recommendations

6d. Full window replacement.*(HW) 2019 BUDGET: $136,000*

7. Scrape and repaint exterior clapboards and trim and replace rotted wood trim as required. *(HW) 2019 BUDGET: $83,000*

8. Renovate main desk (see adjacent page) *(FR) 2019 BUDGET: $8,600*

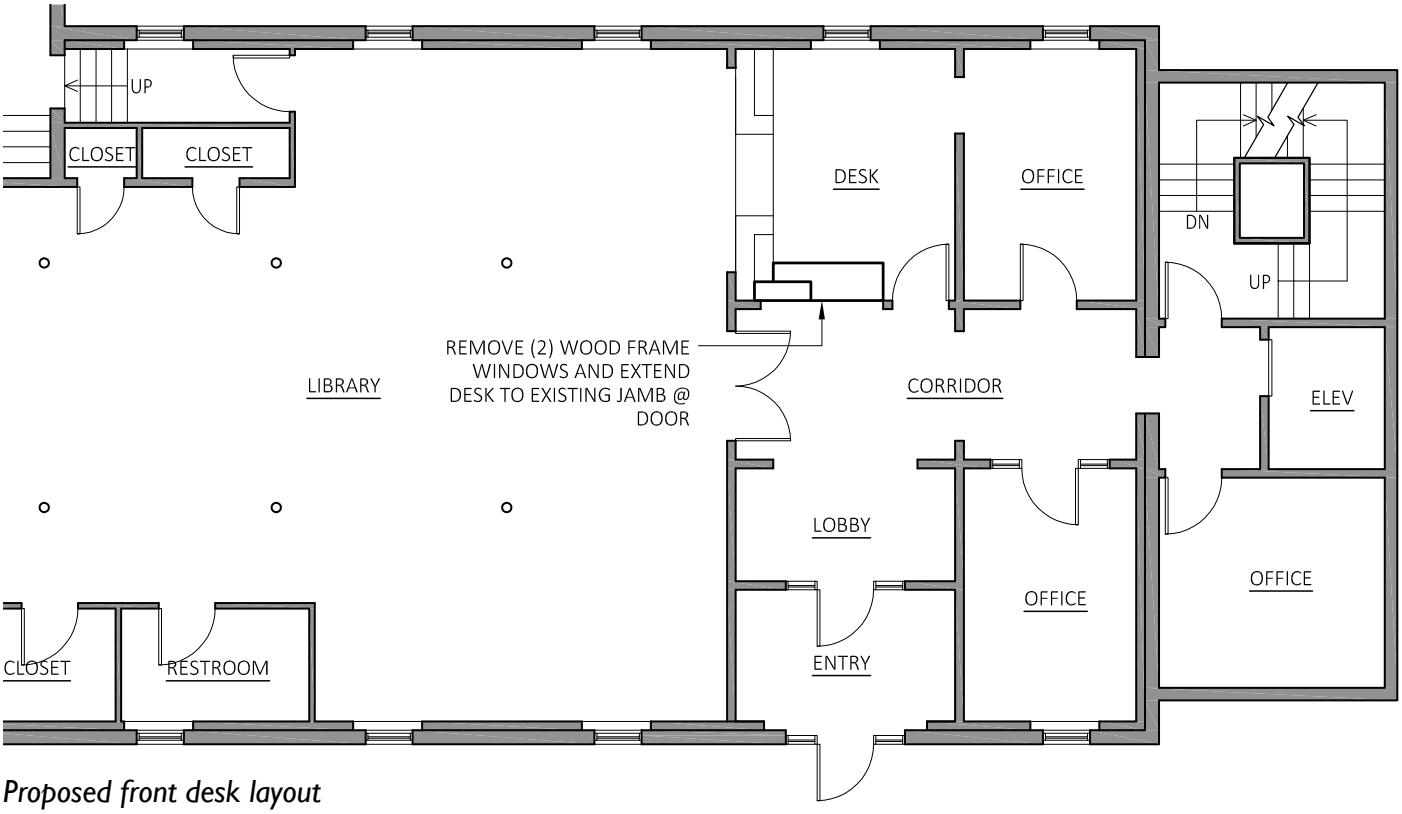
9. Install vapor barrier over basement dirt floor. *(HW) 2019 BUDGET: $8,500*

10a. Repair historic slate roof, full replacement (see reccommendations of 2015 Jan Lewandoski survey in Appendix) *(HW) 2019 BUDGET: $142,000*

10b. Repair/restore roof on North East steeple. *(HW) 2019 BUDGET: $157,000*

11. Install new lighting and controls. *(HW) 2019 BUDGET: $15,000*

12. Add drinking fountains as required by code. *(LSC) 2019 BUDGET: $2,700 EACH*



Proposed front desk layout

Richmond Town Center Building

Richmond Town Center Building

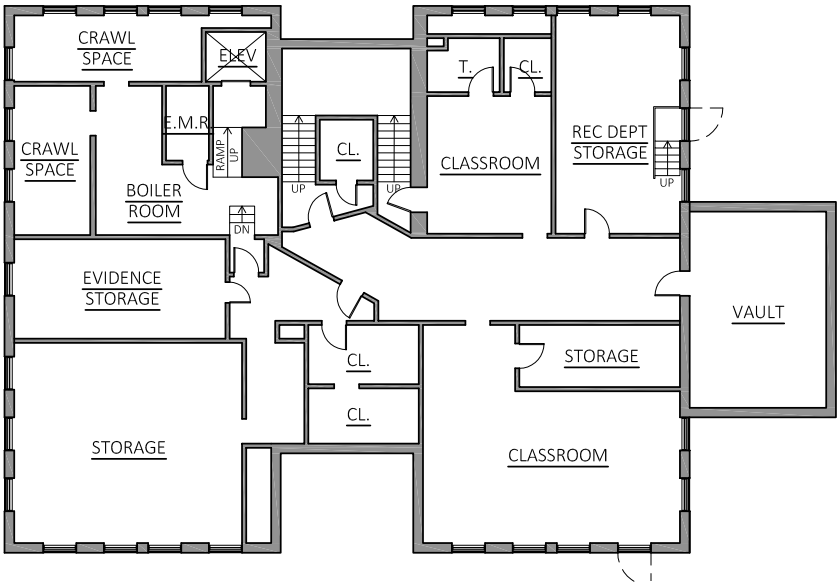
Site Plan

Bridge Street (North) elevation

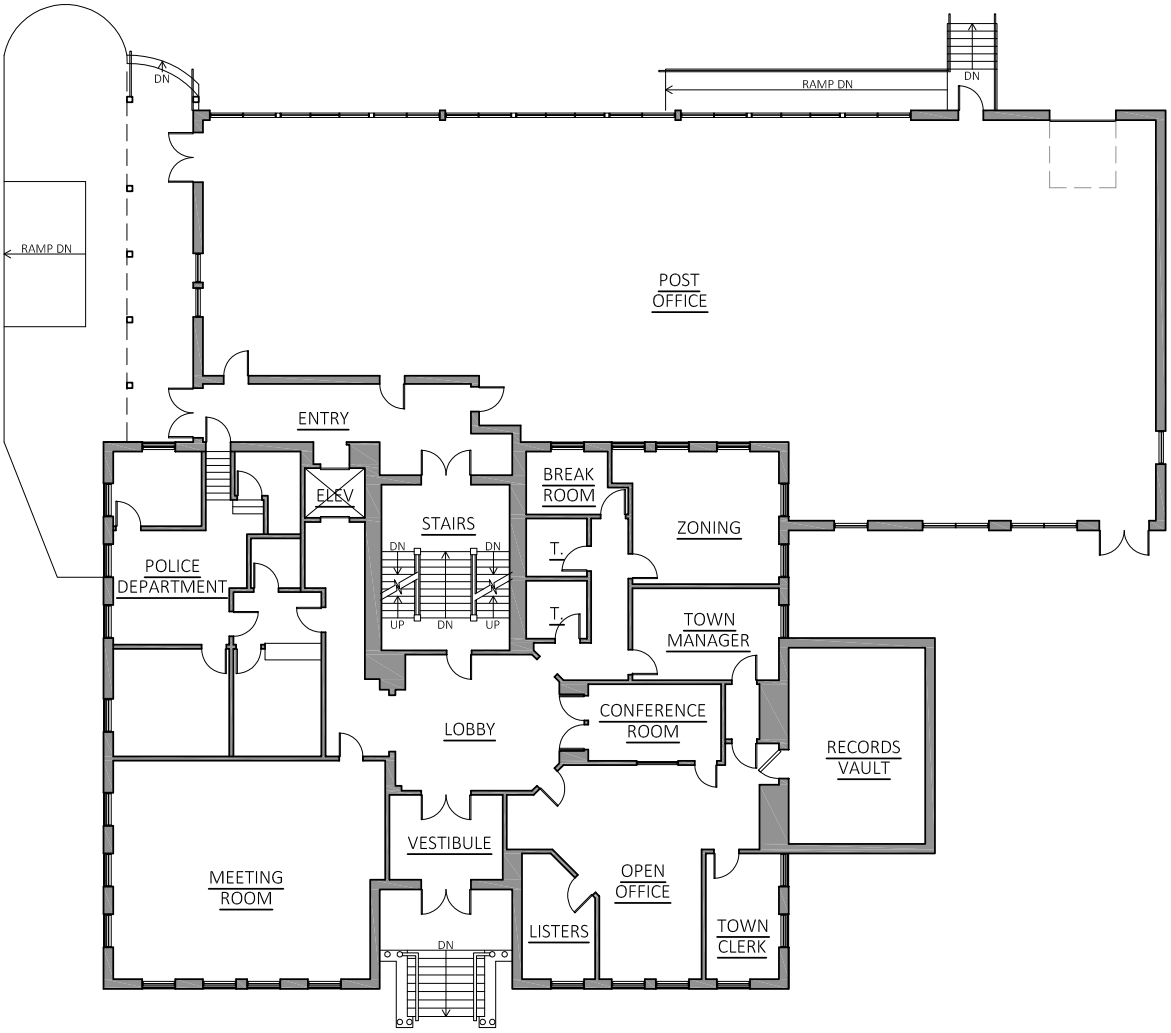
General Information

The Richmond Town Center Building is located at 211 Bridge Street to the west of the Richmond Free Library. Originally built in 1907, the brick building first served as a schoolhouse. The schoolhouse was enlarged in 1914 and continued to serve the area students. In 1989, the building use was changed to the Town Clerk's Office. Currently, the "Town Office" functions are now part of the Town Center complex which also houses the Post Office, Richmond Police Department and the Chittenden East Supervisory Union.

General Information

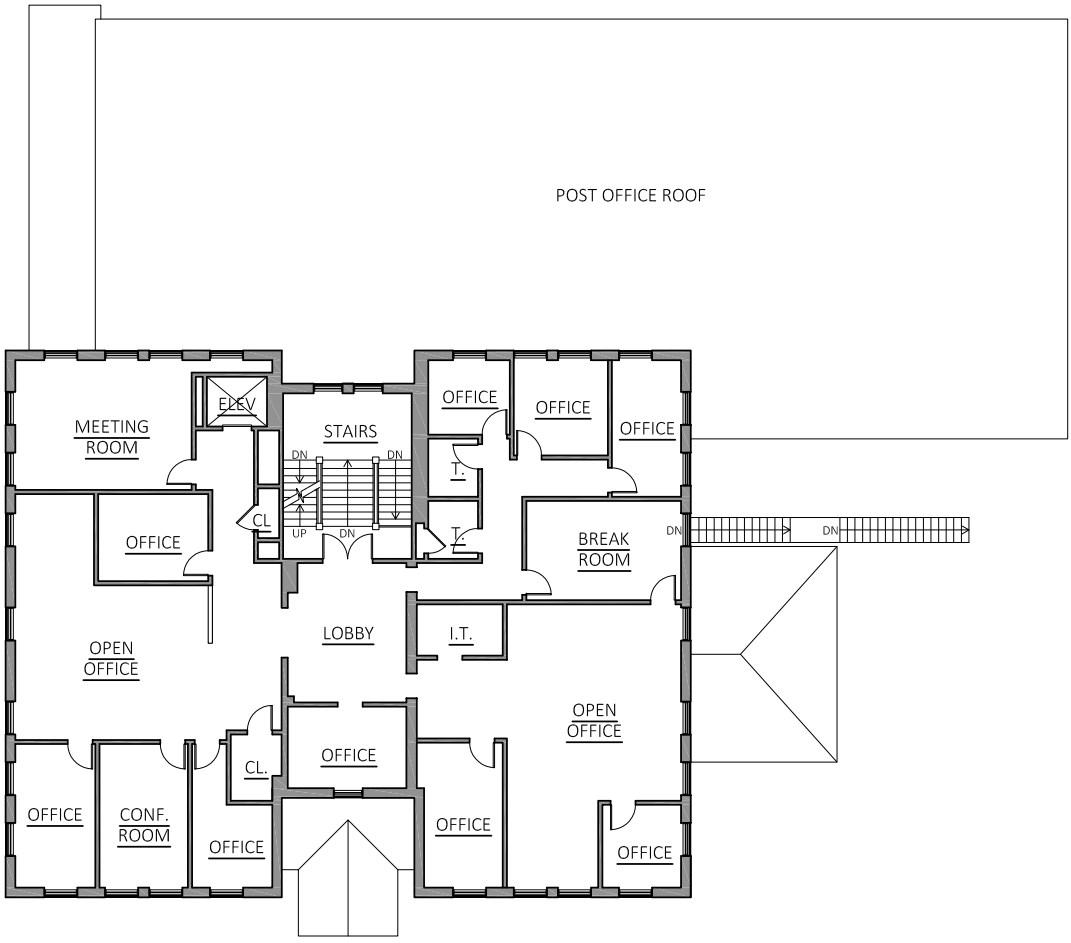


Lower Level Floor Plan



First Floor Plan

General Information



Second Floor Plan

Existing Site Constraints

SITE ACCESS

The Town Center Building shares a 0.75 acre site with the Richmond Free Library, Post Office and Richmond Police. The majority of the Post Office footprint as well as a small portion of the south-west corner of the historic brick building are within the FEMA flood zone. FEMA has listed the Base Flood Elevation (BFE) at 311.3FT, which is approximately 3ft above the basement floor level.

