FINAL REPORT
BARRINGTON TOWN OFFICES
STUDY FOR REMEDIATION,
RENOVATION OR RELOCATION

FOR

THE TOWN OF BARRINGTON, NEW HAMPSHIRE

FEBRUARY 2011

THE H. L. TURNER GROUP Inc.

TURNER GROUP

ARCHITECTS • ENGINEERS • BUILDING SCIENTISTS

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INTRODUCTION

The existing Town Office Building is located at 137 Ramsdell Lane at the corner of Route 9. It is a brick façade building that dates back to the 1930's when the easterly wing of the building was constructed to originally serve the Town of Barrington as a school. In the mid 1950's, a single story addition was constructed to the west that essentially doubled the footprint of the building. Then in the early 1960's, a second level was added to the 50's wing.

Drainage issues around the building have been an ongoing problem for years. The Local Government Center (LGC) identified a problem in September 2007. After flooding that occurred in the early spring of 2010, indoor air quality and suspected mold issues were identified as symptoms of the ongoing moisture intrusion. As indoor air quality degraded to the point that it became a serious health issue in the Town Office, mold testing was ordered in the spring of 2010. Tests were conducted by Desmarais Environmental, Inc. and the Scott Lawson Group. Although there were a small number of samples tested, the results did reveal a high potential for mold growth within some of the wall cavities of the building, particularly those areas below window openings.

In late October, the Town issued a Request for Qualifications for an architectural/engineering firm to complete a comprehensive evaluation of the existing Town Office Building to determine if it could be remediated and renovated for future use. The Town retained The H.L. Turner Group Inc. (TTG) on November 8, 2010 to complete the comprehensive evaluation of the existing building, but in addition, we were tasked to look at alternatives for the Town Offices, including construction of a new building.

The H.L. Turner Group Inc. was charged by the Board of Selectmen to complete the following tasks:

1. Complete a thorough evaluation of the existing Town Office Building and:
    - Identify all necessary remediation work, costs, and schedule to complete long-term air quality improvements.
    - Identify necessary site improvements and costs.
    - Identify all recommended ADA improvements and associated costs.
    - Identify other improvements and costs related to electrical, mechanical, and/or structural issues.

2. Review all recently completed reports on the existing building including architectural studies and indoor air sampling results and reports.

3. Complete a cost effective evaluation of alternatives for a new Town Office Building to be located:

    - At the Town owned Clark-Goodwill site.
    - At the Town owned Route 125 site.
    - At a site identified as the Calef site.

4. For the new office building study, identify the space needs for the Town of Barrington staff and define capital and operating costs.

Starting in early November through early January, TTG worked diligently to complete the above tasks while actively working with the Building Committee to develop a recommendation for the Town of Barrington on how best to proceed forward with this project.

This report summarizes the findings of our evaluation and the results of our meetings with the Building Committee.

EXECUTIVE SUMMARY

On November 17, 2010, The H.L. Turner Group Inc. conducted an on-site, in-depth evaluation of the building. This included an evaluation of the structural elements, mechanical, and electrical components, and an in-depth review of the architectural features of the building, including the current ADA provisions. In addition, we studied the site surrounding the building and walked the sites proposed for a new office building. The results of these evaluations are discussed in part throughout the body of this report. A detailed summary and spreadsheets identifying particular issues and the costs associated with rectifying these issues are included in Appendix A.

Based on evaluation of all the data compiled previously and during this study phase, as well as discussion of the various issues and a review of all the costs involved, it is the recommendation of the Barrington Building Committee and The H.L. Turner Group Inc. that the existing building which currently houses the Barrington Town Offices be remediated, renovated, and upgraded to continue to serve as the Town Office Building. Furthermore, it is recommended that the Selectmen for the Town of Barrington approve a warrant article for a bond issue to appropriate the sum of $3,740,000 for the remediation, renovations, and upgrades.

There is no question that indoor air quality has become a health issue at the existing office building. It has resulted in the need to vacate the office space used by the Town on

the upper level of the 1930's wing and to relocate to the lower level of the 1950's/1960's wing. Health issues have forced several employees to work at other buildings. The Local Government Center, the Town's Attorney, and three separate consultants: Desmarais Environmental, The Scott Lawson Group, and The H.L. Turner Group Inc. have recommended that the Town fix the building or vacate it. If nothing is done, the Town will need to completely vacate the building and look at temporary facilities elsewhere.

THE ISSUES

Moisture Intrusion

The main culprit has been moisture intrusion. The site drainage and grading around the building has been an issue for years, with the situation coming to a head in the early spring of 2010 when heavy rains caused flooding in the building. Site drainage issues and a lack of any moisture barrier allowed water to enter the building through the slab and the foundation walls, while lack of maintenance and the age of some of the building components have allowed water to enter the building through the walls, windows, and roof. Following the flooding, mold was suspected to be the cause of some of the health issues that were being experienced. Mold testing was ordered in early April 2010 and the Town retained Desmarais Environmental. The microbial analysis from Desmarais has suggested that airborne mold spores within the occupied space at the time of the sampling are not greater than the amounts found outdoors. However, the air within the wall cavity at one location was found to be harboring predominately Stachybotrys spores. Active Stachybotrys growth can produce very harmful Mycotoxins. The findings in the Desmarais report were confirmed by similar testing protocol conducted by The Scott Lawson Group and outlined in their reports of June and July 2010. All available reports are presented in their entirety in Appendix B.

Mold and mildew are generic terms that commonly refer to various types of fungi or micro-organisms that depend on other organisms to survive. There are over 100,000 known species of fungi, and this means that the patterns of mold growth and mold activity can be variable over a wide range of environmental conditions. Generally mold propagates by disseminating large numbers of spores, which become airborne, travel to new locations and, under the right conditions, germinate. Molds excrete enzymes which allow them to digest organic materials such as paper and wood; two very common building materials. It is a known fact that the existence of mold can lead to health issues for the occupants of a building where the mold exists. It is not fully understood if the health issues are a direct result of the mold or the Mycotoxins that they can produce.

To thrive and germinate, mold spores require a favorable environment. It is important to note that if these favorable conditions are not present, meaning just one of the key elements for mold growth is missing, the mold spores will remain dormant, and in this state they can do little to no harm. Just what are the conditions that constitute a favorable environment? The most important factor in mold growth is the presence of moisture in

the air, or in the object on which the mold is growing. Moisture in the air is measured as relative humidity. In general, the higher the relative humidity the more readily mold will grow. Most, but not all common molds found in the Northeast require relative humidity to be at least 60%. If areas become wet as a result of water intrusion, this increases their susceptibility to mold growth. Other environmental factors that contribute to mold growth in the presence of moisture are proper temperatures, between 40 degrees F and 140 degrees F (for most common fungus), and of course an organic food source.

Mold spores are everywhere. They exist outside; they exist normally in every room, on every object, and on every person. To create a mold free space takes a sophisticated effort of decontamination of materials, use of highly effective filtration of air systems, and air locks and air pressure gradients between the mold free space and the adjacent space. The most effective control strategy to keep mold levels close to ambient conditions is to eliminate moisture sources in the building by providing an effective envelope barrier to water as a liquid and as a vapor, and to keep the relative humidity of the air within the building spaces below 60%.

The walls of the existing building are constructed of Concrete Masonry Units (CMU) with a facing of brick on the exterior. There is no air space between the brick and the CMU block and the CMU block cores are unfilled. The R-rating of the existing wall is about an R-4. By its nature, brick masonry absorbs water. Over time it can diffuse into the CMU and then under certain vapor pressure conditions be released into the building air. The cells within the CMU block, where the air is moist or water has gained access, is an ideal location for the propagation of mold spores.

Mold in the building at levels less than those considered to be amplified reservoirs may not present a problem to most occupants. However, some occupants may be susceptible to a particular species at levels that are lower than those considered to represent amplified reservoirs. Regardless of levels, active mold growth is a sign of undesired and perhaps uncontrolled levels of moisture (liquid and vapor) in the building space or within the building components. The water source may include roof leaks, moisture entering through the walls and window openings, poor ventilation of the inside space, and poor site drainage allowing water in through the foundation and up through the floor slab. Based on our on-site evaluation, we have identified each of these issues at the existing Town Office Building.

In a separate report prepared by members of Turner Building Science & Design, LLC, are comments on the contents of the Desmarais and Scott Lawson reports (See Appendix B). Based on the information we gathered while on-site and on the microbial sampling work completed by the aforementioned firms, we feel the building can continue to be occupied provided a number of conditions are met. These include:

1. Locate and remediate the active microbial reservoirs.

2. Control building water leakage to minimize the amount of moisture getting into the interior space.

3. Control the indoor space humidity levels with improved ventilation and air conditioning to minimize condensation and high relative humidity levels.

4. Upgrade building components (windows for example) and insulation to increase surface temperatures and further control condensation.

Some of our observations with regard to the former reports include the fact that both firms agree that the indoor air levels within the occupied spaces are low for mold spores. The Scott Lawson Group continues to test the indoor air levels and the spore counts do not appear to be increasing. However, both firms have verified the existence of mold spores in the wall cavities (i.e. in the hollow of the CMU block). The Desmarais report raises concerns about Mycotoxins produced by the microbial agents.

It is our conclusion, based on very limited sampling completed to date, that the building materials may be harboring mold reservoirs. If these reservoirs exist, airborne sampling completed to date suggests that the reservoirs are not feeding spores to the occupied spaces of the building. However, the presence of active mold growth within a building is not a condition that should exist, and we do not recommend continuation of environmental conditions that produce microbial growth. Furthermore, neither firm explored other likely areas for the existence of mold spores such as in the attic where the roof may be leaking, spaces above the ceilings where stained ceiling tiles were noted, carpeting covering the slabs-on-grade, and especially the paper documents in the lower level storage room.

During our investigation, with the help of members of the Building Committee, we made a series of drill holes at four locations throughout the building. Holes were drilled in the walls of the 30's wing and the 50's/60's wing (see the attached Site Observation Report in Appendix A in the Architectural Evaluation section). At each hole it indicated that the brick is tight up against the CMU with no air space. In each hole the core of the CMU block was observed to be dry with no indication of mold. Observations were visual only, aided by a scope camera. No sampling for mold was done and no humidity readings were taken. We did take samples of the masonry block from each wing of the building. The samples were sent to New Hampshire Materials Testing Laboratory to determine the chemical composition of the CMU. The results are included in Appendix A following the Site Observation Report in the Architectural Evaluation Section. One theory that was put forth by Desmarais Environmental was that high levels of carbon in the block could provide a food source for mold. The chemical breakdown indicates 0.9% carbon content in the CMU from the 1950's/1960's wing, and almost 9% carbon content in the CMU from the 1930's wing. It is our opinion that masonry products typically have a high pH level or high alkalinity, and this is not a very hospitable environment for mold growth. However there could be sufficient nutrients in any moisture that has found its way into the wall cavity to support the growth of mold.

Based on sampling results of others and our own observations, The H.L. Turner Group Inc. is recommending that some additional investigation and sampling be conducted in order to pinpoint the mold reservoirs throughout the building. It is these areas that will then be targeted for remediation, as opposed to the entire building. One of the most difficult areas to remediate is within the cores of the CMU walls. This would involve opening the cores from the top and flushing them out with a biocide designed to kill active mold growth. Then the core would be treated with a benign inhibitor to stymie future growth. As a final step, the cores would be sealed airtight. However, there is a caveat when it comes to treating the CMU cores with a biocide. The chemicals that are used to formulate an effective biocide may have harmful affects on the occupants of the building. Therefore if such a process is adopted, it is important to make sure that all the biocide product has completely dissipated from the CMU or has been diluted to very low levels once the mold has been remediated.

Air Infiltration and Heat Loss

Another key issue with the existing building envelope is air infiltration, particularly around the window frames. As part of the building evaluation we performed a blower door test to get an idea of the air leakage rate for the building. The test was conducted with the exterior doors closed and all interior doors open, including the corridor doors to large office spaces and the corridor doors at the stairwells. The average of the readings from the blower door test indicated an air exchange rate of .76 air changes per hour. For comparison, a well-constructed, new building would have an air infiltration rate of .3 to .5 air changes per hour. This difference can represent as much as 5 to 6 BTU's per hour, per square foot in heating cost for the Town Office Building. This represents about a 50% savings in energy costs. This is illustrated on the energy savings graph at the end of this section. So even though new windows would have a small increase in terms of the R-value or thermal resistance, with proper installation, flashing, and sealing around the rough opening, they would make an appreciable difference in terms of cutting down on air infiltration. Furthermore, new windows would fix the condensation issue.

In addition to the blower door test, we also used an infrared camera to determine areas of heat energy variation in the structure, which can pinpoint areas of heat loss, air leakage, and possible pockets of moisture in the walls. This technique is known as thermography. In its engineering application, thermography is used to study heat energy variations over the surface of a structure. Variations in the structure's thermal resistance can, under certain conditions, produce temperature variations on its surfaces. Leakage of air through the structure that is warmer or cooler than the building structure can affect the amount of heat energy at the surface. This means that missing or improper placement of insulation, thermal bridging, and air leaks in a building's enclosing structural components can be located using thermography.

The most common use of thermography is to locate faults and defects in thermal insulation in exterior walls and roofs, and to determine their nature and extent. The task of taking thermographic images can also be used to confirm whether or not the wall or

roof examined has the promised insulation and air tightness characteristics. Insulation deficiencies do not necessarily lead to increased air infiltration. If building insulations are improperly installed, air pockets will form in the building structure. Since these air pockets have a different thermal conductivity than areas where the insulation is properly installed, the air pockets can be detected during the survey.

It is often possible to detect moisture in a structure by using an infrared camera. This is because the wetted area has different heat conductivity properties and different thermal capacity (i.e. specific heat) to store heat than the surrounding material. The presence of water changes the overall thermal conductivity and the overall thermal mass of the building material. Thermal conductivity is a material's ability to conduct heat, while thermal mass is its ability to store heat.

Building defects related to moisture may only show up when heat energy (for example, from the sun) has been applied to the surface of the wall. In the case of the exterior walls of a building, the images taken during the day may appear cooler (blue to dark blue) since the wet areas, due to their conductive and/or thermal capacitive affect, have not absorbed as much heat as the surrounding area. Areas detected in blue to dark blue may indicate internal moisture within the wall cavity, but it may also indicate that there is moisture on the surface of the wall as well. A relatively small amount of water from dew, water running down the siding from melting snow, ice, or gutter runoff may be detected as dark blue patches on the surface of the wall.

A series of infrared photos were taken all around the building. Some of these photos are included in Appendix C. Many of the exterior photos indicated that heat is radiating through the wall as a result of little to no insulation. Some of the interior photos indicate air leakage and possible moisture around the windows. Thermal images taken in the attic of the 1930's wing show air leakage at the intersection of the wall and ceiling.

An infrared inspection alone should never be used as the sole decision point for further actions. Suspicious findings should always be verified using other methods, such as moisture meters, humidity and temperature data logging, and probably the best method: selective demolition to see what's below the surface.

The moisture intrusion, air infiltration, and heat loss issues can all be rectified by upgrading the entire building envelope. This includes first and foremost, a new wall system, which includes a vapor barrier, rigid insulation, an air barrier, an air space, and siding installed on the outside of the existing building. This will produce a wall with an R-rating of R-25+, which is comparable to a new building. Also included would be more attic insulation in the 1930's wing and a proposed new sloping roof for the 1960's wing.

We are proposing that the insulation for the new pitched roof be located at the roof plane providing a tempered attic space for mechanical equipment, as well as a better thermal rating for the roof system. With a new roof and new insulation, a rating of R-35 to R-40 could be achieved. It is anticipated that the new pitched roof would be constructed of

wood trusses spaced at 24-inches on center. The trusses would run north to south and be configured to overhang the face of the building by about 18 to 24 inches. The overhang will help to keep water away from the face of the building.

ADA Compliance

There are a number of areas throughout the building that do not meet current ADA standards. The building is constructed with four distinct and separate levels; not including the former Selectman's meeting room in the lowest level of the 1930's wing. Access between the lower levels is currently provided by two ramps; both however are too steep to meet ADA standards. The only access between the upper levels is a set of stairs. There are two exterior doors that provide ADA access; one to the lower level of the 1950's/1960's wing and one to the Selectman's meeting room. But once inside, there is no access beyond those points. The recommendation therefore is an elevator to provide access to all levels. A ramp is proposed from the upper parking lot through the main entrance at the north side of the building into a lobby area. From the lobby area, access is provided to all other levels by an elevator. A lift device would provide access to and from the Selectman's meeting room.

Other ADA issues include all the handrails and guardrails on the stairs. The handrails do not extend the appropriate distance beyond the last riser and the guardrails at the top of the stairs are not high enough.

The two existing restrooms on the upper level of the building located in the 1930's wing do not meet many ADA standards. Violations include insufficient clear space in front of the door (both inside and outside of the restrooms), and a lack of rear and side transfer grab bars. The mounting heights and locations of existing toilet tissue dispensers, soap dispensers, paper towel dispensers, and mirrors do not meet minimum and/or maximum mounting height requirements. The "clear floor space" requirements for each fixture do not meet the current ADA requirements, and the heights of the existing toilet and urinals do not meet the proper height requirements. There is one additional restroom at the "north" end of the lower level. This restroom is assumed to have met code when it was constructed, but if a major building modification is undertaken, it should be either brought up to current code or abandoned.

More information on the accessibility options can be found in the architectural section of the building evaluation reports in Appendix A.

RENOVATION OF THE EXISTING BUILDING

After a review of all the data and cost implications of renovating the existing building versus the construction of a new Town Office Building, the Building Committee and The H.L. Turner Group Inc. are recommending that the existing office building be fully renovated. The overall renovations shall consist of the following:

1. Conduct further testing to pinpoint the location of mold throughout the building. The testing to date was limited to taking air samples inside the occupied spaces and testing of the wall cavities at a few locations. The proposal is to expand the areas to be tested to include suspected areas that could be harboring mold including under carpets, in the attic space, wall cavities under windowsills, in the wood window frames, the fabric partitions, and even the paper documents stored in the archives.

2. As part of the renovation work all items such as carpet, partitions, etc. that contain mold shall be removed from the building. This shall require a certain amount of demolition. Other areas where mold is found such as in wall cavities shall be remediated by flushing with a biocide treatment, adding an inhibitor to prevent future growth, and finally sealing the wall cavity. Most of the existing interior finishes shall be demolished during the renovation and removed from the building.

3. All paper documents stored in the building shall be removed and copied on new paper or on electronic media. Historic documents or other documents of significance that need to remain in their original form can be decontaminated. The process is similar to historic restoration and is very expensive. Therefore, we do not recommend the cleaning of all old documents, but rather replacement. Please note that this cost is <u>not</u> included in the final numbers for the renovation. Appendix E includes information on mold removal from books and paper documents. This issue would have to be considered regardless of whether the Town stays in the existing building or moves to a new office building.

4. All remaining interior areas shall be thoroughly cleaned and prepared for the new finishes. The interior surface of the perimeter walls shall be sealed with a spray-on, open cell, breathable foam.

5. Complete site work around the building to include waterproofing of the foundation, improved drainage through the installation of drainage pipe, and a crushed stone drip edge around the perimeter of the building. Other site improvements include improved site lighting and improvements to the exterior railing, stairs, and walkways. This site work is intended to supplement the work completed last November.

6. Meanwhile the exterior of the building shall be fitted with a new skin. This shall consist of an external air barrier, a drainage plane, and a minimum of 3-inches of rigid foam, an air space, and new siding. Several options are being considered for new siding including "Hardiplank" cement board siding, vinyl siding, and metal siding. As of the writing of this report, a final decision has not been made. A sketch, SK-A1, of the proposed wall construction is included at the end of this section.

7. A new sloped roof shall be added to the 1960's wing. The roof shall improve the drainage of water away from the building, provide for enhanced insulation, and provide a tempered space for locating mechanical equipment.

8. Renovation work shall consist of upgrades to the mechanical and electrical systems throughout the building. The major work will include a new radiant heating system and a new central ventilating and air conditioning system. The existing oil-fired boilers are only a few years old and therefore will be part of the heating system for the renovated building.

9. Complete upgrades to bring the building in compliance with ADA standards, including the addition of an elevator and upgrades to stairways and bathrooms.

10. Provide a records storage room that addresses issues where the Town is currently non-compliant with the guidelines of The New Hampshire Department of State "Best Practice for Vital Records Preservation".

11. Repair all remaining areas and add finishes and new furniture.

12. Test, monitor, and commission all areas and systems within the building.

We performed a cost evaluation for several options related to renovation of the existing Town Office Building. They are as follows:

- Renovate the existing Town Office Building to include removal and/or remediation of all mold, address all moisture intrusion and air infiltration, building envelope, insulation and mechanical systems, address ADA issues, etc., as described above in items 1 through 12. The total cost for the renovation of the 18,800 square foot building is approximately $154 per square foot for a total construction cost of $2,900,066. The construction cost includes materials, labor, and the contractor's general conditions, overhead and profit. The total project cost is $3,740,000, and in addition to construction, includes all ancillary and soft costs such as architecture and engineering, construction administration, new furniture, a generator, and a 9.5% contingency.

- Renovate the existing Town Office Building to include removal and/or remediation of all mold, address all moisture intrusion and air infiltration, building envelope, insulation and mechanical systems, address ADA issues, etc., but excluding a new roof for the 1960's wing, no work in the proposed SAU and recreation spaces, minimum site work, no generator and no "clerk-of-the-works". The total cost for the renovation of the 18,800 square foot building is approximately $129 per square foot for a total construction cost of $2,425,169. The construction cost includes materials, labor, and the contractor's general conditions, overhead and profit. The total project cost is $3,038,000 and in addition to construction includes all ancillary and soft costs such as architecture and engineering, construction administration, an allowance for 50% new furniture, and a 10.0% contingency.

- Renovate the existing Town Office Building to include the removal of the 1960's wing (i.e. the upper level of the 1950's/1960's wing) and include a new sloped roof over the 1950's wing. In addition, perform all other work described in items 1 through 12 above. The construction cost for demolition of 5,100 square feet and the renovation of 13,700 square feet is approximately $191 per square foot or $2,613,450. The construction cost includes materials, labor, and the contractor's general conditions, overhead and profit. The total project cost is $3,408,000 and in addition to construction includes all ancillary and soft costs such as architecture and engineering, construction administration, new furniture, a generator, and a 10.0% contingency.

For a complete breakdown of the costs see Appendix D.

Renovation of the existing office building can also mean appreciable savings in energy costs. A building's energy consumption may be expressed in terms of British Thermal Units (BTU's) per hour, per square foot. For a properly constructed new building, the average energy usage is typically about 10 to 10.5 BTU's per hour, per square foot. The existing Town Office Building currently has an energy usage rate of about 23.5 BTU's per hour, per square foot. With the renovations proposed this can be reduced by 13.2 BTU's per hour, per square foot to 10.3 BTU's per hour, per square foot. The savings are realized by better insulation in the roof (1.4 BTU's per hour savings), reduction in the air infiltration around the windows (5.9 BTU's per hour savings), insulation in the walls (5.4 BTU's per hour savings), and insulation on the basement walls and floor (.5 BTU's per hour savings). This type of improvement leads to substantial savings in energy costs. For example, with oil at $3.00 per gallon a savings of $12,000 per year can be realized. If oil goes to $5.00 per gallon the savings jump to $20,000 per year. A graphic illustrating the improvements discussed above is included at the end of this section. The figures for BTU's per hour, per square foot and the cost savings listed on the graph are based on the average degree-day formula.

This proposal represents a significant expenditure for the Town of Barrington. However, the structural condition of the existing building is sound and with the extent of the renovations recommended herein, the life expectancy of the newly renovated building could easily approach 100 years provided the building and building systems are properly and regularly maintained and upgraded as required.

EVALUATION OF A NEW TOWN BUILDING

Our scope of work for the Town Hall relocation study included a cost effective evaluation of alternatives for a new Town Office Building to be located at the Town owned Clark-Goodwill site, at the Town owned Route 125 site, and at a site identified as the Calef site. Reference Figures 1, 2, and 3 at the end of this section.

Clark-Goodwill Site

Prior to our assessment of the existing Town Hall site, The H.L. Turner Group Inc. and Charter Weeks visited the Town owned parcel referred to as the Clark-Goodwill site, which has been identified as a possible location for not only a new Town Hall, but other public buildings and recreation spaces, with the idea of creating a multi-usage civic space. This 34 acre site, identified as Lot 234-0001 on Town tax maps, is an undeveloped, wooded site with variable terrain including wetlands, areas of ledge, areas of level terrain and areas of sloping terrain, and approximately 60 feet of elevation difference across the parcel. It has approximately 760 linear feet of frontage and is about 1 mile east of the existing Town Hall. It is our understanding that the Town has obtained a NHDOT driveway permit and the State permits necessary to construct a wetland crossing and to excavate gravel from the site.

The site offers great potential for any number of uses, and could function very well as the home of a new Town Hall, while also providing a source of gravel material for the Town Highway Department. Among the benefits of using the parcel is its proximity to the center of Town, it is already owned by the Town, and for the numerous potential possibilities for future expansion on the property. Site development costs would be the greatest up-front burden, because there is no infrastructure serving any part of this site. Any construction would require clearing and grubbing for driveways, parking, and the structure, site grading to establish a usable building site and road profiles, importation and exportation of fill material, and establishment of utilities, including electrical service, stormwater management, water supply, septic system construction, and mechanical system fuel supply. Certain aspects of these costs could be phased in and coordinated with the site work that will be required to begin excavating gravel. Prior to commencing any site development beyond gravel mining, additional State permits will be required, including an amended Alteration of Terrain permit.

Calef Site

This property is an undeveloped 12-acre parcel identified on Tax Map 239 as Lot 1. It is a mostly level site in both the Residential Zone and Commercial Zone, with frontage on Mallego Road and Route 125. It is adjacent to the post office in the center of Barrington. According to a visual observation of the site and the Complete Summary Appraisal Report dated March 3, 2000 by Madden Appraisal Services, this property offers a lot of potential for development of a new Town Hall. The primary drawback is that the lot is privately owned and would have to be purchased. While construction on this lot would

involve addressing many of the same challenges that exist at the Clark-Goodwill site (clearing, grading, importing fill materials, establishment of utility services), the relatively flat terrain of the land on the Calef site will result in reduced site work costs, and its proximity to the post office and the center of Town will create a center of civic services.

Route 125 Site

There is an additional site that is being considered for development. Located on Route 125 approximately 3 miles south of Route 9, there is a 125-acre parcel identified as Lot 13.1 on Tax Map 265. The site provides 2,300 feet of frontage on Route 125 and is undeveloped and wooded, with some areas of wetlands and a 50' power line easement crossing the site from north to south. Based on our review of the Preliminary Geotechnical Investigation by JGI, dated January 19, 2000, it is clear that much like the Clark-Goodwill site, this property presents many challenges to development. The topography is variable and will require a lot of earthwork to be functional. Any proposal will require clearing and grubbing of significant areas, there will likely be ledge blasting and rock removal, and there are no utilities servicing the site. On a positive note, the size of the parcel lends itself to any number of uses and additional development beyond the Town Hall. It also fronts on a major state road, and is already owned by the Town of Barrington. The property isn't centrally located in Town, but its size could allow for the establishment of a public complex, offering various public services and amenities.

Study of the Space Requirements

In addition to looking at the above sites for a proposed new building, we completed a study to identify the space needs for the Town of Barrington staff. The space needs study did not include space needs for the School Administrative Offices or the Recreation Department. The space needs study was general in nature and included a basic assessment of how much space was needed for the current staff for each department, with some allowance for expansion, and included storage space and core facilities.

The study addressed the requirements of the various offices, departments, and the individuals that would be assigned to those functions. There is also consideration given to core spaces such as copier rooms, break rooms, meeting rooms, restrooms, a server room, and mechanical spaces. The complete list of space descriptions is given on the four-page listing at the end of this section. Following the space descriptions is a space relationship diagram to depict the space relationship between the offices.

Prior to the discovery of mold in the existing Town Office Building, the Town offices occupied approximately 11,333 square feet of space. Both the Selectmen and an architectural firm (Team Design) hired in 2006 came up with a proposal to provide approximately 11,600 square feet of space, which included space for the Recreation Department. We conducted interviews with the Town Manager and some of the department heads to get their input on needed space and came up with a minimum space

requirement for 10,577 square feet. The estimated national average based on standard practices and general guidelines dictates that a space consisting of 9,207 square feet is needed for the Town Offices. Based on the above figures, TTG is recommending a new building with usable office space of 10,800 square feet. The space program square foot breakdown is given on the spreadsheet at the end of this section.

We performed an evaluation for several options related to the construction of a new Town Office Building. They are as follows:

- Construct a new 10,000 square foot Town Office with a full basement. The basement will be unfinished and used for storage and the placement of mechanical equipment. (Note: Although TTG's recommendation from the space needs study calls for about 11,000 square feet of space, a portion of that included space for mechanical equipment and records storage is located in the basement of this proposed building.) The total cost for materials and labor is $196 per square foot. To this we added the cost of the site work $34 per square foot. Along with the contractor's general conditions, overhead and profit, the total for construction is $2,875,000. The total project cost is $3,607,000 and in addition to construction includes all ancillary and soft costs such as architecture and engineering, construction administration, an allowance for 50% new furniture, a generator, and a 10% contingency.

- Construct a new 11,500 square foot Town Office Building that is a slab-on-grade. All offices, storage, and mechanical equipment will be on one level with no basement. The total cost for materials and labor is $156 per square foot. To this we added the cost of the site work $28 per square foot. Along with the contractor's general conditions, overhead and profit, the total for construction is $2,642,500. The total project cost is $3,329,124 and in addition to construction includes all ancillary and soft costs such as architecture and engineering, construction administration, an allowance for 50% new furniture, a generator, and a 10% contingency.

- Construct a new 8,500 square foot Town Office with a full walk-out style basement. Finish 4,000 square feet of space in the basement for office/meeting space. The total usable space shall be 12,500 square feet on two floors. The remaining 4,500 square feet shall be used for mechanical equipment, some storage, and future office space. The total cost for materials and labor is $169 per square foot. To this we added the cost of the site work $27 per square foot. Along with the contractor's general conditions, overhead and profit, the total for construction is $3,065,625. The total project cost is $3,834,123 and in addition to construction includes all ancillary and soft costs such as architecture and engineering, construction administration, an allowance for 50% new furniture, a generator, and a 10% contingency.

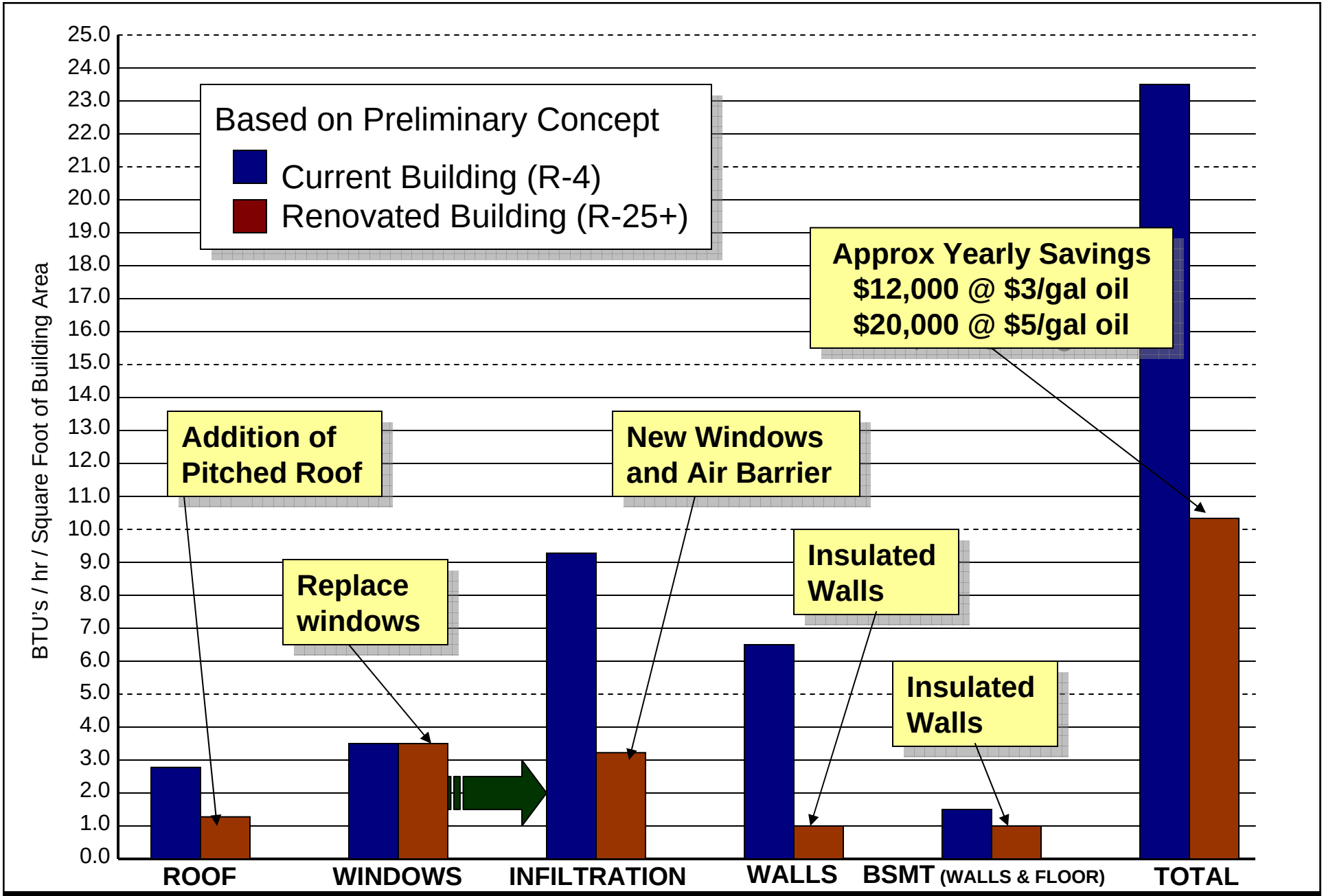
The above total costs include a $320,000 to $340,000 allowance for site development depending on a slab-on-grade versus a full foundation. Development of the Clark-Goodwill site is estimated to be $340,000, while development of the site on Route 125 is estimated to be $400,000. There are a few more challenges with the site on Route 125 including the existence of several ledge outcroppings. Compared to the Clark-Goodwill site, the relatively flat terrain of the land on the Calef site will result in reduced site work costs; however, the Town does not own this land, so the cost of purchasing the parcel must be added to the bottom line. For a complete breakdown of the costs see Appendix D.

Our opinion of cost for new construction is based on several sources including RS Means Building Construction Cost Data. For over 60 years RS Means has been actively engaged in construction cost publishing and consulting throughout North America. At the end of Appendix D, we have included a table from RS Means that shows typical square foot construction costs for a two to three story town office building.

We have calculated the projected operating costs for a new Town Office Building and for renovation of the existing Town Office Building over a 20-year period. At 10,000 square feet plus a full basement, the new building would have substantially less occupied space than the existing building. It is expected that the School Administrative Offices and the Recreation Department would occupy over 8,000 square feet in the renovated building. These entities would not be accommodated in the new building and the total building-to-building cost comparison reflects that difference.

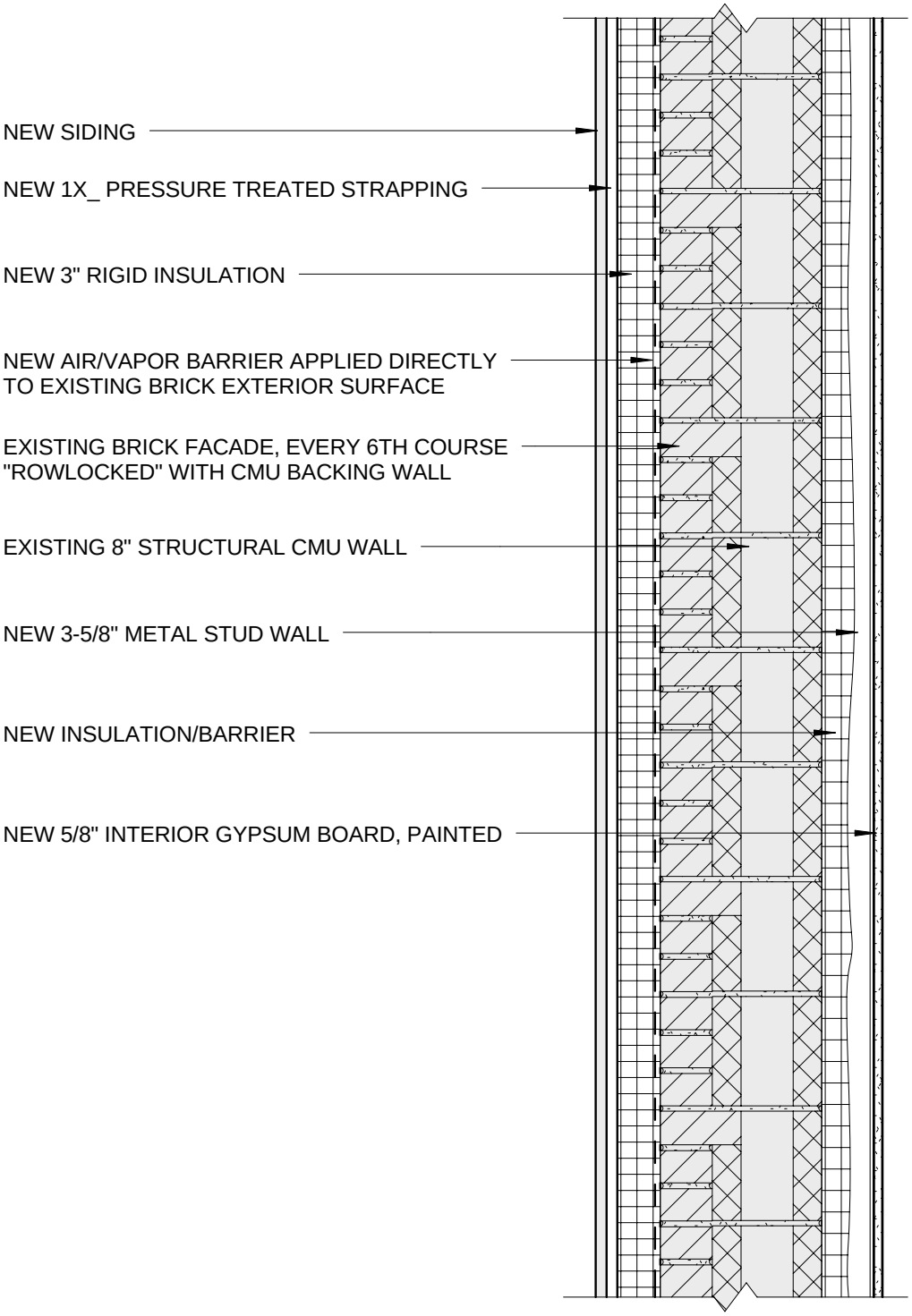
The present day value of the 20-year operating costs is detailed in Appendix D. Based on an annual inflation rate of 2.5% the costs are:

- Renovated Town Office Building - $2,632,600
- New Town Office Building - $1,890,500



Energy Savings

2011 Prepared By: The H.L. Turner Group Inc. ▪ Architect ▪ Engineers ▪ Building Scientists ▪ 603.228.1122 ▪ www.hlturner.com



1

PROPOSED WALL SECTION

Scale: 1" = 1'-0"

TURNER GROUP

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CONCORD, NH HARRISON, ME DANVILLE, VT.
LITTLETON, MA NEW HAVEN, CT

PROPOSED WALL SECTION

BARRINGTON TOWN HALL

137 RAMSDELL LANE
BARRINGTON, NH

Proj. No.: 3632

SK-A1

Ref Sht:

Date: 01/20/11

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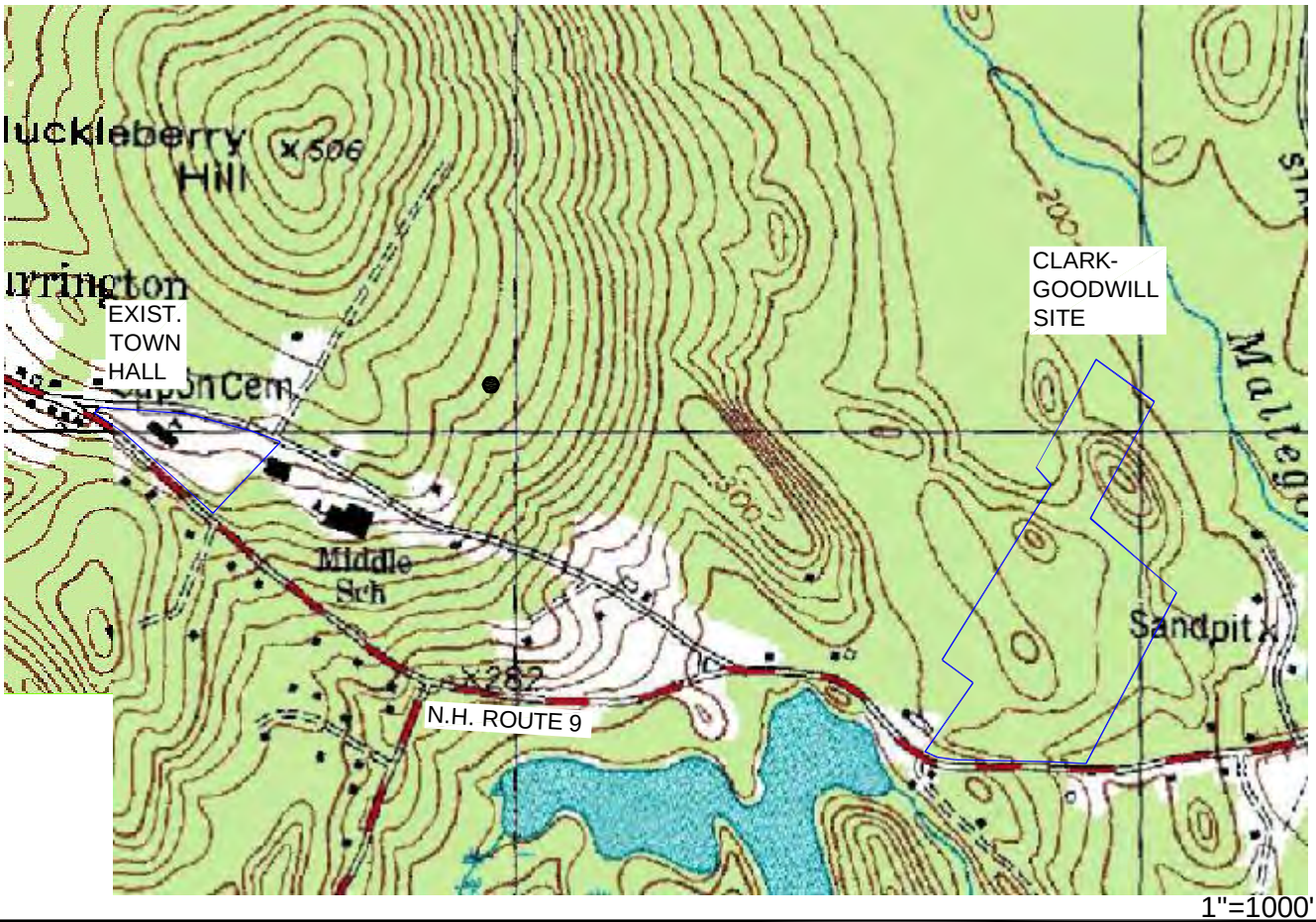

1"=1000'

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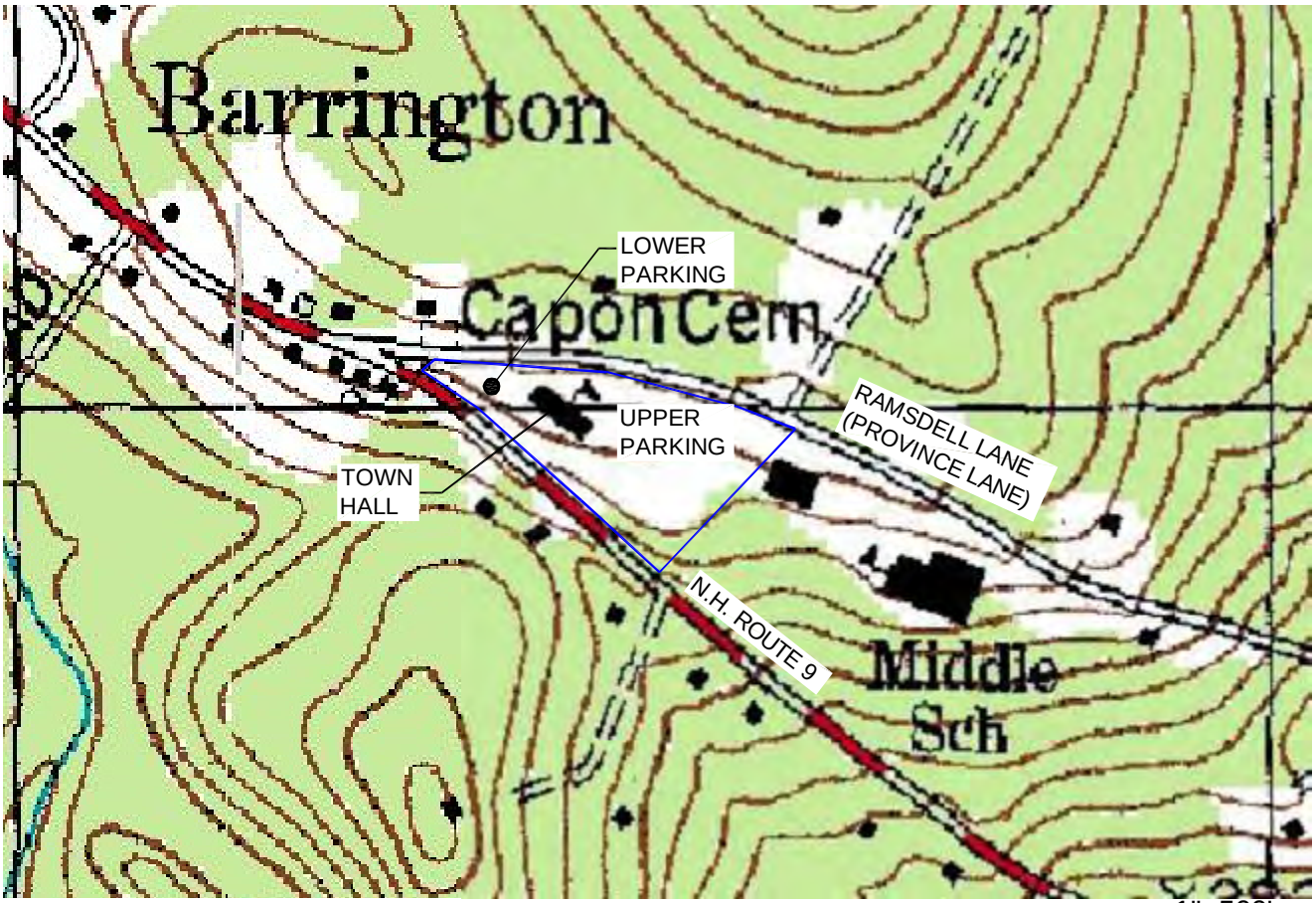
TURNER GROUP	**THE H.L. TURNER GROUP Inc.** ARCHITECTS • ENGINEERS • BUILDING SCIENTISTS 27 LOCKE ROAD CONCORD, NEW HAMPSHIRE 03301 T:603.228.1122 / F:603.228.1126 W:www.hlturner.com CONCORD NH • HARRISON ME • LYNDONVILLE VT LITTLETON MA • NEW HAVEN CT	FACILITY ASSESSMENT REPORT TOWN OF BARRINGTON, NEW HAMPSHIRE	SITE LOCUS PLAN SCALE: AS NOTED	FIGURE: **FIGURE 1** DATE: 12.09.10

1"=200'



1"=500'

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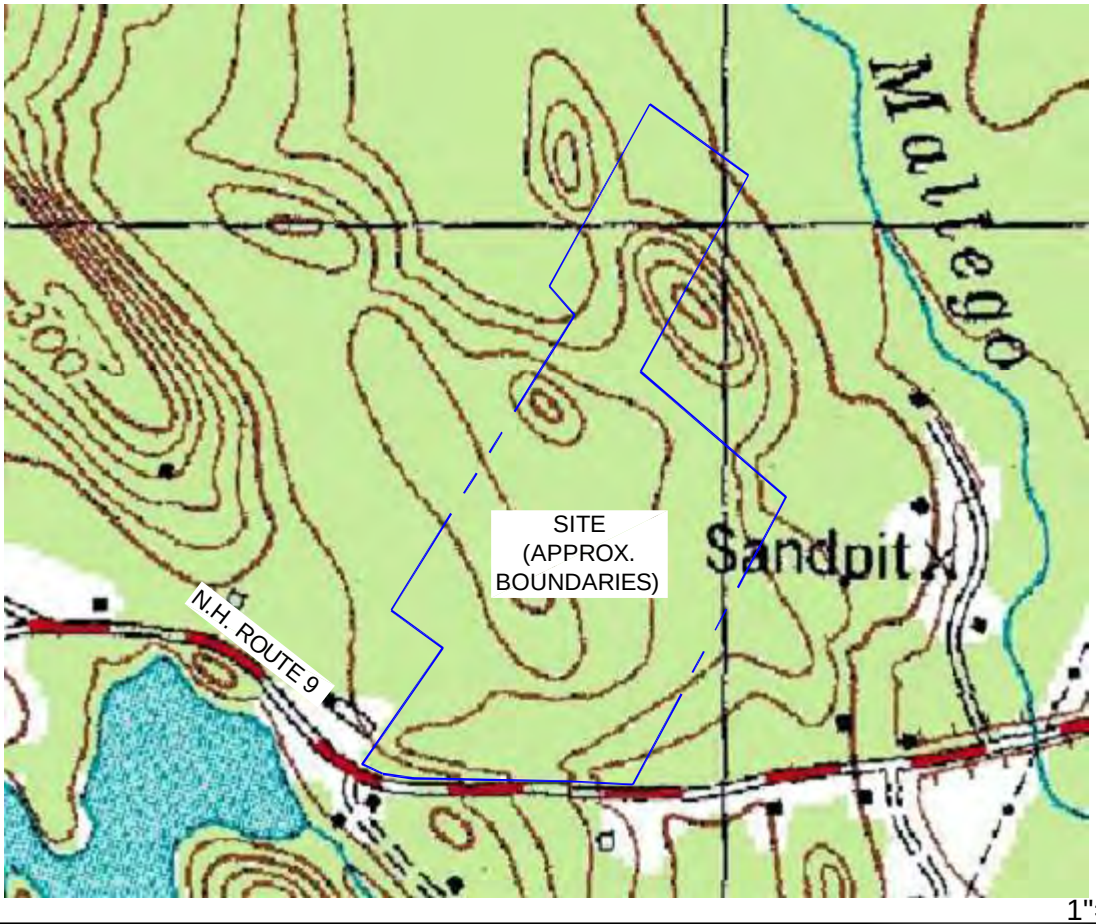
1"=600'



1"=600'

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Space Descriptions
New Municipal Building
Barrington, NH

Updated: 12.11.10

Selectman's Office

- 3 People
- Transaction counter needed (space for 2)
- View to public counter
- Secure Fire Proof Storage
- Counter / window for public (2 spaces)
- Public Records Computer Near by
- Adjacencies:
  - Near Town Admin (Supervision)
  - Near Road Agent (Present Connection)
  - Near Finance/Welfare Office (Payments)
  - Near Tax Collector (Folding Machine)
  - Near Copy Room
- Equipment:
  - Computers
  - Phones

Copy Room (Shared between Selectman, Financial / Welfare, Town Admin, and other offices)

- Large Copy / Printer
- Supplies
- Layout space
- Fax Machine
- Mail Machine
- Mail Boxes

Town Administrator Office

- 1 Person
- Option 1 - Standard 120 sf office with nearby shared conf room
- Option 2 - Larger office 180+ sf with meeting space in office
- Adjacencies:
  - Near Selectman's office
  - Near Financial office
  - Accessible to public not off directly off public space
- Equipment:
  - Computer
  - Phone

Finance/Welfare Office

- 2 people (currently a Director and Asst Dir)
- Part-time Accounts Payable Person
- Discreet entrance for welfare (from public space)
- Need conf space for private conversations
  - Conf space could use computer hook up & telephone
  - 2 staff people & 2 adults
- Adjacencies:
  - Financial near Town Admin
- Access to: long term records storage
- In future maybe waiting area (If full-time Welfare Office)
- People make appointments now
- Equipment:
  - Phone
  - Computer

Road Agent Office (Shared with other transient staff)

- 1+ Person
- Shared office
- Adjacencies:
  - Near Selectman's Office (for paperwork)
  - Near Copy Room
- Equipment:
  - Phone
  - Computer

Tax Collector Office

- 2 People
- 1 Shared person with Clerk
- 2.5 transaction counter / window space
- Secure location to count money
- Adjacencies:
  - Near Clerk (Shared person & equipment)
- Access to: long term records storage
- Equipment:
  - Computer
  - Phone

Town Clerk Office

- 3 people
- 1 Shared person with tax
- 3 window transaction counters (extra large work desks)
- Adjacencies:
  - Near Tax Collector (Shared person & equipment)
- Long work table
- Equipment:
  - Computer
  - Phone

Copy Room (Shared between Tax Collector & Town Clerk)

- Copy / Printer
- Supplies
- Layout space
- Folding Machine

Building Dept

- Building Inspector (private office)
- Health Officer (possible private office)
- Receptionist / Admin Assistant
- Conf / meeting space
- Adjacencies:
  - Near Planning Departments
- Equipment:
  - Phone
  - Computer

Land Use (Planning / Zoning / Conservation)

- Space for files, Maps, Plans, etc
- Layout space (possible stand-up tables)
- Adjacencies:
  - Near Building Departments
- Equipment:
  - Phone
  - Computer

Copy Room (Shared between Land Use & Town Clerk)

- Copy / Printer
- Supplies
- Layout space

Break Room

- Space for 8 people (Away from the public)
- Counter with sink and cabinets
- Cork board
- Equipment:
  - Refrigerator
  - Microwave
  - Table
  - Chairs

Selectman's Meeting Room

- Space for selectmen meetings and zoning hearings and other town meetings
- Need table & Chairs for board
- Need chairs for audience

Community Meeting Room

- Meeting space for community actives i.e.:
  - Weight watchers, Boy Scouts, Girl Scouts, AA, Garden Club, etc
  - Can be used after business hours

Restrooms

Option 1: Separate Male & Female Restrooms
Option 2: Multiple Single Unisex Bathrooms

Janitor

Cleaning supply storage
Water with mop/utility sink

Records Room

Secure, Fire Proof, Protected
Storage shelves to get boxes off the ground
Organized and clearly divided
Common request from all departments

Supply Storage

Space for paper and office supplies
Easily accessible to all departments (direct adjacency not needed)
Locked storage (Secure)

Building Storage

Long term building items
Bulk items
Locked storage (Secure)

Server Room

Present room is too large and unused
Temperature controlled (AC needed)

Lobby

Access to all transaction windows
Hard Floor Surface
Acoustic Baffles on wall
Records computer terminal

Space Relationship Diagram
New Municipal Building
Barrington, NH

Updated: 12.11.10

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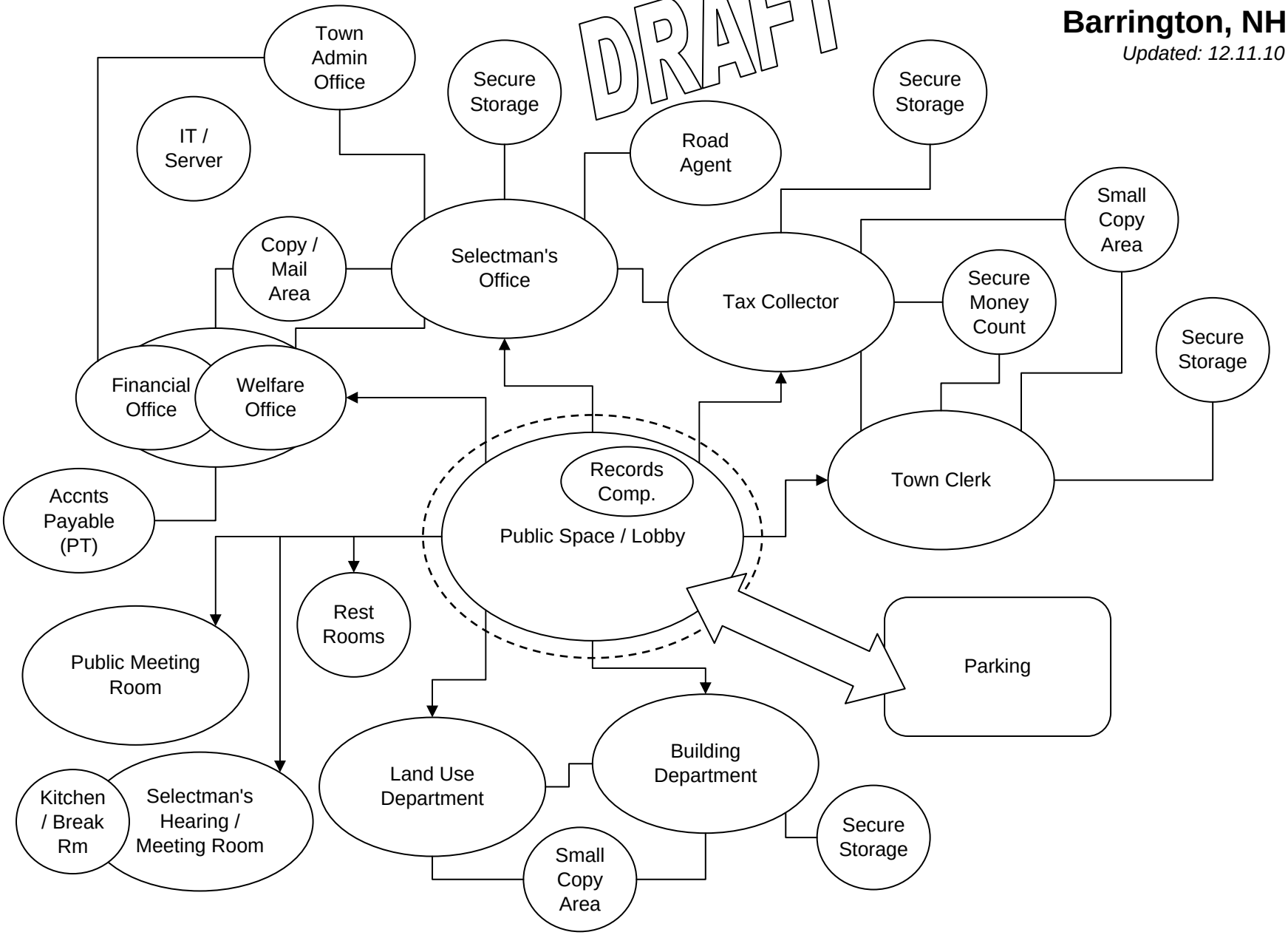

Prepared by: The H.L. Turner Group Inc.
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DRAFT

Space Program
New Municipal Building
Barrington, NH

Updated: 12.11.10

		Existing Space (Premold)	Existing Space (Temp Area)	06 Team Design Plan	Selectman Plan	Requested*	National Average	TTG Suggested	Comments
Selectmen's Office	3	790 sf	795 sf	790 sf	950 sf	800 sf	480 sf	700 sf	
Shared Mail / Copy Area	0						120 sf	120 sf	Shared Copy Room
Town Administrator Office	1	125 sf	0 sf	125 sf	200 sf	160 sf	140 sf	140 sf	
Shared Conf Room	0			130 sf			160 sf		Possibly shared / scheduled (with Welfare)
Finance/Welfare Office	2	620 sf	0 sf	620 sf		360 sf	360 sf	450 sf	
Interview / Conf Room	0				100 sf	80 sf	160 sf	180 sf	Possibly shared / scheduled (with Town Admin)
Road Agent Office	1	195 sf	0 sf	160 sf	150 sf	160 sf	140 sf	180 sf	Possible shared office with several transit people
Facility Manger Office	1			150 sf					
Tax Collector Office	3	285 sf	425 sf	345 sf	750 sf	350 sf	480 sf	350 sf	
Private Money Counting Area	0					100 sf	120 sf	120 sf	Private area - Seating for 3-4 people shared between Clerk and Tax
Town Clerk Office (Private office)	1	285 sf	425 sf	120 sf	150 sf	160 sf	140 sf	140 sf	
Asst Town Clerk Office (wk area)	2	265 sf		395 sf	850 sf	400 sf	360 sf	420 sf	
Vital Record	0			140 sf					
Shared Copy Area	0							120 sf	Shared
Building Dept	1	870 sf	870 sf	590 sf		480 sf	360 sf	360 sf	
Building Inspector	1			155 sf	150 sf	140 sf	140 sf	140 sf	
Asst. Builidng Inspect (Health)	1			100 sf		100 sf	140 sf	120 sf	
Planning / Zoning / Conservation	3	845 sf	845 sf	695 sf	700 sf	845 sf	480 sf	750 sf	
Planning Conf Room	0			150 sf	150 sf		120 sf		
Land Steward	0			180 sf					
Shared Copy Area	0							120 sf	Shared
Selectman's Meeting Room	0	1300 sf	1300 sf	1300 sf	2400 sf	1300 sf	1200 sf	1200 sf	
2nd Public Meeting Room	0	855 sf	0 sf	855 sf		850 sf		600 sf	Ideal if there is space
Break Room (Kitchen)	0	150 sf	205 sf	260 sf	375 sf	200 sf	225 sf	250 sf	Away from public space
Male Restroom (upstairs)	0	90 sf	0 sf	55 sf	100 sf	100 sf	150 sf	150 sf	
Male Restroom (downstairs)	0			55 sf					
Female Restroom (upstairs)	0	90 sf	0 sf	55 sf	100 sf	100 sf	150 sf	150 sf	
Female Restroom (downstairs)	0			55 sf					
Unisex Restroom	0	30 sf	30 sf					50 sf	Ideal if there is space (staff use)
Supply Storage	0	155 sf	155 sf	155 sf		150 sf	100 sf	100 sf	
Storage	0	90 sf	175 sf	160 sf	225 sf		300 sf	300 sf	
Storage Room 2	0	105 sf		115 sf					
Storage Room 3	0	110 sf		45 sf					
Records Room	0	370 sf	370 sf	370 sf	800 sf	740 sf	600 sf	600 sf	
Server Room	0	355 sf	355 sf	155 sf	100 sf	175 sf	120 sf	120 sf	
Janitor	0	85 sf	85 sf	85 sf	150 sf	85 sf	75 sf	75 sf	
Spare Offices	0	330 sf	155 sf						
Recreation	0				200 sf				
Subtotal:	20	8395 sf	6190 sf	8565 sf	8600 sf	7835 sf	6820 sf	8005 sf	
Circulation & Structure (25%)		2098.8 sf	1547.5 sf	2141.3 sf	2150 sf	1958.8 sf	1705 sf	2001.3 sf	Average % for most buildings
Mechanical (10%)		839.5 sf	619 sf	856.5 sf	860 sf	783.5 sf	682 sf	800.5 sf	Average % for most buildings
Total:		**11333 sf**	**8356.5 sf**	**11563 sf**	**11610 sf**	**10577 sf**	**9207 sf**	**10807 sf**	

Notes: *If the requested space was not commented on being bigger or smaller then it was kept the same size it currently is
All spaces are plus or minus 5% depending on fitting into a floor plan.

Prepared by: The H.L. Turner Group Inc.
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Appendix A

- Architectural Evaluation
- Field Observation Report
- Structural Evaluation
- Mechanical Evaluation
- Electrical Evaluation
- Site Issues
  - Review of New Building Sites

BARRINGTON TOWN OFFICES
STUDY FOR REMEDIATION, RENOVATION OR RELOCATION

EXISITNG BUILDING EVALUATION

ARCHITECTURAL EVALUATION

During our site visit and evaluation, we observed many "ADA Violations" that should be brought up to current design standards, and "reasonable accommodations" that should be replaced/updated to make the facility more user friendly. In addition, there were building envelope issues and minor architectural issues that were noticed. Should the building undergo alterations or renovation, the level of work done would determine if ADA upgrades are required under the International Building Code. Work involving new finishes, building envelope upgrades, additions, or modifications to the existing systems, such as the mechanical systems, would constitute "Level 2" alterations and thus under the code, requires the building to be upgraded to meet current ADA requirements.

Vertical Accessibility

Complete accessibility to all areas of the Town Office Building is currently not provided. The entire upper level is not accessible either from exterior grade, or from other levels within the building. The lower level has one room (Selectman's Meeting Room) that can be accessed from the exterior through double doors on the east side of the building. Once in the meeting room, the remainder of the 1930's wing (i.e. the east wing), which is approximately 2-feet higher in elevation, can be accessed by ascending a small steep ramp. The ramp is currently configured at an angle of 12.4 degrees, which far exceeds the ADA maximum of 4.76 degrees (1:12). The proper ramp would require a length of 24-feet in order to be in compliance with ADA.

The attached 1950's/1960's building (i.e the west wing) can be accessed from the lower level of the 1930's wing by ascending another ramp. This ramp is currently constructed at 8.8 degrees, again far exceeding the ADA regulations.

To solve this problem we recommend the installation of a multi-stop elevator near the connection between the original 1930's and the 50's/60's addition. This would require some reconfiguration of the corridor walls as well. In addition we recommend that a platform lift be installed in the "Selectman's Meeting Room" to allow for access from the lowest level of the east wing to the remainder of the building.

It is also important to provide access to the building from the upper parking lot at the rear, or north side of the building into the main entrance and up to the upper level of the east wing. This will require some site re-grading, the construction of a ramp with a proper enclosure such that the ramp is protected from the weather, and the relocation of the entrance door.

Rest Rooms Accessibility

The two existing restrooms on the upper level of the building located in the 1930's wing do not meet many ADA standards. There are numerous ADA violations including insufficient clear space in front of the door (both inside and outside of the restrooms), and a lack of rear and side transfer grab bars. The mounting heights and locations of existing toilet tissue dispensers, soap dispensers, paper towel dispensers, and mirrors do not meet minimum and/or maximum mounting height requirements. The "clear floor space" requirements for each fixture do not meet the current ADA requirements and the heights of the existing toilet and urinals do not meet the proper height requirements. Additionally, the flush controls on the men's toilet are on the wrong side.

There is one additional restroom at the "north" end of the lower level. This restroom is assumed to have met code when it was constructed, but if a major building modification is undertaken, it should be either brought up to current code or abandoned.

The are several small "convenience" toilet facilities in some of the major rooms of the 1960's wing upper level that do not meet code and therefore cannot be included in the total plumbing fixture count for the building.

Drinking Fountains Accessibility

We did not observe any accessible water fountains on any of the levels throughout the building. The best available option is to replace the existing fountain(s) with a new "hi-lo" fixture that meets ADA requirements on each level as required by code.

Stairs and Railings

All of the existing handrails and guardrails at each of the stairwells do not meet current code requirements. Per the building code, all handrails shall have a 1'-0" projection beyond the beginning and end of a stair or ramp run and shall be between 34" and 38" above the finished floor surface, measured perpendicular to the floor. Also, the shape of the handrails at existing stairs and ramps should be examined to insure they meet requirements for the minimum/maximum handrail diameter. There is no guardrail at the opening of the landing at the top of the stairs; a code violation. This handrail would need to be raised to guardrail height and a new handrail installed to the current code.

Building Envelope - Walls

During TTG's visit to the existing Town Office's site, the existing building envelopes of the original 30's school building and the 50's/60's building additions were analyzed and investigated. It was determined that there is no insulation in the existing exterior walls. The original 30's building's exterior wall construction was found to be Concrete Masonry Units (CMU) with a single wythe of brick on the exterior. There is no air space between the CMU and the brick. In the 50's/60's buildings the exterior walls are similarly

constructed with brick and CMU with no air space between. (Note: This has been confirmed by drilling holes into the walls at various locations throughout the building.) The existing wall construction makes for an R-rating of approximately R-4. It is recommended that more insulation be provided throughout the building. The are two ways to achieve this. The first and preferred method is to cover-up or "re-skin" the building. This is accomplished by adding a spray applied air and vapor barrier on the exterior of the brick, install rigid insulation over that, and then add strapping to provide an air space and a point of attachment for the new siding. The suggestion for a siding material would be a durable, maintenance free, metal panel or a cement board siding. The other method is to remove the finishes from the interior of the building, apply an air and vapor barrier, construct a new metal stud wall and add insulation to the interior face of the exterior wall of the building. New gypsum would be added and the interior finish restored.

Building Envelope - Windows

Also contributing to the poor thermal performance of the existing building envelope are the windows/glazing in both portions of the building. The existing windows are loosely fit, with air gaps, and air leakage around them. The windows are also not thermally broken. By removing the existing windows in the 30's building and replacing them with high performance double pane, double hung composite windows, you can improve thermal performance, cut down on air infiltration, and restore historical character to that portion of the building. Similarly, the 50's/60's building could benefit from replacing the existing glazing system with a new thermally broken curtain wall system with high performance double pane vision panels and spandrel panels backed with insulation and interior wall build-out. Both of these solutions will also stop water infiltration at the existing windows.

Building Envelope - Roof

There is approximately 12-inches of batt insulation in the roof space of the 30's building for an R-rating of R-30. There is evidence of approximately 1 to 2 inches of rigid insulation in the existing flat/low sloped roof over the 50's/60's building, for an R-rating of about R-10. (Note: This is assumed based on forensic evidence gathered. No destructive testing was done to confirm this.) The solution to improve the envelope in the 30's roof is to add/check the air seal around all penetrations and against all structures. If possible, adding a few additional inches of blown-in insulation would create an R-40 rating and diminish the thermal loss through the roof. In the 50's/60's wing, we suggest adding a new pitched roof with insulation at the roof plane. This will provide a tempered attic space for mechanical equipment as well as a better thermal rating to the roof system. With a new roof and new insulation a rating of R-35 to R-40 could be achieved. It is anticipated that the new pitched roof would be constructed of wood trusses spaced at 24-inches on center. The trusses would run north to south and be configured to overhang the face of the building by about 18 to 24 inches. This will help to keep water away from the face of the building.

Note: With the added insulation and the sealing of gaps to reduce air infiltration into the building, upgrades to the air handling system will be needed to achieve the correct amount of controlled air changes in the building.

Barrington Town Offices
Study for Remediation, Renovation or Relocation

Field Observation Report

Report By: Jay Doherty, The H.L. Turner Group Inc.
Persons in Attendance: Brian Lenzi, Paul Sanders and Peter Cook – Town of Barrington Building Committee
Date of Site Visit: January 6, 2011

I was out at the building on January 6, 2011 to look at the samples that Brian, Paul, and Pete were drilling. Brian had a hammer drill with a 1-1/2 inch drill bit and we had a scope camera to look inside the walls. We picked several locations that were away from the building occupants.

Hole 1 – 1950's Wing (old nurses office / under the back stairs). The wall thickness was 12-3/8 inches thick (with a true 8-inch Concrete Masonry Unit (CMU) block). We found no air space between the brick and the block. Every 6th course was a Flemish bond or a tie course that connected into the block. The block was cut to accept the brick. There were no brick ties. In addition, the cavity was very dry (as expected this time of year). We looked up and down the wall cavity with the scope camera and there was no visible mold in this area. We took two samples of the block at this location.