PEDESTRIAN ACCESS

ADA access into the building is limited to the mid-level entry on the east side of the building and then via an elevator to the other floors. At grade access is only provided to the Post Office. The Town Office and Police Department are accessed from a mid-level entry on the east side of the building and then via eleavator or interior stair, as well as by stair and sidewalk from Bridge Street.

PARKING

Parking appears to be adequate and is shared between the Library and tenants of the Town Center Building.

Hardscaped entrance to Post Office and Town Office

Bridge Street entrance to Town Offices

Existing Building Assessment

Efflorescence at window sill

EXTERIOR WALL

The exterior brick veneer is in fair condition. Efflorescene is visible under window sills and in mulitple other locations on all sides of the building. Several areas in the brick veneer will need repointing. A washing of all the brick is recommended. There is also new evidence of brick spalling occurring at the southeast corner of the building near the main entrance for the town offices. This may be related to the recent roof replacement and extended drip line which is leading to water falling onto the sidewalk and splashing up against the brick. This condition should be monitored going forward.

West Elevation Brick Veneer

Existing Building Assessment

MAIN BUILDING ROOF

The aspahlt shingle roof on the main building was replaced in July 2017 and is in good condition.

FENESTRATION

All of the windows in the Town Center Building are original and have had storm windows installed. There was a noticeable amount of air infiltration at each window in the building. During the walk through, all windows had plastic sheeting installed on the interior to reduce the draft caused by air infiltration. The windows are coated with lead paint and there is also a possibility that the perimeter caulking contains asbestos. Testing should be done prior to any work on the windows throughout the building. The north and east entry doors are in good condition and no daylight was visible along the thresholds.

POST OFFICE

Only the exterior of the Post Office was part of this survey. The brick veneer appears to be in good condition. The aluminum storefront frames are in good condition as well. There are a few locations where there may be some air infiltration. The wood fascia and soffit has some rot damage and peeled paint and will need to be scraped and repaired as required.

Photo of Post Office roof

Post Office storefront and soffit

Existing Building Assessment

Deteriorating brick mortar at NW corner

Cracked perimeter caulking at jambs

Window exterior elevation photo

Existing Building Assessment

INTERIOR CONDITIONS

LOWER FLOOR LEVEL

The lower floor level has two classroom spaces, one bathroom and storage space for the town's Recreation Department. The mechanical room is located on this level and (2) natural gas boilers provide hot water for the hydronic heating system. Most of the walls on this level are painted brick or concrete block. Light levels appear to be adequate however there is no access to natural daylight from any of the spaces. There are signs of water infiltration along the Bridge Street side of the building. The floor elevation of the lower floor level is at 308.19ft which is approximately three feet below the FEMA Base Flood Elevation (BFE) of 311.3ft. If the Town Center Building were to undergo "substantial improvement" then all building mechanical systems would need to be elevated above the (BFE) and the lower floor level would be restricted to limited storage only.

The mechanical room is not ADA accessible and the elevator access for the lower level is within this space. By code, there needs to be an accessible route from the elevator to the remainder of the basement space and it needs to be separated from the mechanical room by a 1-hr fire rated barrier. There are two crawl spaces off the mechanical room which have dirt floors. There are mulitple locations in these spaces where daylight was visible through the foundation resulting in air infiltration. There is one bathroom on this level that does not have an accessible path to it, nor does it meet ADA compliance for required clear floor space.

Art classroom with no access to daylight

Lower floor level corridor

Non ADA accessible classroom

Existing Building Assessment

First floor lobby Bridge Street entrance

Zoning Office - Infill panels over windows

INTERIOR CONDITIONS

FIRST FLOOR

The first floor consists of the Richmond Town Office and the Richmond Police Department. A central lobby space provides access to the Town Manager's office, Town Clerk and Listers offices, a small conference room, large meeting room and Police Department. Interior conditions on this level are in fair condition. Wood trim and doors have a fair amount of peeling paint and damage. The carpets are in fair to poor condition and there are a few locations that are showing traffic patterns. Most acoustic tile ceilings are beginning to curl and the tracks have started to yellow. Bathrooms on this level are in good condition and are ADA compliant with grab bars and clear floor space. Elevator access is available from grade up to this level. The main stair case is in compliance with NFPA requirements for existing stairs except the railings on the inside edges of the stairs need to be continuous. In the Records Vault, the mechanical, electrical and fire-protection systems are not in compliance with NFPA 232 standards. The vault door is also non-compliant and should be replaced and the walls should be inspected and verified as a UL listed 6-hr fire rated assembly per NFPA 232.

The Police Department is located on the first floor level but has evidence storage in the lower level, which has flooded in the past. There is not a proper mechanical system serving Evidence Storage. Currently, suspects are brought up a flight of stairs accessed through the public entrance to the rest of the building, presenting a safety concern to the public and to officers. The walls are in fair condition and are a mix of original plaster and newer drywall. Flooring appears to be in good condition. The bathroom does not meet ADA requirements for clear floor space.

Existing Building Assessment

INTERIOR CONDITIONS

SECOND FLOOR

The second floor is currently rented by the Chittenden East Supervisory Union. There are two large open office spaces with smaller private offices located against the exterior walls. The interior finishes on this level are in good condition. All windows have significant air infiltration and all were covered in plastic to reduce the draft. There are two bathrooms on this level and both are fully ADA compliant. From the break room, a steel fire-escape stair provides a second means of egress from this floor level. However, if this building were to undergo "substantial improvement" then the fire-escape stair would no longer be allowed to count as an official means of egress and an additional fire rated stair would need to be constructed to comply with NFPA requirements for egress from this level. A new egress stair would need to be designed to accomodate an area of refuge for handicap people per NFPA requirements.

ATTIC

The attic space was in very good condition. Blown-in insulation was installed at the ceiling level and appeared to be consistant throughout. There was no visible evidence of water infiltration at the time of the walk through nor was there any visible evidence of any prior roof leaks.

CESU Open Office Space

CESU Meeting Room

CESU Open Office Space

Existing Building Assessment

Exit door in lower level cannot open to 90 degrees

Non ADA accessible classroom space in lower level

Non compliant egress stair from storage in lower level

LIFE SAFETY & ADA ASSESSMENT

- Storage closet on lower floor level within egress stair is not permitted per NFPA requirements
- Mechanical room is required to be separated from an accessible path leading from the elevator to the lower floor level by a 1-hr fire rated assembly
- There is no ADA access from the elevator to the lower floor level
- The bathroom on the lower floor level is not accessible to those in a wheelchair
- Door from main stair to first floor lobby swings in the wrong direction (into lobby space)
- No smoke detection system or sprinkler system
- Second floor fire-escape stair is not marked as an exit
- No ventilation air system throughout the building
- Police Department bathroom is not ADA accessible
- Exposed Romex wiring that is not code compliant

Existing Building Assessment

MECHANICAL SYSTEMS

The building does not have a ventilation system and relies on the operable windows for building ventilation air. The buildings upper two levels are serviced by six (6) split system air conditioning systems. The systems have a useful service life of 15 to 20 years and have exceeded their useful life. They utilize R-22 as the refrigerant, which is being phased out of production by 2020. While R-22 will be available, the repair cost for these condensing units will quickly outweigh replacement cost with newer more efficient equipment. We recommend the town budget for replacement HVAC system in the near future. In order to resolve both the ventilation air and the aging HVAC equipment, a system utilizing a VRF air source heat pump coupled with dedicated outside air heat recovery system utilizing the current boiler for back-up heating . This type of system would reduce the current buildings energy consumption and increase the indoor air quality of the building.

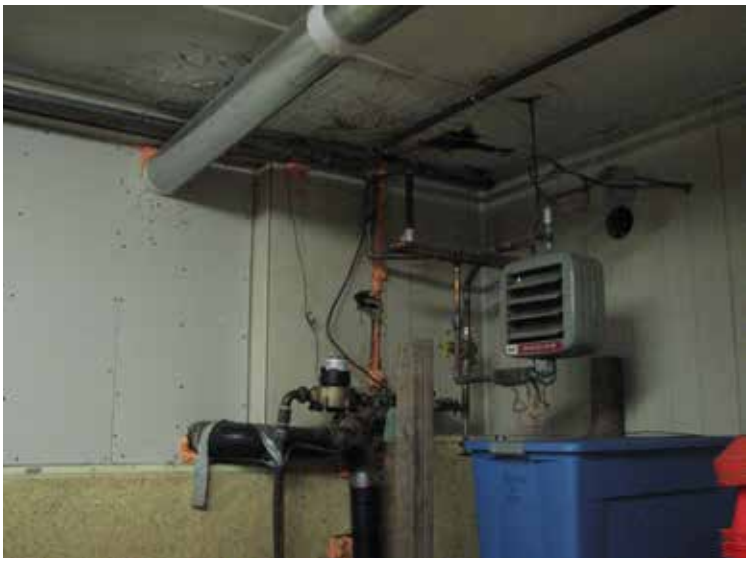
The post office is served by a single roof top air conditioning (RTU) unit that is at beyond the end of its 15 to 20 year useful service life. This unit should be replaced and or the retrofitted office building system should be extended to serve the Post Office.

Two (2) high efficiency natural gas boilers serve the building. The Triangletube Prestige Solo boilers each have a nominal output of 379,000 Btuh. The boilers are in good condition and have an expected life of 25 plus years. The boilers fuel source is a 1-1/2" natural gas line and associated Vt. Gas meter. The boilers serve four (4) zones via Grundfos zone pumps and a copper distribution system serving baseboard, unit heaters and fan coil unit hot water coils. The basement is heated with a series hot water unit heaters controlled by non-programmable T-87 thermostats.

Hot water manifold

New natural gas, high efficiency boilers in basement

Existing Building Assessment



Water service entrance

Water heater for Town Office and Post Office domestic

No outside air / ventilation is provided for the basement spaces. Boilers have standalone Triangletube controller with a Taco zone controller. HVAC system have typical 7-day programmable thermostats with remote averaging sensors. Standalone dehumidifiers were noted in the basement storage areas for summer dehumidification.

PLUMBING SYSTEMS

The building is served via a 1" city water line complete with a water meter, backflow device, and pressure-reducing valve. It appears the water entrance and the sanitary sewer lines are in the same trench coming into the building and are not separated by the current code recommended distances (10'). Domestic hot water is served by a series of electric tank type water heaters. Some of the water heaters observed are missing code mandated mixing valves and most likely have a set point below the recommended temperature of 140° to prevent Legionella. A 6" cast iron sanitary line serves the building. ADA compliant water coolers should be provided in any future major renovations. Mixing valves are needed on all water heaters.

ELECTRICAL SYSTEMS

NM (non-metallic clad) wire (ROMEX) was prevalent throughout the building. Romex is not allowed to be exposed or in ceiling plenums in current construction. Any renovations in areas where this wire is located will require replacement. It was noted that numerous wiring runs (power and data) run above the ceiling where the ceilings were not supported per code. During any renovation, it is likely that a code official will require that all wiring routed above ceiling renovation areas will be required to be reworked with code complaint support. There are fluorescent light fixtures throughout the building. Lighting levels are adequate in most locations.

Existing Building Assessment

A lighting retrofit to LED fixtures should be considered in the near future to take advantage of LED fixture rebates and energy savings. Manual switches are prevalent throughout the building. Occupancy sensors and current technology lighting controls are not prevalent in the building and the basement is missing code compliant emergency lighting in the back of house and storage areas and in some egress paths such as the stair to the half size egress door. The basement level is missing proper code compliant exit signage. Several emergency light fixture were noted to be in fault status due to a failed battery. A review of all emergency lights should be done annually and all in a failed mode should replaced or repaired. GFCI outlets were observed in the majority of the locations required. At least one location was noted to be non-compliant (in the art area laundry tub room).

On demand hot water heater above bathroom ceilings

FIRE PROTECTION SYSTEMS

The building is served by a four-zone GE Series ESL 1500 non-addressable Fire alarm panel. The panel serves pull stations and horn strobes for the building. CO2 & Smoke detection are not provided. The basement is missing code compliant horn strobes in the back of house and storage areas and in some egress paths such as the stair to the half size egress door. The basement is missing a pull station at the stair to the half size egress door in the art room. There is not a code required sprinkler system in the building.