Hole 2 – 1960's Wing (2nd floor front side of building, mid-building). Very similar to the 1950's wing. The wall thickness was a little narrower (due to the CMU block being the modern 8-inch block or true 7-5/8 inches). We found no air space between the brick and the block. Every 6th course was a Flemish bond or a tie course that connected into the block. There were no brick ties. The cavity was very dry (as expected this time of year). We looked up and down the wall cavity with the scope camera and there was no visible mold in this area. We took two samples of the block at this location.

Hole 3 – 1960's Wing (2nd floor over the new door that was recently added in the temporary Selectman's office). Very similar to Holes 2 and 3. We found no air space between the brick and the block. Every 6th course was a Flemish bond or a tie course that connected into the block. There were no brick ties. The cavity was very dry (as expected this time of year). We looked up and down the wall cavity and there was no visible mold in this area. We felt an air draft. Through the camera, we could see the dust created during drilling, blowing around in the wall.

Hole 4 – 1930's Wing (parking lot side in Selectman's meeting room / at previous hole locations). Very similar to 1950's and 1960's wing. The wall thickness was 12-1/2 inches. We found no air space between the brick and the block. Every 6th course was a Flemish bond or a tie course that connected into the block. There were no brick ties. The cavity was very dry (as expected this time of year). We looked up the wall cavity and

there was no visible mold in this area. At this location there was a very strong air draft blowing out of the hole. We took two samples of the block at this location.

At the conclusion of the drilling, Paul was going to add some batt insulation in the holes and put a temp covering over them.

Drilling holes through the CMU.

Using a camera probe to view the wall cavity.

Screen for viewing the wall cavity.

Core of CMU block; visible brick is tie to brick veneer.

New Hampshire
MATERIALS
LABORATORY, INC.
Your Problem Solving Partner

Test Report

January 25, 2011

Mr. Bill Hickey
The HL Turner Group
27 Locke Road
Concord, NH 03301

File Number: 28182
Job # 3632
Phone: 603-228-1122

Overview:
Samples Received: (2) CMU samples
Work Requested: Determination of carbon content
Sample Disposition: Discard 30 days from date of report

Analysis Results:

The two samples were analyzed using energy dispersive spectroscopy with the following results.

	Composition (wt.%)	
Element	30'S	50's-60's
Carbon	8.3	0.9
Oxygen	60.3	68.2
Sodium	0.5	--
Magnesium	0.7	--
Aluminum	2.9	2.1
Silicon	8.6	10.1
Sulfur	0.8	0.5
Chlorine	0.3	--
Potassium	0.4	--
Calcium	16.0	16.7
Iron	1.1	1.4

Prepared by:

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STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISITNG FACILITY

ARCHITECTURAL

COMPONENT	OBSERVATION	RECOMMENDATION	REMAINING USEFUL LIFE	REPLACEMENT/UPGRADE COST
ADA – Ramps In Hallway	Ramp slope is 15.5% or 1:3.5. Ramp should be 1:12 less than 5%.	Option 1: Remove the ramp and replace with much longer ramp. Option 2: Remove the ramp and add a small lift. Option 3: Remove the ramp and add Rail Rider. **Option 4: Remove the ramp and add multi-stop elevator.**	0 Years	See Elevator
ADA – Ramp into Selectmen's Meeting Room	Ramp slope is 22% or 1:2.5. Ramp should be 1:12 less than 5%.	Option 1: Remove the ramp and replace with much longer ramp. **Option 2: Remove the ramp and add a small lift.** Option 3: Remove the ramp and infill entire floor to bring up to level of hallway.	0 Years	$23,000.00
ADA – Male Bathroom Items	Bathroom does not meet today's ADA requirements ie: lack of grab bars, fixture mounting heights, clear space and reach ranges questionable, door clearances, etc.	Totally gut bathroom and replace with up-to-date fixtures and accessories.	0 Years	$17,000.00 (does not include ceiling, includes fixtures, accessories and wall & floor finishes.)
ADA – Female Bathroom Items	Bathroom does not meet today's ADA requirements ie: lack of grab bars, fixture mounting heights, clear space and reach ranges questionable, door clearances, etc.	Totally gut bathroom and replace with up-to-date fixtures and accessories.	0 Years	$17,000.00 (does not include ceiling, includes fixtures, accessories and wall & floor finishes.)

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COMPONENT	OBSERVATION	RECOMMENDATION	REMAINING USEFUL LIFE	REPLACEMENT/UPGRADE COST
ADA – Transition Between Floors	There is no way for people with physical issues to move between the levels of the building.	Add new multi-stop elevator.	0 Years	$122,500.00
ADA – Drinking Fountains	Drinking fountain does not meet ADA requirements.	Replace existing and add new fixtures as required so there is an ADA compliant drinking fountain on each floor.	0 years	$5,250.00
ADA – Main Entries	There are steps at back entry into upper floor and steps at front door to landing between floors.	Leave front entry as is. Make the back entry near parking the main entry / accessible entry by adding a new entry vestibule that extends to the parking lot and has a 1:12 ramp.	0 Years	$88,750.00
Windows	Large gaps and air leakage around all windows. Windows not thermally broken.	**Option 1: Remove existing windows and install new double hung windows to match the classic historical character of the building.** Option 2: Remove existing windows and install new thermally broken curtain wall system. Option 3: Remove existing windows and infill windows with high r-value materials.	0 Years	30's Addition: $177,000.00 50/60's Addition: $204,500.00

ARCHITECTURAL

COMPONENT	OBSERVATION	RECOMMENDATION	REMAINING USEFUL LIFE	REPLACEMENT/UPGRADE COST
Mold	Reports of mold in the building. Without destructive testing we are unsure if mold has formed on back side of interior walls.	1. Provide air and vapor barriers and increased insulation. 2. Provide ventilation and upgraded mechanical systems. 3. Remove interior finishes that contain high levels of mold spores, (assume 50% of interior walls will need to be removed and replaced).	0 Years	1. See Mechanical 2. See Mechanical 3. $53,750.00
Demolition and Abatement	Existing hazardous materials and substances at exterior walls.	Abate existing hazardous building materials (including but not limited to: flooring mastic, caulking, etc.) and substances (including but not limited to; mold, etc.).	0 Year	$111,520.00
Insulation Roof	Little insulation in roof.	30's wing - Add more blown-in insulation above the ceiling. 50's/60's wing – Add new pitched roof (includes roof shingles, insulation, and trim).	0 Years	30's = $6,000.00 50's/60's (Arch) = $41,700.00
Insulation Walls	Little to no insulation at exterior walls.	**Option 1. Add vapor barrier, insulation, and new exterior finish to all walls.** Option 2. Add insulation to interior and exterior of both wings of building.	0 Year	$350,000.00

ARCHITECTURAL

COMPONENT	OBSERVATION	RECOMMENDATION	REMAINING USEFUL LIFE	REPLACEMENT/UPGRADE COST
Moisture & Air Infiltration	At windows and through walls (see above).	Provide replacement windows and new insulated wall (see above).		See both above
Roof Membrane	Signs of edge and seem failures, and mechanical fasteners stressing membrane. Roof drain at high point.	Option 1. Fix / patch all seams. Option 2. Replace entire membrane, add additional insulation, and pitch to drain. **Option 3. Install new insulated pitched roof.**	5 Years	See Structure
Replace Carpet	Much of the carpet is worn, with the exception of the Selectmen's Meeting Room. All carpet may be harboring mold.	Remove all carpet and replace with anti-microbial carpet. Clean Selectmen's Meeting Room.	0 Years	$71,500.00 Carpet $19,000.00 Resilient
Replace Ceiling Tiles	Many of the ceiling tiles are damaged or warped due to moisture difference between occupied space and above.	Replace all ceiling tiles.	0 Years	$70,000.00

ARCHITECTURAL

COMPONENT	OBSERVATION	RECOMMENDATION	REMAINING USEFUL LIFE	REPLACEMENT/UPGRADE COST
Lighting fixtures throughout building	Lenses are discolored. No lighting sensors. Ceiling light fixtures are serviceable, but over time fluorescent lamps lose performance.	Clean, re-lamp, and provide new lenses. Replace bulbs.	10 years	See Electrical
Railings (Guardrails & ADA Handrail extensions)	No guardrails at upper level and in locations needed.	Modify existing rail to become guardrails, and add new handrails.	0 Years	$18,250.00
Stair Well	Stair well not enclosed for fire safety.	Add enclosure and fire rated doors at top and bottom.	0 Years	$10,000.00
Exterior Doors		Replace existing exterior doors with new thermally broken door system. Upgrade door hardware.	5 Years	$42,250.00
			Subtotal	**$1,448,970.00 ($77.00 sf @ 18,800 sf)**

BARRINGTON TOWN OFFICES
STUDY FOR REMEDIATION, RENOVATION OR RELOCATION

EXISITNG BUILDING EVALUATION

MECHANICAL/INDOOR AIR QUALITY

The existing boiler plant consists of two relatively new Buderus cast iron hydronic boilers. The boilers are fired by No. 2 oil fired burners. The oil tanks are located in a below grade enclosed space, below the main entrance at the rear or north side of the building. Both boilers are identical size with a capacity of approximately 100,000 BTU's each. The building is fitted with hot water piping and independent hot water system zone pumps. With having recently been replaced they are in very good condition, and thus it is recommended that they will be included as part of the new heating plant.

The hot water supply and return lines are not insulated and appear to be the original piping. It is recommended that all supply and return branch lines be replaced as part of the mechanical systems overhaul. The rooms are heated by wall-mounted, cast-iron radiators. As part of the new heating system it is recommended that these be removed and replaced with a radiant floor heating system. The radiant floor heating system can be installed directly over the existing concrete slabs at the lower levels. It is recommended that rigid insulation be placed over the slab with the radiant heat tubing over that. Everything would then be encapsulated with a lightweight concrete topping. A similar procedure could be accomplished on the second level without the need for the insulation.

In the 1930's wing of the building, two recently installed air-to-air heat recovery units serve two air handlers. It is believed that these were installed to serve the Town offices that were originally located on the second level on this wing. The 1950's/1960's wing has an infiltration-only system for ventilation with window mounted air conditioning units. A high efficiency central ventilation and air conditioning system is proposed which would replace the existing air handling units as well as all window mounted air conditioning units located throughout the building. During our site visits we counted thirteen separate window mounted units. There are various types of central systems that may be considered for the renovation. One such system that is recommended is a displacement type ventilation system. It provides superior air quality by providing a constant circulation of air throughout the building. Fresh tempered air is introduced into the building at the lower level of the rooms. The occupants in the room, as well as the heat supplied by the radiant floor, heat the air. As the air is warmed, it rises, and is collected and exhausted at the upper extremities of the space. Before the air is exhausted to the outside, the heat is recovered and used for tempering the incoming outside air. The system can be adapted to most spaces because of the ability to utilize smaller size ducts.

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

MECHANICAL/IAQ

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Boiler Plant	Two new cast iron hydronic boilers with #2 oil fired burners. Equal sizing. Building zoned by independent HWS zone pumps. Fuel storage tank buried.	Reuse the existing boilers.	20 plus years	0
HWS & R Piping	Piping not insulated in mechanical room. Piping appears to be reused.	Replace branch piping.	0 years	$28,000
Heating Terminals	Cast iron wall mounted radiators.	Replace with radiant floor heating system. Provide zone control on a room-by-room basis.	0 years	$75,200
1930's Building Ventilation and Air Conditioning System	Two recent air-to-air heat recovery systems serve two air handlers (serving the second floor spaces only).	Replace as part of new central system. Provide central ventilation and air conditioning system. Displacement type.	0 years	$230,800

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

MECHANICAL/IAQ

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
1960's Building Ventilation System: Both Floors	Infiltration only system for ventilation and window mounted A/C units.	Provide central ventilation and air conditioning system. Displacement type.	0 years	$267,600
			Subtotal	**$601,600.00**

NOTES:

Shell Energy Efficiency

In the interest of decreasing the heat loss of the facility, the following items need to be considered:

a.) The building is composed of a circa 1930 building with a circa 1960 addition. The building foundation is poured concrete (1930's) with a slab-on-grade addition. The building walls are not currently insulated and are 8" thick CMU block wall with a brick facade. This wall type will need further study to determine how to increase the walls thermal resistance without causing premature deterioration of the wall structure. It is likely that the walls will not be capable of being insulated sufficiently well to meet current energy standards as published in ASHRAE 90.1 without providing a new exterior facade. Moisture as vapor and liquid intrusions into the building through the walls appear to be ongoing.

b.) The foundation is not currently insulated, while new site work has recently been completed to improve water drainage away from the building. Additional footing drains may be required and additional insulation will need to be added to the floor and wall of the ground contact portions of the building.

New ventilation system:

The ventilation systems currently in use are recommended for removal. A new displacement ventilation system is recommended because of the ability to use smaller sized ducts and superior air quality. The ventilation systems include air-to-air heat recovery systems to be energy efficient and double wall air handlers to help keep the air handlers clean. The systems will provide ventilation air to all occupied spaces, and will incorporate demand control systems for larger meeting rooms. Cooling will be accomplished using dehumidification of the supply air.

New heating system:

The existing heating terminals and branch piping will be removed. A new low temperature radiant floor heating system will be installed to provide heat to the existing spaces. The floor will be a 2" thick concrete layer on top of rigid foam insulation over the existing slab-on-grade floor. The upper level floors will include a 2" thick layer of lightweight concrete. Radiant floor heating piping will be embedded in the new concrete layers. The system will incorporate manifolds to provide multiple zones of control. The existing oil fired heating plant and fuel storage system will remain.

BARRINGTON TOWN OFFICES
STUDY FOR REMEDIATION, RENOVATION OR RELOCATION

EXISITNG BUILDING EVALUATION

ELECTRICAL

The utility that serves the Town offices consists of three (3) pole mounted utility transformers with overhead service entrance conductors to the meter socket, located on the north or front side of the building. The transformers are located approximately 100-feet from the exterior of the main electrical room. The service equipment appears to be original to the building. There are no visible signs of deterioration and there are no reported problems. We observed that new exterior conduit for low voltage cabling had been installed.

The main service equipment appears to have been installed within the last five years. The main service is a Siemens type "S4" Series 400 ampere 120/208 volt, 3-phase distribution board with a 400 ampere main circuit breaker. There are no visual signs of deterioration and no reported problems. The utility, Public Service of New Hampshire (PSNH), has noted that the peak usage for a year is approximately 90 amperes, thus the existing 400 ampere service appears to be adequate for this building.

The panelboards consist of Siemens S1 Series type panels. The panels are in good condition and appear to have been installed within the last five years. The original recessed mounted panels are still in place. Many of the outer covers are screwed shut and some of these old panels are being used as junction boxes. We recommend that recessed junction/pull boxes be provided at these old panel board enclosures.

Remote battery units provide exterior emergency lighting for the building. In addition, there are battery-ballasted fixtures within the building. The exterior doors do not have emergency lighting fixtures and exit signs are a combination of LED and incandescent type lamped devices. We recommend that a normal power shutdown test be conducted during off hours to verify the existing emergency lighting levels throughout the building. Areas with insufficient lighting levels should be noted and additional remote battery units provided. We also recommend that new weatherproof emergency battery units/heads at each exterior door be provided to provide illumination at night during a loss of power. Furthermore, we recommend that the existing incandescent type emergency exit signs be replaced with LED type signs since the LED type signs are low maintenance, more energy efficient, and will provide longer life.

The site lighting consists of utility pole mounted floodlights and there are building mounted fixtures located at each door. The fixtures contain inefficient incandescent lamps. Utility pole mounted fixtures are typically leased from the utility. It is recommended that the Town review the lease agreement with PSNH to analyze the cost

comparisons of providing new pole mounted fixtures on-site. We also recommend that the Town install new energy efficient fixtures at each exit door.

The lighting in the offices and corridors is provided by 2 x 2, 2 x 4, and 1 x 4 lensed surface and recessed mounted fixtures. Many of the lenses on the fixtures are discolored. It was reported during our assessment that the energy efficient florescent T8 lamps are provided for each of the fixtures. The lamp quantity varies based on the fixture style, but lighting levels appear to be sufficient for the working environment. It is recommended that all fixtures be cleaned and re-lamped. Florescent lamps will lose performance over time. Lenses that are discolored should be replaced. We also recommend that the large open office areas be provided with ceiling mounted occupancy sensors to automatically control the lighting fixtures. Likewise, small standard size offices shall be provided with wall mounted occupancy switches and corridors shall be provided with ceiling mounted occupancy sensors as well.

The existing twelve-zone fire alarm control panel currently utilizes six zones, thus leaving six spare zone slots within the panel. Overall smoke/heat detector coverage and audio/visual coverage appears to be adequate. Various locations throughout the building such as outside the main electric room in the basement, the large open offices and area currently designated as "student services" and "finance" shall be provided with additional smoke and audio/visual coverage. Since the building does not have a sprinkler system it shall have adequate smoke and heat detectors throughout. We observed that the current horn and strobe devices in the tax collection and adjacent spaces are not providing adequate coverage due to the fact that the installed millwork inhibits the coverage of these devices. We recommend that additional audio/visual devices be installed in the large open office areas and that existing devices in the tax office and adjacent collection room that are currently being obstructed be relocated as required.

There is an existing security system on the second level in the former area occupied by the Town offices. This should be evaluated to determine if it is usable. The current tax department on the lower level has been fitted with new security devices that appear to be satisfactory.

The layout of the power receptacles throughout the building is a combination of flush mounted receptacles and the surface mounted type. There appears to be an adequate number of receptacles for most locations. Additional surface mounted "wiremold" receptacles may be added as required for additional computers and office equipment. With regard to cabling, all branch circuit feeders shall be metal clad cabling or in conduit for a building of this type/usage. There was no non-metallic cabling observed at the time of this assessment, but this should be verified, and all non-metallic cables should be replaced during the renovation work.

There are telephone/data outlets installed at the desk locations throughout the building. As computers, phones, and other equipment are added, additional outlets should be added.

Provisions for adding more telephone/data devices shall be made at the Tel/Data closet located in the lower level of the 1930's wing. Provide additional patch panels and switch hubs as required.

Finally, we recommend that a 100 Kw standby diesel generator be installed for powering non-life safety items such as boilers, pumps, water heaters, telephones, selected receptacles, etc. All life safety systems such as lighting and the fire alarm system are on existing battery back-up. To put these systems on the generator would require additional transfer switches, panelboards, and a two-hour rated closet. Existing lighting fixtures would have to be re-circuited or new lighting fixtures installed. Replacing the existing battery units is the most cost effective approach.

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Electrical Utility Consists of (3) Pole-mounted utility transformers, service entrance conductors are overhead to the meter socket located at front of the building. Transformers are located approx. 100' from exterior of the Main Electric Room.	*Service equipment appears to be original to the building. No visible signs of deterioration shown and no reported problems. New exterior conduit for low voltage cabling has been installed.*	No recommendations at this time.		
Main Service Seimens, Type 'S4' Series 400 AMP, 120/208V, 3P, 4W distribution board with 400A Main Circuit Breaker	The service equipment appears to be installed within the last five years. No visual signs of deterioration shown and no reported problems. The utility (PSNH) has noted the peak usage for a year is	No recommendations at this time.	30-35 yrs	

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
	approximately 90 amps. The existing 400amp service appears to be adequate for this building.			
Lighting	Emergency Lighting – Remote emergency battery units are in place, in addition to battery ballasted fixtures within the building. The exterior doors do not have emergency lighting fixtures. Exit signs are a combination of LED type and incandescent lamped type.	Provide a building normal power shutdown during off hours to verify the existing emergency lighting levels throughout the building. Areas with insufficient levels shall be noted and additional remote battery units shall be provided. Provide new remote/weatherproof emergency battery units/heads at each exterior door to provide illumination at night during a loss of power. Replace existing incandescent type emergency exit signs with LED type. These energy efficient LED type units are low maintenance and provide longer fixture life.	Fixtures – 15 yrs. Ballasts – 7-8 yrs. EBU – 10 yrs. 10 years	**$2000.00** for shut down and testing $300.00 per emergency fixture (installed price) **(5) $300.00 - $1500.00** $300.00 per emergency LED exit sign (installed price) **(8) $300.00 - $2400.00**
	Site Lighting - Consists	Utility pole mounted fixtures		$1700.00 per fixture with

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
	of utility pole mounted flood lights. Building mounted fixtures are located at each exit door. Fixtures contain inefficient incandescent lamps.	are typically leased from the utility company. The town should review the lease agreement with PSNH to analyze the cost comparisons of providing new pole mounted fixture on site. Provide new energy efficient building mounted fixtures at each exit door.		pole(installed price). **(5) $1700.00 - $8500.00** $350.00 per exterior building mounted fixture (installed price) **(5) $350.00 - $1750.00**
	<u>Offices and Corridors</u> – Consists of 2X2, 2X4 and 1X4 lensed surface and recessed mounted fixtures. Many of the lenses on the fixtures are discolored. During the site survey it was referenced by a town employee that light fixtures are provided with energy efficient fluorescent T8 lamping. Lamping quantities per fixture vary based on fixture style. Lighting levels appear to be	Clean and relamp lighting fixtures throughout the building. Fluorescent lamps, over time, lose performance. Lenses that are discolored, shall be replaced with new. Large open office area shall be provided with ceiling mounted occupancy sensors to automatically control the lighting fixtures. Small/standard size offices shall be provided with wall mounted occupancy switches.	5 years	$75.00 per fixture to clean and relamp **(100) $75.00 - $7500.00** $50.00 per fixture to provide and install new lens. **(25) $50.00 - $1250.00** $240.00 per ceiling mounted occupancy sensor. **(12) $240.00 - $2880.00** $100.00 per wall mounted occupancy sensor. **(30) $100.00 - $3000.00**

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
	sufficient for the working environment. Lighting is switched via standard wall switches. -Light fixtures are controlled via wall switches located at various locations throughout.	Corridors shall be provided with ceiling mounted occupancy sensors to automatically control the lighting fixtures.		$240.00 per ceiling mounted occupancy sensor. **(24) $240.00 - $5760.00**
<u>Fire Alarm System</u> Fire Alarm control panel is a 12 zone analog panel manufactured by Honeywell 12 zone Panel. Key box located at main entrance. Digital Dialer is utilized for connection to the local fire department.	The existing (12) zone fire alarm control panel is currently utilizing (6) zones and leaves (6) spare zones slots within the panel. Overall smoke/heat detector coverage and audio/visual coverage appears to be adequate. Various locations throughout shall be provided with additional smoke and audio/visual coverage. (outside main electric room in	Provide additional smoke detectors in locations that have insufficient coverage. This unsprinklered building shall have smoke/heat detector throughout.	10-15 yrs	$250.00 per smoke detector **(10) $250.00 - $2500.00**

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
The building is unsprinklered.	basement, large open offices, Student services, finances) Horn strobe devices are not providing appropriate coverage in the tax collection and adjacent spaces. These areas have had new mill work provided which inhibits the coverage of the fire alarm devices.	Provide additional audio/visual devices in the large open office areas and relocate existing devices that are being obstructed in the tax office adjacent collections room.		$275.00 per audio/visual **(10) $275.00 - $2750.00**
Security System	There is an installed security system on the second floor in the vacant office area.(old tax office) There are new security devices located in the relocated tax department.	Evaluate the existing system on the second floor. May require service if used in the future. No recommendations at this time.	10-15 yrs.	**$5000.00**

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Receptacles/Power Requirements	General receptacles layouts (flush)are installed with additional surface mounted devices throughout. There appears to be sufficient power requirements for the use of the building.	Provide additional surface mounted (wiremold) receptacles as required for additional computers and equipment. The town shall verify the use of non-metallic cabling within the building. There appeared to be none at the time of visit. Branch circuit feeders shall be in conduit or metal clad cabling within a building for this type/use.		$250.00 per receptacle installed. **(25) $250.00 - $6250.00**
Telephone/Data	Offices have telephone/Data outlets installed at the desk locations throughout the building Telephone/Data equipment is located in the "Tel/Data" Closet on the lower level, at the bottom of the ramp.	Provide additional surface mounted (wiremold) Tel/Data outlets as required for additional computers and equipment in the future. Make provisions for additional tel/data devices to be added. Provide additional patch panels and switch hubs as required.	20yrs.	$200.00 per tel/data location **(10) $200.00 - $2000.00** $2000.00

ELECTRICAL

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Panelboards	*Panelboards consist of Siemens S1 series type panels. These panels are new and appear to be installed within the last 5 years* *Original recessed mounted panels are still in place. Many of the outer covers are screwed shut. Some of these panels are being used as junction boxes.*	No remediation required at this time. Provide existing panelboard enclosures with recessed junction/pull box at these respective locations.	Panels 25yrs. Feeders 30yrs.	**(2) @$1000.00 = $2000.00**
				Total Range of **$85,000.00 - $95,000.00**

BARRINGTON TOWN OFFICES
STUDY FOR REMEDIATION, RENOVATION OR RELOCATION

EXISITNG BUILDING EVALUATION

STRUCTURAL EVALUATION

The existing Town office building located at 41 Province Lane is a brick masonry structure that was built in two phases. The original building, constructed during the 1930's served as a school for the Town of Barrington for many years. The overall size of the 1930's wing is approximately 47' by 93'. The walls of this wing are constructed of concrete masonry units (CMU) with a facing of brick on the exterior. Forensic investigation revealed that the brick is tight against the CMU with no air space. The first floor is a concrete slab-on-grade and the second floor is concrete supported by steel framing, spanning front to back. The roof is a hip style roof and the structure is primarily wood-framed with 1-3/4" x 9-1/4" rafters at 24" on center. There are two steel trusses, one at each end of the building, that span front to back. The steel trusses provide support for the hip rafters. The roof is sheathed with 1" boards and is covered with conventional asphalt shingles. The shingles appear to be in good condition.

In the early 1950's a new one-story wing was added to the west side of the original school. This portion of the building is approximately 60' by 85'. It is our understanding that a second story was added to the 50's wing sometime in the early 1960's. The 50's/60's wing is constructed of concrete masonry unit (CMU) walls with a brick façade. The brick is tight against the CMU with no air space, similar to the 30's wing. The first floor is a concrete slab-on-grade and the second floor is wood-framed with a steel beam line along both sides of the central corridor. The roof structure is composed of steel beams and bar joists with "tectum" panels covered by rigid insulation and an EPDM roof membrane. According to reports, the EPDM roof is only about 15 years old. Typically, a roof of this type has a useful life of at least 20 years. Even though the membrane material itself appears to be in reasonably good condition, we did observe that the edges of some of the seams are easy to lift, indicating that the adhesive is starting to fail. Usually in a roof of this type the seams are often the first to fail. The seams may be redone as a stopgap measure to extend the life of the roof, but in our opinion, there is about another 5 to 6 years of remaining life in the existing membrane. We also observed that the roof drains are located at the centerline of the roof and that there are low spots along the center of the roof where water can pond before it flows to one of the roof drains. One of the drains was clogged with leaves, thus impeding the flow of water off the roof. At the time of our investigation a sizable pond had formed around the drain.

Analysis of Existing Structural Elements

The existing structural components were analyzed for the current code required loadings. The publication TR-02-6 entitled "Ground Snow Loads for New Hampshire" calls for a "ground" snow load of 70 pounds per square foot for the Town of Barrington. Based on

several factors including the “Importance Factor” for the building type and the “Exposure and Thermal factors”, the required roof snow load for the design is 50 pounds per square foot.

The building code also stipulates that office spaces should be designed for a live load of 50 pounds per square foot (psf) with a corridor load of 100 psf for the first floor and 80 psf for corridors above the first floor. Furthermore, the code requires that a partition load of 15 psf be included to account for office partitions and temporary portable partitions.

For this analysis we assumed that the steel used in the 30’s wing has a yield strength of 32,000 pounds per square inch (psi) with an allowable bending stress of 19,000 psi. The steel used in the 50’s/60’s wing has a yield strength of 36,000 psi with an allowable bending stress of 21,000 psi.

1930’s Wing

The capacity of the roof structure is limited by the strength of the 1-3/4" x 9-1/4" wood rafters than span from the ridge to a 6 x 10 timber that is located approximately 10'-6" off the ridge, and then down to the outside wall of the building. The maximum rafter span of 12'-6" is from the outside wall of the building to the 6 x 10 timber. The 6 x 10 beam is supported by a series of wood posts that carry down to the lower level. The analysis indicated that the rafters are capable of supporting the code prescribed snow load of 50 pounds per square foot (psf), plus the dead load of the decking and shingles.

The second floor framing consists primarily of 12" deep wide flange floor beams that span front to back from the outside walls to a central column supported beam line. The beams span approximately 23' and are adequate for the dead load of the 3" to 4" concrete slab and a live load of over 80 psf. The floor over the Selectman’s meeting roof is framed similarly and is adequate for carrying a live load of over 80 psf, plus the dead load.

1950’s/1960’s Wing

The steel bar joists that support the roof of the 1960’s wing are 14" deep over the offices and 8" deep over the corridor. In both cases the joists are capable of supporting a live load of approximately 80 pounds per square foot, considerably more than the code prescribed live load of 50 psf. The committee has expressed a desire to look into adding a simple wood-framed gable style sloped roof. This is feasible and could be achieved relatively easily. We would recommend that the existing roof covering and rigid insulation be removed and that the new roof trusses be configured in such a way that they would provide an attic space for mechanical equipment. We would also recommend a truss with an overhang to help keep the roof runoff away from the face of the building. Furthermore, we would recommend that the roof itself be insulated in order to create a tempered space for the mechanical equipment. The sloped roof is discussed in more detail below.

The second floor corridor is framed with 2 x 8 wood joists at 12" on center, spanning 8' between 10" wide flange beams. The live load capacity of the second floor corridor is well over the 80 psf required by the code. The framing over the office space consists of full dimension 1-1/2 x 13 wood floor joists at 12" on center. These joists span over 24' between supports. The wood floor joists are capable of supporting a live load of 45 pounds per square foot (psf) slightly less than the code prescribed basic live load of 50 psf, with no allowance for the required partition load allowance. Since most of the partitions are fixed and located over known load bearing walls or are located directly over partition walls below, this additional code required allowance can be safely ignored. However, since the existing second floor is slightly below capacity, the occupants should avoid placing heavy filing cabinets or a group of cabinets in any given office space on the second floor of the 60's wing.

New Sloped Roof for 60's Wing

The Building Committee has inquired about the possibility to add a sloped roof to the existing 1960's wing. The wing is approximately 60' x 85' for a total area of 5,100 square feet. A new gable style sloped roof could be added to the existing building by utilizing the existing bearing lines, which include the north and south exterior walls and the bearing lines on each side of the central corridor. The simplest approach would involve the installation of prefabricated wood trusses spaced at 24" on center. The existing roof would be removed including the membrane and rigid insulation prior to installing the wood trusses. The roof would have a pitch from 5:12 to 6:12 and the trusses could be constructed as attic style trusses, which would provide a space at the center for mechanical equipment. As mentioned above, the trusses would have an 18" to 24" overhang. The trusses would be sheathed with plywood, vented insulation board with a plywood backing and covered with ice and water shield and standard asphalt shingles. Insulating the roof provides a tempered space in the attic making it an ideal location for mechanical equipment. The projected cost for adding the new roof is broken down as follows:

- Prepare existing roof for installation of the trusses $21,000
- Install prefabricated wood trusses.....$31,000
- Plywood sheathing.....$ 6,500

Sub Total.....$58,500

Other costs (carried under architectural work)

- Ice and water shield .....$ 2,000
- Shingles.....$18,000
- Trim.....$ 6,000
- Insulation.....$15,700

Sub Total.....$41,700

BARRINGTON TOWN OFFICES
STUDY FOR REMEDIATION, RENOVATION OR RELOCATION

EXISITNG BUILDING EVALUATION

SITE ISSUES

This report summarizes our evaluation of the site issues present at the Barrington Town Hall, and the potential challenges they may present to the Town should they opt to renovate the building as a long-term solution to their municipal needs. On the day of our visit, the Town was in the process of having some site drainage improvements installed, to alleviate a problem with water infiltration into the building. The impact of these completed improvements has been considered in this investigation, which addresses the identified issues in detail in the following sections.

The Barrington Town Hall is situated on a 5.48 acre parcel identified as Lot 233-0044 on Town tax maps, which is located at the intersection of Route 9 and Ramsdell Lane (Province Lane); see Figures 1 and 2. The site slopes from north to south toward Route 9 with parking on two levels, connected by a paved ramp. Primary access to the building is adjacent to the lower parking area on the west side of the structure.

Stormwater runoff is allowed to flow overland from the north side of the site toward Route 9, with little infrastructure needed to address its management. A grassed slope on the south side of the lot intercepts runoff from the impervious surfaces before it reaches the roadway. The new drainage improvements include footing drains and yard drain inlets on the northeast side of the building, at the toe of an existing slope that pitches toward the structure.

Parking

The Barrington Town Hall site includes dedicated off-street parking for 46 vehicles in two separate lots, both accessed from Ramsdell Lane and connected by a steep asphalt ramp. The lower asphalt lot, which sits adjacent to the accessible building entrance on the west side of the facility, includes 23 designated spaces, one of which is delineated as an accessible space. The lot slopes from its northern boundary, abutting Ramsdell Lane, in a southerly direction at grades ranging from 9% to 2%, which allows for stormwater to flow off the lot and onto a sloping grassy lawn. Since the lot abuts Ramsdell Lane directly, there is little to no separation between the edge of the public street and the upper row of parking spaces. A separate entrance and exit provides for a smooth vehicular flow through what could potentially be a difficult lot to navigate. The dumpster for the facility is located at the southwest corner of the lot and is situated such that a garbage truck can access the vessel directly from the entrance, without having to drive along the travel lane between rows of parked vehicles.

The upper parking lot sits on the north side of the Town Hall, 8 to 10 feet higher than the lower lot, and consists of a paved section and a gravel section. The paved section includes 23 striped spaces, 2 of which are designated as van accessible, separated by an accessible aisle. The gravel area appears that it could accommodate up to an additional 30 to 40 vehicles. The lot is graded to intercept stormwater runoff before it can flow down against the building, and directs it eastward toward a grass swale that slopes toward Route 9. There are two entrances on the north side of the Town Hall facing this parking area; however, neither of them is compliant with ADA (Americans with Disabilities Act) accessibility regulations. An asphalt sidewalk provides pedestrians with access to the ramp connecting the two lots. The ramp slopes at 17% for approximately 40 linear feet, which does not meet current ADA guidelines. There is a second at-grade entrance on the east side of the building; however, there is no ADA accessible route to this door either. Utilizing this door from the upper parking lot requires one to walk down a gravel driveway with a 9% to 10% slope.

These lots appear to be functioning adequately for the Town Hall's needs, but to ensure long-term functionality we offer the following recommendations:

- If space permits, utilize the grassed slope on the south side of the lower lot (see Civil Photo 1) to reconstruct the lot further south from its current location and establish greater separation between the parking spaces and the public right-of-way. Construct a raised, curbed island between Ramsdell Lane and the lot to create a physical barrier as well (see Civil Photo 2). We understand that there is an existing leaching field in the grassed area south of the lower lot and therefore it may not be possible to reconstruct the subject lot further south. Further investigation is required in order to confirm the space available. We also understand that curbing is an impediment to efficient snow removal. This would have to be carefully considered along with input from the Facility Manager before implementing this recommendation.

- One option calls for the relocation of all accessible spaces to the lower parking area on the west side of the building. There are currently a sufficient number of spaces to meet ADA regulations, so if the total number of parking spaces isn't increased, additional accessible spaces are not required. To ensure compliance with ADA specifications, the portion of the lot with these spaces may require regrading to ensure the slope is 2% or less.

- Accessible spaces should not be maintained at the upper parking area; unless the paved ramp is reconstructed to be compliant with ADA guidelines (see Civil Photos 7 and 8). If a new ramp is constructed into the rear entrance on the north side of the building, the accessible spaces will be maintained and there would be no need to reconstruct the paved ramp that runs down to the lower lot on the west side of the building. Furthermore, some of the accessible spaces at the lower level could be eliminated.