Fire alarm control panel or partial alarm system in entry

Summary & Recommendations

In summary, the Town Center will require work to make this building more code compliant, comfortable, and efficient. There are multiple code deficiencies on the lower level, and occupant comfort is compromised throughout by leaking windows and the absence of a ventilation system. While some internal systems have been upgraded and improvements have been made over the last few years, a major renovation will be required to make dramatic changes that will bring the building up to modern standards. The police station is very small is in need of modernization (this report did not do an analysis of the police facility with regards to its operation as a modern police facility)

In addition to the estimates for specific improvements to the Town Center, we have included an estimate for the complete renovation of the Town Center to a Net-Zero building. The Richmond Town Center building is very similar to the Hartford Town Offices, which Bread Loaf designed and renovated to a Net-Zero Ready building in 2015. This allowed us to use the Town of Hartford model and apply it to Richmond's building to develop an estimate for a similar conversion. This estimate is included at the end of the estimate section of this report.

RICHMOND TOWN CENTER BUILDING

1. Install code required automatic sprinkler system. *(LSC) 2019 BUDGET: $119,000*

2. Install code required fire alarm system. *(LSC) 2019 BUDGET: $50,000*

3. Install code required exit signage. *(LSC) 2019 BUDGET: $2,700*

4. Abandon storage closet under stair at lower floor level. *(LSC) 2019 BUDGET: $1,800*

5. Replace Mechanical Room door and frame with a 1-hr fire rated door and frame. *(LSC) 2019 BUDGET: $3,400*

6. Provide an ADA compliant ramp at door to lower level classroom and bathrooms. *(LSC) 2019 BUDGET: $6,200*

Summary & Recommendations

7. Provide a 1hr fire rated corridor that is separated from the boiler room and provides access to the remainder of the floor space at the same floor level *(LSC) 2019 BUDGET: $16,000*

8. Reverse door swing direction from first floor lobby to egress stair for code compliance. *(LSC) 2019 BUDGET: $600*

9. Replace HVAC system and provide ventilation throughout building. *(LSC) 2019 BUDGET: $726,000*

10. Replace all windows with new energy code and historic compliant windows. *(HW) 2019 BUDGET: $305,000*

11. Remove and replace all exposed Romex wiring. *(LSC) 2019 BUDGET: $40,000*

12. Renovate Police Department bathroom to be ADA compliant with grab bars and required clear floor space. *(LSC) 2019 BUDGET: $11,000*

13. Clean exterior brick veneer and repointing as required. *(FR) 2019 BUDGET: $74,000*

14a. Replace Post Office HVAC system. *(HW) 2019 BUDGET: $37,000*

14b. Extend office building HVAC system to serve the Post Office. *(HW) 2019 BUDGET: $63,000*

15. Install new lighting and controls. *(FR) 2019 BUDGET: $26,000*

16. Complete renovation of the building to be a modern, Net-Zero Ready facility. *2019 BUDGET: $3,195,000*

17. Install windows in existing openings at basement and flood blowout panels as required by FEMA. *(FR) 2019 BUDGET: $44,000*

18. Add air ventilation system to the basement. *(HW) 2019 BUDGET: $19,000*

End of Report

BreadLoaf
Architects
Planners
Builders

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Appendix

Bread Loaf Corp.
7/16/2018

LSC= Life Safety Code
HW= Health & Welfare
FR= Functionality Recommendation
ADA= American Disabilities Act

Line #	Building	Description	Category	2019 Est. Cost	Priority	Yearly Escalation @ 3%/Year
1	Fire Station	Upgrade bathroom to ADA	ADA	$9,400	1	$282
2	Fire Station	New egress door	LSC	$3,500	1	$105
3	Fire Station	Install code required exit and emergency light fixtures	LSC	$3,600	1	$108
4	Fire Station	Install code required exterior Horn Strobe	LSC	$700	1	$21
5	Fire Station	Construct a new decontamination room	HW	$41,000	1	$1,230
6a	Fire Station	Install vehicle exhaust removal system for apparatus bays (AIRVAC System)	HW	$38,000	1	$1,140
6b	Fire Station	Install vehicle exhaust removal system for apparatus bays (MagnaGrip System)	HW	$57,000	1	$1,710
7	Fire Station	Replace all windows	HW	$2,500	3	$75
8	Fire Station	New full size truck bay	FR	$193,000	2	$5,790
9	Fire Station	Replace asphalt shingle roof and gutters. (HW)	HW	$30,000	3	$900
10	Fire Station	Remove existing apron paving, compact soil at sewage pump station and repave	FR	$9,000	3	$270
11	Fire Station	Increase size of water service line to the building to 4" & STORZ provide truck fill port on side of building	FR	$16,200	2	$486
12	Fire Station	Replace all interior lighting with LED fixtures (FR) (If both LED & Controls #13 are completed, a rebate of $1,600 can be taken)	FR	$6,500	3	$195
13	Fire Station	New automatic lighting controls	HW	$2,600	3	$78
14	Fire Station	Energy recovery for meeting and office area	FR	$9,600	2	$288
15	Fire Station	Replace and insulate domestic water distribution piping	FR	$5,400	3	$162
16	Fire Station	Insulate heating hot water distribution piping	FR	$1,800	3	$54
17a	Fire Station	Replace PVC truck fill piping with Sch 80 PVC piping	FR	$4,000	3	$120
17b	Fire Station	Replace PVC truck fill piping with Copper piping	FR	$6,000	3	$180
18	Fire Station	Replace jamb trim at overhead doors	FR	$2,000	3	$60
19	Fire Station	Add mezzanine above new apparatus bay	FR	$27,000	2	$810

Appendix

Bread Loaf Corp.
7/16/2018

LSC= Life Safety Code
HW= Health & Welfare
FR= Functionality Recommendation
ADA= American Disabilities Act

Line #	Building	Description	Category	2019 Est. Cost	Priority	Yearly Escalation @ 3%/Year
1	Library	Install code required exit sign in second floor community room.	LSC	$800	1	$24
2	Library	Install additional code required emergency lighting in stair tower.	LSC	$1,600	1	$48
3	Library	Enclose north stair in community room per code	LSC	$23,000	1	$690
4	Library	Install new weather-stripping and door bottom at exit door in stair tower	HW	$700	2	$21
5a	Library	Replace radiant floor heat system at first floor	HW	$32,000	1	$960
5b	Library	Hire ATC to perform air / mold test at basement elevator shaft	HW	$2,800	1	$84
5c	Library	ERV for ventilation air on first floor	HW	$22,000	1	$660
5d	Library	Add smart thermostats	FR	$1,600	1	$48
6a	Library	Window Air Infiltration (Add Weather Stripping to close major gaps)	HW	$8,100	2	$243
6b	Library	Window Air Infiltration (Add Interior Storm Panels)	HW	$27,000	3	$810
6c	Library	Paint Exterior of Windows	HW	$24,000	3	$720
6d	Library	Full Window Replacement	HW	$136,000	3	$4,080
7	Library	Scrape and repaint exterior clapboards and trim and replace damaged wood trim as need (Not including windows)	HW	$83,000	3	$2,490
8	Library	Renovate main desk	FR	$8,600	2	$258
9	Library	Install vapor barrier over basement dirt floor	HW	$8,500	2	$255
10a	Library	Repair historic slate roof (Full Replacement)	HW	$142,000	3	$4,260
10b	Library	Tall Steeple Restoration	HW	$157,000	3	$4,710
11	Library	New lighting and controls	HW	$15,000	3	$450
12	Library	Add watercoolers - each	HW	$2,700	3	$81

Appendix

Jan Lewandoski
92 Old Pasture Rd.
Greensboro Bend, Vermont
05842

June 6, 2015

The Richmond Free Library
Richmond, Vermont

A Preservation Trust of Vermont

Technical Assistance Report

The Richmond Free Library is located on two levels within a former church structure dating from the 1870-1885 period. The church building is Gothic Revival in style, executed in wood, and the exterior has been maintained faithfully in terms of clapboard and trim, lancet windows and doorways, false

buttresses, decorative trim, asymmetrical steeples (tall to the north, short to the south), stone front steps and slate roofing. Like many churches in this style, the main body of the church sits several feet in elevation above a partially sub-grade first floor level. The lower level, which has windows on all sides is covered in horizontal boards, rusticated to suggest stonework. The main body is clapboarded. The tan with red trim paint scheme is appropriate to the period.

This structure has been extensively remodeled in recent decades to serve as a library and this included structural repairs to both the wooden floor system over the small crawl space and basement, and some timber and steel plate work in the square portions of the steeple. The church has been examined recently by a roofing contractor using a lift, who was able to identify problems not visible from the ground.

The church/library is largely framed in dimensional lumber with the exception of the steeple, which is mostly timber framed. The roof system is a series of closely spaced trusses based upon 2 x 8 plank nailed and bolted together. The trusses are of the raised bottom chord type, where paired 2 x 8 arch bracing rises from the feet of the 2 x 8 rafters to meet the 2 x 8 tie beams near their mid span. 1 inch boards drop from the apex of the rafters and spike to the center of this span. The arch bracing produces the shape of a considerable vault, but currently the ceiling over the main performance space upstairs is only slightly coved.

The walls of the church, where they can be seen are framed with 2 x 5s covered with diagonal 7/8 inch sheathing. There

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may be larger, or built up timber concealed in the walls below. The floor framing is 2x joists reinforced with steel to help support the heavy library loads.

No foundation displacement or grading problems are obvious and the site slopes away well. Most of this structures maintenance needs will be concentrated on the wood trim, most of it original, and the slate roofing on the body and the spires, and the complicated flashings produced by this building style.

Richmond Free Library: Maintenance Needs

1. Slate Roofing:

Main Roof: The main roof of this former church is covered in dark grey slate, while the steeple roofing is the same dark grey with decorative patterns in both light grey and reddish purple slates. The slate is likely original to the building and thus at least 130 years old. However, the relatively steep pitch of the main roof (about 10/12) and its lack of dormers, and the extreme steepness of the steeple slopes, causes slate to both last longer due to shedding snow and moisture quickly, and to

resist water entry even when some slates are cracked and broken. Major roofing problems will occur where the slate meets, and is flashed into, dormers and other decorative woodwork features at the lower part of the tall steeple, and all along the shorter one.

I looked at the main roof slating from the ground but did not examine it from a lift as the roofing contractor did. I could see various slates with cracks or corners broken off but no wholesale failure, nor any slate remnants in the grass , which are common in failing roofs. I walked the entire interior length of the roof system looking for evidence of leakage in the form of water staining on the boards and puddling in the insulation but found none current, and only a few pinpricks of light visible through the roof deck.

There was evidence that roof damage had occurred around the short steeple in the past.

The contractor's figure for replacing entire slopes of the roof is reasonable, but I recommend inquiring further as to whether wholesale replacement is necessary. Rather, you might develop a relationship with one or more slate roofers for periodic replacement of individual slates. A slate does not need to be replaced because a corner is broken off. It is more likely that the original flashings are rusting through (the contractor identified some of these locations) at the drip edge and sidewall, and that replacing these will involve pulling numerous square feet of slate in the process. A second opinion is always a good idea, less inquiring into the goodness of flashings, which we know to be compromised, but into the life span of the good

Appendix

slate. An example of the options are the nearby monitor barns. The West Monitor (I dismantled and re-erected the frame) was covered in a sort of black slate that crumbled in ones hands at less than 100 years of age, and was largely responsible for the deterioration of the structure. The East Monitor is covered in Vermont grey and colored slate that, while leaking and missing slates have occurred, the slate itself is still good, probably for a very long time. Remember, there is a substantial industry in this state and New York of salvaging very old, but good quality slate roofs and using the slate again on prestigious projects.

Another possibility is that the nails fastening the main roof slates are rusty and starting to release slates. This can be determined by a knowledgeable person being up there. If the fasteners are bad, you will need to pull the entire roof, and even if you can reuse many of the slates, the labor cost on and off will still be much that of a new roof.

Steeples:

I examined the interior of the tall steeple in some detail and could find no evidence of current leakage into its structure. Repair work from the past indicates that leakage and rot occurred on a large scale at its northeast junction with the church, a shady and damp area, but this has been stopped. The extreme steepness of pitch on the spire The upper tapering cone) itself allows water and snow to slide by at such a rate that infiltration rarely occurs, and in fact there are numerous

all wood spires around the state, one of which I restored in Grafton last year, and another in Lyndon Corner recently.

The only concern I have is the possibility of rot in the spire right below the ornament. While designed to cap and flash the top of the spire, the extreme difficulty of maintenance causes ornaments (and weathervanes) to deteriorate and allow water to rot the top of the spire framing. Someone in a tall lift or crane basket should rise to the ornament, grasp it, and see if it is stable and not allowing water in. If the ornament is compromised, it should be removed, rebuilt with new flashings, and restored to position on repaired steeple apex framing. It may be possible to renew its flashings in place.

The lower portion of the tall steeple and the entirety of the short steeple share the problem of fast moving runoff quickly being stopped and diverted by dormers and trim, with potential ice and snow buildup as well. It is at these locations where there is woodwork deterioration, nail deterioration (evidenced by some woodwork pulling free of the steeple) and old flashing rusting through. While rot is not occurring in the frame of the steeple or attic currently, water is entering the cornice and skirting roofs of the steeples.

At the lower, dormered areas, of the steeple and the entire short steeple, it will be necessary, the sooner the better, to replace the valley, ridge and sidewall flashings and all deteriorated woodwork associated with them. Any moldings should be copied exactly, and not just replaced with similar ones off the shelf, unless they provide a exact fit.