- Construct a concrete dumpster pad to provide a more firm, impervious surface beneath the container. Provide a fence around the perimeter to establish visual screening (see Civil Photo 4).

- Install curbs around landscaped islands at upper parking lot to prevent damage to vegetation and to prevent soil from being flushed onto pavement (see Civil Photo 9).

- Pave gravel access drive on east side of structure, linking upper lot to paved driveway intersecting with Route 9. If the door on the east end of Town Hall is to be used as a means of accessible access, provide an ADA compliant pedestrian route from the parking spaces to the entrance (see Civil Photo 10).

- Pave the gravel parking area and stripe parking spaces. Additional accessible spaces may be required with an addition of delineated spaces (see Civil Photo 11).

Site Drainage

Because the site slopes consistently to the southwest toward Route 9, most of the runoff at this site flows overland, with very little infrastructure to provide control or management. A drainage swale along the shoulder of the State road keeps runoff from flooding the pavement. At the lower parking lot this has not appeared to create problems, because there is a clear path from the pavement to Route 9 along the west side of the facility; however, this absence of drainage measures has been particularly problematic on the north side of the Town Hall, where a vegetated slope angles sharply from the upper parking lot to the building, providing a direct path for runoff to approach the structure. In the fall of 2010, in order to address a problem with moisture infiltrating into the building, perforated footing drains were installed along the northern face of the building, yard drains were placed to collect any ponded surface water from the vegetated area on the north side of the facility, and a portion of the upper parking lot was regraded to intercept runoff and redirect it around the building. The installed pipes tie into an existing culvert and daylight below the building on its south side, routing collected surface water and groundwater onto the grassed lawn that slopes toward Route 9. Based on the design drawings provided to The H.L. Turner Group Inc., it does not appear that the existing foundation walls were treated with a waterproofing material, nor were any foundation drains installed along the below-grade spaces on the south and southeast sides of the Town Hall. Furthermore, the original Barrington School building has a sloping roof that directs rainfall and snowmelt directly onto the ground below the eaves, and there is an absence of stone drip zones with surface drains to collect the roof runoff.

The following additional recommendations should be implemented to eliminate building moisture intrusion:

- Install additional stone and geotextile-wrapped foundation drains around the perimeter of all sections of the building with below-grade rooms (see Figure 4).

- Apply a waterproofing membrane and drainage board to the exterior foundation walls for the entire length of the foundation drain. In other words, apply these measures to the foundation wall everywhere it is backed by a below-grade space. Backfill with a free-draining material (see Figure 4).

- Install a 6' to 8' wide, 12" deep stone drip edge beneath all sloped roofs. Place 2" to 3" diameter stone over non-woven geotextile fabric, and install a perforated surface drain at the bottom of the stone. Daylight the surface drains away from the structure. Ensure top of drip edge stone is at least 4" below the sill of all at-grade windows and drop grade at existing doorpad 2" to 3" to prevent water from ponding in front of the door. Slope grade away from sidewalk between stairs and door pad (see Civil Photo 14 and Figure 4).

- Construct stabilized outlet at daylighted culvert off southwest corner of building (see Civil Photo 13). Repair and reseed rill erosion in grassed slope.

Miscellaneous Site Issues

Should the Town of Barrington decide to make the investment in their current facility to utilize it for the future, there are some additional items that should be included in future designs for this site:

- Exterior site lighting should be added to illuminate the parking lots and pathways.

- The front steps at the employee entrance should be reconstructed or repaired and the railings should be replaced to meet current regulations (see Civil Photo 14).

- Replace railings at accessible ramp and stairways to be ADA compliant.

- Spring 2011 - Inspect the seed that was planted in the fall of 2010 to assess germination. If necessary, reseed and restabilize. Review performance of yard drains and their effectiveness at removing standing surface water, particularly during spring thaw and spring rains (see Civil Photos 15 - 18).

- Review performance of yard drains, particularly during spring thaw and spring rains.

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

CIVIL/SITE

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Footing Drains	Installed in fall of 2010. Not installed around entire perimeter of below-grade spaces.	Install additional footing drains at perimeter of all below ground spaces. Pipe should be surrounded by stone-wrapped geotextile (installed foundation drain is so constructed). Approx. 120 if required.		**$6,000.00**
Foundation Walls	No waterproofing or insulation appears to have been installed against exterior face of foundation at below-grade spaces.	Apply waterproofing to exterior of foundation walls and install rigid insulation/drainage board. Backfill trench with free draining material. (340 lf +/-)		**$18,000.00**
Drip Edge/Surface Drains	Absence of stone drip edge beneath portion of building with sloping roofs. New yard drains installed in fall 2010 to manage surface runoff on north side of building.	Install 6' – 8' wide, 12" deep stone drip edge with 2" – 3" stone beneath all sloping roofs. Place perforated drain pipe at bottom of stone and daylight to drain. (230 lf +/-)		**$12,000.00**
Culvert Outlet - Southwest Corner of Facility	Absence of outlet protection creating rill erosion on vegetated slope facing Route. 9	Install outlet protection (riprap or similar) at outlet to prevent erosion. Repair existing erosion and reseed.		**$500.00**

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

CIVIL/SITE

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Grade along north side of building.	Little separation between windowsills and finish grade. Finish grade flush with concrete door pad and asphalt walk on north side of building.	Provide minimum 4" vertical separation between finish grade and windowsills. Slope grade away from sidewalk and door pad.		**$2,000.00**
Accessible ramp from upper parking lot to entrance.	Ramp is not compliant with ADA regulations (too steep). Handrail is not compliant with ADA.	Reconstruct ramp and replace handrail in accordance w/ ADA specifications. Alternatively, relocate accessible parking spaces (see below).		**$10,000.00**
Accessible parking spaces.	One located at lower lot, two located at upper lot.	Restripe lower parking lot (west side of facility) so all accessible spaces are located adjacent to accessible entrance. Ensure new spaces meet all ADA regulations.		**$1,000.00**
Lower parking lot (lot on west side of building).	Virtually no separation between Ramsdell Lane travel way and row of parking spaces.	Reconstruct parking lot to shift it away from Ramsdell Lane. Provide a raised landscaped island between lot and public road to provide a physical barrier/separation.	**Note**: The relocation of the parking lot is dependent upon the location of an existing leaching field and the space available. Further investigation is required.	**$20,000.00**

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

CIVIL/SITE

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Upper parking lot (north side of building).	Landscaped islands flush with pavement.	Install curbing to protect material planted in islands and to prevent soil/mulch from flushing onto parking area.		**Granite: $4,500.00** **Bituminous: $2,000.00**
Gravel driveway on east side of building, connecting upper lot and driveway off of Route 9.	Gravel material washed off of slope onto paved driveway by runoff.	Pave gravel driveway. Pave and stripe the gravel parking area, if the area is utilized as parking.		**Driveway: $8,000.00** **(Gravel Parking: $20,000.00)**
Dumpster	Well-situated for ease of access by garbage truck, but it is unscreened and sits on bare ground.	Place concrete pad for dumpster to sit upon. Install fence around dumpster to provide visual screening.		**$2,500.00**
Site Lighting	Extremely minimal.	Develop site lighting plan to provide greater visibility, security, and aesthetic appeal, while preventing off-site light spillage.		**Included in Electrical Costs**

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

CIVIL/SITE

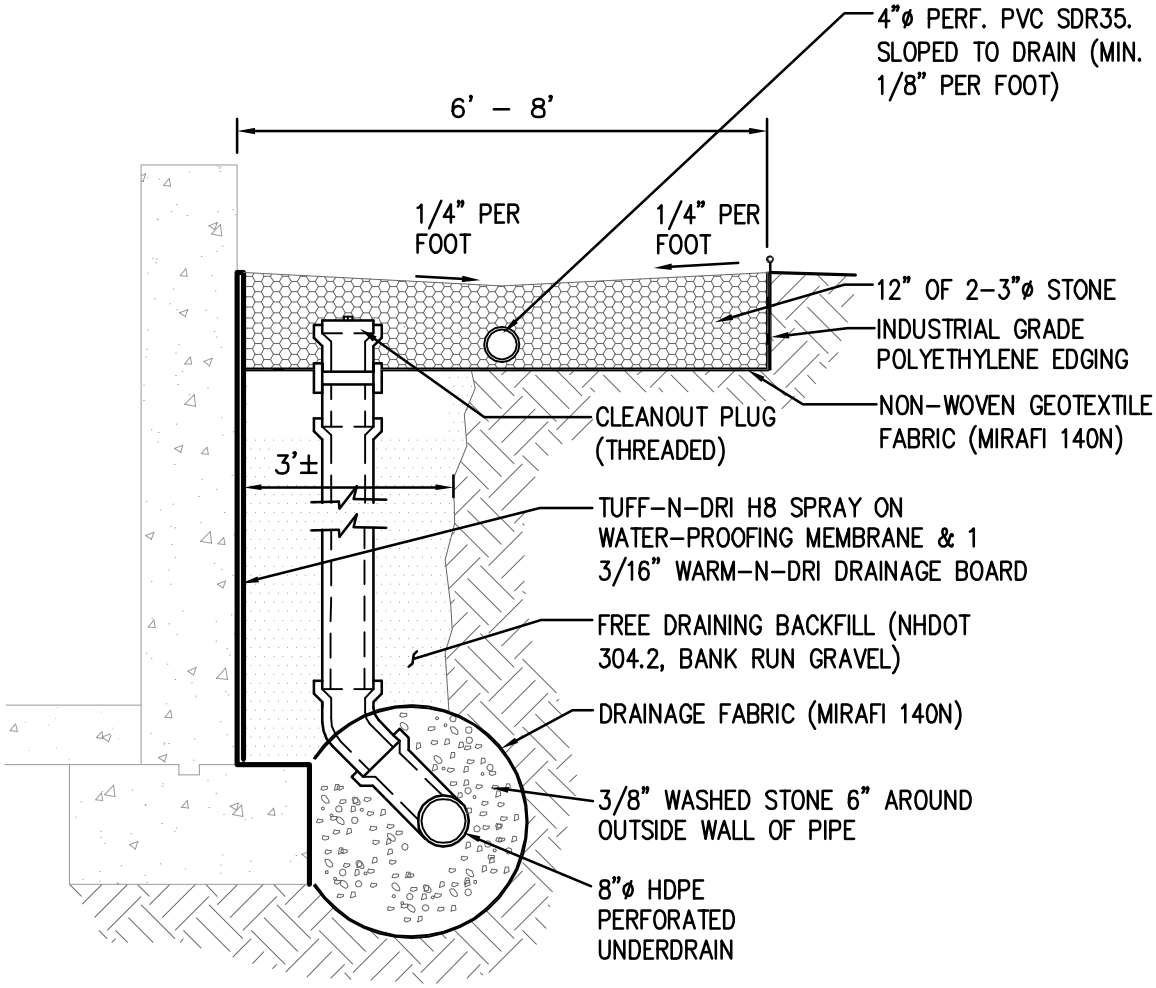
COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Exterior railings at stairs and walkways.	In various states of adequacy and ADA compliance.	Replace railings for safety and consistent ADA compliance.		**$4,000.00**
South side stairs (employee entrance).	Very weathered.	Repair or replace.		**Included in Architectural Costs.**
Fall 2010 seeding	Installed late in growing season.	Review status of germination in springtime. Reseed if unsuccessful.		**--**
Yard Drains	Installed during fall of 2010.	Review performance of drains during spring thaw and rainy season.		**--**
			SUBTOTAL	**$90,000.00 – $112,500.00**

STUDY FOR REMEDIATION, RENOVATION OR RELOCATION OF TOWN OFFICES, BARRINGTON, NH

ASSESSMENT OF EXISTING FACILITY

CIVIL/SITE

COMPONENT	OBSERVATION	RECOMMENDATION	Remaining Useful Life	Replacement/Upgrade Cost
Undeveloped Site	Preliminary estimate of site development costs required to establish a new Town Hall facility with vehicular access and parking on an entirely undeveloped site.			**$350,000.00**



TURNER GROUP	THE H.L. TURNER GROUP Inc. ARCHITECTS • ENGINEERS • BUILDING SCIENTISTS 27 LOCKE ROAD CONCORD, NEW HAMPSHIRE 03301 T:603.228.1122 / F:603.228.1126 W:www.hlturner.com CONCORD NH • HARRISON ME • LYNDONVILLE VT LITTLETON MA • NEW HAVEN CT	FACILITY ASSESSMENT REPORT TOWN OF BARRINGTON, NEW HAMPSHIRE	TYPICAL FOOTING DRAIN & DRIP EDGE DETAIL SCALE: NONE	FIGURE: **FIGURE 4** DATE: 12.09.10

Facility Assessment Report
Barrington, NH Town Hall

Civil/Site Photos

Civil Photo 1: Grassy expanse down slope from lower parking lot, looking east.

Civil Photo 2: Separation of lower parking area from Ramsdell Lane, looking west.

Civil Photo 3: Lower parking area on west side of Town Hall, looking east.

Civil Photo 4: Dumpster location, looking southeast from Ramsdell Lane.

Civil Photo 5: Accessible space at lower parking lot and accessible building entrance.

Civil Photo 6: Grassy expanse down slope from lower parking lot, looking north.

Civil Photo 7: Paved ramp connecting parking lots, looking northeast.

Civil Photo 8: Paved ramp connecting parking lots, looking north.

Civil Photo 9: Upper lot, uncurbed landscaped island at left side, looking northeast.

Civil Photo 10: Gravel drive from upper lot to driveway intersecting Route 9.

Civil Photo 11: Upper lot looking east toward gravel parking area.

Civil Photo 12: Finished grade at windows and door pad.

Civil Photo 13: Existing outlet from drop inlet.

Civil Photo 14: Existing stairs at employee entrance.

Civil Photo 15: Slope between building and upper parking lot.

Civil Photo 16: Existing drop inlet and non-ADA compliant handrail.

Civil Photo 17: Drainage improvements in progress (fall 2010).

Civil Photo 18: New sidewalk at upper lot, looking west.

Appendix B

- Indoor Air Quality (IAQ) Testing and Reports
  - The H.L. Turner Group Inc.
    Review of IAQ Reports
  - Desmarais Environmental Reports
  - The Scott Lawson Group Reports

TURNER GROUP

TURNER BUILDING SCIENCE & DESIGN, LLC

P.O. BOX 1365, 75 SOUTH STREET, LYNDONVILLE, VERMONT 05851-1365 TEL. (802) 626-8233

www.hlturner.com www.turnerbuildingscience.com

December 21, 2010

Town of Barrington
Selectmen Offices
41 Province Lane
Barrington, NH 03825

SUBJECT: Review of Microbial Test Results of Sampling Completed by Others and Recommendations for Improvements of Existing Facility

Ladies and Gentlemen:

In accordance with your request, we are providing the following review of air quality reports completed by others, and our recommendations for improvement of the existing facility with respect to maintaining acceptable indoor air quality. Our recommendations are based on our visual observations made at the site and analysis of provided reports. We did not conduct interviews with occupants to ascertain occupant concerns, nor did we collect building operation or maintenance history.

The enclosed report is of a technical nature; therefore, the reader will need to have technical knowledge of the facility to properly evaluate the recommendations made herein.

Turner Building Science & Design, LLC (TBS) has enjoyed the opportunity to serve as professional consultants to the Selectmen of the Town of Barrington. Please contact me if you have any questions or need further clarification of any items within this report. You can reach me at our Vermont office at (802) 626-8233 or Mr. William Turner in our Harrison, Maine office at (207) 583-4571, ext 11.

Sincerely,

TURNER BUILDING SCIENCE & DESIGN, LLC

Frederick T. McKnight
Senior Vice President, P.E.

William A. Turner, P.E.
President/CEO

FTM/sai

Enclosures

REVIEW OF INDOOR AIR QUALITY REPORTS

Based on information collected while on-site and on air quality reports of microbial sampling work completed by others, we feel that the building can be occupied if a number of conditions are met. These conditions include improving the building water tightness by repairing window openings, roof leaks, piping leaks, and providing improved thermal barriers on walls to limit condensation, as well as replacement of windows to limit condensation.

We have reviewed reports from Desmarais Environmental and Scott Lawson Group that were made available to us concerning possible mold growth within this building. The reports and letters include, in chronological order:

April 9, 2010:	IAQ Investigation from Desmarais Environmental
June 24, 2010:	Draft Indoor Air Quality Survey from Scott Lawson Group
July 20, 2010:	Indoor Air Quality Survey Follow-Up from Scott Lawson Group
September 16, 2010:	Indoor Air Quality Survey from Scott Lawson Group
August 13, 2010:	Letter from Desmarais Environmental

Our review of the provided reports indicates that both testing firms agree that the indoor air levels are low for mold spores.

They both found mold spores within the indoor air, but at levels that were lower than corresponding outdoor air samples that were collected at the time the indoor samples were collected. Generally, spore count totals found indoors that are lower counts than the number of spores found outdoors do not indicate amplified reservoirs within the indoor spaces. Additionally, lower indoor counts suggest that there are active pathways connecting some hidden source to the indoor air, at least during the time of sampling. Lower spore counts indoors are accepted as normal dispersion of spores from the outside to the inside through normal air movement through the building via openings in the building enclosures. These openings include doors, windows, and louvers. Mold may also be carried into the indoor space by people entering the space from the outdoors and the normal operation of a buildings ventilation system, as well as from infiltration air that is sucked into the building through unintended openings (i.e. cracks in the building enclosure). However, it should be made clear that the types of tests employed are susceptible to false negatives. Additionally, the air sampling findings in the consultant's reports apply only for the time period covered by the sampling.

1. Both Testing Firms Verify that Mold was Found in the Wall Cavities

   It is normal to find mold spores within building wall cavities. The reported counts of mold spores found on the samplers from wall cavity sampling are also typical of what might be found in a wall cavity when there is no visible mold

growth within the occupied space. The unusual part about the reported wall cavity sampling is the report of Stachybotrys identified in the Desmarais Environmental report. The sample was collected from under a window in the Finance Office (actual location within the building is not known).

2. Desmarais Environmental Raises Concerns About Mycotoxins

   Mycotoxins produced by Stachybotrys were raised as a concern; however, Mycotoxins would require a transport mechanism and pathway from the sample location, reportedly a CMU wall under a window. The sampling to date suggests that spores from known sources in wall cavities did not show-up in quantities greater than outdoor levels, indicating an absence of transport mechanisms. It is possible that the known sources could adversely affect the space if the weather conditions differ from those at the time of sampling. Some of the different weather conditions that may allow spores to migrate into the occupied space include cool outdoor temperatures and windy conditions. These conditions are more likely to exist from late fall through early spring.

3. Neither Testing Firm Reported Visible Mold

   We observed mold on some window sashes in the lower level of the 1960's building. In the small office in the corner labeled as "Office 2" mold appeared on the painted wood finish of the window. The source of moisture was likely condensation that formed on the window glass and drained down to the sash. The observed mold was a small area. The office was empty of furnishings and was not inhabited at the time of our observation. Neither firm reported finding visible mold within the building. This observed mold may be more recent than the dates of the work completed by the consultants whose reports were provided to us.

The sampling and provided reports do not provide sufficient data or interpretation to suggest that the spaces may be harboring amplified mold reservoirs and that these reservoirs are feeding contaminants to the air spaces of the occupied spaces of this building. Mold at the levels reported will normally be found in the air of occupied spaces of buildings and will also normally be found in wall cavities. The species Stachybotrys is also commonly found on damp or wet building surfaces. It especially favors cellulose-based products (i.e. paper and wood to a degree). However, lignin is also present in wood and makes wood a less favorable food source for Stachybotrys.

4. Neither Testing Firm Explored Other Possible Locations

   Other possible locations where mold may grow were not reported observed. These locations include spaces above the ceilings, especially near roof leaks, carpeting covering slab-on-grade floors, carpeting near sources of moisture such

as roof leaks, and other infrequent sources of water (spills, etc.). However, based on the current rounds of air sampling, none of these additional sources were emitting contaminants into the occupied air space at the time the air samples were collected.

RECOMMENDATIONS

Recommendation #1: Remediate Stachybotrys Reservoir

Based on the data presented in the reports from Desmarais Environmental and from Scott Lawson Group we recommend the reported Stachybotrys sampled site be located precisely, and a remediation protocol be devised and implemented as soon as possible. In addition, the mold observed on the window sash in Office 2 should be removed. The amount observed is small and therefore, according to ACGIH procedures outlined in their publication *Bioaerosols Assessment and Control* can be removed by cleaning staff using hot soapy water and a damp cloth.

Recommendation #2: Improve Control of Sources of Moisture

We observed a number of moisture sources that could at times adversely affect the indoor air quality by providing moisture inside the building that may promote the growth of mold periodically. The sources include roof leaks, possible water intrusion through window openings, possible flooding from surface runoff, water from condensation forming on cool ground contact, non-insulated walls, condensation from water vapor near cold window glass, possible piping leaks, and water entering the subgrade areas of the building through abandoned or unsealed penetrations through the foundations walls. In addition, we also observed works in progress that were intended to address the water intrusions from surface runoff by regrading the site around the parking lot side of the building.

In brief, these repairs to the building enclosures will require repairs to the roof, patching, and resealing seams. Window leak openings will need flashing repairs and new, more energy efficient windows will be required to limit condensation accumulations on the window glass, and subsequently onto the wooden window sashes and frame. Additional insulation will be required on the ground contact walls to limit condensation on these surfaces.

DESMARAIS ENVIRONMENTAL, INC.

62 Al Wood Drive Barrington, NH 03825
603/664/5500 603/664/5600 fax

April 9, 2010

Ms. Carol Reilly
Town of Barrington
41 Province Lane
Barrington, NH 03825

Re: IAQ Investigation - Barrington Town Hall

Dear Ms. Reilly,

As you are aware, we are currently conducting an Indoor Air Quality investigation at the Barrington Town Hall to determine the cause of building-related health complaints. We have some preliminary data as part of our investigation that we feel should be brought to your attention as soon as possible.

Due to the types of health complaints reported, the principal focus of our investigation has been to identify and locate moisture intrusion into the building envelope which could result in a mold or bacterial amplification. To date we have not visually located any biological amplification but these may be hidden in or around the windows or adjacent walls.

Water from the roof is collecting on the north side of the building and is trapped by the building's topography; this eventually seeps through the building foundation or enters through several doors and windows located at ground level. The services of a civil engineer should be engaged to properly design a drain system to channel moisture away from the building.

The second main source of moisture is around the window frames throughout the building. Elevated moisture levels were detected with moisture meters on interior surfaces of most windows tested. The aluminum trim of one window was lifted for inspection and an interior portion of the window was removed without causing any damage. This inspection was very limited in exposing the window substructure and results were inconclusive.

On April 2 we collected air samples from four locations within the building utilizing several methods of testing for biologicals. Two of three sampling methods were tests for viable (live) forms of fungus and bacteria; those results are still pending as they require a minimum of 10 days to incubate. The third type of sampling utilizes an Alergenco-D spore trap, which collects both live and dead fungal spores and identifies the type of fungus by morphology. Results from interior rooms tested indicate acceptable levels of spores when compared to outdoor levels. However, a sample that was collected from within the Concrete Masonry Unit (CMU) wall beneath the window in the finance area indicated that there is a significant amplification of fungus inside the wall cavity itself.

The predominant fungus identified inside the wall cavity is Stachybotrys. Stachybotrys produces several forms of mycotoxins which could cause the building-related health complaints experienced at the Town Hall Building. The spores themselves are often not found in room air samples; however, the resulting mycotoxins will disperse throughout the building. Typical investigations uncover it by wall cavity testing where the spores are concentrated or during a physical investigation of the building. In this case, the amplification inside masonry makes it difficult to find. The presence of Stachybotrys in the building is a sufficient indicator that mycotoxins are present.

At this point in time we have a single sample indicating a potential major building-related problem around the windows. The presence of moisture detected at most of the windows suggests a possible failure of the window system or building envelope. Given that complaints are reported throughout the building, it is reasonable to believe that the problem is building-wide at varying degrees depending on moisture intrusion into a particular window.

Until the full extent of the problem can be ascertained, it is our recommendation that occupants who are experiencing building-related complaints be moved or allowed to work temporarily from another location outside this building. Any children's activities should also be moved to another location until a full assessment of the risks can be determined or the problems remediated.

Exposure to the fungus and toxins is typically self-limiting in that once removed from the problem environment the symptoms abate. Continued exposure typically results in sensitization and increasing or more severe symptoms with increased exposure.

Recommended Action Plan

I understand that the drainage issue is currently being addressed and that track should continue and work be completed as soon as possible. Critical to the success of any mitigation is eliminating all sources of moisture intrusion into the building envelope.

We are investigating window failure as the most likely culprit. Other possible causes are faulty masonry wall design or deterioration of the exterior brick and mortar.

To that end we suggest the following actions:

- Interpret additional test results as they become available.
- Sample other CMU wall cavities beneath windows similar to what was done at the finance window to determine if we have similar conditions throughout the building with regard to possible window failures.
- Sample CMU wall cavities in areas that would not be influenced by possible window failures to ascertain if the CMU wall itself may be the source.
- If the additional wall cavity testing indicates that only window-influenced samples indicate biological amplifications, then the next step would be to remove a window down to the masonry for further investigation. This work should be accomplished by a trained mold remediation contractor.

I anticipate that the actions above will provide us with the data to move forward on a remediation plan for the entire building or indicate where we need additional discovery.

I would be happy to meet with building occupants and Selectmen to provide any background information or address concerns they may have.

Please feel free to call if you have any questions.

Sincerely,

Ray Desmarais, CIH, CSP

EMLab P&K

Report for:

Mr. Tim Hunt
Desmarais Environmental Inc.
62 Alwood Dr
Barrington, NH 03825

Regarding: Project: Barrington Town Hall; 41 Province Lane Barrington, NH
EML ID: 644068

Approved by:

Dates of Analysis:
Spore trap analysis: 04-07-2010

Lab Director
Eric Ciotti

Service SOPs: Spore trap analysis (I100000)

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EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

Document Number: 200091 - Revision Number: 5

EMLab P&K
1936 Olney Avenue, Cherry Hill, NJ 08003
(866) 871-1984 Fax (856) 489-4085 www.emlab.com

Client: Desmarais Environmental Inc.
C/O: Mr. Tim Hunt
Re: Barrington Town Hall; 41 Province Lane
Barrington, NH

Date of Sampling: 04-02-2010
Date of Receipt: 04-03-2010
Date of Report: 04-07-2010

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Lab ID-Version‡ Location	Air vol. (L)	Background Debris	Counts of Fungal Structures	Fungal Structures/m3	Presumptive Fungal ID (raw counts*)	Percentage
2852877-1	75	2+	16	210	Cladosporium (4)	94
637132			1	13	Smuts, Periconia, Myxomycetes (1)	6
Finance Office				§ Total: 230		
Comments:						
2852878-1	75	1+	4	53	Basidiospores (1)	50
637128			4	53	Cladosporium (1)	50
Tax Collector				§ Total: 110		
Comments:						
2852879-1	75	1+	4	53	Basidiospores (1)	40
637133			3	40	Eurotium (3)	30
Community Room			1	13	Pithomyces (1)	10
			2	27	Smuts, Periconia, Myxomycetes (2)	20
				§ Total: 130		
			1	13	Hyphal fragments (1)	N/A
Comments:						
2852880-1	75	2+	8	110	Cladosporium (2)	80
637126			1	13	Epicoccum (1)	10
Discovery Center			1	13	Smuts, Periconia, Myxomycetes (1)	10
				§ Total: 130		
Comments:						

Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.
The Limit of Detection is the product of a raw count of 1 and 100 divided by the percent read. The analytical sensitivity (counts/m3) is the product of the Limit of Detection and 1000 divided by the sample volume.

*All AIHA accredited laboratories are required to provide raw counts of fungal structures in spore trap reports. These counts are defined by AIHA as "Actual count without extrapolation or calculation". The number in parentheses next to the fungal type represents the exact number (or raw count) of fungal structures observed.

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Date of Report: 04-07-2010

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Lab ID-Version‡ Location	Air vol. (L)	Background Debris	Counts of Fungal Structures	Fungal Structures/m3	Presumptive Fungal ID (raw counts*)	Percentage
2852881-1	75	2+	1	13	Alternaria (1)	< 1
637124			8	110	Ascospores (2)	2
Outside			280	3,700	Basidiospores (70)	81
			1	13	Botrytis (1)	< 1
			52	690	Cladosporium (13)	15
			1	13	Epicoccum (1)	< 1
			2	27	Smuts, Periconia, Myxomycetes (2)	1
				§ Total: 4,600		
			4	53	Hyphal fragments (4)	N/A
			46	610	Pollen (46)	N/A
Comments:						
2852882-1	15	> 4+	1	67	Aureobasidium (1)	8
637158			1	67	Smuts, Periconia, Myxomycetes (1)	8
Finance Office - Wall Cavity Beneath Window			10	670	Stachybotrys (10)	83
				§ Total: 800		
Comments: Visibility was obscured by the presence of bubbles and debris in the grease itself. Counts should be regarded as minimums and may be higher than reported.						

Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.
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EMLab P&K

Report for:

Mr. Tim Hunt
Desmarais Environmental Inc.
62 Alwood Dr
Barrington, NH 03825

Regarding: Project: Barrington Town Hall; 41 Province Lane, Barrington NH
EML ID: 646530

Approved by:

Dates of Analysis:
Spore trap analysis: 04-12-2010

Lab Director
Eric Ciotti

Service SOPs: Spore trap analysis (I100000)

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Client: Desmarais Environmental Inc.
C/O: Mr. Tim Hunt
Re: Barrington Town Hall; 41 Province Lane, Barrington NH

Date of Sampling: 04-09-2010
Date of Receipt: 04-10-2010
Date of Report: 04-12-2010

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Lab ID-Version‡ Location	Air vol. (L)	Background Debris	Counts of Fungal Structures	Fungal Structures/m3	Presumptive Fungal ID (raw counts*)	Percentage
2864752-1	15	4+	48	3,200	Penicillium/Aspergillus types (12)	100
637138						
Discovery Center				§ Total: 3,200		
Right - Wall Cavity						
Comments:						
2864753-1	15	4+	4	270	Cladosporium (1)	25
609070			12	800	Penicillium/Aspergillus types (3)	75
Building Department -				§ Total: 1,100		
Wall Cavity						
Comments:						
2864754-1	15	4+	4	270	Penicillium/Aspergillus types (1)	100
637151						
Discovery Center Left -				§ Total: 270		
Wall Cavity			2	130	Pollen (2)	N/A
Comments: Visibility was obscured by the presence of bubbles and debris in the grease itself. Counts should be regarded as minimums and may be higher than reported.						
2864755-1	15	3+	8	530	Cladosporium (2)	3
637146			288	19,000	Penicillium/Aspergillus types (72)	97
Community Room -				§ Total: 20,000		
Wall Cavity			1	67	Hyphal fragments (1)	N/A
Comments:						
2864756-1	15	3+	152	10,000	Penicillium/Aspergillus types (38)	99
637130			1	67	Smuts, Periconia, Myxomycetes (1)	1
Selectman's Office -				§ Total: 10,000		
Wall Cavity			12	800	Hyphal fragments (12)	N/A
Comments:						

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Client: Desmarais Environmental Inc.
C/O: Mr. Tim Hunt
Re: Barrington Town Hall; 41 Province Lane, Barrington NH

Date of Sampling: 04-09-2010
Date of Receipt: 04-10-2010
Date of Report: 04-12-2010

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Lab ID-Version‡ Location	Air vol. (L)	Background Debris	Counts of Fungal Structures	Fungal Structures/m3	Presumptive Fungal ID (raw counts*)	Percentage
2864757-1	15	3+	4	270	Ascospores (1)	16
637145			1	67	Chaetomium (1)	4
Finance Office			4	270	Cladosporium (1)	16
(Window Wall) - Wall			16	1,100	Penicillium/Aspergillus types (4)	64
Cavity				§ Total: 1,700		
Comments:						
2864758-1	15	4+	32	2,100	Penicillium/Aspergillus types (8)	100
637142						
Finance Office (Non				§ Total: 2,100		
Window Wall) - Wall						
Cavity						
Comments:						
2864759-1	15	3+	8	530	Cladosporium (2)	29
637131			20	1,300	Penicillium/Aspergillus types (5)	71
Tax Collector's Office -				§ Total: 1,900		
Wall Cavity			1	67	Hyphal fragments (1)	N/A
Comments:						
2864760-1	15	3+	24	1,600	Penicillium/Aspergillus types (6)	100
637122						
Student Service's -				§ Total: 1,600		
Wall Cavity						
Comments:						

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EMLab P&K

Report for:

Mr. Tim Hunt
Desmarais Environmental Inc.
62 Alwood Dr
Barrington, NH 03825

Regarding: Project: Barrington Town Hall; 41 Province Lane Barrington, NH
EML ID: 644067

Approved by:

Lab Director
Eric Ciotti

Dates of Analysis:
Culturable air fungi full (Pen&Clad genus): 04-12-2010

Service SOPs: Culturable air fungi full (Pen&Clad genus) (I100002)

For clarity, we report the number of significant digits as calculated; but, due to the nature of this type of biological data, the number of significant digits that is used for interpretation should generally be one or two. All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank corrections of results is not a standard practice. The results relate only to the items tested.

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Client: Desmarais Environmental Inc.
C/O: Mr. Tim Hunt
Re: Barrington Town Hall; 41 Province Lane
Barrington, NH

Date of Sampling: 04-02-2010
Date of Receipt: 04-03-2010
Date of Report: 04-12-2010

CULTURABLE AIR FUNGI REPORT

Lab ID-Version‡ Location	Air vol. (L)	Medium	Dilution Factor	Fungal ID	Colony Counts	CFU/m3	%
2852870-1	84.9	MEA	N/A	Aspergillus versicolor	1	12	4
M1				Basidiomycetes	4	47	15
Finance Office				Cladosporium	17	200	65
				Penicillium	2	24	8
				yeasts	2	24	8
						§ Total: 310	
Comments:							
2852871-1	84.9	MEA	N/A	Aspergillus versicolor	1	12	9
M2				Basidiomycetes	5	59	45
Tax Collector				Cladosporium	4	47	36
				Penicillium	1	12	9
						§ Total: 130	
Comments:							
2852872-1	84.9	MEA	N/A	Aspergillus sydowii	1	12	5
M3				Aspergillus versicolor	2	24	9
Community Room				Basidiomycetes	5	59	23
				Cladosporium	8	94	36
				Penicillium	6	71	27
						§ Total: 260	
Comments:							
2852873-1	84.9	MEA	N/A	Aspergillus versicolor	2	24	13
M4				Basidiomycetes	8	94	50
Discovery Center				Cladosporium	5	59	31
				Penicillium	1	12	6
						§ Total: 190	
Comments:							
2852874-1	84.9	MEA	N/A	Basidiomycetes	10	120	30
M5				Cladosporium	20	250	64
Outside				Non-sporulating fungi	2	24	6
						§ Total: 390	
Comments:							

The Limit of Detection is the product of a raw count of 1 and 100 divided by the percent read. The analytical sensitivity (counts/m3) is the product of the Limit of Detection and 1000 divided by the sample volume.