Appendix

2· Exterior Woodwork:

There are enough trim and flashing problems around the lower portions of the tall spire and much of the small spire to justify scaffolding, or working from a lift if preferable, to rebuild much of its woodwork· Some, on the south and west faces, is extremely weathered· Others, on the north of the tall spire and against main roofs, suffers from excessive moisture· Where flashings have to be replaced, trim will be removed (as well as slates) , and this is the time to replace any in very worn condition· Flashing should never be nailed to the exterior of woodwork, but always inserted under it·

The new flashings should be copper and the trim select white pine·

The flat boarding on the west lower face of the steeple, and the clapboard above the west main door of the Library are quite weathered but can probably be improved when being painted with minimal carpentry·

3· Windows: The lower window **on the north** side of the tower needs reglazing·

Appendix

June 7, 2015

Richmond Free Library: Cost Estimates

1. Slate roofing:

Main Roof: Get a second opinion on the longevity of the current slate. Your options will be spending approximately $50,000 per slope to have the entire main roof rebuilt within the next 10 years, or every few years spending $4000 to

2. Woodwork Repairs: Both steeples. Custom woodwork , coordinated with flashing and slate work above, lift or scaffolding included;

Cost: $25-30000

3. Reglaze the north tower window: $500

Appendix

HEADWATERS

CONSTRUCTION & RESTORATION

SUMMARY

Project: Richmond Free Library **Date: 2/3/15**

201 Bridge Street

Richmond, VT 05477

C/O Rebecca Mueller

Contractor hereby proposes to furnish materials, labor and equipment necessary to complete the following scope of work:

Hi Rebecca,

We found the South roof to be nearing the end of its natural life. We could have easily changed one in three slates due to deterioration. We knew we had a limited number of slates to work with so we repaired the obvious leakers' recommend replacing the entire S roof within the next 5 years or so.

I believe the North roof has a little bit more life left and think it could go on with moderate repair for the next 10 years or so.

Both sides eave flashing is of copper and should be replaced whenever the slate is replaced.

The short steeple has been repaired at the areas that had deteriorated because of inadequate flashing. However, there needs to be some supplemental repair on the hip slates that have spread away from the metal flashing. The flashing itself is compromised at this point. We saved some examples for you to see. They have been left in the cellar.

The main steeple in need of repair and soon. We found a number of problems that need correcting before you begin to take on water and the wood decking and framing begin to look like the rot we found on the short steeple.

Appendix

We found missing slates, rotten wood, and rusted and missing flashing all around the main steeple.

Some of the action needed to correct the deterioration will be slate repair, some will be metal flashing installation and some will be slate repair. All need to be done together, as a system.

I'll send photos of what we found.

Estimates

South Roof restoration	$39,500 add $9,000 for the lower copper steeple flashing
North Roof restoration	$38,000 add $11,400 for the tall copper steeple flashing

Or $2,200 per square + rubbish removal+ papering+ O.H.+ fasteners and back nailing+ mobilization

Ridge Cap appears to be in good shape- ($50 per lineal foot to replace)

Estimates for immediate repairs

Short Steeple remaining Hip repair (should be done ASAP) $3,500-$4,000 (does not include lift)

Tall Steeple repair	$9,000-$10,000 (slate and hip course flashing only, does not include lift)
Tall Steeple Carpentry	$18,000-$20,000 (does not include lift)
Short Steeple Carpentry	$5,500- $7,000

Tall Steeple will need at least an 85' lift.

65’ lift per month $3,750 for lower work

85’ lift per month $5,000 for tall steeple. 85’ could be used for all repairs.

Immediate repairs 1 month rental

Restoration 3 month’s rental

Total restoration of the tall tower

$139,000

Regards,

Ben Dunham and Keith Schumacher

Appendix

Bread Loaf Corp.
7/16/2018

LSC= Life Safety Code
HW= Health & Welfare
FR= Functionality Recommendation
ADA= American Disabilities Act

Line #	Building	Description	Category	2019 Est. Cost	Priority	Escalation @ 3%/Year
1	Town Office	Install code required automatic sprinkler system	LSC	$119,000	1	$3,570
2	Town Office	Install code required fire alarm system	LSC	$50,000	1	$1,500
3	Town Office	Install code required exit signage	LSC	$2,700	1	$81
4	Town Office	Abandon storage closet under stair at lower floor level	LSC	$1,800	1	$54
5	Town Office	1 Hour Rating in Boiler Room	LSC	$3,400	1	$102
6	Town Office	Provide an ADA compliant ramp at door to lower level classroom and bathrooms.	LSC	$6,200	1	$186
7	Town Office	Provide a 1hr fire rated corridor that is separated from the boiler room and provides access to the remainder of the floor space at the same floor level	LSC	$16,000	1	$480
8	Town Office	Reverse door swing direction from first floor lobby to egress stair for code compliance	LSC	$600	1	$18
9	Town Office	Replace HVAC system and provide ventilation throughout building	HW	$726,000	2	$21,780
10	Town Office	Replace all windows with new energy code and historic compliant windows	LSC	$305,000	1	$9,150
11	Town Office	Remove and replace all exposed Romex wiring	LSC	$40,000	1	$1,200
12	Town Office	Renovate Police Department bathroom to be ADA	ADA	$11,000	1	$330
13	Town Office	Clean exterior brick veneer and repointing	FR	$74,000	3	$2,220
14a	Town Office	Post Office HVAC Replace	FR	$37,000	2	$1,110
14b	Town Office	Post Office HVAC Extend from Building Reno	FR	$63,000	2	$1,890
15	Town Office	New lighting and controls	FR	$26,000	3	$780
16	Town Office	Full building renovation to net zero ready	FR	$3,195,000	3	$95,850
17	Town Office	Replace Basement windows & install flood blowout panels	FR	$44,000	2	$1,320
18	Town Office	Add ventilation air to the basement	FR	$19,000	2	$570

Appendix

Appendix

Hall-Kimbrell

PRIORITIZATION ASBESTOS ASSESSMENT STUDY

STATE OF VERMONT

RICHMOND ELEMENTARY SCHOOL

Building Number 04-12-166-01
Richmond, Vermont

Conducted By
Hall-Kimbrell Environmental Services, Inc.

Report Number L70001

August 1989

Appendix

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Appendix

0. EXECUTIVE SUMMARY

Appendix

EXECUTIVE SUMMARY

RICHMOND ELEMENTARY SCHOOL
Richmond, Vermont

Hall-Kimbrell Environmental Services was retained by the State of Vermont to conduct an inspection for possible asbestos-containing materials in Richmond Elementary School in Richmond, Vermont. The inspection included the assessment of friable insulation, plaster, and fireproofing, as well as cementitious building materials.

As a result of the inspection and laboratory analysis of bulk samples collected, seven priority levels were generated to assist in planning and implementing a phased abatement program. Priority Level I areas contain materials which will require immediate attention due to poor material condition and/or ease of public access. Priority Level II through VII areas are those which contain materials with decreasingly lower exposure potentials. These materials should be repaired as necessary and monitored as part of an operations and maintenance program until removal is dictated by deteriorating material condition, or renovation or demolition of the building.

As a vital segment of the building study, Hall-Kimbrell has provided budgetary estimates for removal of all asbestos-containing materials and replacement with nonasbestos materials. A detailed listing of costs by priority level is provided below.

Priority Level	Removal Cost	Replacement Cost	Total Cost
I	$ 585	471	1,056
II	$ -0-	-0-	-0-
III	$ -0-	-0-	-0-
IV	$ 1,850	1,267	3,177
V	$ 2,224	1,243	3,467
VI	$ 2,100	1,500	3,600
VII	$ -0-	-0-	-0-
Total	$ 6,759	4,481	11,240

Please note: These costs do not include architectural/engineering, air monitoring, reimbursable, or contingency fees.

Appendix

1. INTRODUCTION

Appendix

INTRODUCTION

Asbestos, once commonly referred to as the miracle mineral, was first used as a reinforcement fiber as long as 3,000 years ago. Today, it is used in thousands of commercial applications. This fibrous mineral has excellent tensile strength, is almost totally chemical and fire resistant, and, when combined with other materials, possesses excellent acoustical qualities. Because asbestos is so abundantly available, it has been used extensively in building materials since before the turn of the century.

While it is the primary concern of the building owner to provide a safe environment, there are also many other issues raised by the presence of asbestos in buildings. Currently, there are very few statutory regulations that require a building owner to inspect for asbestos-containing materials, much less abate those materials. Due to the amendments to Public Law 99-519, many owners are giving serious consideration to either total removal of asbestos-containing materials or at least a phased abatement approach integrated with a well-defined and organized operations and maintenance control program.

ASBESTOS ASSESSMENT SURVEY

The State of Vermont authorized Hall-Kimbrell Environmental Services to conduct an asbestos inspection of its facilities. Samples of suspect materials were collected and then analyzed by Polarized Light Microscopy. The inspection was comprised of the following six elements:

1. A visual determination of the extent of suspect materials and the condition of these materials in the rooms, boiler/mechanical rooms, hallways, storage rooms, and other designated areas.

2. A physical "hand pressure" test for determining the condition of suspect materials.

3. Sampling and documentation of observable suspect friable materials (and nonfriable materials, when applicable) according to Environmental Protection Agency guidelines.

4. Measurement of all observable and friable suspect materials sampled to determine the quantity existing within the facility. The quantity is determined by a visual inspection and/or by blueprint examination.

5. Determination and expression of the exposure potential by using a numerical algorithm. Factoring of the algorithm is based on approximately twenty variables which contribute to the exposure potential.

6. Assessment of suspect cementitious and miscellaneous materials and their locations.

It should be noted that the survey conducted was a general building survey of accessible materials only. Any suspect materials above permanent ceilings or enclosed within walls were not sampled; however, quantities were estimated from blueprints or drawings, if those were available. Accurate identification of material composition and quantity can only be made by destructive sampling and subsequent analysis of materials.

Appendix

SPREADSHEET DATA FORMAT

The field data and the laboratory results are analyzed by the Hall-Kimbrell management program and presented in spreadsheet format. Since the spreadsheet format is oriented to data only, a short explanation of each element contained therein is given below. The data are organized under fourteen column headings. The following explains the content of each column and its relationship to the other items on the page.

Location: This includes an area number which is assigned by the data management group for reference purposes only. Also in this column are the area description and the material location. The area description describes (within the primary building) the room, floor, or section of a room where materials were found. The material location describes where in the area or room the material was observed.

Sample Group Number: This is the number assigned to the single bulk material that was collected. The sample group number is assigned to a single sample or a cluster of samples that were taken from a single material. This number is separate from the individual sample number assigned to each sample; e.g., if three samples are taken from a surfacing material, those three samples will each have a separate individual sample number, but the group will be assigned a single group identification number. The purpose of this categorization system is to aid in the analytical process. Sample group numbers with a "99" prefix are reserved for materials which were not sampled due to inaccessibility or contractual requirements, but which should be treated as asbestos-containing until they can be sampled and analyzed.

Number of Samples: This is the number of samples represented by the sample group number.

Material Description: This column is a written identification of the material that was taken from the area, such as pipe covering, spray-applied acoustical plaster, or boiler packing. This is used for identification purposes.

Percent Asbestos: Since the percent of asbestos in a sample is one of the primary factors determining the potential for exposure, it is listed separately in terms of the total percentage. A more detailed breakdown of the types and percentages of each type of asbestos found in the sample can be found in the petrographic analysis for that sample. If a zero is present in this column, the samples in the sample group contained no asbestos, and no exposure potential or cost estimates are listed in subsequent columns.

Sample group numbers with a "90" prefix will be indicated by *00% in this field. These materials were not sampled due to inaccessibility or contractual requirements, but should be treated as asbestos-containing until they can be sampled and analyzed.

Quantity: This is the actual quantity of the material to be used for estimating costs. The quantity is expressed in absolute units such as linear feet, square feet, or other applicable units. Quantities have been determined by on-site measurement or plan take-offs. Where access is restricted, best estimates are determined from whatever information is available. An accuracy factor of +/- 10% can be assumed.

Appendix

O & M Code: This column contains the operations and maintenance code for this particular material. An explanation of these codes follows.

O & M CODE	MATERIAL REFERENCED	BULK SAMPLE CODES
OMA	Pipe lagging and mud-packed joints	BS - E,F,G,N,O,P,Q
OMB	Insulation on boilers, tanks, breeching, and ducts	BS - H,I,U,T
OMC	Fireproofing	BS - R,C
OMD	Acoustical plasters	BS - A,B,D
OME	Stored Insulations/ Materials	BSY
OMF	Debris	BSX
OMG	Ceiling tiles, panels	BS - K,L,V
OMH	Tape/woven paper	BSJ
OMI	Miscellaneous nonfriable materials	
OMZ	Other	BS - M,S,W,Z

Exposure Potential: The exposure potential is determined for each area where asbestos-containing materials have been found. The exposure potential differs from actual ambient exposure. Ambient exposure refers to the amount of asbestos that is inhaled on a day-to-day basis in a contaminated building. Exposure potential is the possibility, expressed numerically, of an accidental disturbance of the material occurring. The disturbance may be from impact with the material, vibration from mechanical systems, water damage, or other causes. There are approximately 20 variables which contribute to the propensity of material disturbance. The exposure potential is very important in determining priority for abatement as well as the necessity for immediate implementation of control measures.