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EMLab P&K

Report for:

Mr. Tim Hunt
Desmarais Environmental Inc.
62 Alwood Dr
Barrington, NH 03825

Regarding: Project: Barrington Town Hall; 41 Province Lane Barrington, NH
EML ID: 644066

Approved by:

Dates of Analysis:
Culturable air bact gram stain and counts: 04-12-2010

Lab Director
Eric Ciotti

Service SOPs: Culturable air bact gram stain and counts (I100015)

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C/O: Mr. Tim Hunt
Re: Barrington Town Hall; 41 Province Lane
Barrington, NH

Date of Sampling: 04-02-2010
Date of Receipt: 04-03-2010
Date of Report: 04-12-2010

CULTURABLE AIR BACTERIA REPORT

Location:	B1: Finance Office		B2: Tax Collector		B3: Community Room		B4: Discovery Center		B5: Outside	
Comments (see below)	None		None		None		None		None	
Lab ID-Version‡:	2852860-1		2852861-1		2852862-1		2852863-1		2852864-1	
	raw ct.	cfu*/m3	raw ct.	cfu*/m3	raw ct.	cfu*/m3	raw ct.	cfu*/m3	raw ct.	cfu*/m3
Actinomycetes	ND	< 12	ND	< 12	ND	< 12	ND	< 12	ND	< 12
Bacillus	ND	< 12	1	12	2	24	2	24	ND	< 12
Gram negative rods	2	24	1	12	6	71	6	71	ND	< 12
Gram positive cocci	11	130	27	330	41	520	12	140	ND	< 12
Gram positive rods	ND	< 12	ND	< 12	ND	< 12	ND	< 12	ND	< 12
Positive Hole	342		342		342		342		342	
Sample volume (liters)	84.9		84.9		84.9		84.9		84.9	
§ TOTAL CFU*/M3		150		350		610		240		< 12

* cfu = colony forming units Positive hole correction chart used for all calculations

Comments:

The Limit of Detection is the product of a raw count of 1 and 100 divided by the percent read. The analytical sensitivity (counts/m3) is the product of the Limit of Detection and 1000 divided by the sample volume.

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§ Total CFU/m3 has been rounded to two significant figures to reflect analytical precision.

Stachybotrys sp. Mitosporic fungus. Hyphomycetes.

Distribution	Where Found	Mode of Dissemination
Ubiquitous; cosmopolitan. Approx. 15 species.	Soil, decaying plant substrates, decomposing cellulose (hay, straw), leaf litter, and seeds. Growth not influenced by soil pH or copper; growth enhanced by manure./span>	Wet spore. Insects, water splash. Wind when dried out.

Allergen	Potential Opportunist or Pathogen	Potential Toxin Production
Not well studied. Type I allergies reported.	No reports of human infection. (No species grow well at 37°C.)	Macrocyclic trichothecenes: verrucarin J, roridin E, satratoxin F, G & H, sporidesmin G, trichoverrol; cyclosporins, stachybotryolactone. Stachybotrys mycotoxicosis: human toxicosis has been described; may be characterized by dermatitis, cough, rhinitis, itching or burning sensation in mouth, throat, nasal passages and eyes. The best described toxicoses are from domestic animals that have eaten contaminated hay and straw or inhaled infected material from contaminated bedding.

Growth Indoors	Industrial Uses	Other Comments
Commonly found indoors on wet materials containing cellulose, such as wallboard, jute, wicker, straw baskets, and other paper materials. (See "Characteristics: Growth/Culture"). Aw=0.94	Not known.	Many human reports of Stachybotrys toxicosis are anecdotal. Stachybotrys mycotoxicosis is currently the subject of toxin research.

Characteristics: Growth/Culture	Notes on Spore Trap Recognition	Notes on Tape Lift Recognition

Grows well on general fungal media. Stachybotrys is slow growing as compared to Penicillium and other common mold genera, and may not compete well in the presence of other fungi. However, when water availability is high for prolonged periods on environmental material, Stachybotrys may gradually become the predominating mold, especially on cellulose containing materials.	Spores of the species S. chartarum are distinctive, and not easily confused with other genera. Carbon fragments which may be oval and of similar size may sometimes be confused with S. chartarum. Memnoniella and Gliomastix produce spores with similar gray black pigment. Note: Spore trap samples are more likely to demonstrate the presence of Stachybotrys than culturable samples (Andersen).	Distinctive, readily identifiable on tape lift samples. Direct microscopic observation of samples is often necessary as Stachybotrys may be missed if only culture methods are used.

Aspergillus sp.

Mitosporic fungus. Hyphomycetes.Teleomorphs (sexual state): Eurotium, Neosartorya, Emericella (Ascomycetes).

Distribution	Where Found	Mode of Dissemination
Ubiquitous; cosmopolitan. Approx. 200 species.	Soil, decaying plant debris, compost piles, stored grain./span>	Dry spore. Wind.

Allergen	Potential Opportunist or Pathogen	Potential Toxin Production
Common. Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis: Humidifier lung, Malt worker's lung, Compost lung, Wood trimmer's disease, Straw hypersensitivity, Farmer's lung, Oat grain hypersensitivity, others. Other: A. fumigatus: allergic bronchopulmonary aspergillosis (ABPA), allergic fungal sinusitis.	Respiratory, invasive, cutaneous, ear, and corneal disease. Severe, invasive disease is usually associated with immunosuppressed hosts. Many species grow at 37°C (body temperature). A. fumigatus: fungus ball and invasive disease. A. flavus: nasal sinus lesions, invasive disease. A. niger: "Swimmer's ear," and invasive disease.	Partial list: A. flavus: aflatoxin B1 & B2, cyclopiazonic acid, kojic acid A. fumigatus: ergot alkaloids, fumigaclavines, gliotoxin, fumigatoxin, fumigillin, fumitremorgens, helvolic acid, tryptoquivaline tremorgens, verruculogen. A. niger: malformin C, oxalic acid. A. ustus: austocystins. A. versicolor: aspercolorin, averufin, cyclopiazonic acid, sterigmatocystin, versicolorin.

Growth Indoors	Industrial Uses	Other Comments
On a wide range of substrates. Water requirements range widely (dependent on species). Aw=0.71-0.94 (minimum for various species).	Many, including practical applications in food production. For example, A. oryzae is used to ferment soybeans to soy sauce. A. terreus produces mevinolin which is able to reduce blood cholesterol; A. niger is used in the bread and beer making industries (enzyme production) and also is able to decompose plastic. A. niger and A. ochraceus are used in cortisone production.	Aspergillus is one of the most common fungal genera, worldwide, and Aspergillus fumigatus is one of the most common species found.

Characteristics: Growth/Culture	Notes on Spore Trap Recognition	Notes on Tape Lift Recognition

Aspergillus species grow well on general fungal media. Some xerophilic species prefer dryer conditions.	Free spores are indistinguishable from Penicillium, and other genera with small round to oval colorless spores. Penicillium/Aspergillus spores may have remnants of cell wall connections.	If sporulating structures are present, Aspergillus is readily identifiable on tape samples. Old growth or samples with very large numbers of spores may not contain structures necessary for identification and are reported as "spores typical of Penicillium/Aspergillus."

Photographs:

Penicillium sp. Mitosporic fungus. Hyphomycetes. Teleomorphs (sexual state): Eupenicillium, Talaromyces (Ascomycetes).

Distribution	Where Found	Mode of Dissemination
Ubiquitous; cosmopolitan. Approx. 200 species.	Soil, decaying plant debris, compost piles, fruit rot. P. glabrum has been isolated from diesel fuel./span>	Dry spore. Wind, insects (fungus serves as a food source for storage mites).

Allergen	Potential Opportunist or Pathogen	Potential Toxin Production
Common. Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis: Cheese washer's lung, Woodman's lung, Moldy wall hypersensitivity.	One species of Penicillium species, P. marneffei, is a cause of human infection. It has not yet been found in the United States.	Various toxins by different species: penicillic acid, peptide nephrotoxin, viomellein, xanthomegin, xanthocillin X, mycophenolic acid, roquefortine C & D, citrinin, penicillin, cyclopiazonic acid, isofumigaclavine A, penitrem A, decumbin, patulin citreoviridin, griseofulvin, verruculogen, ochratoxin, chrysogine, and meleagrin.

Growth Indoors	Industrial Uses	Other Comments
Widespread. Commonly found in house dust. Grows in water damaged buildings on wallpaper, wallpaper glue, decaying fabrics, moist chipboards, and behind paint. Also found in blue rot of apples, dried foodstuffs, cheeses, fresh herbs, spices, dry cereals, nuts, onions, and oranges. Aw=0.78-0.86 (minimum for various species).	Roquefort and camembert cheese, salami-sausages starter culture; anti-bacterial antimicrobial penicillin, and anti-fungal antimicrobial griseofulvin.	Penicillium is one of the most common fungal genera, worldwide. Microbial volatile organic compounds (MVOCs) produced: Penicillium commune produces 2-methyl-isoborneol, a heavy musty odor.

Characteristics: Growth/Culture	Notes on Spore Trap Recognition	Notes on Tape Lift Recognition
Grows readily on general fungal media. Colonies are	Free spores are indistinguishable from	Penicillium is readily identifiable on tape samples if sporulating

usually shades of blue, green, and white.	Aspergillus and other genera with small round to oval colorless or slightly pigmented spores. Penicillium/Aspergillus spores may have remnants of cell wall connections.	structures are present. Old growth or samples with high numbers of spores may not exhibit sporulation structures necessary for identification and are therefore reported as "spores typical of Penicillium/Aspergillus."

SELECTMEN'S MEETING
WEDNESDAY, APRIL 14, 2010
PUBLIC SAFETY BUILDING
Meeting Agenda

1. Opening remarks
2. Overview of Air Quality Issue
3. What does this mean for employees?
4. What's next?
5. Questions?

1. Opening remarks

Good Morning, we wish to thank you for attending this meeting with us. We would like to convey to you that your health and safety is of utmost concern to us.

2. Overview of Air Quality Issue

Several issues have transpired that have led us to question if the air quality at the town offices has deteriorated. We recognize that numerous employees have expressed concern over health issues they have experienced that may be building related. As such, the Board of Selectmen obtained the services of Desmarais Environmental to conduct several types of indoor air quality testing. These tests included mold spore collection, mold and bacteria cultures and wall cavity tests throughout the building. The results of this testing indicate that an amplification of mold is present within the building. Elevated levels of Aspergillus, Penicillium and Stachybotrys molds have been verified through an independent lab used by Desmarais Environmental.

3. What does this mean for employees?

Employees need to be aware that deterioration of the indoor air quality can make you feel ill and produce a number of symptoms including tiredness, more pronounced allergic or asthmatic responses, itchy, watery eyes, headaches, and muscle aches to name a few. Employees need to understand that there can be associated health risks as a result of this type of poor indoor air quality. Employees need to communicate in writing to Carolyn Berryment or Carol Reilly any health issues or concerns you may have and if you wish to voluntarily be located to an alternate work

space. Every effort is being made to insure that every employee has a safe work environment in which to perform their jobs.

4. What's next?

The Board of Selectmen will be consulting with Ray Desmarais and our Property Liability Trust Company to determine the extent of remediation or corrections needed to improve the indoor air quality. This may mean that a temporary location will need to be provided for all occupants of Town Offices during the remediation or correction efforts. As information becomes available, it will be communicated to the employees. In the meantime, please do not hesitate to contact us or Carol with questions or comments.

5. Questions?

MEETING NOTES

2007

October 2007

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

November 2007

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

December 2007

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

2008

January 2008

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

February 2008

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

March 2008

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

April 2008

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

May 2008

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

June 2008

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

July 2008

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

August 2008

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September 2008

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October 2008

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November 2008

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

December 2008

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

4/14/2010
Employee Meeting

Dave Vernon - opening remarks

several issues have transpired
communicate in writing to Carolyn or Carol

temporary location

Servpro sampling duplicated

Henry - release to be in building
1991 documents relating to air quality
issues.

Ted - Common in brick/block buildings? Ray - No
no vapor barrier, no weep holes

attic - usual inspection by Ray

Paul - 2 yrs ago AC issue - Kim asked about
ceiling tiles.
Brick veneer acts as a wick to bring in water.

Public Service of New Hampshire

DESMARAIS ENVIRONMENTAL, INC.

62 Al Wood Drive Barrington, NH 03825
(603) 664-5500

August 13, 2010

Town of Barrington Selectman
41 Province Lane
Barrington, NH 03825

Re: Scott Lawson Group Opinion Dated July 20, 2010

I received a copy of the Scott Lawson Group, Ltd. opinion dated July 20, 2010 and have the following concerns with regard to that opinion that the Selectman should consider prior to acting.

The opinion is very carefully worded to base their opinion on non-cavity air testing conducted by SLG and Desmarais Environmental. They concur that wall cavities are experiencing a microbial amplification and that remediation would be difficult and impossible to completely remediate due to inaccessibility.

If our opinion to vacate was based solely on air testing non-cavities we may have made the same conclusion but what the SGL opinion failed to consider is the following:

- Previous occupants of the Discovery Center were experiencing issues in the space following repeated cleaning similar to what SGL is recommending in order to occupy the space now.
- They failed to address the level of symptoms being experienced by building staff, visitors and customers within the building at the measured levels they state are safe.
- They did not address mycotoxins likely emanating from the wall with an ongoing amplification that cannot be remediated.
- If the walls cannot be completely remediated I cannot foresee a scenario where the building is safe for occupancy at this time.

I suggest the Selectman reconsider the decision to move offices to the Discovery area as I believe it would not be prudent at this time.

Sincerely,

Ray Desmarais, CIH, CSP

DRAFT

June 24, 2010

Mr. Paul Sanders
Town of Barrington
41 Province Lane
Barrington, New Hampshire 03825

Re: Indoor Air Quality Survey at the Barrington Town Hall
SLGL File Number 91270

Dear Mr. Sanders:

On June 8, 2010 *The Scott Lawson Group, Ltd. (SLGL)* conducted an Indoor Air Quality (IAQ) Survey at the Barrington Town Hall located at 41 Province Lane in Barrington, New Hampshire. The building is a two-story brick building. The objective of the Survey was to evaluate the current indoor environment and perform a follow-up assessment to an IAQ investigation performed by Desmarais Environmental, Inc. in April and May of 2010. The survey was accomplished by conducting limited interior visual observations of the affected area(s) in the building, collection of samples for airborne Fungi, Culturable Fungi and Bacteria, and the collection of data with a TSI Q-TRAK™.

During the survey, *SLGL* collected: ambient air samples with a BioTest™ Impaction Air Sampler for Fungus and Bacteria, for the evaluation of total colony forming units per cubic meter (CFU/m^3). Air samples for Total Spore Counts with Predominant Species Identification was also conducted with a Buck BioAire™ Bioaerosol Sampling Pump. Samples were collected outside the building (for comparison purposes), along with analytical field blanks (for quality control purposes). In addition, direct readings for Carbon Monoxide, Carbon Dioxide, Temperature, and Relative Humidity were collected with the TSI Q-TRAK™. On the day of the survey, there were no visible signs of microbial growth on observed interior surfaces. However, it should be noted that *SLGL* did not perform any destructive investigations of wall cavities areas, other than the small holes drilled for sampling purposes.

All results were compared to one or more of the following: the Occupational Safety and Health Administration's Permissible Exposure Limits (OSHA PEL), the National Institute for Occupational Safety and Health's Recommended Exposure Limits (NIOSH REL), the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (ACGIH TLV), the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), and/or the Environmental Protection Agency (EPA) guidelines or regulations, as applicable. Public health guidelines for exposure to contaminants such as those published by ASHRAE, EPA, and the World Health Organization (WHO), are typically one-tenth of occupational exposure limits, e.g., OSHA, ACGIH, and NIOSH. Public health guidelines or standards include protection for the old, young, pregnant women, and other sensitive population groups

Fungi are typically introduced into a building from the outdoor environment, through a number of sources, including windows, doors, building occupants, and air handling systems. Other events may include leaking roofs or basements, inclement weather, pipe leaks or flooding. Fungus spores are found in ambient air most times of the year, from spring through fall, with numbers declining in the winter months. Fluctuations can occur though, along the coastline or swampy areas, in different regions of the United States and can depend in a large part on the type of weather at the time of sample collection.

Air Samples - Total Spore Counts with Predominant Genus Identification:

SLGL collected Spore Trap samples, plus an outdoor air sample, and a requisite analytical blank for quality control purposes, for the evaluation of total airborne fungal spore concentrations (viable and non-viable, i.e., spores that have the ability to grow and those that do not). Each sample was collected by drawing air through an Air-O-Cell® sampling cassette at a flow rate of approximately fifteen liters per minute (15 lpm), for one (1) to five (5) minutes. Upon the completion of each sample, each cassette was sealed, issued a unique identification number, and its location documented. A summary of the analytical results (see Appendix A) are as follows:

Analysis of the Air-O-Cell cassettes (with count and identification by Predominant Genus) was used to determine total airborne viable and non-viable Fungi spores. All Fungi are considered to be potentially allergenic. (The term "genus" refers to the particular "family" of Fungi or Bacteria, and there are individual species within each genus.)

- Results for the four (4) samples collected indoors in general office areas measured ambient fungal spore concentrations from 107 spores per cubic meter of air (107 Ct/m^3), to 3,787 Ct/m^3, with the predominant genus of fungus identified as *Basidiospores and Cladosporium*. For comparison, the outdoor sample result had a total spore count of 6,827 Ct/m^3, with the predominant genus *Basidiospores*.

- Nine (9) samples were also collected indoors in selected exterior wall cavities, with results ranging from < 267 Ct/m^3, to 19,467 Ct/m^3, with the predominant genus of fungus identified as *Basidiospores and Aspergillus/Penicillium*-like. It should be noted that only a relatively low concentration of *Aspergillus/ Penicillium*-like was found outdoors on the day of the survey,and that high debris loading on these samples may indicate actual spore counts would be higher.

Note: There is no acceptable limit for fungus exposures in non-industrial settings. A general rule of thumb in this industry is to look at a factor of ten (10), i.e., when indoor concentrations are greater than those found outdoors by a factor of 10 or more, indoor amplification is likely. In addition, when one genus of Fungus becomes predominant indoors versus outdoors, amplification is likely. Source: ACGIH - Bioaerosols: Assessment, and Control.

Air Samples - Total fungi with Predominant Genus Identification:

Using a BioTest Impaction air sampler equipped with Rose Bengal Agar strips, four (4) air samples were collected inside the building, with analyses showing airborne Total fungi ranging from sixty-three (63) to two-hundred forty four (244) CFU/m^3. The predominant species within the facility by this method of testing was *Cladosporium*. The outside sample had 413 CFU/m^3 with *Cladosporium* again as the predominant genus.

Air Samples – Total bacteria with Predominant Genus Identification:

Bacteria commonly found during IAQ surveys may be human-shed (e.g., *Micrococcus* or *Staphylococcus*) or can commonly be associated with stagnant water found in drip pans associated with air handling equipment, or water-damaged building materials. Bacteria are classified by several means, including their reaction to a Gram stain. For the purposes of this report, Bacteria are discussed as "Gram Negative" or "Gram Positive". Gram Negative Bacteria are typically associated with water soaked or damaged building materials, or microbial build-up in locations such as condensate drip pans in air handling systems, sumps, water reservoirs of humidifiers, and other moist areas. Examples of Gram Negative Bacteria include *Pseudomonas* and *Legionella*. Gram-positive Bacteria on the other hand, are typically human-associated, such as *Staphylococcus* and *Streptococcus*; Gram Positive Bacteria are shed into the air with human skin scales and respiratory droplets.

Using a Biotest Impaction air sampler equipped with Tryptic Soy Agar (TSA) strips, four (4) air samples were collected inside the building. Analysis of the TSA strips with count and identification by Predominant Genus has determined that Total airborne Bacteria levels ranged from 31 to 538 CFU/m^3. The concentration of airborne Bacteria found outside the facility was 38 CFU/m^3. The levels of Bacteria found inside the building are not abnormal when considering the number of occupants. *Bacillus* was identified as predominant in two (2), and Gram Positive in two (2) of the indoor air samples. Gram Positive Bacteria are commonly human associated Bacteria and Bacillus are also commonly isolated in interior environments.

Relative humidity:

In an environment in which occupants are engaged in light, primarily sedentary activity (such as a home or office environment), ANSI/ASHRAE standard 55-1992 recommends that RH be controlled to a range of 30% to 60%. These are the upper and lower limits based on considerations of dry skin, eye irritation, respiratory health, microbial growth, and moisture-related phenomena. When RH levels are below 30%, the mucous membranes of the upper respiratory system begin to dry out, possibly rendering nasal passages and the throat, as well as the eyes, more susceptible to irritation and/or infection from indoor air pollutants. RH levels exceeding 60% may cause condensation problems, and as a result, fungal and Fungi infestations are common.

- RH readings indicated that level from within the building ranged from 28.6 to 46.1%, which was just below the recommended comfort guideline of 30%. Exterior humidity levels were observed to be 42.3%.

Temperature:

ANSI/ASHRAE standard 55-1992 recommends an optimum operative temperature of 71 degrees Fahrenheit (71°F) be maintained during the winter months, with a comfort range of 68°F to 75°F. An optimum summer temperature of 76°F is also recommended, with a comfort range of 73°F to 79°F.

Ambient temperature ranged from 68.3 to 75.6°F. Based on these readings, some of the rooms are below the recommended comfort range for this time of year.

Carbon dioxide:

Studies indicate that CO_2 is an excellent surrogate indicator of indoor air quality. Since CO_2 is given off by humans when exhaling, its levels in the air provide a good indication of the quality of air circulation and how effectively the ventilation system, if present, is diluting and removing pollutants from the air. It must be noted that it is (generally) not necessarily the concentration of CO_2 itself that is of concern in this type of setting, but rather it is the levels of CO_2 exceeding 1,000 parts per million (1,000 ppm), which are indicative of inadequate fresh/outdoor air introduction -- or under-ventilation.

Spot readings were collected throughout the building using a TSI Q-Trak IAQ monitor. The results ranged from approximately 397 parts per million (ppm) to 846 ppm. Spot readings indicate that CO_2 should not be of concern at this time.

Carbon monoxide:

CO is not a natural component of indoor air, and is considered an indoor air pollutant. Overexposure to CO can deprive the body of Oxygen-carrying hemoglobin, and cause immediate or chronic health effects to those individuals exposed to elevated levels.

The CO levels were 0 ppm. These levels are below the OSHA PEL of 50 ppm, as well as within the ACGIH TLV of 25 ppm, and the NIOSH REL of 35 ppm. WHO uses 9 ppm as a "concentration of concern" and notes that indoor concentrations of CO should not exceed those found outdoors by more than 3 ppm. CO does not appear to be of concern in regards to indoor air quality.

Discussion

Based on the sampling results summarized above, *SLGL* can confirm the finding from the Desmarais report that mold/fungal amplification is likely occurring inside at least some wall cavity areas of the building. However, since only one of the wall cavity samples had highly elevated levels, *SLGL* cannot confirm the assumed widespread extent of the fungal growth stated in the Desmarais report. In addition, the ambient air samples collected in the building (not in wall cavities) do not indicate a major concern to building occupants at the present time from the likely fungal growth in wall cavity areas. It should be noted this is based only on the single round of sampling performed by *SLGL* during this survey, ambient airborne fungal levels may be higher at other times or under other weather conditions.

Recommendations

1. As stated in the Desmarais report, feasible corrective actions should be taken as soon as possible to prevent additional water intrusion into the building, which would tend to increase fungal growth. Should future water intrusions/leaks occur, it is recommended that water leaks and moisture intrusions be cleaned and dried within 24 - 48 hours. Building materials such as drywall, wood and carpets that remain wet for periods beyond 48 hours are at an increased risk to develop fungal growth, and potentially impact the air quality.

2. *SLGL* recommends that further investigations be performed to determine the extent of the likely microbial growth within the wall cavity areas. These types of destructive or intrusive investigations should be done while ~~the while~~ the selected area(s) are unoccupied, and if extensive fungal growth is encountered, work should stop until proper containment and remediation methods can be utilized, to prevent potential spread of fungal spores from the areas into the remainder of the building.

3. If further investigations identify fungal contaminated areas, a remediation plan should be developed that addresses cleaning of affected surfaces or disposal of damaged materials, as well as prevention of future growth. Unless extensive fungal contamination is identified, remediation may be able to be done in phases, that would allow for continued use of the facility.

Thank you for utilizing the services of *The Scott Lawson Group, Ltd.* We enjoyed working with you on this project and would welcome the opportunity to work with you on future projects. We trust that you will find everything in order; however, should you have any questions or comments, please contact or me at your earliest convenience.

Sincerely,

The Scott Lawson Group, Ltd.

Stephen L. Zabel, B.S.
Senior Safety & Health Professional

WARRANTY

The conclusions and recommendations contained in this report are based on information available to *SLGL* as of June 8, 2010. *SLGL* provides no warranties on information provided by third parties and contained herein. Data compiled were in accordance with *SLGL's* approved scope of services and should not be construed beyond their limitations. Any interpretations or use of this report other than those expressed herein are not warranted. The use, partial use, or duplication of this report without the expressed written consent of *The Scott Lawson Group, Ltd.* is strictly prohibited.

APPENDIX A

ANALYTICAL RESULTS

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91270
Client Project: Town Hall
Report Date: June 10, 2010
Date Sampled: June 8, 2010
Date Received: June 8, 2010
Collected by: SLZ
Analyzed by: NEF

Analytical Results

Lab Number:	282107	282108	282109
Sample Identification:	060810-91270-A22, Area, center of finance office	060810-91270-A23, Area, center of tax collector office	060810-91270-A24, Area, basement, center of community room
Analysis:	Bacteria Enumeration & Identification - Culturable	Bacteria Enumeration & Identification - Culturable	Bacteria Enumeration & Identification - Culturable
Methodology:	SLGL-3016	SLGL-3016	SLGL-3016
Sample Media:	Tryptic Soy Agar (TSA)	Tryptic Soy Agar (TSA)	Tryptic Soy Agar (TSA)
Air Volume (L):	160.0	160.0	160.0
Minutes:	4	4	4
Date Analyzed:	June 9, 2010	June 9, 2010	June 9, 2010

Bacteria Type	CFU	CFU/m³	CFU	CFU/m³	CFU	CFU/m³
Actinomycetes						
Bacillus			43	269	1	6
Gram Negative rods						
Gram Positive cocci	8	50	43	269	3	19
Gram Positive rods					1	6
Total CFU/m³:	8	50	86	538	5	31
Limit of Detection:	1	6	1	6	1	6
Comments:						

Lab Number:	282110	282111	282112
Sample Identification:	60810-91270-A25, Area, basement floor, at door between left and right rooms at discovery center	060810-91270-A26, Area, outside, in upper parking lot of Town Hall	060810-91270-A27, Analytical field blank
Analysis:	Bacteria Enumeration & Identification - Culturable	Bacteria Enumeration & Identification - Culturable	Bacteria Enumeration & Identification - Culturable
Methodology:	SLGL-3016	SLGL-3016	SLGL-3016
Sample Media:	Tryptic Soy Agar (TSA)	Tryptic Soy Agar (TSA)	Tryptic Soy Agar (TSA)
Air Volume (L):	160.0	160.0	0.0
Minutes:	4	4	0
Date Analyzed:	June 9, 2010	June 9, 2010	June 9, 2010

Bacteria Type	CFU	CFU/m³	CFU	CFU/m³	CFU	CFU/m³
Actinomycetes						
Bacillus	4	25				
Gram Negative rods						
Gram Positive cocci	1	6	2	13		
Gram Positive rods			4	25		
Total CFU/m³:	5	31	6	38	<1	---
Limit of Detection:	1	6	1	6	1	---
Comments:						

TNTC: Too numerous to count
<: Less Than
>: Greater Than

CFU: Colony Forming Unit
CFU/m³: CFU per Meter Cubed

Reviewed by: Melanie L. Patterson

Approved By: Helen M Frazer
Norman Fletcher, Lab Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91270
Client Project: Town Hall
Report Date: June 10, 2010
Date Sampled: June 8, 2010
Date Received: 6/8/10
Collected by: SLZ
Analyzed by: NEF

QC Batch : B10-10111

Lab Number:	282108	282108SC	
Sample Identification:	060810-91270-A23, Area, center of tax collector office	060810-91270-A23, Area, center of tax collector office	
Analysis:	Bacteria Enumeration & Identification - Culturable	Bacteria Enumeration & Identification - Culturable	
Methodology:	SLGL-3016	SLGL-3016	
Sample Media:	Tryptic Soy Agar (TSA)	Tryptic Soy Agar (TSA)	
Air Volume (L):	160.0	160.0	
Minutes:	4	4	
Date Analyzed:	June 9, 2010	June 9, 2010	

Bacteria Type	CFU	CFU/m³	CFU	CFU/m³		
Actinomycetes						
Bacillus	44	275	43	269		
Gram Negative rods	12	75				
Gran Positive cocci	31	194	10	63		
Gram Positive rods			33	206		
Total CFU/m³:	87	544	86	538		
Limit of Detection:	1	6	1	6		
Comments:						

TNTC: Too numerous to count
<: Less Than
>: Greater Than

CFU: Colony Forming Unit
CFU/m³: CFU per Meter Cubed

Reviewed by: _____

Approved By: _____
Norman Fletcher, Lab Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91270
Client Project: Town Hall
Report Date: June 15, 2010
Date Sampled: June 8, 2010
Date Received: June 8, 2010
Collected by: SLZ
Analyzed by: NEF

Analytical Results

Lab Number:	282113	282114	282115
Sample Identification:	060810-91270-A16, Area, center of finance office	060810-91270-A17, Area, center of tax collector office	060810-91270-A18, Area, basement, center of community room
Analysis:	Fungi Enumeration & Identification - Culturable	Fungi Enumeration & Identification - Culturable	Fungi Enumeration & Identification - Culturable
Methodology:	SLGL-3053	SLGL-3053	SLGL-3053
Sample Media:	MEA	MEA	MEA
Air Volume (L):	160.0	160.0	160.0
Minutes:	4	4	4
Date Analyzed:	June 15, 2010	June 15, 2010	June 15, 2010

Mold/Fungi Type	CFU	CFU/m³	CFU	CFU/m³	CFU	CFU/m³
Acremonium			1	6		
Alternaria	1	6	1	6	5	31
Aspergillus						
Aureobasidium						
Bipolaris						
Botrytis						
Chaetomium						
Cladosporium	8	50	2	13	22	138
Curvularia					1	6
Epicoccum	1	6	1	6		
Fusarium	1	6				
Geotrichum						
Mucor						
Nigrospora						
Paecilomyces						
Penicillium	2	13			4	25
Phoma						
Pithomyces						
Rhizopus						
Sporotrichum						
Stachybotrys						
Stemphylium						
sterile/ non-sporulating fungi			2	13	5	31
Trichoderma						
Ulocladium	1	6				
unknown / unidentified						
yeast			3	19		
Basidiomycetes	2	13			2	13
Total CFU/m³:	16	100	10	63	39	244
Limit of Detection:	1	6	1	6	1	6
Comments:						

TNTC: Too numerous to count
<: Less Than
>: Greater Than

CFU: Colony Forming Unit
CFU/m³: CFU per Meter Cubed

Reviewed by: Norman Fletcher

Approved By: Helen M Enzer
Norman Fletcher, Laboratory Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91270
Client Project: Town Hall
Report Date: June 15, 2010
Date Sampled: June 8, 2010
Date Received: June 8, 2010
Collected by: SLZ
Analyzed by: NEF

Analytical Results

Lab Number:	282116	282117	282118
Sample Identification:	060810-91270-A19, Area, basement floor, at door between left and right rooms at discovery center	060810-91270-A20, Area, outside, in upper parking lot of Town Hall	060810-91270-A21, Analytical field blank
Analysis:	Fungi Enumeration & Identification - Culturable	Fungi Enumeration & Identification - Culturable	Fungi Enumeration & Identification - Culturable
Methodology:	SLGL-3053	SLGL-3053	SLGL-3053
Sample Media:	MEA	MEA	MEA
Air Volume (L):	160.0	160.0	0.0
Minutes:	4	4	0
Date Analyzed:	June 15, 2010	June 15, 2010	June 15, 2010

Mold/Fungi Type	CFU	CFU/m³	CFU	CFU/m³	CFU	CFU/m³
Acremonium						
Alternaria	1	6	5	31		
Aspergillus						
Aureobasidium						
Bipolaris						
Botrytis						
Chaetomium						
Cladosporium	6	38	49	306		
Curvularia						
Epicoccum			10	63		
Fusarium						
Geotrichum						
Mucor						
Nigrospora						
Paecilomyces						
Penicillium			2	13		
Phoma						
Pithomyces						
Rhizopus						
Sporotrichum						
Stachybotrys						
Stemphylium						
sterile/ non-sporulating fungi	5	31				
Trichoderma						
Ulocladium						
unknown / unidentified						
yeast	1	6				
Total CFU/m³:	13	81	66	413	<1	---
Limit of Detection:	1	6	1	6	1	---
Comments:						

TNTC: Too numerous to count
<: Less Than
>: Greater Than

CFU: Colony Forming Unit
CFU/m³: CFU per Meter Cubed

Reviewed by: Melissa L. Patterson

Approved By: Helen M. Frazer
Norman Fletcher, Laboratory Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants

July 20, 2010

Mr. Paul Sanders
Town of Barrington
41 Province Lane
Barrington, New Hampshire 03825

Re: Indoor Air Quality Survey at the Barrington Town Hall- Follow-up
SLGL File Number 91365

Dear Mr. Sanders:

On July 14, 2010, *The Scott Lawson Group, Ltd. (SLGL)* met with the Board of Selectman for Barrington to discuss the Indoor Air Quality (IAQ) issues at the Barrington Town Hall. The purpose of this letter is to address some questions that discussed during the meeting.

The primary area of concern regarding the IAQ at the Town Hall building is the recommendation by Desmarais Environmental, Inc. (Desmarais) that the building be vacated, based on their observations and sampling done in April and May of this year. *SLGL* has performed subsequent sampling similar to that performed by Desmarais, and the following recommendations and position on building occupancy is based on our sampling, and a review of the available results from the Desmarais testing. Note; the following recommendations assume that the Town has addressed the issue of water/ moisture intrusion into the building to prevent future problems.

Discussion/Recommendations

1. *SLGL* does not feel that the results from the ambient (non-wall cavity) sampling conducted both by Desmarais and *SLGL*, warrant vacating the building at this time. The ambient results from both rounds of testing are, in general, not indicative of a major IAQ concern, and indicate that the microbial amplification occurring in the wall cavity areas has not greatly affected IAQ throughout the occupied areas of the building.

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www.slgl.com • scott@slgl.com

2. During the meeting it was discussed if it were feasible to relocate some occupants to temporarily vacated areas of the building such as the Discovery Center area. Based on the sampling results, *SLGL* feels that this would be a viable option for the town, rather than vacating the building. Please see following recommendations concerning re-occupancy plan.

3. Prior to re-occupancy, the areas should be throughly cleaned and any water damaged materials replaced or removed (such as stained ceiling tiles noted in Discovery Room). In addition, all holes, wall penetrations etc. through the exterior walls should be sealed. Once the areas are cleaned and ready for re-occupancy, another limited round of air testing should be done to document ambient (non-wall cavity) levels of fungal spores at that time. This limited "background" testing should be repeated, after the areas has been occupied, every other week for at least two (2) additional rounds to document that the ambient levels remain at acceptable levels.

4. Long-term <u>total</u> remediation of the microbial growth in wall cavity areas may not be feasible due to building construction. However, limited remediation of the wall cavity spaces to reduce and inhibit future growth may be possible. As long as background sampling results remain at acceptable levels, immediate remediation of these area should not be necessary, and could be carried out in phases. In general, the recommended remediation should occur only in un-occupied areas, and would include sealing off the alloted work area, installing temporary vent holes in the bottom of the exterior walls to assist in drying of the areas, followed by a misting/ fogging of the cavity space with an anti-microbial agent to help inhibit future growth. All holes generated during the remediation process would then be re-sealed.

SLGL feels that the above recommendations should allow the Town of Barrington to continue to occupy and utilize the town hall building. It should be noted that even at the relatively modest levels of airborne fungal spores in ambient areas identified by both Desmarais and *SLGL*, some sensitive individuals may continue to experience IAQ concerns associated with time spent in the building. Further, it is to be expected that similar levels would continue to be documented during the proposed additional background testing.

Thank you for utilizing the services of *The Scott Lawson Group, Ltd.* We trust that you will find everything in order; however, should you have any questions or comments, please feel free to contact or me at your earliest convenience.

Sincerely,

The Scott Lawson Group, Ltd.