While ambient exposure is generally relatively low in public buildings, material disturbances can result in the release of massive doses of asbestos fibers into the work area and a building occupant's breathing zone for short periods of time. Many experts have concluded that peak exposures from accidental disturbance contribute the vast majority of asbestos fibers in human lungs, compared to those inhaled ambiently.

Appendix

Priority Level: The distribution of all numerical exposure potential values for all materials sampled has been divided into priorities, with Priority Level I posing the greatest exposure hazard. Subsequent priorities characterize areas with lower exposure potentials. Exposure potential numbers are distributed on a continuum, and the priority is based on the distribution. Priority Level I usually designates those materials which are creating a very serious exposure threat to the building occupants, determined by the exposure potential number, as well as subjective interpretation of notes taken during the inspection. Although Priority Level II should be considered serious, it does not yield the degree of danger that Priority Level I does, and so on. The priority levels are primarily used in conjunction with a phased abatement program, where the highest priority areas are removed first and lower priorities are managed under an operations and maintenance plan until they can ultimately be removed.

Removal Cost: This is the portion of the cost associated with removal of the asbestos-containing material. This cost includes area preparation prior to abatement, and cleanup and disposal of waste after abatement. The removal cost does not include costs incurred accessing materials which may be enclosed behind ceilings or other obstacles.

Replacement Cost: This is the cost associated with replacement of the asbestos-containing material with nonasbestos material, or reinsulation of the specific item from which asbestos has been removed.

Total Cost: The total cost is the sum of the cost estimated for removal of the asbestos-containing material and the cost of replacing the material with nonasbestos material of equivalent or greater quality. Estimates are based on average unit values for the type of material and, in general, Hall-Kimbrell's cumulative experience in estimating the cost of asbestos abatement projects. Other variables which contribute to the cost factors are accessibility to the material, building use and occupancy, total size of the project, ceiling height, number of floors in the buildings, and HVAC system. The unit prices used in this estimate are based on projects in the client's respective geographical location. A subtotal appears for each exposure area. At the end of the column, the abatement cost is totaled for that building. Engineering, air monitoring, and other related costs are not included in the base abatement cost which appears on the spreadsheets.

ASBESTOS ABATEMENT COST AND ASSOCIATED FEES

In general building construction, the architect's estimate is used as a base figure, with contingency fees added to determine a total project cost figure. Contingency fees include unexpected bid fluctuations, last minute owner-requested change orders, and other changes that may not be anticipated. An asbestos project is no different; therefore, a 5 to 15 percent contingency should be added depending on the size of the project.

Professional fees must also be considered in the total project scope, since almost all abatement projects today must be designed and managed by a professional engineering or consulting firm specializing in this unique area. The fees for designing the project; developing the plans and specifications; conducting all the necessary prebid and preconstruction conferences; and providing contract administration, supervision and final clearance of the project are usually based either on a percent of the total construction cost (with the percentage dropping as the total cost of construction increases) or on a lump sum or "not to exceed" basis. The professional fees for managing and designing the project and ensuring it is being conducted under stringent, safe conditions could range from 5 to 8 percent for projects over one-quarter of a million dollars in construction estimates, to as high as 10 to 12 percent for much smaller projects. The fees are always exclusive of reimbursable expenses and travel-related costs.

Appendix

On-site air monitoring and construction supervision is absolutely vital during an asbestos abatement project. Unlike the general construction project in which the architect or engineer monitors the job from time to time, the unregulated nature of the abatement industry requires constant vigilance to ensure that the contractor is complying with all aspects of the specifications, that the procedures are followed to the letter, and that sophisticated monitoring of not only the air inside the work area, but also the air outside the work area and inside the building, is carried out to be sure that asbestos fiber levels do not exceed safe levels. In addition, the air monitoring records provide the owner with tangible evidence of the safety of the project and can be used in a public relations program, since tenants or other building occupants are concerned about the "healthfulness" of their spaces during and after an asbestos abatement project.

The fees for an on-site air monitoring crew and an on-site laboratory for rapid analysis of these critical barrier and final clearance samples are either charged on a per shift basis or as a percent of the total construction cost, depending on the size of the project. They are usually separate from the architectural/engineering fees but may in some instances be combined into one contract with the architectural/engineering portion of the project. These fees are difficult to estimate without knowing such factors as the time of year the work is to be performed, the number and size of the work areas, time constraints, and the use and occupancy of the building. However, a gross estimate for construction supervision and air monitoring is approximately two (2) percentage points higher than the architectural/engineering fees. As a general rule of thumb, it can be estimated that the associated architectural/engineering fees, construction supervision, air monitoring fees, reimbursable expenses, will run approximately 15 to 17 percent of the construction cost for larger projects and could be as high as 20 to 25 percent of the construction cost for smaller projects.

In addition to professional fees during the actual project, there are other fees that may be associated with the asbestos abatement program. These include:

1. The cost of the asbestos assessment survey.
2. The cost to develop and maintain an operations and maintenance program to monitor asbestos-containing materials remaining in the building system.
3. The cost of relocation, in some instances, of employees and other building occupants during asbestos abatement.
4. Down time in productivity for personnel administering the asbestos abatement program.
5. Litigation assistance cost if a cost recovery lawsuit is planned to recover the cost of asbestos abatement from the manufacturers.
6. Other internal costs related to the program.

COMPLIANCE WITH EPA NOTIFICATION RULE
(For Public and Private Schools K-12 Only)

As a result of the increasing awareness of the hazards associated with inhalation of asbestos fibers, the United States Environmental Protection Agency has enacted a rule which requires all public and private schools K-12 to have their buildings inspected for friable asbestos-containing materials. The ruling was published in the Federal Register, Volume 47, No. 103, on Thursday, May 27, 1982, and became effective June 28, 1982. Local education agencies were to comply with the provisions by June 28, 1983, as extended in the June 10, 1982 Federal Register.

Under this EPA ruling, if friable materials are identified during the inspection, the materials must be sampled and analyzed for asbestos by Polarized Light Microscopy or x-ray diffraction. The results of the analysis must be kept on file with the Superintendent of Education. If asbestos is reported present, the local school officials must notify parents and employees of the situation, post necessary notices and warnings, and maintain records at each school building as per the rule.

Appendix

RECORD KEEPING REQUIRED

40 CFR 763.114

A. Local education agencies shall compile and maintain in the administrative offices of each school under their authority a record which shall include:

1. The name and address of the school

2. A list of all school buildings associated with the school indicating whether each building has been inspected for friable material in compliance with 763.105, and which buildings contain friable materials.

3. Copies of the Notice To School Employees found in 763.111 (a).

4. For each school building which contains friable materials:

   (i) A blueprint, diagram, or written description of the building which identifies clearly the location(s) and approximate area(s) of such material(s), the locations at which samples were taken, and the identification number of each sample and which shows or describes clearly whether each sampling area of friable material contains asbestos, including an estimate of its percent asbestos content as determined by calculating the average of the percent asbestos contents of all samples taken in that area.

   (ii) A copy of all laboratory reports and all correspondence with laboratories concerning the analysis of samples taken in accordance with 763.107.

5. If the school contains friable asbestos-containing materials, copies of the "Guide for Reducing Asbestos Exposure" contained in 763.111 (b), and one copy of "Asbestos-Containing Material in School Buildings: A Guidance Document," Parts 1 and 2 (EPA No. C00090), which can be obtained by calling 800-424-9065.

6. A statement that the requirements of the rule have been satisfied, signed by the person responsible for compliance with the rule and including the date and the person's name and title.

B. Each local education agency shall retain in the administration office of the agency:

1. A list of all schools under its authority, indicating whether schools were inspected in accordance with 763.105, and which schools contain friable materials.

2. A record of the friable material in schools which were sampled and analyzed in accordance with 763.107 and 763.109, indicating which materials contain asbestos.

3. For each school which contains friable asbestos-containing materials, the total areas of such materials in square feet, and the total number of school employees who regularly work in the school.

C. Form: Each local education agency shall complete and retain in the administrative office of the local education agency the following form, "Inspections for Friable Asbestos-Containing Materials."

Appendix

OPERATIONS AND MAINTENANCE PLAN OVERVIEW

Although the U.S. Environmental Protection Agency has banned the use of most asbestos-containing building products, the problem remains--what to do with the materials that still remain in millions of buildings across the country. The optimal choice is immediate and safe removal of all asbestos-containing materials; however, the magnitude of the problem, along with the high costs associated with this option, renders it impractical. The most prudent approach in addressing this problem is to prioritize all the materials in a facility based on the potential for exposure of the workers and other building occupants. Those materials having a high degree of exposure potential should be abated and those having a lesser potential should be controlled for a period of time until they can be abated.

With a phased abatement approach, a program must be implemented to systematically monitor and control the materials remaining in the buildings. This program is commonly referred to as an operations and maintenance (O & M) program.

An operations and maintenance program follows a systematic approach to document the building owner's intentions and to provide an interdisciplinary approach to the protection of the building occupants. The following pages represent a condensed operations and maintenance plan to serve as a guide for controlling exposure to the material in the facilities until they can be abated.

It should be noted that a specific, detailed operations and maintenance program for asbestos-containing materials in public schools as part of the Asbestos Hazard Emergency Response Act of 1986 has been drafted. This plan will supersede all others for implementation in public and private schools.

OPERATIONS AND MAINTENANCE CODES

The operations and maintenance (O & M) procedures are designed to structure a program for handling specific types of asbestos-containing materials (ACM) and activity areas. The purpose of the program is to minimize the exposure potentials of a specific type of ACM or activity area by addressing and organizing special procedures to: 1) clean up and properly dispose of asbestos fibers previously released; 2) repair damaged ACM; 3) prevent further disturbance or damage of the ACM; and 4) monitor conditions until removal.

The operations and maintenance codes are listed in a column on the spreadsheets and are used to reference the proper operations and maintenance procedures for that asbestos-containing material.

If ACM has been identified, some level of exposure potential exists. If damaged ACM is in an area, it should be assumed that exposure has occurred and potential for future exposure still exists.

Most areas with ACM can be cleaned by wet methods and/or HEPA-vacuuming methods following the procedures covered in the section "Mechanisms for Reducting Exposure to Asbestos." As different circumstances arise, modifications may be necessary. Regardless of the circumstances, prudent safety precautions should be used. Cleaning and/or removal of ACM should never be performed without a NIOSH-approved respirator and wet methods of cleaning or removal.

When these repair procedures are conducted, workers should follow all requirements of the Vermont regulations for asbestos control.

Appendix

OMA Pipe Insulations and Mudded Joint Fittings

Work area preparation and cleaning shall be in accordance with the requirements previously listed in this section.

Repair minor dents and tears in the protective jacket with duct tape or bridging encapsulant with glass cloth reinforcement. Duct tape should only be used for temporary control until the bridging encapsulant is installed. If glove bag removal is not feasible, wrap uncovered pipe insulations with protective jackets consisting of a bridging encapsulant with glass cloth reinforcement.

Wrap moderately water damaged or contact damaged pipe insulations with new protective jackets, or reinsulate affected areas. Eliminate the source of the water damage. More severely damaged pipe insulations may require removal by glove bag or gross containment techniques. Request authorization for removal by a work order form the building/system Asbestos Coordinator. Routinely clean the area using procedures covered in the section "Mechanisms for Reducing Exposure to Asbestos." Persons performing this work must be certified by the Vermont Department of Health.

OMB Insulations on Boilers, Breeching, Ducts, etc.

Work area preparation and cleanup shall be in accordance with the requirements previously listed in this section.

Repair minor dents and tears in insulation on boilers and breeching with a bridging encapsulant with glass cloth reinforcement. Duct tape or nonasbestos mastic should only be used for temporary control until the protective jacket is applied. Wrap uncovered insulations with new protective jackets or coverings consisting of a bridging encapsulant with glass cloth reinforcement.

If damage is more severe, cleanup may involve removing the asbestos-containing materials. Consult with the building/system Asbestos Coordinator if removal is necessary. Use proper emergency abatement techniques covered in "Minor Abatement and Repair Techniques."

Minor damage to duct work insulated with ACM should be repaired with a bridging encapsulant with glass cloth reinforcement. Duct tape or nonasbestos mastic should only be used for temporary control until the protective jacket is applied.

If insulated duct work exists above drop ceilings which are missing ceiling tiles, replace the tiles to help keep the asbestos-containing material isolated from the building occupants.

Consider replacing perforated drop ceilings with a more sealed barrier to prevent exposure to asbestos-containing materials.

Persons performing this work must be certified by the Vermont Department of Health.

Appendix

OMC Fireproofing

Work area preparation and cleaning shall be in accordance with the requirements listed in this section.

On a temporary basis, the exposure potential of fireproofing can be reduced by constructing airtight walls and ceilings around the ACM, enclosing the exposed area. This process will disturb the ACM through contact, vibration, etc., so the same isolation and control techniques used for removal projects (Chapters V and VI) must be incorporated into this type of work. An enclosure project would generally be applicable only to a small area. Enclosure of a large area often requires such effort and expense that removal is more cost effective and practical.

The fireproofing may be sprayed with an encapsulant if the fireproofing is well bonded to its substrate and is less than one inch thick. This is to be considered a temporary control measure with a life expectancy of five to six years. As with enclosure, isolation and control techniques used for removal projects must be incorporated into encapsulation work. Test results have shown that, due to the impact of the spray, spraying with an encapsulant can entrain into the air more fibers than a gross wet removal project.