Richard Lent, B.S.
Director of Technical Services

WARRANTY

The conclusions and recommendations contained in this report are based on information available to *SLGL* as of June 8, 2010. *SLGL* provides no warranties on information provided by third parties and contained herein. Data compiled were in accordance with *SLGL's* approved scope of services and should not be construed beyond their limitations. Any interpretations or use of this report other than those expressed herein are not warranted. The use, partial use, or duplication of this report without the expressed written consent of *The Scott Lawson Group, Ltd.* is strictly prohibited.

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants

September 16, 2010

Ms. Carol Reilly, Town Administrator
Town of Barrington
41 Province Lane
Barrington, New Hampshire 03825

Re: Indoor Air Quality Survey at the Barrington Town Hall - September 2, 2010
SLGL File Number 91487

Dear Ms. Reilly:

On September 2, 2010, *The Scott Lawson Group, Ltd.* (*SLGL)* conducted a limited Indoor Air Quality (IAQ) Survey at the Barrington Town Hall located at 41 Province Lane in Barrington, New Hampshire. The objective of the Survey was to evaluate the current indoor environment and perform a follow-up assessment to previous IAQ investigations in the building. The survey was accomplished by conducting limited interior visual observations of the affected area(s) in the building, collection of samples for airborne fungal spores and for Culturable Fungi.

During the survey, *SLGL* collected: ambient air samples with a BioTest™ Impaction Air Sampler for fungus, for the evaluation of total colony forming units per cubic meter (CFU/m^3). Air samples for Total Spore Counts with Predominant Species Identification was also conducted with a Buck BioAire™ Bioaerosol Sampling Pump. Samples were collected inside the occupied areas of the building, in selected interior wall cavities, and outside the building (for comparison purposes). On the day of the survey, there were no visible signs of microbial growth on observed interior surfaces.

In general, sample results were similar to previous testing, in that airborne fungal levels were relatively low in occupied areas, but still elevated in wall cavity areas.

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www.slgl.com • scott@slgl.com

Air Samples - Total Spore Counts with Predominant Genus Identification:

SLGL collected Spore Trap samples, plus an outdoor air sample, and a requisite analytical blank for quality control purposes, for the evaluation of total airborne fungal spore concentrations (viable and non-viable, i.e., spores that have the ability to grow and those that do not). Each sample was collected by drawing air through an Air-O-Cell® sampling cassette at a flow rate of approximately fifteen liters per minute (15 lpm), for one (1) to five (5) minutes. Upon the completion of each sample, each cassette was sealed, issued a unique identification number, and its location documented. A summary of the analytical results (see Appendix A) are as follows:

Analysis of the Air-O-Cell cassettes (with count and identification by Predominant Genus) was used to determine total airborne viable and non-viable Fungi spores. All Fungi are considered to be potentially allergenic. (The term "genus" refers to the particular "family" of Fungi or Bacteria, and there are individual species within each genus.)

- Results for the six (6) samples collected indoors in general office areas measured ambient fungal spore concentrations from 53 spores per cubic meter of air (53 Ct/ m^3), to 587 Ct/m^3, with the predominant genus of fungus identified as Basidiospores. For comparison, the outdoor sample result had a total spore count of 12,427 Ct/m^3, with the predominant genus Basidiospores and *Cladosporium.*

- Two (2) samples were also collected indoors in selected exterior wall cavities in the town office areas on the ground floor, with results ranging from 22,400 Ct/m^3, to 29,867 Ct/m^3, with the predominant genus of fungus identified as *Aspergillus/ Penicillium*- like.

Note: There is no acceptable limit for fungus exposures in non-industrial settings. A general rule of thumb in this industry is to look at a factor of ten (10), i.e., when indoor concentrations are greater than those found outdoors by a factor of 10 or more, indoor amplification is likely. In addition, when one genus of Fungus becomes predominant indoors versus outdoors, amplification is likely. Source: ACGIH - Bioaerosols: Assessment, and Control.

Air Samples - Total Culturable Fungi with Predominant Genus Identification:

Using a BioTest Impaction air sampler equipped with Rose Bengal Agar strips, two (2) air samples were collected inside the same building wall cavities as above, with analyses showing airborne total Fungi ranging from 275 to 375 CFU/m^3. The predominant species within the wall cavity areas was *Aspergillus.* The outside sample had 219 CFU/m^3 with *Cladosporium* and *Alternaria* as the predominant types.

Discussion

Based on the sampling results summarized above, conditions inside the building remain generally the same as during previous testing. Measured fungal spore levels in occupied areas of the building remain at relatively low levels. However, spore counts remain elevated in the wall cavity areas sampled. In addition, this round of testing has shown that the predominant viable fungal type in the wall cavity areas tested is *Aspergillus.*

Thank you for utilizing the services of *The Scott Lawson Group, Ltd.* We enjoyed working with you on this project and would welcome the opportunity to work with you on future projects. We trust that you will find everything in order; however, should you have any questions or comments, please feel free to contact or me at your earliest convenience.

Sincerely,

The Scott Lawson Group, Ltd.

Richard Lent

Richard Lent, B.S.
Director of Technical Services

Enclosures

WARRANTY

The conclusions and recommendations contained in this report are based on information available to *SLGL* as of September 2, 2010. *SLGL* provides no warranties on information provided by third parties and contained herein. Data compiled were in accordance with *SLGL's* approved scope of services and should not be construed beyond their limitations. Any interpretations or use of this report other than those expressed herein are not warranted. The use, partial use, or duplication of this report without the expressed written consent of *The Scott Lawson Group, Ltd.* is strictly prohibited.

APPENDIX A

ANALYTICAL RESULTS

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91487
Client Project: Town Hall IAQ Sampling
Report Date: September 3, 2010
Date Sampled: September 2, 2010
Date Received: September 2, 2010
Collected by: SLZ
Analyzed by: NEF, #01040036

Analytical Results

Lab Number:	284237	284238	284239
Sample Identification:	090210-91487-A01, Ground floor, center of Selectman / Assessing Office	090210-91487-A02, Area, ground floor, Selectman / Assessing Office, in exterior wall cavity	090210-91487-A03, Area, ground floor, in center of Town Clerk's Office
Analysis:	Fungi Enumeration & Identification - Direct Examination	Fungi Enumeration & Identification - Direct Examination	Fungi Enumeration & Identification - Direct Examination
Methodology:	SLGL-3067	SLGL-3067	SLGL-3067
Sample Media:	Air-O-Cell	Air-O-Cell	Air-O-Cell
Debris Rating:	2	4	2
Air Volume (L):	75.0	15.0	75.0
Minutes:	5	1	5
Date Analyzed:	September 3, 2010	September 3, 2010	September 3, 2010

Mold/Fungi Type	Raw Count	Count/m³	Raw Count	Count/m³	Raw Count	Count/m³
Alternaria						
Ascospores						
*******Aspergillus/Penicillium*- like	1	53	112	29,867		
Basidiospores	2	107			1	53
Bipolaris/Drechslera -like						
Botrytis						
Chaetomium						
Cladosporium	1	53				
Curvularia						
Epicoccum						
Fusarium						
Myxomycetes/*Periconia* /smuts					1	53
Nigrospora						
Oidium/Erysiphe/Peronospora						
Phoma						
Pithomyces					1	53
rusts						
Spegazzinia						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
unknown/unidentified						
hyphal fragments						
Pollen						
Total fungal spores and fragments:	4	213	112	29,867	3	160
Limit of Detection:	1	53	1	267	1	53
Comments:						

TNTC: Too numerous to count

<: Less Than

>: Greater Than

Count/m3: Count per meter cubed

PAACB: Pan-American Aerobiology Certification Board

Detection Limit: The detection limit is equal to one fungal spore or hyphal fragment.

**: *Aspergillus* and *Penicillium* spores (and others such as *Paecilomyces*) are small and round with few distinguishing characteristics. They cannot be distinguished by this method.

*: No analytical field blank submitted with associated sample(s).

Background Debris: Background debris is an indication of the amount of non-microbial debris present on the slide and is rated on a scale of 1 to 5:

Debris Load of 1: <10% debris present. Counts not affected.

Debris Load of 2: 11-25% debris present. Counts not affected.

Debris Load of 3: 25-75% debris present. Counts may be underestimated.

Debris Load of 4: 76-90% debris present. Counts underestimated.

Debris Load of 5: >90% debris present. Counts could not be determined, sample overloaded.

Reviewed by: Melanie L. Patterson

Approved By: Helen M Fletcher
Norman Fletcher, Lab Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91487
Client Project: Town Hall IAQ Sampling
Report Date: September 3, 2010
Date Sampled: September 2, 2010
Date Received: September 2, 2010
Collected by: SLZ
Analyzed by: NEF, #01040036

PAACB

Analytical Results

Lab Number:	284240	284241	284242
Sample Identification:	090210-91487-A04, Area, ground floor, center of Building Department Office	090210-91487-A05, Area, ground floor, center of Planning Department	090210-91487-A06, Area, 1st floor, center of Road Agent Office
Analysis:	Fungi Enumeration & Identification - Direct Examination	Fungi Enumeration & Identification - Direct Examination	Fungi Enumeration & Identification - Direct Examination
Methodology:	SLGL-3067	SLGL-3067	SLGL-3067
Sample Media:	Air-O-Cell	Air-O-Cell	Air-O-Cell
Debris Rating:	2	2	1
Air Volume (L):	75.0	75.0	75.0
Minutes:	5	5	5
Date Analyzed:	September 3, 2010	September 3, 2010	September 3, 2010

Mold/Fungi Type	Raw Count	Count/m^3	Raw Count	Count/m^3	Raw Count	Count/m^3
Alternaria						
Ascospores						
***Aspergillus/Penicillium*- like						
Basidiospores	5	267	1	53	1	53
Bipolaris/Drechslera -like						
Botrytis						
Chaetomium						
Cladosporium						
Curvularia						
Epicoccum						
Fusarium						
Myxomycetes/*Periconia* /smuts	1	53				
Nigrospora						
Oidium/Erysiphe/Peronospora						
Phoma						
Pithomyces						
rusts						
Spegazzinia						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
unknown/unidentified					1	53
hyphal fragments						
Pollen						
Total fungal spores and fragments:	6	320	1	53	2	107
Limit of Detection:	1	53	1	53	1	53
Comments:						

TNTC: Too numerous to count

<: Less Than

>: Greater Than

Count/m3: Count per meter cubed

PAACB: Pan-American Aerobiology Certification Board

Detection Limit: The detection limit is equal to one fungal spore or hyphal fragment.

**: *Aspergillus* and *Penicillium* spores (and others such as *Paecilomyces*) are small and round with few distinguishing characteristics. They cannot be distinguished by this method.

*: No analytical field blank submitted with associated sample(s).

Background Debris: Background debris is an indication of the amount of non-microbial debris present on the slide and is rated on a scale of 1 to 5:

Debris Load of 1: <10% debris present. Counts not affected.

Debris Load of 2: 11-25% debris present. Counts not affected.

Debris Load of 3: 25-75% debris present. Counts may be underestimated.

Debris Load of 4: 76-90% debris present. Counts underestimated.

Debris Load of 5: >90% debris present. Counts could not be determined, sample overloaded.

Reviewed by: Melanie L Patterson

Approved By: Helen M Fletcher
Norman Fletcher, Lab Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228~3610 / (800) 645~7674 / Fax (603) 228~3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91487
Client Project: Town Hall IAQ Sampling
Report Date: September 3, 2010
Date Sampled: September 2, 2010
Date Received: September 2, 2010
Collected by: SLZ
Analyzed by: NEF, #01040036

Analytical Results

Lab Number:	284243	284244	284245
Sample Identification:	090210-91487-A07, Area, ontside, at lower parking lot at SAU entrance to building	090210-91487-A08, Analytical field blank	090210-91487-A13, Area, ground floor, Building Department Office, in exterior wall cavity
Analysis:	Fungi Enumeration & Identification - Direct Examination	Fungi Enumeration & Identification - Direct Examination	Fungi Enumeration & Identification - Direct Examination
Methodology:	SLGL-3067	SLGL-3067	SLGL-3067
Sample Media:	Air-O-Cell	Air-O-Cell	Air-O-Cell
Debris Rating:	2	1	4
Air Volume (L):	75.0	0.0	15.0
Minutes:	5	0	1
Date Analyzed:	September 3, 2010	September 3, 2010	September 3, 2010

Mold/Fungi Type	Raw Count	Count/m³	Raw Count	Count/m³	Raw Count	Count/m³
Alternaria						
Ascospores	4	213				
***Aspergillus/Penicillium*- like					83	22,133
Basidiospores	147	7,840			1	267
Bipolaris/Drechslera -like						
Botrytis						
Chaetomium						
Cladosporium	78	4,160				
Curvularia						
Epicoccum						
Fusarium						
Myxomycetes/*Periconia* /smuts						
Nigrospora						
Oidium/Erysiphe/Peronospora						
Phoma						
Pithomyces						
rusts						
Spegazzinia						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
unknown/unidentified	3	160				
hyphal fragments	1	53				
Pollen						
Total fungal spores and fragments:	233	12,427	< 1	----	84	22,400
Limit of Detection:	1	53	1	----	1	267
Comments:			None detected			

TNTC: Too numerous to count

<: Less Than

>: Greater Than

Count/m3: Count per meter cubed

PAACB: Pan-American Aerobiology Certification Board

Detection Limit: The detection limit is equal to one fungal spore or hyphal fragment.

**: *Aspergillus* and *Penicillium* spores (and others such as *Paecilomyces*) are small and round with few distinguishing characteristics. They cannot be distinguished by this method.

*: No analytical field blank submitted with associated sample(s).

Background Debris: Background debris is an indication of the amount of non-microbial debris present on the slide and is rated on a scale of 1 to 5:

Debris Load of 1: <10% debris present. Counts not affected.

Debris Load of 2: 11-25% debris present. Counts not affected.

Debris Load of 3: 25-75% debris present. Counts may be underestimated.

Debris Load of 4: 76-90% debris present. Counts underestimated.

Debris Load of 5: >90% debris present. Counts could not be determined, sample overloaded.

Reviewed by: Melanie L Patterson

Approved By: Helen M Frazer
Norman Fletcher, Lab Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
Post Office Box 3304, Concord, NH 03302-3304
(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91487
Client Project: Town Hall IAQ Sampling
Report Date: September 3, 2010
Date Sampled: September 2, 2010
Date Received: September 2, 2010
Collected by: SLZ
Analyzed by: NEF, #01040036

PAACB Certified Spore Trap Analyst

Analytical Results

Lab Number:	284246		
Sample Identification:	090210-91487-A14, Area, 2nd floor, center of hallway, in SAU office area		
Analysis:	Fungi Enumeration & Identification - Direct Examination		
Methodology:	SLGL-3067		
Sample Media:	Air-O-Cell		
Debris Rating:	2		
Air Volume (L):	75.0		
Minutes:	5		
Date Analyzed:	September 3, 2010		

Mold/Fungi Type	Raw Count	Count/m³				
Alternaria						
Ascospores						
***Aspergillus/Penicillium*- like						
Basidiospores	10	533				
Bipolaris/Drechslera -like						
Botrytis						
Chaetomium						
Cladosporium	1	53				
Curvularia						
Epicoccum						
Fusarium						
Myxomycetes/*Periconia* /smuts						
Nigrospora						
Oidium/Erysiphe/Peronospora						
Phoma						
Pithomyces						
rusts						
Spegazzinia						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
unknown/unidentified						
hyphal fragments						
Pollen						
Total fungal spores and fragments:	11	587				
Limit of Detection:	1	53				
Comments:						

TNTC: Too numerous to count

<: Less Than

>: Greater Than

Count/m3: Count per meter cubed

PAACB: Pan-American Aerobiology Certification Board

Detection Limit: The detection limit is equal to one fungal spore or hyphal fragment.

**: *Aspergillus* and *Penicillium* spores (and others such as *Paecilomyces*) are small and round with few distinguishing characteristics. They cannot be distinguished by this method.

*: No analytical field blank submitted with associated sample(s).

Background Debris: Background debris is an indication of the amount of non-microbial debris present on the slide and is rated on a scale of 1 to 5:

Debris Load of 1: <10% debris present. Counts not affected.

Debris Load of 2: 11-25% debris present. Counts not affected.

Debris Load of 3: 25-75% debris present. Counts may be underestimated.

Debris Load of 4: 76-90% debris present. Counts underestimated.

Debris Load of 5: >90% debris present. Counts could not be determined, sample overloaded.

Reviewed by: Melanie L Patterson

Approved By: Helen M Ferren
Norman Fletcher, Lab Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants
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Concord, New Hampshire 03301
Ph: (603) 228-3610, Fax: (603) 228-3871
www.slgl.com email: Lab@slgl.com

Submitting Co.: TOWN OF BARRINGTON
SLGL Job #: 91487
Address:
Client Project: TOWN HALL IAQ SAMPLING
Client PO:
Attention:
Sampled By: SLZ
Phone: Fax:
email:

Turnaround Time (select one)
[ ] 3 hours* [ ] 6-8 hours* [ ] 24 hours* [ ] 48 hours* [ ] 72 hours*
[✓] 5 days [ ] 10 days [ ] Weekend [ ] Other: _____

**Not available for all tests. Schedule rush and weekend tests in advance.*

Sample Matrix Type (select one)
[✓] Air [ ] Bulk [ ] Soil [ ] Water, drinking or waste
[ ] Aqueous [ ] Oil [ ] Solid [ ] Wipe
[ ] Agar (biostrip) [ ] Paint [ ] Swab [ ] Wipe composite
[ ] Agar (plate) [ ] Sludge [ ] Tape Lift [ ] Other: _____

Comments:

All samples on this form should be of the SAME matrix type. Use additional forms as needed.

Samples received in good condition? [ ]Yes [ ]No

SLGL Lab #	Sample Identification	Analysis	Date Sampled	Time	Media/ Container	Preservative	4°C	Swab/Wipe Area Units: ____	Air Volume (L)	Minutes
91487	090210-91487-A01	FUNGI COUNT & ID	9/2/10	N/A	AIR-O-CELL	N/A	N/A	N/A	75.0	5
	A02	″	″	″	″	″	″	″	15.0	1
	A03	″	″	″	″	″	″	″	75.0	5
	A01	″	″	″	″	″	″	″	75.0	5
	A05	″	″	″	″	″	″	″	75.0	5
	A06	″	″	″	″	″	″	″	75.0	5
	A07	″	″	″	″	″	″	″	75.0	5
	A08	″	″	″	″	″	″	″	———	———
	A13	″	″	″	″	″	″	″	15.0	1
	A14	✓	✓	✓	✓	✓	✓	✓	75.0	5

Sample Collection and Custody Information

Samples Shipped Via: [ ] FedEx [ ] UPS [ ] DHL [ ] US Mail [ ] Drop Box [✓] Drop Off [ ] Other

Relinquished By:	Date/Time:	Received By:	Date/Time:
Steve Zoll	9-2-10 / 1430	[illegible]	9/2/10 1435
Relinquished By:	Date/Time:	Received By:	Date/Time:

A Note to Customer: by signing and relinquishing your samples to the laboratory, you agree with the terms and conditions found on the back of this Chain of Custody Form.

The Scott Lawson Group, Ltd.
Analytical Services Agreement

These terms and conditions are only for analysis of the samples submitted with this chain of custody form. Accordingly, SLGL takes no responsibility for the accuracy of the sampling process and the analysis is based solely on the condition of the samples as received by us.

Laboratory Reports will contain only the analytical data for the samples submitted. No interpretations, consultations, or advise will be provided regarding the analytical results for these samples, as submitted. SLGL may, but is not required to, state in the Report that the analysis(es) indicates the presence of potentially hazardous concentration(s) of materials or the presence of hazardous substance(s) and that the report should be reviewed and dealt with promptly. Responding to the severity of the results provided is the sole responsibility of the customer and not SLGL. You are responsible for deciding how to use the information provided in the report and are solely responsible for dealing with the presence of any substance(s) identified in the report. SLGL can, under separate arrangements for professional consultation services, assist you with the interpretation of the report(s) and with how you should deal with the information provided. Contact the laboratory for further information.

The laboratory will retain the unanalyzed portion of the samples and the remains of the analyzed samples for six (6) weeks from the date the samples are received by us. After that six-week period, both will be disposed of in accordance with SLGL company programs and policies. Upon request, other arrangements can be made to retain the samples longer. Contact the laboratory for assistance.

The laboratory will retain the analytical reports for these samples, including data and calculations, for ten (10) years from the date SLGL prepares the reports. After that ten-year period, the reports, and included data and calculations, will be disposed of in accordance with SLGL programs and policies. Upon request, other arrangements can be made to retain the reports longer. Contact the laboratory for assistance.

All laboratory sample submittals must be paid for on a COD basis, cash, check, or credit card unless the customer has an approved account with *The Scott Lawson Group, Ltd.* Payment terms are NET 30-days from date of invoice. In the event of the customer's default in any of the terms of this Agreement, the customer will be responsible for all collection costs for *The Scott Lawson Group, Ltd.*, including all reasonable court costs and attorney's fees. Interest on late payments will be charged at two percent (2%) per month. This transaction being entered into the State of New Hampshire and New Hampshire law being applicable for its enforcement.

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants

20 Chenell Drive
Concord, New Hampshire 03301
Ph: (603) 228-3610, Fax: (603) 228-3871
www.slgl.com email: Lab@slgl.com

Submitting Co.: Town of Bennington

SLGL Job #:

Address:

Client Project: Town Hall IAQ Sampling

Client PO:

Attention:

Sampled By: SLG

Phone: Fax:

email:

Turnaround Time (select one)
[ ] 3 hours* [ ] 6-8 hours* [ ] 24 hours* [ ] 48 hours* [ ] 72 hours*
[✓] 5 days [ ] 10 days [ ] Weekend [ ] Other: _____

Not available for all tests. Schedule rush and weekend tests in advance.

Sample Matrix Type (select one)
[✓] Air [ ] Bulk [ ] Soil [ ] Water, drinking or waste
[ ] Aqueous [ ] Oil [ ] Solid [ ] Wipe
[ ] Agar (biostrip) [ ] Paint [ ] Swab [ ] Wipe composite
[ ] Agar (plate) [ ] Sludge [ ] Tape Lift [ ] Other: _____

Comments:

All samples on this form should be of the SAME matrix type. Use additional forms as needed.

Samples received in good condition? [ ]Yes [ ]No

SLGL Lab #	Sample Identification	Analysis	Date Sampled	Time	Media/ Container	Preservative	4°C	Swab/Wipe Area Units: ____	Air Volume (L)	Minutes
	070210-9MT-A01	Fungi Count & ID	9/2/10	N/A	Air-O-Cell	N/A	N/A	N/A	75.0	5
	A02								15.0	1
	A03								75.0	5
	A04								75.0	5
	A05								75.0	5
	A06								75.0	5
	A07								75.0	5
	A08								———	———
	A12								15.0	1
	A14	✓	✓	✓	✓	✓	✓	✓	75.0	5

Sample Collection and Custody Information

Samples Shipped Via: [ ] FedEx [ ] UPS [ ] DHL [ ] US Mail [ ] Drop Box [ ] Drop Off [ ] Other

Relinquished By:	Date/Time:	Received By:	Date/Time:
Steve Schell	9-3-10 / 14:30		
Relinquished By:	Date/Time:	Received By:	Date/Time:

A Note to Customer: by signing and relinquishing your samples to the laboratory, you agree with the terms and conditions found on the back of this Chain of Custody Form.

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Environmental, Health & Safety Consultants
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(603) 228-3610 / (800) 645-7674 / Fax (603) 228-3871

Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91487
Client Project: Town Hall IAQ Sampling
Report Date: September 9, 2010
Date Sampled: September 2, 2010
Date Received: September 2, 2010
Collected by: SLZ
Analyzed by: NEF

Analytical Results

Lab Number:	284233	284234	284235*
Sample Identification:	090210-91487-A09 Area, ground level, in Selectmen / Assessing Office, in exterior wall cavity	090210-91487-A10 Area, ground level, in Building Department Office, in exterior wall cavity	090210-91487-A11, Area, Outside, in lower parking lot of building at SAU Office entrance
Analysis:	Fungi Enumeration & Identification - Culturable	Fungi Enumeration & Identification - Culturable	Fungi Enumeration & Identification - Culturable
Methodology:	SLGL-3053	SLGL-3053	SLGL-3053
Sample Media:	Rose Bengal Agar	Rose Bengal Agar	Rose Bengal Agar
Air Volume (L):	40.0	40.0	160.0
Minutes:	1	1	4
Date Analyzed:	September 9, 2010	September 9, 2010	September 9, 2010

Mold/Fungi Type	CFU	CFU/m³	CFU	CFU/m³	CFU	CFU/m³
Acremonium						
Alternaria					12	75
Aspergillus	11	275	14	350	1	6
Aureobasidium						
Bipolaris						
Botrytis						
Chaetomium						
Cladosporium					15	94
Curvularia						
Epicoccum						
Fusarium						
Geotrichum						
Mucor						
Nigrospora						
Paecilomyces						
Penicillium			1	25	3	19
Phoma						
Pithomyces						
Rhizopus						
Sporotrichum						
Stachybotrys						
Stemphylium						
sterile					4	25
Trichoderma						
Ulocladium						
unknown / unidentified						
yeast						
Total CFU/m³:	11	275	15	375	35	219
Limit of Detection:	1	25	1	25	1	6
Comments:					*Overgrown, results may be affected	

TNTC: Too numerous to count
<: Less Than
>: Greater Than

CFU: Colony Forming Unit
CFU/m³: CFU per Meter Cubed

Reviewed by: Helen M Erzen

Approved By: Norman E Fletcher
Norman Fletcher, Laboratory Manager

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Client: Town of Barrington
41 Province Lane
Barrington, NH 03825
SLGL Job #: 91487
Client Project: Town Hall IAQ Sampling
Report Date: September 9, 2010
Date Sampled: September 2, 2010
Date Received: September 2, 2010
Collected by: SLZ
Analyzed by: NEF

Analytical Results

Lab Number:	284236		
Sample Identification:	090210-91487-A12, Analytical field blank		
Analysis:	Fungi Enumeration & Identification - Culturable		
Methodology:	SLGL-3053		
Sample Media:	Rose Bengal Agar		
Air Volume (L):	0.0		
Minutes:	0		
Date Analyzed:	September 9, 2010		

Mold/Fungi Type	**CFU**	**CFU/m³**
Acremonium		
Alternaria		
Aspergillus		
Aureobasidium		
Bipolaris		
Botrytis		
Chaetomium		
Cladosporium		
Curvularia		
Epicoccum		
Fusarium		
Geotrichum		
Mucor		
Nigrospora		
Paecilomyces		
Penicillium		
Phoma		
Pithomyces		
Rhizopus		
Sporotrichum		
Stachybotrys		
Stemphylium		
sterile		
Trichoderma		
Ulocladium		
unknown / unidentified		
yeast		
Total CFU/m³:	<1	---
Limit of Detection:	1	---
Comments:	None Detected	

TNTC: Too numerous to count
<: Less Than
>: Greater Than

CFU: Colony Forming Unit
CFU/m³: CFU per Meter Cubed

Reviewed by: Helen M Egan

Approved By: Norman E Fletcher
Norman Fletcher, Laboratory Manager

The Scott Lawson Group, Ltd.
Environmental, Health & Safety Consultants

20 Chenell Drive
Concord, New Hampshire 03301
Ph: (603) 228-3610, Fax: (603) 228-3871
www.slgl.com email: Lab@slgl.com

Submitting Co.: TOWN OF BARRINGTON

SLGL Job #: 91487

Address:

Client Project: TOWN HALL IAQ SAMPLING

Client PO:

Attention:

Sampled By: SLZ

Phone: Fax: email:

Turnaround Time (select one)
[ ] 3 hours* [ ] 6-8 hours* [ ] 24 hours* [ ] 48 hours* [ ] 72 hours*
[ ] 5 days [✓] 10 days [ ] Weekend [ ] Other: _____

**Not available for all tests. Schedule rush and weekend tests in advance.*

Sample Matrix Type (select one)
[ ] Air [ ] Bulk [ ] Soil [ ] Water, drinking or waste
[ ] Aqueous [ ] Oil [ ] Solid [ ] Wipe
[✓] Agar (biostrip) [ ] Paint [ ] Swab [ ] Wipe composite
[ ] Agar (plate) [ ] Sludge [ ] Tape Lift [ ] Other: _____

Comments:

All samples on this form should be of the SAME matrix type. Use additional forms as needed.

Samples received in good condition? [ ]Yes [ ]No

SLGL Lab #	Sample Identification	Analysis	Date Sampled	Time	Media/ Container	Preservative	4°C	Swab/Wipe Area Units: ____	Air Volume (L)	Minutes
2491	090210-91487-A09	FUNGI COUNT + ID (ASPERGILLUS)	9/2/10	N/A	ROSE BENGAL STRIP	N/A	N/A	N/A	40.0	1
2492	A10	"	"	"	"	"	"	"	40.0	1
2493	A11	"	"	"	"	"	"	"	160.0	4
2494	A12	"	"	"	"	"	"	"	____	____

Sample Collection and Custody Information

Samples Shipped Via: [ ] FedEx [ ] UPS [ ] DHL [ ] US Mail [ ] Drop Box [ ] Drop Off [ ] Other

Relinquished By:	Date/Time:	Received By:	Date/Time:
Steve Zoll	9-2-10 / 1430	[illegible]	9/2/10 1450
Relinquished By:	Date/Time:	Received By:	Date/Time:

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Ph: (603) 228-3610, Fax: (603) 228-3871
www.slgl.com email: Lab@slgl.com

Submitting Co.: Town of Barrington	SLGL Job #:
Address:	Client Project: Town Hall IAQ Sampling
	Client PO:
Attention:	Sampled By: SLZ
Phone: / Fax:	email:

Turnaround Time (select one): [ ] 3 hours* [ ] 6-8 hours* [ ] 24 hours* [ ] 48 hours* [ ] 72 hours* [ ] 5 days [✓] 10 days [ ] Weekend [ ] Other: ______

Not available for all tests. Schedule rush and weekend tests in advance.

Sample Matrix Type (select one): [ ] Air [ ] Aqueous [✓] Agar (biostrip) [ ] Agar (plate) [ ] Bulk [ ] Oil [ ] Paint [ ] Sludge [ ] Soil [ ] Solid [ ] Swab [ ] Tape Lift [ ] Water, drinking or waste [ ] Wipe [ ] Wipe composite [ ] Other: ______

Comments:

All samples on this form should be of the SAME matrix type. Use additional forms as needed.

Samples received in good condition? [ ]Yes [ ]No

SLGL Lab #	Sample Identification	Analysis	Date Sampled	Time	Media/ Container	Preservative	4°C	Swab/Wipe Area Units: ____	Air Volume (L)	Minutes
	100210 91437-007	Fungal count + ID (Aspergillus)	9/2/10	N/A	[illegible]	N/A	N/A	N/A	40.0	1
	-010	|	|	|	|	|	|	|	40.0	1
	-011	|	|	|	|	|	|	|	160.0	4
	-012	✓	✓	✓	✓	✓	✓	✓	—	—

Sample Collection and Custody Information

Samples Shipped Via: [ ] FedEx [ ] UPS [ ] DHL [ ] US Mail [ ] Drop Box [ ] Drop Off [ ] Other

Relinquished By:	Date/Time:	Received By:	Date/Time:
Steve Zaleski	9-2-10 / 14:20	[illegible signature]	9/2/10 1450
Relinquished By:	Date/Time:	Received By:	Date/Time:

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Environmental, Health & Safety Consultants

January 6, 2011

Ms. Carol Reilly, Town Administrator
Town of Barrington
41 Province Lane
Barrington, New Hampshire 03825

Re: Indoor Air Quality at the Barrington Town Hall

Dear Ms. Reilly:

As requested we are sending you this letter to review issues discussed at a meeting with town officials, Ray Desmarais of Desmarais Emvironmental, Inc. (Desmarais), and Richard Lent of *The Scott Lawson Group Ltd. (SLGL)*. The purpose of the meeting was to discuss and review sampling results, as well as opinions, recommendations and options relating to occupancy of the building. It was requested that *SLGL* and Desmarais develop a letter or Interim Report that stated areas of agreement and/or differences of opinion as expressed in the meeting.

First it was agreed after reviewing sampling results from the building by both companies, that the results generally indicated the same thing. Overall fungal spore levels in the occupied areas of the building were low or could be considered at relatively "normal" levels. However, testing in the wall cavities show elevated levels that indicate there is microbial contamination in these CMU wall cavities.

The rest of the discussions at the meeting involved opinions on the possible effect of the contamination in the wall, and options or recommendations for occupancy of the building. It is *SLGL's* opinion based on a limited review and understanding of the building construction, and a review of literature relating to microbial contamination, that the wall cavity contamination should not be causing widespread health effects in building occupants. However, as related by Desmarais and confirmed by town officials, there are still indoor air quality complaints or allergic-type health effects apparently related to building occupancy being reported. Based on this additional information, *SLGL* will agree that it is possible that building occupants are still being affected by the wall cavity contamination in some manner. This may include adverse reactions to exposure to fungal mycotoxins migrating in some fashion from the cavity areas.

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www.slgl.com • scott@slgl.com

The remainder of the meeting discussion revolved around possible remediation methods, and options the town has for moving forward. Remediation options are limited by the wall construction, may prove to be expensive, and would not likely remove all microbial contamination. It may also prove to be the case that any remediation would not prevent the same conditions from re-occurring in the future.

Options

Ray Desmarais reiterated his recommendation that the best long term solution for the town is to move the offices to another building or location. This is due to possible adverse health effects from the wall contamination, the difficulty/expense of remediation of the wall cavity area, and on-going potential liability of the town from building occupants. While *SLGL* agrees that the best or ideal solution to eliminate all building occupant complaints would be to move the offices, we are reluctant to say that this would be the only option. This is primarily due to the uncertainty of a proven mechanism for the contamination in the wall cavities to be causing all building occupant adverse symptoms.

In *SLGL's* opinion, it may prove that the continuing efforts to reduce water infiltration, improve drainage around the building, coupled with a feasible remediation plan will help reduce the effects, and help to improve building IAQ, which will reduce building occupant complaints, while still occupying the building. It must be noted however, that this option assumes that conditions will remain the same, and therefore that the town would still be faced with the continuing issue/liability of building occupant complaints.

In the interim, until a final decision can be made by the town on the occupancy issue, it was agreed that testing would continue to be performed on a monthly basis to start with, to document that conditions within the building are at least remaining the same, and not deteriorating. In addition, the town should continue with the practice of finding other work locations for those employees who are having adverse reactions to working in the building and who wish to work elsewhere.

As an added update, the monthly testing conducted through the end of November 2010, has continued to show the same results as previous rounds of testing. Fungal spore counts remain low in occupied areas of the building, while testing has continued to show elevated spore counts in the wall cavity areas.

Thank you for utilizing the services of *The Scott Lawson Group, Ltd.* We trust that you will find everything in order; however, should you have any questions or comments, please feel free to contact or me at your earliest convenience.

Sincerely,

The Scott Lawson Group, Ltd.

Richard Lent, B.S.
Director of Technical Services

Enclosures

WARRANTY

The conclusions and recommendations contained in this report are based on information available to *SLGL* as of September 2, 2010. *SLGL* provides no warranties on information provided by third parties and contained herein. Data compiled were in accordance with *SLGL's* approved scope of services and should not be construed beyond their limitations. Any interpretations or use of this report other than those expressed herein are not warranted. The use, partial use, or duplication of this report without the expressed written consent of *The Scott Lawson Group, Ltd.* is strictly prohibited.