If the fireproofing has localized water damage and/or is becoming delaminated in a small area, spot removal of the damaged material may be necessary. Follow techniques outlined in "Minor Abatement and Repair Techniques." If the remaining fireproofing is well bonded to its substrate, it can then be encapsulated; however the source of the water must be eliminated.

If work involves hanging ducts, conduit or pipes, etc., from surfaces sprayed with fireproofing, follow the techniques outlined in "Minor Abatement and Repair Techniques." Avoid disturbing fireproofing whenever possible. Always wear an approved and fit-tested respirator and disposable coveralls when working around friable fireproofing.

Persons performing this work must be certified by the Vermont Department of Health.

OMD Acoustical Plasters

If the plaster is in good condition, with no delamination, deterioration, or signs of water damage, it requires no immediate attention, but should be carefully monitored for signs of change in status.

If the plaster is water damaged and/or is becoming delaminated from the substrate, it should be removed rather than encapsulated. Encapsulation can make the condition worse by increasing the rate of delamination. The source of the water damage must be eliminated. Authorization and a work order for spot removal should be obtained from the building/system Asbestos Coordinator. Emergency abatement techniques should be followed.

Avoid disturbing acoustical plaster by not hanging plants, drilling holes in the ceiling, moving furniture, etc. Work area preparation and cleanup for all types of maintenance and repair work shall be in accordance with the requirements listed previously in this section. When the plaster must be disturbed, mist the affected area with amended water and use a HEPA vacuum to collect fibers being released.

Persons performing this work must be certified by the Vermont Department of Health.

Appendix

OME Stored Insulations

Work area preparation and cleanup should be in accordance with the requirements previously listed in this section.

Stored pipe lagging, tank packing, joint compound, fireproofing, and other miscellaneous asbestos-containing materials should be cleaned up and disposed of properly. If the items are not in a container and there is a potential for exposure, the items should be carefully wet with a light mist and put into an asbestos disposal bag and disposed of properly.

Persons performing this work must be certified by the Vermont Department of Health.

OMF Debris

Work area preparation and cleanup should be in accordance with the requirements previously listed in this section, except the application of floor plastic, which would not be practical.

Large amounts of debris should be cleaned up following procedures discussed in the section "Minor Abatement and Repair Techniques." Smaller amounts can be cleaned up using a HEPA vacuum and wet wiping or wet mopping. Dispose of larger pieces by misting and carefully moving the pieces to an asbestos disposal bag to be properly discarded.

Persons performing this work must be certified by the Vermont Department of Health.

OMG Ceiling Tiles

When ceiling tiles are noted as asbestos-containing materials, precautions can be taken to greatly minimize exposure from the tiles.

Whenever the tiles are cut, broken, or damaged, they should be disposed of properly and replaced by new tiles. Tiles should never be broken to fit into an asbestos disposal bag.

If an area is to be renovated or the ceiling totally replaced, the removal should follow site preparation and procedures from "Minor Abatement and Repair Techniques." Consult with the building/system Asbestos Coordinator and obtain a work order form. Dispose of all tiles as contaminated waste.

Monitor ceiling tiles and report any damage. Maintain condition and follow interim control measures until tiles have been completely replaced.

Persons performing this work must be certified by the Vermont Department of Health.

OMH Tape/Woven Paper

Asbestos-containing tape is used primarily for sealing seams on duct work. Loose or frayed ends of the tape should be wetted with amended water, cut, and properly disposed. Care must be taken not to damage the tape by ripping or tearing it during this procedure.

Damaged tape should be carefully painted with a bridging encapsulant with minimal overspray or overbrushing. When the tape must be disturbed, mist it with amended water (unless the disturbance is due to the encapsulation process) and use a HEPA vacuum to collect fibers being released.

Persons performing this work must be certified by the Vermont Department of Health.

Appendix

OMI Miscellaneous/Cementitious Materials

Fiber release from cementitious (nonfriable) materials is normally extremely low, unless these materials are broken, drilled, sanded or otherwise disturbed. During disturbance, the material should be thoroughly dampened and a HEPA vacuum used to collect fibers being released. Follow the work area preparation and cleanup requirements previously listed in this section. Some examples of cementitious materials that may contain asbestos are:

- Floor tiles
- Wall plasters
- Scratch coats
- Transite-type panelling
- Exterior Siding
- Friction products (brake linings, clutches, etc.)
- Tile underlay
- Transite pipes
- Drywall plaster
- Linoleum
- Roofing felts

OMZ Other Materials

This code applies to miscellaneous asbestos-containing materials (ACM) that rarely create a significant problem, but can pose an exposure risk when being damaged or removed. Listed are some of the asbestos-containing materials that fall into this classification. If an asbestos-containing material is not directly addressed in the operations and maintenance codes, an operations and maintenance procedure may be applied using one or more of the codes that involve similar materials.

Persons performing this work must be certified by the Vermont Department of Health.

Batt Insulation - Cutting or tearing the asbestos-layered paper backing can cause fiber release. Wet the backing with amended water and wear a half-face respirator if batting needs to be cut or moved.

Friable Hardboard - Precautions should be taken to minimize exposure from the hardboard. Replace broken or damaged hardboard with a nonasbestos material. If removal is necessary, wet the material and try to remove it in one piece. The hardboard should never be broken up to fit into an asbestos disposal bag.

Vibration Joint Cloth - Vibration joint cloth is most often found on duct work near air handlers. Loose or frayed ends should be wet with amended water or a diluted encapsulant. Carefully cut and remove the joint cloth and dispose of properly.

Wiring - Care should be taken when cutting or stripping asbestos wire insulation. In general, it is not a safe practice to wet the wire insulation. Dispose of the stripped insulation properly.

Other Asbestos-Containing Materials

Carpet - Carpets normally do not contain asbestos but can become contaminated if located in a room with damaged asbestos-containing ceiling plaster or fireproofing. Always clean with wet methods, while wearing respirators. If carpet is to be replaced, obtain a work order from the Asbestos Coordinator, remove and dispose of it as contaminated waste.

Appendix

Earth Floors - When mechanical insulations located in crawl spaces or tunnels deteriorate or are damaged, the earth floors beneath them can become contaminated. Often the asbestos materials are broken up and ground into the loose earth by maintenance workers performing work in these areas. If the contamination is found to be limited to the loose, dusty portion of the surface of the floor, cleanup with a HEPA vacuum will normally suffice. If the asbestos is ground into the earth floor by foot traffic or if the floor is dry and cracked, it may be necessary to HEPA vacuum the loose material and then remove the outer two to three inches of the firm soil. In either case, the remaining floor surface should be covered with a thin layer of gunnite (if the area is not too large) or sprayed with a penetrating soil encapsulant made specifically for this purpose such as "EarthKote" by American Coatings Corporation. Apply such soil treatments as per the manufacturer's recommendations.

Vinyl Asbestos Floor Tiles (VAT) - When damaged, vinyl asbestos floor tiles become friable and could present a problem. If spot removal becomes necessary, the following method should be utilized. Seal all doors and grills. Turn off the HVAC system as a safety precaution. Mix amended water to a slightly stronger than normal strength. Spray the entire surface of the tiles to be removed, wait six to eight hours and repeat the spraying. Most vinyl asbestos tile glues are water soluble and the tiles will loosen up so that they may be physically removed, placed in a sealed plastic bag, and disposed of as asbestos waste. When the tiles are loose the ends will curl up or under. As a further safety precaution, wear respirator and disposable coveralls. After completion of the project, wet wipe all surfaces in the area. Note: Dispose of the paper-like underlay with the vinyl asbestos tiles, as it usually contains asbestos.

O & M CODE	MATERIAL REFERENCED	BULK SAMPLE CODES
OMA	Pipe lagging and mud-packed joints	BS - E,F,G,N,O,P,Q
OMB	Insulation on boilers, tanks, breeching, and ducts	BS - H,I,U,T
OMC	Fireproofing	BS - R,C
OMD	Acoustical plasters	BS - A,B,D
OME	Stored Insulations/ Materials	BSY
OMF	Debris	BSX
OMG	Ceiling tiles, panels	BS - K,L,V
OMH	Tape/woven paper	BSJ
OMI	Miscellaneous nonfriable materials	
OMZ	Other	BS - M,S,W,Z

Appendix

OPERATIONS AND MAINTENANCE RECORD KEEPING

To document the progression of the program and to provide evidence that the written plan of intent was in fact carried out, a thorough and well-organized record keeping system is absolutely necessary. All documents and records pertaining to the operations and maintenance program should be kept in an organized filing system in the office of the Asbestos Coordinator. Although there are many possible records that may be maintained in this system, there should be, at minimum, the following documents:

* The original copy of the operations and maintenance plan/survey report/laboratory results of samples collected.
* Copies of federal or state regulations pertaining to asbestos.
* Copies of all periodic in-house reinspections or change of status monitoring results.
* Copies of any written notifications issued to the building staff.
* An employee list of maintenance personnel, custodians, and other staff affected by the program.

Optional:

* Minutes of any advisory council established to govern the operations and maintenance program
* Lists of areas in the buildings where the asbestos-containing materials have been removed or temporarily encapsulated
* Copies of routine asbestos cleaning schedules for the custodial staff
* Copies of cleaning and repair handbooks issued to the maintenance staff.

Asbestos Coordinator: _____

Room #: _____

Asbestos File #: _____

Appendix

WARNING AND NOTIFICATION PROCEDURES

An operations and maintenance program cannot be effectively carried out without a provision for notifying the workers and building occupants of the presence of and status of the asbestos-containing materials. There are many methods by which this can be accomplished, depending upon the system and circumstances. Each individual building manager must decide which procedure will work best for the building/system. For public schools, in addition, please refer to notification requirements as per EPA regulations discussed earlier in this report.

Examples of a notification to the staff outlining the presence and status of the materials are as follows:

1. Written notices may be posted in employee lounges, custodial closets, and mechanical rooms.

2. Notification may be provided through an open, verbal discussion of the situation with the workers and building staff in a specially called meeting.

MEDICAL SURVEILLANCE

Beginning in 1979, when the U.S. Environmental Protection Agency issued guidelines in the "Orange Book" and later in the "Blue Book" for establishing operations and maintenance programs, a medical surveillance or screening program was included in the necessary elements. During the last few years, however, there has been considerable controversy over the necessity for medical screening in an operations and maintenance program.

Due to the latency period between exposure and onset of disease (20 to 40 years), the efficacy of medical screening is sometimes questionable. A medical expert should be consulted on this element of the operations and maintenance program.

IN-HOUSE MONITORING

To monitor the condition of the materials that will remain in the facilities, routine and systematic procedures for inspecting those materials must be implemented. This in-house inspection and change of status monitoring is usually conducted by either an Asbestos Coordinator (the person charged with managing the operations and maintenance program), individual maintenance supervisors, or others. This monitoring could be provided on a quarterly or semiannual basis. Regardless of the time interval chosen, the inspection and monitoring should be done routinely by the same person or persons on approximately the same day of the month to maintain consistency and continuity.

In-house monitoring is not the same as the semiannual inspection, but is simply a check on the material during routine duties to determine if the material has further deteriorated or sustained further water damage, if there has been a change regarding the occupancy status or rate in the area, or if other changes have affected the exposure potential of the materials. If, upon routine inspection, the status has changed, there are proper steps to take to notify the Asbestos Coordinator and forms to fill out.

Appendix

EMPLOYEE TRAINING PROGRAM

Custodial/Maintenance Training

The key element in initiating and carrying out a functional operations and maintenance program is the maintenance/custodial staff. This group will be responsible for the initial cleanup of asbestos from walls, floors, furniture, etc.; periodic cleanup under specialized techniques; and emergency repairs to areas containing asbestos. To keep a building "asbestos clean," specialized mopping, vacuuming, and wiping techniques must be employed. Key elements include:

1. Introduction - A general background of abatement, including the need for and understanding of operations and maintenance planning.

2. Background on Asbestos Use - A brief history of the uses of the mineral, construction applications during the twentieth century, physical properties, etc.

3. Medical Effects of Inhalation - A brief background from studies conducted at Mt. Sinai and Harvard, present day theories, projections of health effects, etc.

4. Mechanism for Exposure - A review of the physical means by which asbestos becomes airborne, fiber size, peak exposure vs. ambient exposure, present day maintenance operations which contribute to exposure, factors in the algorithm which tend to amplify the hazard exposure index, etc.

5. Warnings/Notifications System for Workers

6. Mechanism for Controlling Exposure

7. Emergency Abatement Techniques (Note: Any employee who will be performing/supervising abatement activities in the State of Vermont must first be certified as an Asbestos Abatement Worker or an Asbestos Supervisor by the Vermont Department of Health.)

8. Inspection/Indication of Potential Problem

9. Special Response Team - The elements necessary to develop a select group to handle most emergency abatements. This group should be trained in glove-bag and other minor removal and patching operations. These employees must be certified as covered in 7. above.

Custodial Training

1. Introduction - General background on asbestos, explanation of Operations and Maintenance Plan, abatement efforts to date, etc.

2. Medical/Mechanisms for Exposure - Condensed version of medical review from maintenance employees' session, along with similar mechanisms for exposure, with emphasis on fiber entrainment mechanisms.