Appendix C

- Photos of the Barrington Town Offices

ROOF

ROOF

ROOF

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ROOF

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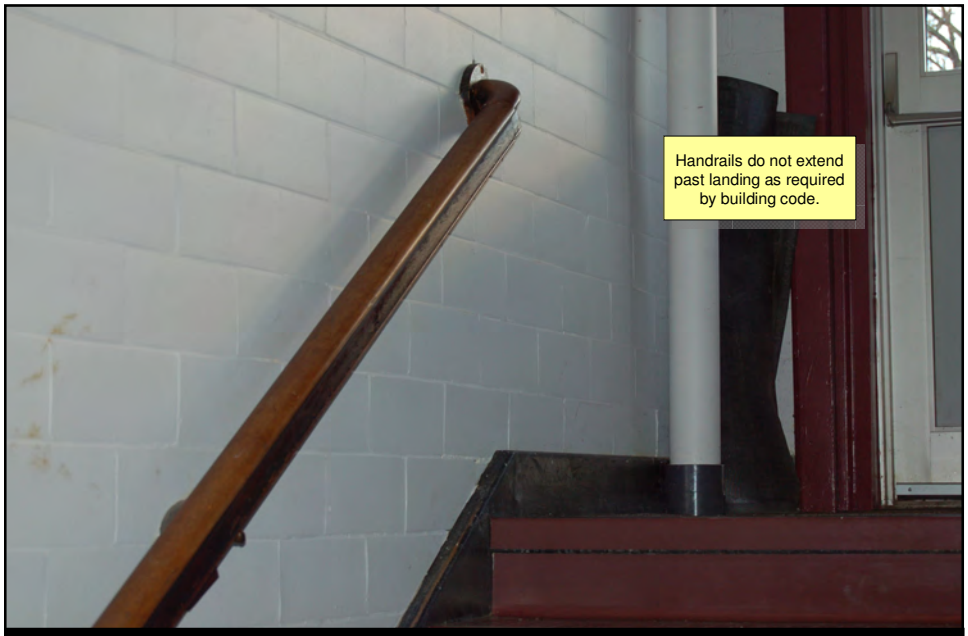

HANDRAILS

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GUARDRAILS

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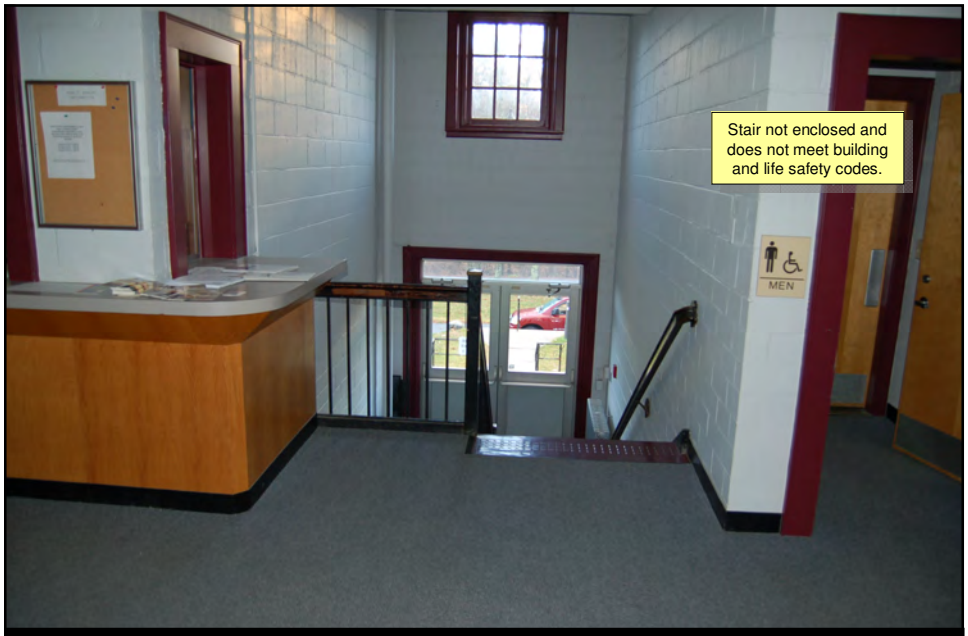

FIRE RATING

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ACCESSIBILITY (ADA)

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EXISTING RAMPS

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ACCESSIBILITY (ADA)

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ACCESSIBILITY (ADA)

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MOLD

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AIR INFILTRATION

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INSECTS

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Signs of soil up against wall and windows.
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Signs of soil up against brick and on window sill.
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WALL CONSTRUCTION

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LEAKS

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LEAKS

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BOILERS

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VENTILATION

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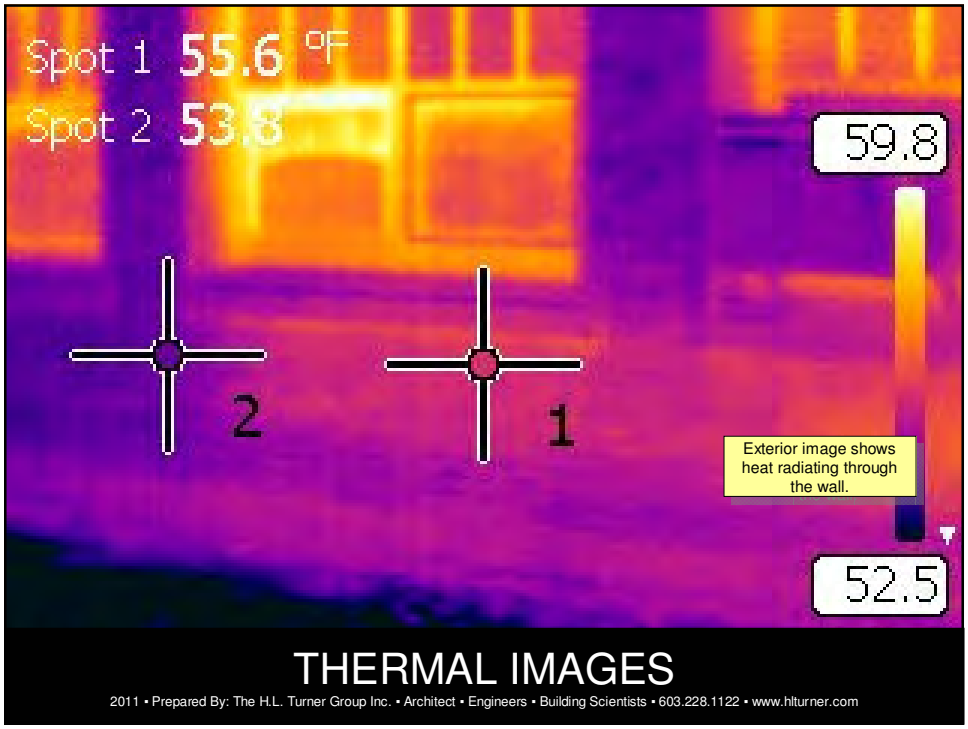
Spot 1 55.6 °F
Spot 2 53.8
59.8
2
1
Exterior image shows heat radiating through the wall.
52.5
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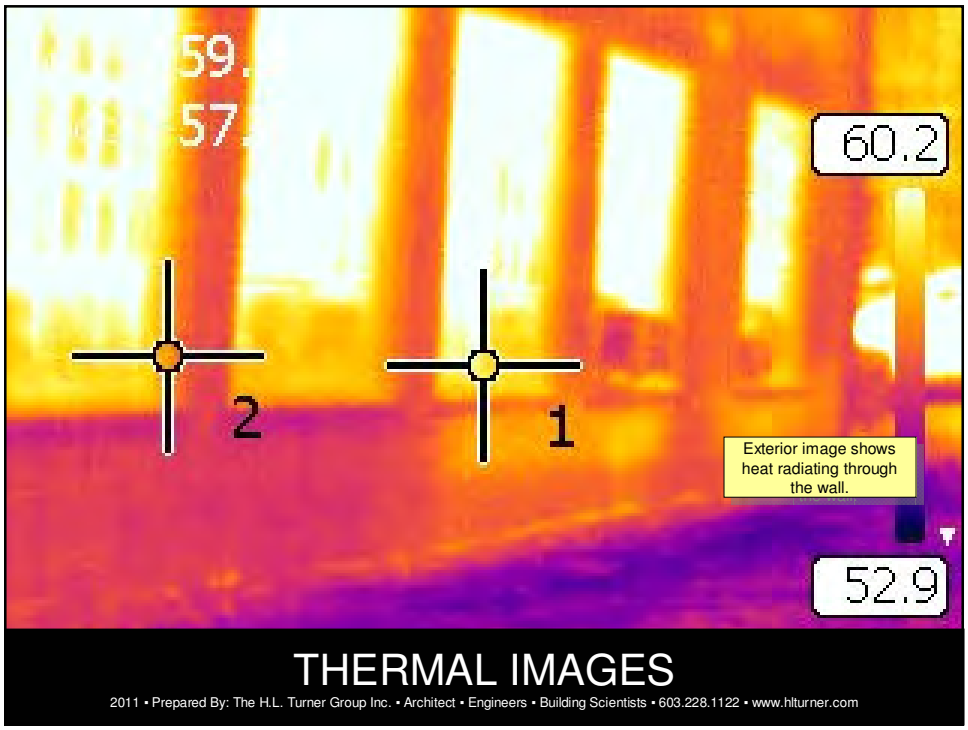
59.
57.
60.2
2
1
Exterior image shows heat radiating through the wall.
52.9
THERMAL IMAGES
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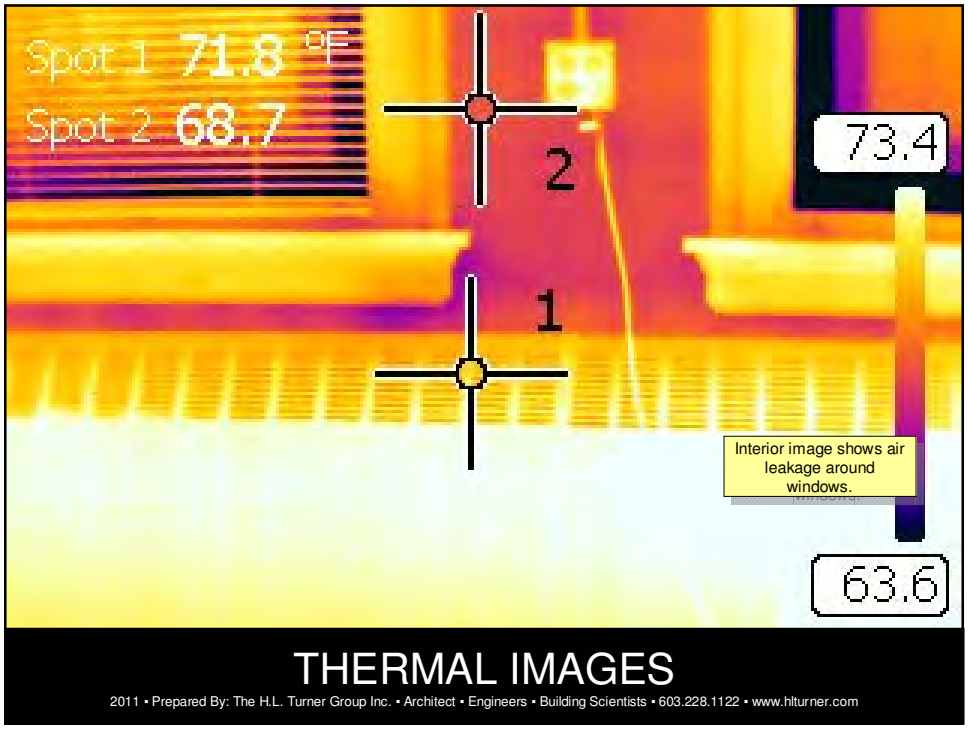
Spot 1 71.8 °F
Spot 2 68.7
2
1
73.4
Interior image shows air leakage around windows.
63.6
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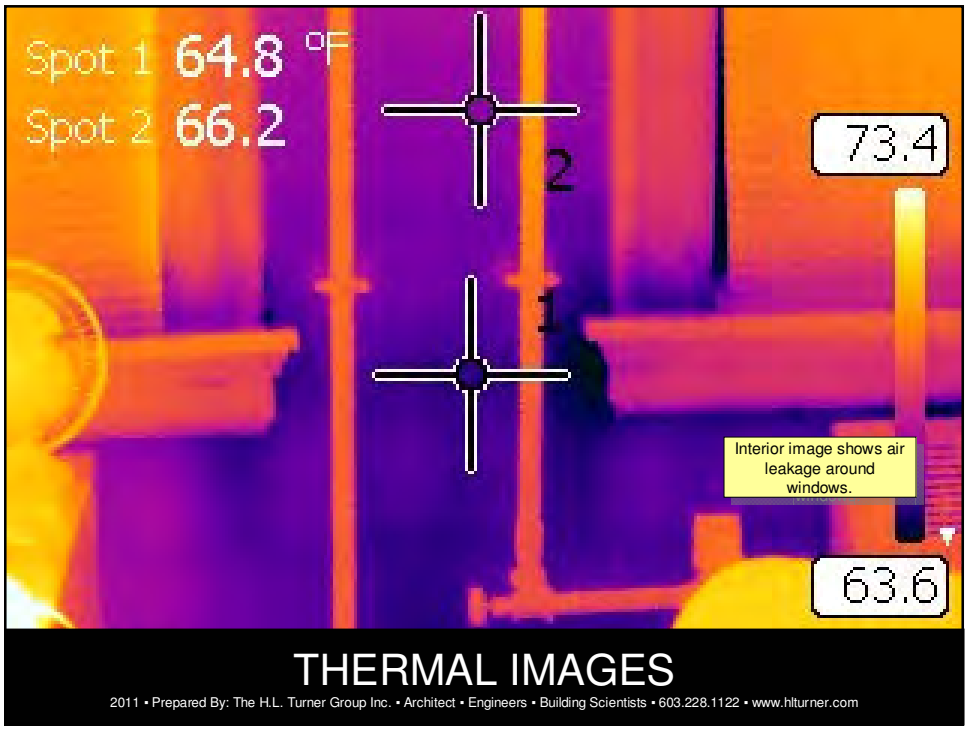
Spot 1 64.8 °F
Spot 2 66.2
2
1
73.4
Interior image shows air leakage around windows.
63.6
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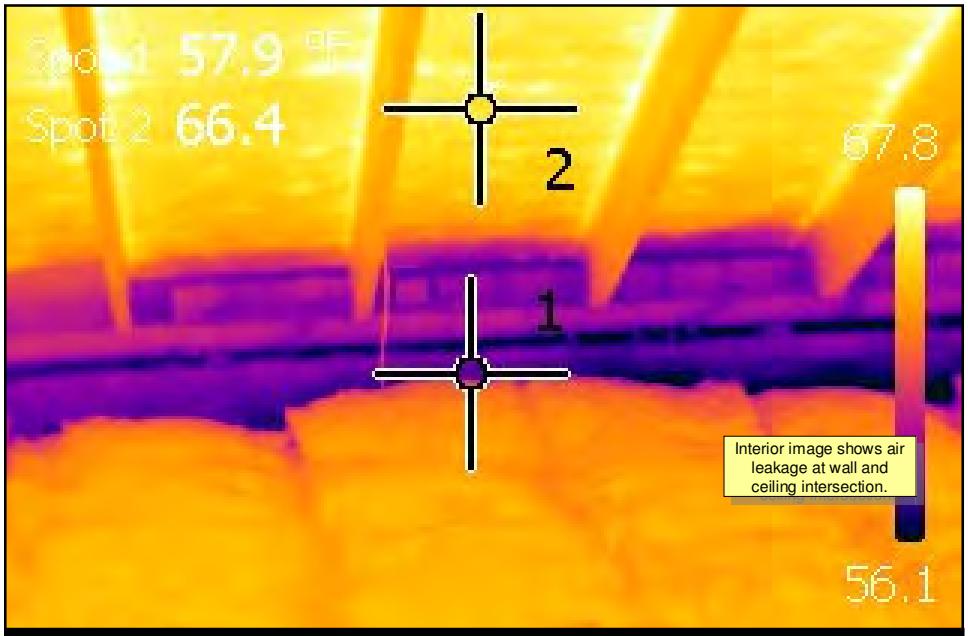

THERMAL IMAGES

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WALL CONSTRUCTION

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Appendix D

- Costs

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Renovated Town Offices ~ Barrington, NH
Architect's Opinion of Cost
Updated: 01.09.11

			Opinion of Cost	Comments
CONSTRUCTION:				
Building:				
Structural	$11	5,100	$58,500	New sloped roof (does not include seismic upgrades)
Architectural	$77	18,800	$1,448,953	Includes ADA upgrades, new ext wall system, new finishes, building code upgrades, demo
Mechanical	$28	18,800	$526,400	New Ventalation System
Radiant Floor	$4	18,800	$75,200	Radiant floor add
Plumbing				Fixtures in Architectural
Fire Protection	$3	18,800	$56,400	
Electrical	$4.50	18,800	$84,600	Range from $85k-$95k (Adjusted)
Communications				In electrical numbers
Subtotal:	$120		$2,250,053	
Site:				
Civil			$70,000	Range from $85k-$115k (Adjusted)
Subtotal:	$123		$2,320,053	
Construction (General Requirements)	10%		$232,005	
Construction (Overhead & Profit)	15%		$348,008	
SUBTOTAL CONSTRUCTION:	$154		**$2,900,066**	**Construction Contract Only**
ANCILLARY COSTS:				
Architectural/Engineering	7.5%		$217,505	Design, Bid Documents
Construction Administration	2.0%		$58,001	Construction Oversight
Construction Testing			$3,000	Soils, concrete, steel, etc. quality control
Commissioning			$25,000	Confirmation that all systems are fully functional under all conditions
Utility Charges			$0	Transformers, primaries, etc. (none known at this time)
Bond Counsel			$10,000	Preparation to sell public bond. Number verified by town.
Moving and Storage			$0	Done by town
Clerk-of-the-works			$30,000	Owner's Representative (Possibly not needed)
Printing / Plotting			$7,000	Construction drawings
Miscellaneous Expenses			$10,000	Misc Expenses (non-construction related)
Additonal Mold Testing			$18,000	To determine location of mold
Records Cleaning / Replacement			$0	Done by town
SUBTOTAL ANCILLARY:			**$378,506**	**Associated "Soft" Costs**
FURNISHINGS/EQUIPMENT:				
Furniture	20	$4,000	$80,000	Allowance to replace loose furniture and technology equipment
Generator			$70,000	For Critical Systems Only (Not Full Building)
			$150,000	
CONTINGENCY:	9.50%		**$311,464**	Unencumbered for unexpected costs
TOTAL PROJECT BUDGET	$199		**$3,740,036**	**Opinion of Cost**
$/sf	18,800	sf		Total Building SF

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Renovated Town Offices (Minimal) ~ Barrington, NH

Architect's Opinion of Cost

Updated: 12.28.10

			Opinion of Cost	Comments
CONSTRUCTION:				
Building:				
Structural	$0	5,100	$0	None (does not include seismic upgrades)
Architectural	$67	18,800	$1,257,335	Includes ADA upgrades, new ext wall system, patch & repair, building code upgrades, demo
Mechanical	$28	18,800	$526,400	Included displacement vent
Radiant Floor	$0	18,800	$0	Radiant floor add
Plumbing				Fixtures in Architectural
Fire Protection	$3	18,800	$56,400	
Electrical	$4	18,800	$80,000	Range from $85k-$95k
Communications				In electrical numbers
Subtotal:	$102		$1,920,135	
Site:				
Civil			$20,000	Range from $85k-$115k
Subtotal:	$103		$1,940,135	
Construction (General Requirements)	10%		$194,014	
Construction (Overhead & Profit)	15%		$291,020	
SUBTOTAL CONSTRUCTION:	$129		**$2,425,169**	**Construction Contract Only**
ANCILLARY COSTS:				
Architectural/Engineering	7.5%		$181,888	Design, Bid Documents
Construction Administration	2.0%		$48,503	Construction Oversight
Construction Testing			$3,000	Soils, concrete, steel, etc. quality control
Commissioning			$40,000	Confirmation that all systems are fully functional under all conditions
Utility Charges			$0	Transformers, primaries, etc. (none known at this time)
Bond Counsel			$10,000	Preparation to sell public bond. Number verified by town.
Moving and Storage			$0	Done by town
Clerk-of-the-works			$0	Owner's Representative (Possibly not needed)
Printing / Plotting			$7,000	Construction drawings
Miscellaneous Expenses			$10,000	Misc Expenses (non-construction related)
SUBTOTAL ANCILLARY:			**$300,391**	**Associated "Soft" Costs**
FURNISHINGS/EQUIPMENT:				
Furniture	20	$2,000	$40,000	Allowance 50% New / 50% Reused (Loose furniture and technology equipment)
Generator			$0	For Critical Systems Only (Not Full Building)
			$40,000	
CONTINGENCY:	10%		**$272,556**	Unencumbered for unexpected costs (10%)
TOTAL PROJECT BUDGET	$162		**$3,038,116**	**Opinion of Cost**
$/sf	18,800	sf		Total Building SF

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Renovated Town Offices ~ Barrington, NH
Architect's Opinion of Cost
Updated: 01.04.11

			Opinion of Cost	Comments
CONSTRUCTION:				
Building:				
Structural	$11	5,100	$58,500	New sloped roof (does not include seismic upgrades)
Architectural	$90	13,700	$1,231,935	Includes ADA upgrades, new ext wall system, new finishes, building code upgrades, demo
Demo	$15	5,100	$74,175	
Mechanical	$32	13,700	$438,400	
Radiant Floor	$4	13,700	$54,800	Radiant floor add
Plumbing				Fixtures in Architectural
Fire Protection	$4	13,700	$47,950	
Electrical	$6	13,700	$85,000	Range from $85k-$95k
Communications				In electrical numbers
Subtotal:	$145		$1,990,760	
Site:				
Civil			$100,000	Range from $85k-$115k
Subtotal:	$153		$2,090,760	
Construction (General Requirements)	10%		$209,076	
Construction (Overhead & Profit)	15%		$313,614	
SUBTOTAL CONSTRUCTION:	$191		**$2,613,450**	**Construction Contract Only**
ANCILLARY COSTS:				
Architectural/Engineering	7.5%		$196,009	Design, Bid Documents
Construction Administration	2.0%		$52,269	Construction Oversight
Construction Testing			$3,000	Soils, concrete, steel, etc. quality control
Commissioning			$40,000	Confirmation that all systems are fully functional under all conditions
Utility Charges			$0	Transformers, primaries, etc. (none known at this time)
Bond Counsel			$10,000	Preparation to sell public bond. Number verified by town.
Moving and Storage			$0	Done by town
Clerk-of-the-works			$30,000	Owner's Representative (Possibly not needed)
Printing / Plotting			$7,000	Construction drawings
Miscellaneous Expenses			$10,000	Misc Expenses (non-construction related)
SUBTOTAL ANCILLARY:			**$348,278**	**Associated "Soft" Costs**
FURNISHINGS/EQUIPMENT:				
Furniture	20	$4,000	$80,000	Allowance to replace loose furniture and technology equipment
Generator			$70,000	For Critical Systems Only (Not Full Building)
			$150,000	
CONTINGENCY:	10%		**$296,173**	Unencumbered for unexpected costs (10%)
TOTAL PROJECT BUDGET	$249		**$3,407,901**	**Opinion of Cost**
$/sf	13,700 sf			Total Building SF

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New Town Offices (10,000 sf with basement) ~ Barrington, NH

Architect's Opinion of Cost

Updated: 12.28.10

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			Opinion of Cost	Comments
CONSTRUCTION:				
Building:				
Structural	$35	10,000	$350,000	
Architectural	$77	10,000	$770,000	Brick with mtl stud backup
Elevator	$12	10,000	$120,000	
Mechanical	$30	10,000	$300,000	
Plumbing	$14	10,000	$140,000	
Fire Protection	$6	10,000	$60,000	
Electrical & Communications	$22	10,000	$220,000	
Subtotal:	$196		$1,960,000	
Site:				
Civil			$340,000	Includes: site prep, building excavation, final grading, road, parking, utilities, walkways (showing Clark-Goodwill Site / Add $60,000 for Rt 125 Site)
Off site improvements			$0	None known at this time
Subtotal:	$230		$2,300,000	
Construction (General Requirements)	10%		$230,000	
Construction (Overhead & Profit)	15%		$345,000	
SUBTOTAL CONSTRUCTION:	$288		**$2,875,000**	**Construction Contract Only**
ANCILLARY COSTS:				
Architectural/Engineering	6.5%		$186,875	Design, Bid Documents
Construction Administration	2.0%		$57,500	Construction Oversight
Construction Testing			$6,000	Soils, concrete, steel, etc. quality control
Commissioning			$20,000	Confirmation that all systems are fully functional under all conditions
Utility Charges			$20,000	Transformers, primaries, etc. (verify)
Bond Counsel			$10,000	Preparation to sell public bond. Number verified by town.
Moving and Storage			$0	Done by town
Clerk-of-the-works			$30,000	Owner's Representative (Possibly not needed)
Printing / Plotting			$7,000	Construction drawings
Miscellaneous Expenses			$10,000	Misc Expenses (non-construction related)
Land Acquisition			$0	Varies depending on chosen site
Sale Price of Existing Structure			$0	Unknown at this time
Site Survey & Design Testing			$10,000	Survey, test pits, soils, etc.
SUBTOTAL ANCILLARY:			**$357,375**	**Associated "Soft" Costs**
FURNISHINGS/EQUIPMENT:				
Furniture	20	$2,000	$40,000	Allowance 50% New / 50% Reused (Loose furniture and technology equipment)
Generator			$70,000	For Critical Systems Only (Not Full Building)
			$110,000	
CONTINGENCY:	10%		**$334,238**	Unencumbered for unexpected costs (10%)
TOTAL PROJECT BUDGET	$361		**$3,606,613**	**Opinion of Cost**
	$/sf 10,000 sf			Total Building sf

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New Town Offices (11,500 sf Slab on Grade) ~ Barrington, NH

Architect's Opinion of Cost

Updated: 12.28.10

DRAFT

			Opinion of Cost	Comments
CONSTRUCTION:				
Building:				
Structural	$28	11,500	$322,000	
Architectural	$65	11,500	$747,500	Brick with mtl stud backup (No Elev)
Mechanical	$26	11,500	$299,000	
Plumbing	$12	11,500	$138,000	
Fire Protection	$4	11,500	$46,000	
Electrical Communications	$21	11,500	$241,500	
Subtotal:	$156		$1,794,000	
Site:				
Civil			$320,000	Includes: site prep, building excavation, final grading, road, parking, utilities, walkways (showing Clark-Goodwill Site / Add $60,000 for Rt 125 Site)
Off site improvements			$0	None known at this time
Subtotal:	$184		$2,114,000	
Construction (General Requirements)	10%		$211,400	
Construction (Overhead & Profit)	15%		$317,100	
SUBTOTAL CONSTRUCTION:	$230		**$2,642,500**	**Construction Contract Only**
ANCILLARY COSTS:				
Architectural/Engineering	6.5%		$171,763	Design, Bid Documents
Construction Administration	2.0%		$52,850	Construction Oversight
Construction Testing			$6,000	Soils, concrete, steel, etc. quality control
Commissioning			$20,000	Confirmation that all systems are fully functional under all conditions
Utility Charges			$20,000	Transformers, primaries, etc. (verify)
Bond Counsel			$10,000	Preparation to sell public bond. Number verified by town.
Moving and Storage			$0	Done by town
Clerk-of-the-works			$30,000	Owner's Representative (Possibly not needed)
Printing / Plotting			$7,000	Construction drawings
Miscellaneous Expenses			$10,000	Misc Expenses (non-construction related)
Land Acquisition			$0	Varies depending on chosen site
Sale Price of Existing Structure			$0	Unknown at this time
Site Survey & Design Testing			$10,000	Survey, test pits, soils, etc.
SUBTOTAL ANCILLARY:			**$337,613**	**Associated "Soft" Costs**
FURNISHINGS/EQUIPMENT:				
Furniture	20	$2,000	$40,000	Allowance 50% New / 50% Reused (Loose furniture and technology equipment)
Generator			$70,000	For Critical Systems Only (Not Full Building)
			$110,000	
CONTINGENCY:	10%		**$309,011**	Unencumbered for unexpected costs (10%)
TOTAL PROJECT BUDGET	$289		**$3,329,124**	**Opinion of Cost**
$/sf	11,500 sf			Total Building sf

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New Town Offices (8.5k \+ Basement 4k Fin 4.5k Unfin) ~ Barrington, NH

Architect's Opinion of Cost

Updated: 12.28.10

DRAFT

			Opinion of Cost	Comments
CONSTRUCTION:				
Building:				
Structural	$30	12,500	$375,000	
Architectural	$80	12,500	$1,000,000	Brick with mtl stud backup (Includes Elev.)
Mechanical	$26	12,500	$325,000	
Plumbing	$10	12,500	$125,000	
Fire Protection	$4	12,500	$50,000	
Electrical & Communications	$19	12,500	$237,500	
Subtotal:	$169		$2,112,500	
Site:				
Civil			$340,000	Includes: site prep, building excavation, final grading, road, parking, utilities, walkways (showing Clark-Goodwill Site / Add $60,000 for Rt 125 Site)
Off site improvements			$0	None known at this time
Subtotal:	$196		$2,452,500	
Construction (General Requirements)	10%		$245,250	
Construction (Overhead & Profit)	15%		$367,875	
SUBTOTAL CONSTRUCTION:	$245		**$3,065,625**	**Construction Contract Only**
ANCILLARY COSTS:				
Architectural/Engineering	6.5%		$199,266	Design, Bid Documents
Construction Administration	2.0%		$61,313	Construction Oversight
Construction Testing			$6,000	Soils, concrete, steel, etc. quality control
Commissioning			$20,000	Confirmation that all systems are fully functional under all conditions
Utility Charges			$20,000	Transformers, primaries, etc. (verify)
Bond Counsel			$10,000	Preparation to sell public bond. Number verified by town.
Moving and Storage			$0	Done by town
Clerk-of-the-works			$30,000	Owner's Representative (Possibly not needed)
Printing / Plotting			$7,000	Construction drawings
Miscellaneous Expenses			$10,000	Misc Expenses (non-construction related)
Land Acquisition			$0	Varies depending on chosen site
Sale Price of Existing Structure			$0	Unknown at this time
Site Survey & Design Testing			$10,000	Survey, test pits, soils, etc.
SUBTOTAL ANCILLARY:			**$373,578**	**Associated "Soft" Costs**
FURNISHINGS/EQUIPMENT:				
Furniture	20	$2,000	$40,000	Allowance 50% New / 50% Reused (Loose furniture and technology equipment)
Generator			$70,000	For Critical Systems Only (Not Full Building)
			$110,000	
CONTINGENCY:	10%		**$354,920**	Unencumbered for unexpected costs (10%)
TOTAL PROJECT BUDGET	$307		**$3,834,123**	**Opinion of Cost**
$/sf	12,500 sf			Total Building sf

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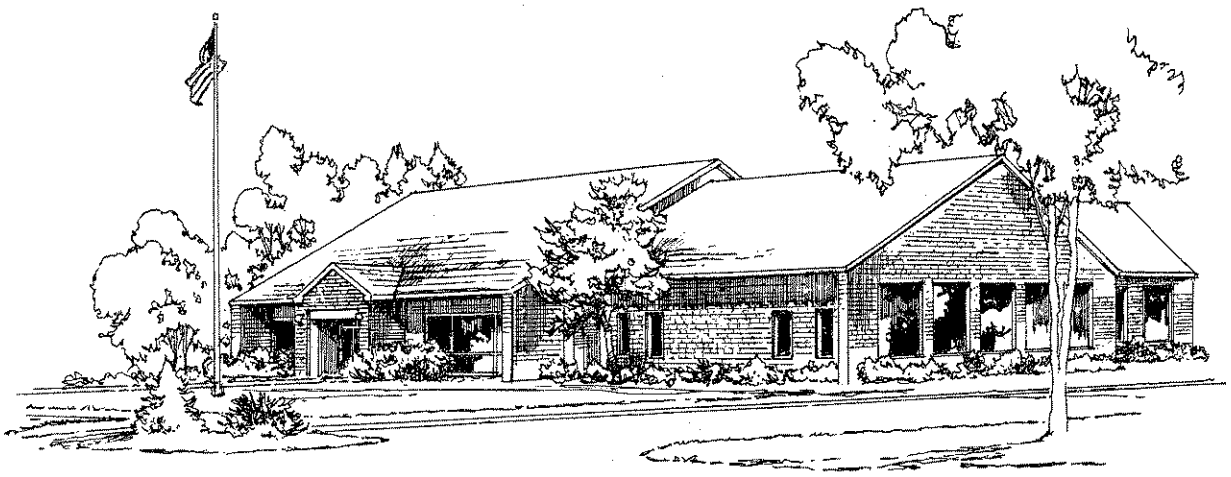

Costs per square foot of floor area

Exterior Wall	S.F. Area	5000	6500	8000	9500	11000	14000	17500	21000	24000
	L.F. Perimeter	300	360	386	396	435	510	550	620	680
Face Brick with Concrete Block Back-up	Steel Joists	151.55	145.40	138.45	132.30	129.90	126.45	121.85	119.85	118.65
	Wood Joists	149.75	143.55	136.30	130.05	127.55	124.00	119.25	117.25	116.00
Stone with Concrete Block Back-up	Steel Joists	154.20	147.90	140.60	134.20	131.65	128.05	123.25	121.15	119.90
	Wood Joists	152.40	145.95	138.45	131.90	129.30	125.65	120.65	118.50	117.25
Brick Veneer	Wood Frame	141.10	135.35	128.85	123.25	121.05	117.80	113.60	111.70	110.65
E.I.F.S.	Wood Frame	129.35	124.30	118.95	114.40	112.50	109.65	106.20	104.65	103.70
Perimeter Adj., Add or Deduct	Per 100 L.F.	15.20	11.65	9.50	8.05	6.90	5.40	4.35	3.65	3.15
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	2.80	2.55	2.20	1.90	1.80	1.65	1.50	1.35	1.30
For Basement, add $28.70 per square foot of basement area										

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from $86.30 to $227.00 per S.F.

Common additives

Description	Unit	$ Cost
Directory Boards, Plastic, glass covered		
30" x 20"	Each	595
36" x 48"	Each	1450
Aluminum, 24" x 18"	Each	600
36" x 24"	Each	675
48" x 32"	Each	980
48" x 60"	Each	2025
Emergency Lighting, 25 watt, battery operated		
Lead battery	Each	282
Nickel cadmium	Each	805
Flagpoles, Complete		
Aluminum, 20' high	Each	1650
40' high	Each	3475
70' high	Each	10,100
Fiberglass, 23' high	Each	1775
39'-5" high	Each	3325
59' high	Each	8225
Safe, Office type, 1 hour rating		
30" x 18" x 18"	Each	2400
60" x 36" x 18", double door	Each	8750

Description	Unit	$ Cost
Smoke Detectors		
Ceiling type	Each	187
Duct type	Each	480
Vault Front, Door & frame		
1 Hour test, 32" x 78"	Opening	5175
2 Hour test, 32" door	Opening	5600
40" door	Opening	6400
4 Hour test, 32" door	Opening	6075
40" door	Opening	7125
Time lock movement; two movement	Each	1850

Important: See the Reference Section for Location Factors

We have calculated projected operating costs for a new building and for a renovation of the existing town hall building. At 10,000 square feet plus a full basement, the new building would have substantially less occupied space than the existing building. Over 8,000 square feet of space in the renovation would be occupied by entities (Recreation Department and School District) that would not be accommodated in the new building, and the total building-to-building cost comparison reflects that difference.

There are many imponderables in the projection of costs, but most would affect both the new building and renovation scenarios proportionally, maintaining the validity of the comparison between the two.

Assumptions & Factors

Factor	Existing Building	Renovated Building	New Building	Notes
Building Area (s.f.)	18,800	18,800	10,000	New building to include full basement
Configuration	Elongated, 2 stories		1 story	
Roof insulation	R30 & R 7.5	R40	R40	
Wall insulation	R4	R25+	R25+	
Windows	Substantial air infiltration	New		
Lighting	T8 fluorescent	New lamps	T8 fluorescent	
Heating	Oil fired boilers, 85% efficiency			
A/C	13 window units	Central A/C	Central A/C	
Cleaning/ maintenance staff	2	2	1	Current staff of four serves all town buildings
Capital renewal: MEP&FFE				Annual allowance based on overall average of 20-year useful life; costs can be applied to repair or replacement.
Inflation				An annual inflation factor of 2.5% has been used for all lines except for cleaning and maintenance (staff), for which a 4% factor has been used.