3. Use of HEPA Vacuums - Theory of HEPA filtration, use of HEPA vacuums, filter changes, etc.

4. Special Sweeping/Mopping Techniques - Use of special cleaning methods, installation of muslin cloths, disposal, techniques to replace dusting, etc.

Appendix

5. Daily Awareness/Inspection - Training to focus an awareness of the indications of potential problems, chain of command and notification, and general techniques to avoid exposure.

6. Coordination with Asbestos Coordinator - Schedules for cleaning, mopping, etc.

Management/Administration Training

1. Review Objectives of Operations and Maintenance Plan

2. Review Elements of Operations and Maintenance Plan

3. Establishment of Asbestos Coordinator/Hierarchy of Authority

4. Review of Budget - Necessary Purchases of Special Equipment

5. In-House Inspection Program

6. Medical Surveillance

7. Record Keeping

8. Update/Review of Operations and Maintenance Scheduling of semiannual review, update sessions and elements to consider.

MECHANISMS FOR REDUCING EXPOSURE TO ASBESTOS

For more information, please consult the Vermont Department of Health and Vermont regulations for asbestos control.

Initial Cleanup

When asbestos-containing materials are present on structural steel members or overhead ceilings and mechanical areas, asbestos fibers have probably been released from the ceiling, along with other materials such as perlite or vermiculite, and have settled on walls, furniture, floors, etc. Because most asbestos-containing ceiling materials contain chrysotile asbestos, a thorough initial cleaning is imperative to remove the contaminants from those surfaces and thereby reduce the possibility for fiber entrainment.

Fibers may be released from the ceiling materials due to thermal movement, vibrations from air handlers, and general building settling. When people walk through buildings, the movement of their feet, sweeping, mopping and air flows reentrain those once-settled fibers into the air. The fibers later settle, and the cycle resumes. Those fibers that are small enough to be entrained and suspended in the air are the ones which cause serious bodily harm. The following steps should be taken to remove airborne as well as settled asbestos fibers.

Appendix

Use of Water

During asbestos cleanup all references to "wet wiping" or "wet mopping" refer to that activity using nonamended water.

However, amended water should be used when wetting the asbestos-containing material before repair or abatement. Amended water is water that has a surfactant added to reduce the surface tension, thereby retarding evaporation and increasing penetrability of the asbestos-containing materials. Most commercial products are a 50-50 mixture of polyoxyethylene esters and polyoxyethylene ethers with approximately three percent emulsifier. The product is purchased in a concentrated form and diluted with water. Usually one adds only one to three tablespoons of concentrated surfactant to a five-gallon pail of water, depending on the wetness desired. Refer to specific instructions by the manufacturer of the surfactant.

Order of Initial Cleanup of an Area

1. HEPA vacuum all sills, wall protrusions, signs, air vents, suspended light fixtures and other immovable fixtures.
2. Lightly mist the air with water, starting high at the ceiling and ending low to the ground.
3. Wet wipe all areas previously HEPA vacuumed in A above.
4. Wet wipe all walls, excluding areas with sprayed-on asbestos-containing materials.
5. HEPA vacuum all carpets twice.
6. Wet mop the floors.

Disposable Mop Heads/Cloths

All wet wiping and wet mopping will be carried out using disposable cloths and/or disposable mop heads. NOTE: all items contaminated with asbestos fibers must be disposed of in six-mil polyethylene bags and properly labeled as per EPA regulations. More information on disposal bags is found below. The most economical method for obtaining disposal cloths/mop heads is to purchase a large roll of muslin or similar cotton-type material, and cut out wiping cloths, wet mop covers, and dust mop covers.

Wet-wipe cloths (approximately 18" x 18")
Wet-mop covers (40" x 15")
Dust mop covers (24" x length of mop head)

A supply of each of the above should be kept at each building. The covers are folded over the mop head and either stapled or twist-tied. When the cloth becomes full of debris, the cover should be removed and disposed of in six-mil bags. All cloths should be rolled into tight balls for disposal to allow for increased bag capacity.

Disposal Bags

Each building will have a location where asbestos disposal bags are kept. These areas should be located on opposite ends of the building and out of the access of building occupants and noncustodial personnel. The six-mil polyethylene bags will be kept closed at all times and twist tied. When the bag becomes full, it will be twist-tied and placed in another six-mil bag and again twist-tied. The full bags will be placed in a 55-gallon steel or fiberboard drum and disposed of in an approved landfill. Until time for disposal, all full bags and drums will be kept away from extreme heat, wet areas, and areas accessed by noncustodial personnel. If the bags are not punctured or damaged, the drums may be cleaned and reused. Otherwise, they should be disposed of as contaminated waste.

Appendix

HEPA Vacuuming

HEPA vacuum cleaners are to be used for the purpose of cleaning sills, wall protrusions, and carpets. As mentioned in the *"Use of Water"* section above, the first stage of an initial cleanup is vacuuming of the above. A HEPA vacuum must be able to filter out 99.97% of all fibers greater than 0.3 microns in length. Most HEPA vacuums have four filters. The initial paper filter must be changed on a basis similar to a non-HEPA, i.e. when it becomes full. The secondary filter should be changed every month, depending on use.

The tertiary cloth filter should be cleaned or replaced every six months. The HEPA filter, under normal conditions, needs to be replaced every two years or more, depending on brand, usage, etc. When any one of the filters needs to be changed or cleaned, it must be done outside of the building and removed very slowly to reduce the possibility of a sudden burst of fibers to the breathing zone. An approved respirator and disposable coveralls must be worn during bag changing. Upon removal, all filters must be disposed of as contaminated waste.

Personal Protection

The following will be worn during initial cleanup of all buildings with asbestos-containing materials, as well as the times when there is a likelihood of coming into contact with asbestos-containing material.

> Disposable Coveralls - A "Tyvek" brand or similar disposable coverall will be worn over the clothes to prevent capturing asbestos fibers on the worker's clothing. For ease of movement an extra-large size should be worn.
>
> Respirators - A respirator with disposable cartridges approved for asbestos dust by NIOSH will be worn at all times during initial cleanup and during emergency repair operations.
>
> The respirator should be fitted according to instructions provided in the Hall-Kimbrell training session to prevent excess inhalation of fibers.

All disposable respirator cartridges and coveralls will be rolled and disposed of at day's end in the six-mil asbestos disposal bags.

After the wet-cleaning of all building areas and removal and disposal of all contaminated material, the building should be relatively asbestos-free, except for that contained in the original material. The two following routines should be employed to retain this asbestos-free condition after the initial cleanup.

Daily Use of Disposable Mop Heads

To prevent fiber entrainment there will be no dry mopping or sweeping in areas where friable asbestos-containing materials are located. Until all asbestos materials are removed from the ceiling, all daily mopping will be carried out with dampened disposable mop heads. Disposable cloths on mop heads cannot be reused daily and should be changed at day's end. Contaminated mop water will be filtered through a five-micron filter and disposed of in a sanitary sewer.

Weekly Cleaning

In addition to the regular daily activity of mopping with disposable mop heads, a weekly cleaning of walls and fixtures is to be conducted. All walls and fixtures will be "wet wiped" and the cloths disposed of in six-mil disposal bags.

Appendix

Custodial Inspection

On a daily basis during routine custodial activity, the building custodians will keep a constant check for signs of contact damage, developing water damage and dislodgment of ceiling material.

Water Damage

After a preliminary inspection by the Asbestos Coordinator, all areas of water damage will be noted and marked with a colored spray encapsulant. From that time on, any new water damage area which develops will be brought to the attention of the Asbestos Coordinator. Any new development in water or contact damage will be noted and described on a Change of Status Form. The custodian will look for discoloration of the asbestos material. The first signs of water penetration will show as a discolored brownish ring. The ring will gradually spread to form a complete brown spot. The second stage, and the stage when there is a higher fiber release, will be indicated by a white/brown "snowflake" ring on the perimeter of the spot. The third stage will be a gradual filling of the discolored area with the white "snowflake" appearance. The fourth and final stage will be dislodgment of the material. It is very important to stop the water leakage during the first stage.

Contact Damage

Areas of existing contact damage will be noted on the floor plan for each building or other appropriate document. Any signs of continued damage by students, workers, etc., will be called to the attention of the Asbestos Coordinator.

RESPIRATORY PROTECTION PROGRAM

Introduction

This written respiratory protection program has been established in accordance with the respiratory requirements of 29 CFR 1910.134 and 29 CFR 1926.58. These are generally guidelines which are more stringent than OSHA requirements. During sampling and inspection of materials suspected to contain asbestos, or during renovation activities involving asbestos-containing materials, employees may be exposed to high concentrations of asbestos fibers for short periods of time. When an employee is exposed to concentrations of airborne toxic materials which are above the maximum standards established by OSHA, the law requires implementation of feasible engineering controls and/or administrative controls to reduce employee exposure. For the subject abatement activities, these controls are not feasible; as an alternative, the employer must provide respiratory protection for employees conducting sampling, inspection, or abatement work with asbestos-containing materials. In addition to providing respiratory equipment, the employer has the responsibility of implementing a respiratory protection program. The following sections provide for the establishment of standard operating procedures for the respiratory protection of employees.

Appendix

Designation of a Program Administrator

A program administrator will be selected to be responsible for the implementation of and adherence to the provisions of the respiratory protection program.

Selection and Use of Respiratory Protection Equipment

Respirators used will be selected from those approved by NIOSH for use atmospheres containing asbestos fibers. A NIOSH-approved respirator contains the following: an assigned identification number placed on each unit, a label identifying the type of hazard the respirator is designed to protect against, and additional information on the label which indicates limitations and identifies component parts approved for use with the basic unit.

The approved respirator will be worn for the existing working conditions specified as follows:

Asbestos Concentrations	Required Respirator
Up to 0.1 f/cc	Half-mask air-purifying respirator equipped with high-efficiency (HEPA) filters.
Up to 0.5 f/cc	Full facepiece air-purifying respirator equipped with high-efficiency (HEPA) filters.
Up to 1.0 f/cc	Any powered air-purifying respirator equipped with high-efficiency (HEPA) filters. Any supplied-air respirator operated in a continuous flow mode.
Up to 10.0 f/cc	Full facepiece supplied-air respirator operated in pressure demand mode.
> 10.0 f/cc	Full facepiece supplied-air respirator operated in pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus.

The Worker is Exposed

For the purpose of this program, the only hazard considered is airborne asbestos fibers. Accordingly, during any sampling or inspection of materials suspected to contain asbestos that directly disturbs the material, air-purifying respirators will be worn. During any asbestos abatement project which directly disturbs the asbestos-containing material, Type "C" positive pressure, air-supplied respirator will be worn. However, during minor operations and maintenance abatement and repair, air-purifying respirators shall be sufficient. During cleanup and waste removal activities, all affected personnel should wear air-purifying respirators.

Respirator Fit Tests

Each employee determined medically fit to wear a respirator shall be qualitatively fit tested upon receiving the equipment and semiannually thereafter. The type of fit test conducted depends on the respirator type. The manufacturer;s literature should be consulted to determine the proper fit test.

Appendix

MINOR ABATEMENT AND REPAIR TECHNIQUES

The following are general guidelines; however, all abatement and repair work shall be done by certified personnel in accordance with the Vermont regulations for asbestos control.

During the time from implementation of the operations and maintenance program until final removal of the asbestos-containing materials, it may become necessary to remove or encapsulate material that has become very friable. There are three primary situations where an emergency measure could become necessary. These situations are discussed below, along with the appropriate emergency removal techniques.

1. Water Damaged ACM

   If asbestos ceiling material becomes heavily water damaged from roof leaks, the material will become swollen and lose its bonding capability. During this stage, the white "snowflake" material releases many more fibers into the air than undamaged material. To retard fiber release the material should be encapsulated with a very light bridging encapsulant or the material should be removed. This procedure should only be used for lightly damaged areas. For heavily damaged areas, follow the procedures in Section 2 below. Although each situation could call for modification of the encapsulation procedure, the basic procedure to encapsulate a small water damaged area is:

   a. Move all movable fixtures away from the area with water damage after "wet wiping".

   b. Place six-mil polyethylene on the floor and wall (if damage is within a few feet of the wall).

   c. Patch the area of the roof where the leakage is occurring. Allow at least 24 hours before preceding with encapsulation.

   d. Wearing disposable coveralls and respirators, HEPA vacuum the damaged area holding the nozzle one-half to one inch from the material. Do not brush the material with the nozzle.

   e. With an airless sprayer or compressed air sprayer set to a fine mist, lightly coat the damaged area with a colored bridging encapsulant. Apply the encapsulant with the sprayer held eight to twelve inches from the material and apply in several passes over the material.

   f. Allow four to eight hours for fibers to settle. Dispose of plastic and asbestos debris and clean the surrounding area as outlined in the section "Mechanisms for Reducing Exposure to Asbestos."

2. *Dislodged/Separated ACM*

   In some cases the asbestos-containing ceiling material, through water damage or building vibration, has become dislodged and physically separated from the substrate. The material is then ready to break off and fall to the floor, thereby releasing many fibers into the air. The dislodged material should be removed in the following method while wearing respirator and disposable coveralls:

   a. As above, wet wipe and remove furniture and place plastic in the area of the fiber fallout.

   b. Isolate the work area.

   c. Shut down HVAC or place plastic over return air grills.

d. HEPA vacuum the material as in 1

e. Mist the area to be removed with amended water.

f. With a utility knife or other cutter, slice through the material to the substrate around the area which is dislodged.

g. While one worker holds the HEPA nozzle equipped with a spread cone close to the material, gently remove the dislodged material using a putty knife and place in the cone and/or disposal bag.

h. Revacuum the area.

i. As in 1, spray a light coating of colored encapsulant on and around the area to retard further fiber release.

h. Dispose of plastic in disposal bags and wet wipe and HEPA vacuum the area as described in the section titled "Mechanisms for Reducing Exposure to Asbestos."

3. *Glove-Bag Removal of Pipe Covering*

In the event that mudded joint packings or pipe covering becomes deteriorated, damaged, or if the material requires removal to work on pipes, valves, elbows, etc., the material must be removed by "glove bag" operations:

a. After sealing off the work area and HVAC system and donning respirator and coveralls, cut the sides of the glove bag to fit the size pipe to be worked on and insert the tools needed into the attached tool pocket.

b. Attach the glove bag to the working area by folding the open edges together and sealing with staples and tape. (Remember, this sealed area will be supporting the weight of the debris; additional support may be necessary.)

c. Seal the edges of the glove bag around the working area with tape or "Velcro" ties to form a tight seal. Slice open the slide port to allow entry of the wetting nozzle and HEPA vacuum hose. Insert the nozzle from the portable sprayer and thoroughly wet the area to be removed. The HEPA vacuum hose may then be inserted into the side port and sealed with tape.

d. Insert arms into the armholes and gloves and proceed to remove the asbestos from the valve fitting and pipe. Insert a spray nozzle and spray the pipe and any remaining insulation with encapsulant. When the job has been completed, turn on the HEPA vacuum to remove air from the bag.

e. As the air is being removed from the glove bag, squeeze the bag tightly (as close to the top as possible) and twist seal and tape closed to keep the asbestos material safely at the bottom of the bag. Turn off the HEPA vacuum and remove the hose from the side port, taking care to seal the side port with staples and tape.

f. The glove bag may now be cut and removed from the working area, placed into another plastic bag, and disposed of properly.

g. Proceed to HEPA vacuum the work area for any residual materials and seal the exposed edges with the proper sealant.

h. Once all pipe insulation has been removed, decontaminated and disposed of according to these specifications, the entire work area shall be wet cleaned and/or HEPA vacuumed. NOTE: The reference to the use of a HEPA vacuum indicates that the vacuum used should have a filter efficiency of 99.97 at 0.3 micron or better.

Any time an area of asbestos-containing material has to be encapsulated or removed, it must be recorded and the area must be color coded for reference. NOTE: Emergency encapsulation or removal should be performed by a Special Response Team.

CHANGE OF STATUS NOTIFICATION PROCEDURES

During the course of their normal duties, custodial and maintenance personnel will look for signs of contact or water damage. A Change of Status form should be completed for each change noted. The inspector should date and sign the form and send it to the Asbestos Coordinator. A copy of this form should be forwarded to the Vermont Department of Health. Areas to be inspected include:

* All ceiling material
* Controlled areas
* Boiler room/mechanical room pipe covering, elbow packing, and boiler insulation
* Any other areas containing asbestos

Appendix

CHANGE IN STATUS FORM (Master Copy)

Campus Name: _____

Date: _____ Building Name: _____ Building #: _____

Room #: _____ Asbestos Material Type: _____

Inspector (Custodial/Maintenance): _____

STATUS - Contact Damage: Y / N

Water Damage: Y / N

Other: _____

_____

Comments on Change in Status: _____

_____

_____

_____

Action Taken: _____

_____

_____

_____

Action Approved By: _____ Date: _____

(Asbestos Coordinator)

Appendix

2. PETROGRAPHIC RESULTS

Appendix

PETROGRAPHIC CODES

AH	Animal Hair
AN	Antigorite
BR	Brucite
BI	Biotite
CA	Calcite
CF	Ceramic Fiber
CG	Cellular Glass Foam
CO	Cotton
CK	Cork
DI	Diatoms
DT	Dirt
EG	Extruded Glass Fibers
FA	Fly Ash
FC	Fired Clay
FE	Feather
GM	Granular Minerals
GY	Gypsum
HO	Hornblende
LZ	Lizardite
MF	Metal Foil
MV	Muscovite
OP	Opaques
PL	Plastic
PT	Paint
QZ	Quartz
SF	Synthetic Fiber
SM	Synthetic Foam or Styrofoam
TA	Tar
TL	Talc
VR	Vinyl Rubber
WO	Wollastonite

The above legend is a reference to the one- to four-digit codes found in the column called "other" in this document. Please refer to this page when decoding is necessary for clarification.

HALL-KIMBRELL ENVIRONMENTAL SERVICES INC.
ASBESTOS PETROGRAPHIC ANALYSIS

CLIENT:
PROJECT #: 12 STATE OF VERMONT

BUILDING #: 20199
BUILDING: RICHMOND ELEMENTARY SCHOOL

				ASBESTOS					OTHER MATERIALS								
GROUP#	SAMPLE NUMBER	CONSISTENT	TOT ASB	CHRY	AMO	CRO	ANT	TRE	WOOL	CEL	MICA	PER	BINDER	OTHER 1	OTHER 2	OTHER 3	TOT NON-ASB
1	70937	Y	0	0	0	0	0	0	0	0	0	0	82	18 SF	0	0	100
1	70938	Y	0	0	0	0	0	0	33	0	0	0	67	0	0	0	100
1	70939	Y	0	0	0	0	0	0	12	0	0	0	78	10 SF	0	0	100
2	70941	Y	0	0	0	0	0	0	37	0	0	0	51	12 GM	0	0	100
2	70942	Y	0	0	0	0	0	0	31	0	0	0	69	0	0	0	100
2	70943	Y	0	0	0	0	0	0	33	0	0	0	67	0	0	0	100
3	70945	Y	0	0	0	0	0	0	15	0	0	0	69	16 GM	0	0	100
3	70946	Y	0	0	0	0	0	0	38	0	0	0	62	0	0	0	100
3	70947	Y	0	0	0	0	0	0	27	0	0	0	61	12 GM	0 `0-	0	100
4	70949	Y	0	0	0	0	0	0	37	35	0	16	12	0	0	0	100
4	70950	Y	0	0	0	0	0	0	34	38	0	17	11	0	0	0	100
4	70951	Y	0	0	0	0	0	0	29	45	0	12	14	0	0	0	100
5	70953	Y	0	0	0	0	0	0	23	38	0	26	13	0	0	0	100
5	70954	Y	0	0	0	0	0	0	25	39	0	24	12	0	0	0	100
5	70955	Y	0	0	0	0	0	0	37	27	0	23	13	0	0	0	100
6	70957	Y	0	0	0	0	0	0	0	81	0	11	8	0	0	0	100
6	70958	Y	0	0	0	0	0	0	0	72	0	16	12	0	0	0	100
6	70959	Y	0	0	0	0	0	0	0	80	0	10	10	0	0	0	100
7	70961	Y	96	96	0	0	0	0	0	0	0	0	4	0	0	0	4
8	70966	Y	67	9	58	0	0	0	0	0	0	0	33	0	0	0	33
9	70969	Y	42	42	0	0	0	0	0	0	0	0	15	22 CA	21 QZ	0	58

Appendix

3. SPREADSHEETS

ASBESTOS ASSESSMENT SURVEY
STATE OF VERMONT

Client Number : 04-12-166-01
Building Number: 20199
Building Name: RICHMOND ELEMENTARY SCHOOL
Address : RICHMOND, VERMONT

Building Type:
Year Constructed: 1939
Date Inspected: 04/03/87
Inspector: Andy Fridley

LOCATION	SAMPLE GROUP NUMBER	NUMB OF SAMPS	MATERIAL DESCRIPTION	% ASB	QUANTITY	O&M CODE	EXP POT	PRIORITY LEVEL	REMOVAL COSTS	REPLACEMENT COSTS	TOTAL COSTS
** Area 1 Crawl Space											
throughout	8	1	pipe covering	67%	40 ft. 4 in. O.D.	OMA	38	IV	$349	$218	$567
throughout	8	1	pipe covering	67%	20 ft. 6 in. O.D.	OMA	38	IV	$254	$159	$413
throughout	8	1	pipe covering	67%	90 ft. 8 in. O.D.	OMA	38	IV	$1,247	$890	$2,137
throughout	9	1	mjp on pipe covering	42%	72 4 in. joint	OMA	25	V	$1,979	$1,099	$3,078
throughout	9	1	mjp on pipe covering	42%	4 6 in. joint	OMA	25	V	$151	$89	$240
throughout	9	1	mjp on pipe covering	42%	2 8 in. joint	OMA	25	V	$94	$55	$149
This crawl space ran under the 1955 wing of the building. The supply line to the radiators was insulated.						AREA #	1	TOTALS	$4,074	$2,510	$6,584
** Area 2 Basement-Boiler Room											
middle of room	1	3	boiler/tank insulation	0%	81 sq.ft.	OMB	0		$0	$0	$0
behind boiler	2	3	breecher/exhaust stack packing	0%	72 sq.ft.	OMB	0		$0	$0	$0
throughout	3	3	mjp on non-suspect pipe cover	0%	9 10 in. joint	OMA	0		$0	$0	$0
throughout	3	3	mjp on non-suspect pipe cover	0%	2 12 in. joint	OMA	0		$0	$0	$0
throughout	3	3	mjp on non-suspect pipe cover	0%	22 4 in. joint	OMA	0		$0	$0	$0
throughout	3	3	mjp on non-suspect pipe cover	0%	2 6 in. joint	OMA	0		$0	$0	$0
throughout	3	3	mjp on non-suspect pipe cover	0%	9 8 in. joint	OMA	0		$0	$0	$0
						AREA #	2	TOTALS	$0	$0	$0
** Area 3 Gym-Basement											
on round ducts	7	1	exterior duct insulation	96%	25 sq.ft.	OMB	72	I	$585	$471	$1,056

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LOCATION	SAMPLE GROUP NUMBER	NUMB OF SAMPS	MATERIAL DESCRIPTION	% ASB	QUANTITY	O&M CODE	EXP POT	PRIORITY LEVEL	REMOVAL COSTS	REPLACEMENT COSTS	TOTAL COSTS
Dirt floor with masonry walls and low ceiling, only a small amount of asbestos paper tape was found on abandoned duct work.						AREA #	3	TOTALS	$585	$471	$1,056
** Area 4 Gym-Basement-Walls											
on walls housing boiler	901	0	Transite panel	*00%	300 sq.ft.	OMI	12	VI	$2,100	$1,500	$3,600
*Asbestos assumed.						AREA #	4	TOTALS	$2,100	$1,500	$3,600
** Area 5 Throughout Building-Ceilings											
2nd floor-room #17	4	3	drop or lay-in panel	0%	536 sq.ft.	OMG	0		$0	$0	$0
basement-room #1	4	3	drop or lay-in panel	0%	900 sq.ft.	OMG	0		$0	$0	$0
2nd floor-hallway	4	3	drop or lay-in panel	0%	450 sq.ft.	OMG	0		$0	$0	$0
2nd floor-room #15	4	3	drop or lay-in panel	0%	561 sq.ft.	OMG	0		$0	$0	$0
2nd floor-room #16	4	3	drop or lay-in panel	0%	536 sq.ft.	OMG	0		$0	$0	$0
1st floor-room #7	5	3	acoustical tile	0%	841 sq.ft.	OMG	0		$0	$0	$0
1st floor-boys room	5	3	acoustical tile	0%	100 sq.ft.	OMG	0		$0	$0	$0
basement-room #2	5	3	acoustical tile	0%	200 sq.ft.	OMG	0		$0	$0	$0
1st floor-room #8	5	3	acoustical tile	0%	100 sq.ft.	OMG	0		$0	$0	$0
1st floor-wing hallway	5	3	acoustical tile	0%	850 sq.ft.	OMG	0		$0	$0	$0
1st floor-room #5	6	3	acoustical tile	0%	841 sq.ft.	OMG	0		$0	$0	$0
1st floor-room #4	6	3	acoustical tile	0%	841 sq.ft.	OMG	0		$0	$0	$0
1st floor-room #6	6	3	acoustical tile	0%	841 sq.ft.	OMG	0		$0	$0	$0
						AREA #	5	TOTALS	$0	$0	$0

Appendix

ASBESTOS ASSESSMENT SURVEY
STATE OF VERMONT

Client Number : 04-12-166-01
Building Number: 20199
Building Name: RICHMOND ELEMENTARY SCHOOL
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Page: 12
Building Type:
Year Constructed: 1939
Date Inspected: 04/03/87
Inspector: Andy Fridley

LOCATION	SAMPLE GROUP NUMBER	NUMB OF SAMPS	MATERIAL DESCRIPTION	% ASB	QUANTITY	O&M CODE	EXP POT	PRIORITY LEVEL	REMOVAL COSTS	REPLACEMENT COSTS	TOTAL COSTS
BUILDING # 20199 TOTALS									$6,759	$4,481	$11,240

Appendix

CERTIFICATION OF REPORT

The information contained in this document is based on physical inspections conducted by Hall-Kimbrell Environmental Services. We certify that the presence or absence of asbestos is based on the petrographic analysis of bulk samples taken during the survey.

Andrew L. Clayton
Project Manager

Joel K. Davidson
Microscopy Department Manager

Appendix