Present Value

Based on an annual inflation rate of 2.5%, the present value of the 20-year projected operating costs detailed on the next page are:

- Renovated building: $2,632,570
- New Building: $1,890,464

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20-year Projection of Building-Related Operating Costs, Renovated Building

	1	2	3	4	5	6	7	8	9	10
Electricity	$12,460	$12,772	$13,091	$13,418	$13,754	$14,097	$14,450	$14,811	$15,181	$15,561
Heating oil	$11,790	$12,085	$12,387	$12,697	$13,014	$13,339	$13,673	$14,015	$14,365	$14,724
Clean / Maint	$24,750	$25,740	$26,770	$27,840	$28,954	$30,112	$31,317	$32,569	$33,872	$35,227
Trash	$1,000	$1,025	$1,051	$1,077	$1,104	$1,131	$1,160	$1,189	$1,218	$1,249
Capital renewal	$81,149	$83,178	$85,257	$87,388	$89,573	$91,812	$94,108	$96,460	$98,872	$101,344
Total	$131,150	$134,801	$138,558	$142,424	$146,403	$150,499	$154,714	$159,052	$163,518	$168,114

	11	12	13	14	15	16	17	18	19	20	Total
Elect	$15,950	$16,349	$16,757	$17,176	$17,606	$18,046	$18,497	$18,959	$19,433	$19,919	$318,286
Heating	$15,092	$15,470	$15,856	$16,253	$16,659	$17,075	$17,502	$17,940	$18,388	$18,848	$301,172
Cln / Mnt	$36,636	$38,101	$39,626	$41,211	$42,859	$44,573	$46,356	$48,211	$50,139	$52,145	$737,007
Trash	$1,280	$1,312	$1,345	$1,379	$1,413	$1,448	$1,485	$1,522	$1,560	$1,599	$25,545
Capital	$103,877	$106,474	$109,136	$111,865	$114,661	$117,528	$120,466	$123,477	$126,564	$129,729	$2,072,918
Total	$172,846	$177,718	$182,733	$187,896	$193,213	$198,687	$204,323	$210,127	$216,104	$222,259	$3,455,138

20-year Projection of Building-Related Operating Costs, New Building

	1	2	3	4	5	6	7	8	9	10
Electricity	$6,563	$6,727	$6,895	$7,067	$7,244	$7,425	$7,610	$7,801	$7,996	$8,196
Heating oil	$6,790	$6,960	$7,134	$7,312	$7,495	$7,682	$7,874	$8,071	$8,273	$8,480
Cleaning / Maint	$12,375	$12,870	$13,385	$13,920	$14,477	$15,056	$15,658	$16,285	$16,936	$17,613
Trash	$750	$769	$788	$808	$828	$849	$870	$892	$914	$937
Capital renewal	$68,520	$70,233	$71,989	$73,788	$75,633	$77,524	$79,462	$81,448	$83,485	$85,572
Total	$94,998	$97,560	$100,193	$102,899	$105,681	$108,542	$111,482	$114,504	$117,612	$120,807

	11	12	13	14	15	16	17	18	19	20	Total
Elect	$8,401	$8,611	$8,826	$9,046	$9,273	$9,504	$9,742	$9,986	$10,235	$10,491	$167,637
Heating	$8,692	$8,909	$9,132	$9,360	$9,594	$9,834	$10,080	$10,332	$10,590	$10,855	$173,448
Cln / Mnt	$18,318	$19,051	$19,813	$20,605	$21,429	$22,287	$23,178	$24,105	$25,069	$26,072	$368,504
Trash	$960	$984	$1,009	$1,034	$1,060	$1,086	$1,113	$1,141	$1,170	$1,199	$19,158
Capital	$87,711	$89,904	$92,151	$94,455	$96,817	$99,237	$101,718	$104,261	$106,867	$109,539	$1,750,312
Total	$124,092	$127,470	$130,943	$134,515	$138,188	$141,964	$145,848	$149,843	$153,951	$158,176	$2,479,270

Appendix E

- Cleaning Procedures for Mold

From the University of Hawaii.

PROCEDURES FOR CLEANING MOLD ON BOOKS

1. Locate areas within the library that contain moldy books.
2. Place several clean book carts (wiped down with a commercial disinfectant) outside of the library, away from public traffic.
   (Note: The commercial disinfectant used to wipe down books should be tested to ensure that it does not damage the books and must be approved for use by the library's Director. We recommend using Simple Green-D which is a water-based cleaner/disinfectant solution.)
3. Leave a container of disinfectant, paper towels and trash bags with the book carts.
4. Have other carts ready to load the moldy books from the shelves.
5. When handling contaminated books, workers must wear protective gear. This includes wearing long sleeve shirt or other protective coat over street clothing, particulate dust mask (i.e. N95 particulate) and vinyl examination gloves. Unprotected indiv iduals may aggravate or develop allergic sensitivities to the mold spores.
6. Unload the moldy books from the shelves and place them on the book carts to be taken outside for cleaning. Cleaning must be conducted away from air intakes, other building openings and public areas.
7. HEPA vacuum moldy books by covering the following areas: outside front and back covers, joints between the covers, spine, text block and inside back and front covers. A soft-bristled brush may be used for stubborn growth.
   (Note: When the user experiences a noticeable operating resistance when using the HEPA vacuum, the HEPA filter for the vacuum cleaner should be checked and replaced if it appears to be overloaded. The used filters must be removed, misted with water, p laced in a zip lock bag or sealed trash bag and disposed of in a dumpster.)
8. Place clean book on a disinfected book cart.
9. Once cleaning of books are completed, book carts that were holding moldy books must be cleaned with disinfectant and paper towels.
10. Once the books have been cleaned and before reshelving, the floors and shelf areas must be cleaned and disinfected. The shelves and flooring must be cleaned with disinfectant and paper towels. All paper towels used in steps 9 and 10 must be discarde d in a trash bag for disposal.
11. the exterior of the HEPA vacuum cleaner must be wiped down with disinfectant.
12. Worker must remove protective coat, eye protection, dust mask, and gloves outside. Wash hands with soap and hot water after completing the

cleaning session.

13. Keep a record of where the problem areas are and note the time and day when the cleaning took place for future reference.
14. Institute a preventative cleaning program to address the continuing mold problem in the library. Books must be given to a quick wipe down with an appropriate disinfectant solution before re-shelving.

Personal Protective Equipment:

- long sleeved shirt and long pants or protective coat
- disposal gloves (non-powdered)- avoid using latex gloves since some individuals maybe allergic to latex
- dust mask
- eye protection (chemical goggles)

Supplies Needed:

- commercial disinfectant (i.e.Simple Green-D, Lysol, diluted bleach, etc.)
- paper towels
- trash bag
- duct tape
- HEPA vacuum
- soft-bristled brush
- soap
- sponge/rags

3.8 Emergency Salvage of Moldy Books and Paper

Beth Lindblom Patkus
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Introduction

Most librarians and archivists have seen the effects of mold on paper materials, but many have never experienced an active mold outbreak. Dealing with such an outbreak (large or small) can be overwhelming. This leaflet provides some basic information about mold and outlines the steps that need to be taken to stop mold growth and begin to salvage collections.

Please note that the actions recommended here are basic stabilization techniques to be undertaken in-house for small to moderate outbreaks. The complexities of dealing with a large number of wet and moldy materials will usually require outside assistance, and some suggestions for dealing with a major mold outbreak, appear at the end of this leaflet. In all cases, a conservator or preservation professional should be consulted if any questions arise or if further treatment is necessary.

What is Mold?

Mold and mildew are generic terms that refer to various types of fungi, microorganisms that depend on other organisms for sustenance. There are over 100,000 known species of fungi. The great variety of species means that patterns of mold growth and the activity of mold in a particular situation can be unpredictable, but it is possible to make some broad generalizations about the behavior of mold.

Mold propagates by disseminating large numbers of spores, which become airborne, travel to new locations, and (under the right conditions) germinate. When spores germinate, they sprout hair-like webs known as mycelium (visible mold); these in turn produce more spore sacs, which ripen and burst, starting the cycle again. Molds excrete enzymes that allow them to digest organic materials such as paper and book bindings, altering and weakening those materials. In addition, many molds contain colored substances that can stain paper, cloth, or leather. It is also important to realize that mold can be dangerous to people and in some cases can pose a major health hazard. Mold outbreaks should never be ignored or left to "go away on their own."

Why Does Mold Grow?

To germinate (become active), spores require a favorable environment. If favorable conditions are not present, the spores remain inactive (dormant); in this state they can do little damage.

The most important factor in mold growth is the presence of moisture, most commonly in the air, but also in the object on which the mold is growing. Moisture in the air is measured as relative humidity (RH). In general, the higher the RH the more readily mold will grow. If the RH is over 70% for an extended period of time, mold growth is almost inevitable. It is important to remember, however, that it is possible for some species of mold to grow at lower RH as well. If collections have become wet as the result of a water disaster, this increases their susceptibility to mold growth. Other factors that will contribute to mold growth in the presence of moisture are high temperature, stagnant air, and darkness.

Mold spores, active or dormant, are everywhere. It is not possible to create an atmosphere free of spores. They exist in every room, on every object in the collection, and on every person entering the collection area. The only wholly dependable control strategy is to keep the humidity and temperature moderate so the spores remain dormant, keep collections as clean as possible, and prevent the introduction of new active mold colonies.

Basic Principles of Salvage

Reduce the humidity: As noted above, moisture initiates mold growth. Reducing the humidity is essential to stopping the mold growth.

Do not turn up the heat: This will not help to dry out collections and storage areas. Additional heat in the presence of moisture will cause the mold to grow faster.

If collections are wet, dry or freeze them: Mold will normally grow on wet materials in about 48 hours (sometimes sooner). If you know you cannot get the affected material dry within 48 hours, it is best to freeze it. This will not kill the mold, but it will stop further growth until you have a chance to dry and clean the material.

Consider the health risks: A few mold species are toxic to people, and many molds are powerful sensitizers. Exposure to mold can lead to debilitating allergy even among people not prone to allergies. Everyone who works with moldy objects must be properly protected.

Avoid "quick and easy" cures: "Quick cures" that you may have heard about (such as spraying Lysol on objects or cleaning them with bleach) may cause additional damage to items or be toxic to people; they are also often ineffective. In the past, mold-infested collections were often treated with fumigants. Ethylene oxide (ETO) will kill active mold and mold spores; other chemicals that have been used are less effective. All of these chemicals can have adverse effects on both collections and people, and none of them will keep the mold from recurring.

Step-by-Step Salvage

This section provides specific steps for responding to a small or moderate mold outbreak. While the steps are

numbered for convenience, they may not be carried out in exactly this order, and some of these activities will occur simultaneously.

1. Find out what is causing the mold growth. You need to know what is causing the problem so that additional mold on collections not yet affected can be avoided.
   - Look first for an obvious source of moisture, such as a water leak.
   - If there is no obvious source of moisture, use a monitoring instrument to measure the relative humidity in the affected area. If the humidity is elevated, there might be a problem with the HVAC (heating, ventilating, and air conditioning) system, or the area might be subject to higher humidity for another reason, such as having shelves placed against an outside wall. Mold might also develop in areas with poor air circulation or in areas where there is a lot of dust and dirt that might provide a food source for mold.
   - Initiate repairs or resolve the problem as soon as possible. If the problem cannot be resolved quickly, salvage the collections as directed below and develop a strategy for frequent monitoring of the area for additional mold growth.
2. Take steps to modify the environment so that it is no longer conducive to mold growth.
   - Mop up and/or use a wet-dry vacuum to remove any standing water. Bring in dehumidifiers, but be sure that a mechanism is in place to drain them periodically so they do not overflow. Bring in fans to circulate the air, and open the windows (unless the humidity is higher outside).
   - Your goal should be to reduce the relative humidity to 55% or lower. Temperature should be moderate, below 70°F. Get a monitoring instrument that can measure the relative humidity and temperature accurately, and record the measurements in a log several times a day. Do not rely on your own impression of climate conditions.
3. Implement safety precautions for staff and others working with moldy items.
   - A mycologist should be consulted to insure that no toxic mold species are present (a local hospital or university should be able to provide a reference). If toxic molds are present, DO NOT attempt to salvage materials yourself.
   - If there are no toxic molds present, collections can be salvaged in-house, but everyone working with the affected materials must wear disposable plastic gloves and clothing, and use a protective mask when working with moldy objects.
   - Use a respirator with a HEPA (high efficiency particulate) filter; pollen dust masks available in drug and hardware stores are not adequate. If you cannot use disposable clothing, be sure to leave dirty clothes in a designated area and wash them in hot water and bleach. Respirators should be wiped periodically with rubbing or denatured alcohol.
   - Be aware that some people cannot wear respirators. The respirator must fit well with good contact around the nose and mouth area. In addition, they make breathing somewhat difficult and can be problematic for people with asthma or heart conditions, or people who are pregnant. It is a good idea to consult your doctor before wearing a respirator to work with moldy materials.[1]
4. Isolate the affected items.
   - Quarantine items by removing them to a clean area with relative humidity below 45%, separate from the rest of the collection. Items should be transferred in sealed plastic bags to avoid transfer of mold to other items during the move, but they should not remain in the bags once in the clean area, since this will create a micro-environment that can foster further mold growth.
   - In the case of a large mold outbreak it may be impractical to move the items; in that case the area in which they are housed should be quarantined and sealed off from the rest of the building to the extent possible (remember that this includes shutting off air circulation from the affected area).
5. Begin to dry the materials. Your goal is to make the mold go dormant, so that it will appear dry and powdery rather than soft and fuzzy. This will allow you to remove the mold residue more easily.
   - Wet material should be dried in a cool, dry space with good air circulation. An air-conditioned space is the best for this purpose, but if that is impossible, use fans to circulate air (do not aim fans directly at objects, however, as this can damage materials and further scatter mold spores). Place paper toweling or unprinted newsprint (regular newspapers may transfer print to the wet objects) under the drying items to absorb moisture, and change this blotting material often. Air drying takes time and attention, since you must check drying materials often, and you must maintain cool, dry conditions and air circulation in the space.
   - Collections may also be dried outside in the sun (sunlight or ultraviolet light can cause some molds to become dormant). The outside humidity must be low. Be aware that the sun causes fading and other damage to paper-based collections, however. Materials should be monitored closely and left outside no more than an hour or so.
   - Special attention should be paid to framed objects (such as prints and drawings) and to the interior of the spines of books. A frame provides an ideal environment for mold; the back is dark, air does not circulate, and humidity can be trapped inside. Similarly, the interior of the spine of a book is particularly vulnerable to mold growth. Spines should be checked regularly during the drying process. Framed materials should be unframed immediately, and dried as above. If the item appears to be stuck to the glass in the frame, remove the backing materials from the frame and leave the item in the frame and attached to the glass. Place the framed item in a cool, dry space as described above, and consult a professional conservator.

6. If immediate drying is not possible, freeze the affected items.

- If the item is small enough, it can be placed in the freezer compartment of a home refrigerator, with freezer paper loosely wrapped around it to prevent it from sticking to other items.
- For items that are too big for a freezer compartment or for larger numbers of items, a commercial freezer may be necessary (grocery store, university food service, commercial cold storage facility, etc.). It is a good idea to make arrangements for commercial freezer storage before an emergency arises, since there may be restrictions on storing moldy items in a freezer that normally holds foodstuffs.
- Once time and resources are available, frozen materials can be thawed and dried in small batches, or they can be freeze-dried or vacuum freeze-dried (with the exception of photographs, which should not be freeze-dried or vacuum freeze-dried).

7. Clean the affected items. ***Do not*** try to clean active mold (soft and fuzzy) yourself. This should be done only by a conservator, who will use a vacuum aspirator to avoid further embedding the mold into the paper. The following instructions apply only to inactive (dry and powdery) mold and materials that do NOT have artifactual value:**2**

- Remove mold residue outdoors rather than in an enclosed space whenever possible. Be sure to wear protective gear (see above). If you must work indoors, use a fume hood with a filter that traps mold or in front of a fan, with the fan blowing contaminated air out a window. Close off the room from other areas of the building (including blocking the air circulation vents).
- Vacuum the mold. Use a vacuum with a HEPA filter; this will contain the mold spores. A normal vacuum will simply exhaust the spores out into the air. You can also use a wet-dry commercial-strength vacuum if the tank is filled with a solution of a fungicide such as Lysol diluted according to the label instructions. A tube from the hose inlet should extend into the solution so that incoming spores are directed there.
- Do not vacuum fragile items directly, since the suction can easily cause damage. Papers can be vacuumed through a plastic screen held down with weights. A brush attachment covered with cheesecloth or screening should be used for books to guard against loss of detached pieces. Boxes can be vacuumed directly. When disposing of vacuum bags or filters, seal them in plastic trash bags and remove them from the building.
- It is also acceptable to clean off mold with a soft brush, but this must be done carefully. Once moldy material is dry and the residue appears powdery, take a soft, wide brush (such as a watercolor wash brush) and lightly brush the powdery mold off the surface of the item. This should be done outside or the mold should be brushed into a vacuum nozzle. Be careful not to rub the mold into the surface, since that will attach it permanently to paper fibers or the cover of a book.

8. Dry and thoroughly clean the room(s) where the mold outbreak occurred. You may do this yourself or hire a company to provide dehumidification and/or cleaning.

- Vacuum shelves and floors with a wet-dry vacuum filled with a fungicide solution such as Lysol, then wipe them down with Lysol or a similar solution. Allow them to dry fully before returning any materials. If a musty odor lingers in the room, open containers of baking soda may help.
- It is also a good idea to have the HVAC system components (heat-exchange coils, ductwork, etc.) cleaned and disinfected, particularly if you suspect they have caused the problem.

9. Return materials to the affected area. Do this ***only*** after the area has been thoroughly cleaned ***and*** the cause of the mold outbreak has been identified and dealt with.

10. Continue to monitor conditions and take steps to avoid additional mold growth.

- Take daily readings of temperature and relative humidity, and be sure that the climate is moderate. It is particularly important to keep humidity below 55% to insure that mold will not reappear. Temperature should not exceed 70°F.
- Check problem areas frequently to insure that there is no new mold growth. Be sure to examine the gutters of books near the endbands and inside the spines.
- Keep areas where collections are stored and used as clean as possible, since dust and dirt are a source of spores, both active and dormant. Clean floors with a HEPA filter vacuum rather than sweeping, since sweeping scatters dust. House collections in protective enclosures whenever possible to keep them free of dust. Vacuum shelves and the tops of unboxed, shelved books, or clean them with a magnetic wiping cloth.
- If funds permit, install a multi-stage particulate filtration system in the building or storage area.
- Keep windows closed to prevent active spores from entering, and prohibit live plants in collection storage or use areas, since these are also a source of spores.
- Quarantine new acquisitions for a few days, and check them carefully for signs of mold.
- Avoid storing collections in potentially damp areas or in locations where water accidents are possible. Insure that regular maintenance is carried out on the building to reduce the chance of water emergencies.
- Regularly inspect the HVAC system, which is a good breeding ground for mold. Regularly clean the heat exchange coils, drip pan, and ductwork. Change air filters frequently.
- Prepare a disaster plan. This will prevent some accidents and provide strategies for dealing quickly and effectively with problems. Be sure that all employees are familiar with the plan.

Dealing with a Major Mold Outbreak

If a large portion of the collection is affected by the mold outbreak, if dangerous species of mold are present, or if the HVAC system and the building itself are also infected with mold, outside assistance will be needed. Particularly in the latter cases, it is essential to make sure that the building is safe for occupancy by staff. There

are a variety of companies experienced in working with cultural collections that can assist institutions with recovery.

Most of the disaster recovery companies that provide drying services will also clean surface mold off collections. Conservators or regional conservation centers provide treatment services for individual items with artifactual value.

There are also several disaster recovery companies that specialize in dehumidifying and cleaning of buildings. In the case of a severe infestation of mold and/or an infestation that poses serious health risks to staff, companies specializing in indoor air quality can help to insure that the building is safe for occupancy. In severe cases, fumigation of the affected area may be necessary. Due to the potential for damage, fumigants should not be used directly on or in the presence of collections unless there is no other choice. Fumigation should always be done by a licensed professional.

A list of service providers is given at the end of this leaflet. Be sure that the company you choose is familiar with the requirements of cultural collections. If you are not sure how to choose a service provider, always contact a conservator or preservation professional for advice.

Summary

Spores, active or dormant, are ubiquitous. Although it is impossible to get rid of all the spores, mold growth can be controlled. Most important for mold control is maintaining RH conditions below 55%, or, better, below 45%. Use of protective enclosures, meticulous housekeeping, monitoring of RH and temperature, and a watchful eye are also important. If resources allow, high-level filtration of storage areas, if not of the whole building, is recommended. Protecting library and archival collections from water accidents should be among the highest priorities for any institution. Wet collections must be immediately dried or stabilized by freezing. Moldy materials must be isolated, dried if wet, then cleaned using the strictest precautions.

GENERAL PROCEDURES FOR MOLD CLEANING

1. Identify where mold is present.
2. Inform building occupants where and when cleaning will take place. If possible try to conduct cleaning during off-hours, early morning, late afternoon or on weekends.
3. Assemble personal protective and cleaning equipment before proceeding with cleaning.

   Personal Protective Equipment:
   - long sleeved shirt and long pants or protective cloth covering
   - disposable gloves (non-powdered) - avoid using latex gloves since some individuals maybe allergic to latex
   - dust mask (N95 particulate)
   - eye protection (chemical goggles)

   Cleaning Supplies:
   - HEPA Vacuum
   - Commercial disinfectant (i.e. Simple Green -D, diluted bleach, Lysol, etc.)
   - trash bags
   - paper towels
   - soft-bristled brush
   - soap
   - sponge/rags

4. Don personal protective equipment.
5. HEPA vacuum moldy areas and/or materials initially to remove loose dirt and mold. (Note: When the user experiences a noticeable operating resistance when using the HEPA vacuum, the HEPA filter for the vacuum cleaner should be checked and replace d if it appears to be overloaded. The used filters must be removed, misted with water, placed in a zip lock bag or sealed trash bag and disposed of in a dumpster.)
6. After HEPA vacuuming, use water and soap to remove mold using a sponge, rag and/or soft-bristled brush for stubborn growth.
7. Once mold has been cleaned, spray disinfectant on the cleaned surfaces (allow 10 minutes of contact time).
8. Wipe of disinfectant and thoroughly dry surface with paper towel.
9. The exterior clothing worn by workers should be vacuumed with the HEPA vacuum cleaner and placed in trash bags for laundering. If disposable coveralls such as tyvek suits are worn, these can disposed of as regular trash.
10. The exterior of the HEPA vacuum cleaner must be wiped down with disinfectant.
11. Worker must remove protective clothing, eye protection, dust mask and gloves outside. Wash hands with soap and hot water after completing the cleaning session. Disposable protective gear such as dust mask and gloves should be placed in trash bag and disposed of as regular trash. Eye protection (chemical goggles) must be cleaned and disinfected.
12. Keep a record of where the problem areas are and note the time of day when the cleaning took place for future reference.

PROCEDURES FOR CLEANING MOLD ON BOOKS

1. Locate areas within the library that contain moldy books.
2. Place several clean book carts (wiped down with a commercial disinfectant) outside of the library, away from public traffic. *(Note: The commercial disinfectant used to wipe down books should be tested to ensure that it does not damage the books and must be approved for use by the library's Director. We recommend using Simple Green-D which is a water-based cleaner/disinfectant solution.)*
3. Leave a container of disinfectant, paper towels and trash bags with the book carts.
4. Have other carts ready to load the moldy books from the shelves.
5. When handling contaminated books, workers must wear protective gear. This includes wearing long sleeve shirt or other protective coat over street clothing, particulate dust mask (i.e. N95 particulate) and vinyl examination gloves. Unprotected individuals may aggravate or develop allergic sensitivities to the mold spores.
6. Unload the moldy books from the shelves and place them on the book carts to be taken outside for cleaning. Cleaning must be conducted away from air intakes, other building openings and public areas.
7. HEPA vacuum moldy books by covering the following areas: outside front and back covers, joints between the covers, spine, text block and inside back and front covers. A soft-bristled brush may be used for stubborn growth. *(Note: When the user experiences a noticeable operating resistance when using the HEPA vacuum, the HEPA filter for the vacuum cleaner should be checked and replaced if it appears to be overloaded. The used filters must be removed, misted with water, p laced in a zip lock bag or sealed trash bag and disposed of in a dumpster.)*
8. Place clean book on a disinfected book cart.
9. Once cleaning of books are completed, book carts that were holding moldy books must be cleaned with disinfectant and paper towels.
10. Once the books have been cleaned and before reshelving, the floors and shelf areas must be cleaned and disinfected. The shelves and flooring must be cleaned with disinfectant and paper towels. All paper towels used in steps 9 and 10 must be discarded in a trash bag for disposal.
11. the exterior of the HEPA vacuum cleaner must be wiped down with disinfectant.
12. Worker must remove protective coat, eye protection, dust mask, and gloves outside. Wash hands with soap and hot water after completing the cleaning session.
13. Keep a record of where the problem areas are and note the time and day when the cleaning took place for future reference.
14. Institute a preventative cleaning program to address the continuing mold problem in the library. Books must be given to a quick wipe down with an appropriate disinfectant solution before re-shelving.

Personal Protective Equipment:

- long sleeved shirt and long pants or protective coat
- disposal gloves (non-powdered)- avoid using latex gloves since some individuals maybe allergic to latex
- dust mask
- eye protection (chemical goggles)

Supplies Needed:

- commercial disinfectant (i.e.Simple Green-D, Lysol, diluted bleach, etc.)
- paper towels
- trash bag
- duct tape
- HEPA vacuum
- soft-bristled brush
- soap
- sponge/rags

MOLD PREVENTION AND CONTROL TIPS FOR BUILDING OCCUPANTS

1. At least once a month, room surfaces such as desks, shelves, books, etc. should be wiped down with disinfectant (i.e. lysol).
2. Remove plants from the area, wet soil/plants and/or containers such as wicker baskets introduce moisture in the air and promotes fungal growth.
3. Maintain good housekeeping by not accumulating items which harbor spores/mold such as old books, journals/magazines, clothing, etc.
4. When water leaks or spills occur indoors- ACT QUICKLY. Call facilities to repair leak; and have them dry or replace damp material within 24-48 hours.
5. If ceiling tiles appear to be water-damaged or if a leak occurs, immediately call facilities to repair the leak and replace ceiling tiles.
6. When the air-conditioning system is in operation, keep all exterior doors and windows closed. If the temperature in an area is very cold, call facilities to have the temperature adjusted. Do not open exterior doors and/or windows because this will introduce higher humidity and moisture; and do not block supply air registers because this may cause some areas to have warmer temperatures and higher humidities.

CLEANING PROCEDURES FOR MOLD
(Proceedings of Healthy Buildings 2000, Volume 3, Pages 39-48, 2000)

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ABSTRACT

Successful cleaning of mold requires an understanding of the location of contamination and the reason why fungal growth initially occurred. In buildings with extensive moisture damage, the extent of hidden mold colonization is almost always greater than that which is readily visible in the occupied space. In buildings with extensive moisture damage it is generally necessary to open-up and inspect representative structural components in order to estimate the extent of mold growth to be removed by cleaning. Basic steps in mold cleaning include the physical removal of colonized materials, the removal of associated dusts and debris, the prevention of dusts and spores generated during clean-up from entering occupied or clean areas, and the use of appropriate protective equipment by knowledgeable clean-up workers. When surfaces are cleaned emphasis must be placed on thorough physical removal of dusts and mold residues rather than on use of microbiocidal agents. A clear pathway for data evaluation including an informed inspection should proceed any sampling performed in buildings including those undergoing cleaning. The limitations of the sampling methods should be understood (e.g., a negative air sampling result does not prove the absence of hidden growth in a wall cavity). The procedures used to clean mold are highly influenced by variables such as the kind of occupant (e.g., very conservative guidelines are used for cleaning of mold in health care centers), the kind of building (e.g., generally more wood framing is used in small residential buildings), or kinds of materials in a building (e.g., library and archival materials are difficult to clean). Special protocols are needed for mold cleaning in these different types of buildings. Finally, the ultimate success of mold cleaning is dependent upon prevention of leaks and dampness that can lead to new growth.

KEY WORDS: Cleaning, Fungi, Inspection, Mold, Renovation

INTRODUCTION

A problem building in the context of mold growth almost certainly means that chronic leaks or dampness conditions exist. Filamentous fungi will likely grow on biodegradable water-damaged or damp finishing and construction materials. The necessity for clean-up of mold in a building implies that extensive biodeterioration or growth has already occurred. Almost all mold contamination problems in buildings are caused by failure to keep infrastructure clean and dry, and/or by failure in the design, operation, and maintenance of building systems.

This paper describes cleaning procedures for mold beginning with a review of consensus documents. The importance of an informed inspection prior to cleaning or renovation is emphasized. General principles for removal of colonized materials as well as sampling as a component of the inspection process are reviewed.

Review of Consensus Publications

<u>International workshop on health implications of fungi in indoor environments</u>.
This workshop held in Baarn, the Netherlands in 1992 [1] presented recommendations with regard to cleaning and removal of fungal growth in buildings. It was agreed that the health risks

of biocides are not adequately understood and therefore biocides should be used only as a last option for controlling fungal growth indoors. In addition, the inhalation of fungal spores and other mycological byproducts should be avoided when handling contaminated materials.

NYC Stachybotrys Guidelines. A panel in 1993 in New York City discussed appropriate remediation actions when visible Stachybotrys chartarum growth occurs on interior surfaces [2]. It was recommended that materials visibly colonized by mold should be removed by persons using appropriate personal protective equipment including respirators and gloves. The use of containment barriers (plastic sheeting) and negative pressurization was recommended for removal of moldy materials with a surface area greater than about $3m^2$. Smaller amounts of moldy materials should be removed or cleaned by simpler methods. A proposed revision of the 1993 document has been widely discussed but not yet published. Some highlights of the proposed revision are (a) all fungi that may colonize interior surfaces, not just Stachybotrys chartarum must be considered during clean-up. The inspection process of the building for water damage and mold colonization is the most important step in designing remediation and clean-up strategies. Four size areas of mold colonization (<1 m^2, 1 -3 m^2, 3-10 m^2, >10 m^2) with more conservative containment strategies (proportional to area colonized) have been proposed.

Health Canada [3] Fungal Contamination Guide. Health Canada published a guide to assist investigators in managing fungal contamination issues in buildings. An appendix in the guide recommended the use of personal protective equipment by persons doing clean-up of moldy materials. For large-scale (colonized surfaces greater than about $10m^2$) clean-up operations, physical isolation and negative pressurization of the clean-up area from both the HVAC system and from the interior spaces was recommended. Evacuation of building occupants should also be considered in large-scale fungal remediations.

ISIAQ Task Force Report. A 1996 ISIAQ report [4] reviewed previous publications on fungal remediation and recommended additionally that soft porous materials that are visually colonized should be discarded [5]. Cleaning and remediation should not render interior surfaces sterile, but rather return the building to a condition where normal (background) kinds and concentrations of fungi occur.

ACGIH bioaerosols committee. The ACGIH 1999 publication [6] classifies the extent of fungal colonization in buildings as minimal, moderate, and extensive without assignment of numerical surface area guidelines. During clean-up plastic sheeting barriers and negative pressurization should be used to contain dusts when extensive colonization is removed.

The Building Inspection

Successful cleaning of mold requires an understanding of the location(s) of contamination and the reason(s) why fungal growth has occurred. The informed building inspection is central to the clean-up process. Components of the inspection process include identifying those building materials affected by both fungal growth and moisture damage. Literature on identification of moisture and fungal growth problems in buildings [4, 6-10] should be reviewed prior to the inspection process.

The location and extent of visible fungal colonization must be determined during the inspection [11, 12]. An inventory of visibly moldy interior surfaces should be made including the extent (m^2) and location of colonized materials. It should be realized that fungal micro-colonies invisible to the unaided human eye may extend outward for considerable distances (approximately 0.5m) from moldy materials such as paper fiber gypsum board [13]. The presence of mycelia or

fruiting structures as seen by direct microscopic examination (e.g., cellotape samples) verifies that visible contamination is of fungal origin [6, 14].

During the inspection it should be determined if materials that are highly susceptible to biodeterioration such as those containing amorphous cellulose are hidden in damp moist niches in building components. In moisture-damaged buildings, the extent of hidden colonization is almost always greater than that which is readily visible in the occupied space [15]. In buildings with substantial moisture damage it may be necessary to open-up and inspect floor, wall and ceiling structural components in order to estimate the extent of hidden mold growth. Precautions must be taken during destructive opening of building structural components to protect occupants and investigators from spores that may be aerosolized if hidden colonization is found. Demolition of structural components may be required to expose pockets of contamination (e.g., sewage contaminated water) for adequate cleaning and drying [16].

As an aid to finding locations of hidden mold growth a clear understanding of locations of moisture damage as well as reasons for the damage is necessary. Cleaning of the building will ultimately be ineffective if moisture problems persist. A moisture meter can be used to determine if some finishes and construction materials which appear superficially dry actually contain significant amounts of moisture [17]. Literature on condensation and dampness problems in building envelopes in hot humid or cold climate/seasons should be reviewed in order to understand the reasons for consequential mold growth [9, 10]. Moisture problems associated with below grade structures and the building foundation especially if biodegradable materials are used in construction (e.g., wood joists and framing) must be revealed during the inspection in order to plan a strategy for cleaning.

Principles for Mold Clean-up

Important components of mold cleaning are (a) the physical removal of colonized materials, (b) removal of settled dusts containing spores that may have previously been dispersed from moldy surfaces, (c) prevention of spores and dusts generated during clean-up from entering occupied or clean areas, and (d) use of appropriate personal protective equipment by clean-up workers.

Porous materials such as paper fiber gypsum board, ceiling tiles, insulation, wallpaper, carpet, pressed wood products etc., that are visually moldy should be discarded. Mold growth that may be present on non-porous surfaces such as sheet metal, ceramic tiles, glass, etc., is physically removed by cleaning. Tap water with detergents or surfactants should be effective for most cleanings of non-porous materials.

The method used to remove colonization on semi-porous materials such as wood framing depends on the degree to which fungi have penetrated the substrate. Lumber that is dry rotted or wet rotted [17] is discarded. Wood that is sound with the exception of colonization of the outer surface may be sanded, planed, refinished, and reused. The principle for reuse is the absence of hyphae and fruiting structures (over and above that normally present in sound wood) in the wood cells of the timber being salvaged.

The airborne concentration of spores can exceed 10^6/m? when moldy materials are disturbed [18-19]. Consequently those persons involved in clean-up activities must use personal protective equipment. The use of a N-95 respirator and gloves is adequate during the clean-up of minimal (small surface area) colonization [6]. For remediations involving extensive colonization the use of full body disposable protective clothing and P-100 respirators is essential.

The use of containment barriers, depressurizing techniques, and dust suppression methods during removal of moldy materials is required to prevent dissemination of spores into occupied or clean areas [20]. The extent of the surface colonized (minimal, moderate, extensive) in a room or in one area of a building is the most important factor to be considered with regard to selection of containment methodology or dust suppression methods [6]. When moldy materials are removed or cleaned the area where the clean-up is occurring should be depressurized (negative air machine for large scale containment; nozzle of a HEPA vacuum for source containment) so that the flow of air is always from clean areas into the location where cleaning is occurring. Additional factors important in determining the dust containment methods employed during a remediation include (a) the presence of highly susceptible occupants [21] and (b) the likelihood that hidden colonization may be uncovered within building components.

A principle common to guidelines on fungal remediation [2, 4, 6] is that building maintenance personnel with proper training can perform clean-up involving minimal and moderate surface area colonization. Interior surfaces with minimal fungal growth (e.g., 1 or 2 ceiling tiles, 0.1 or 0.2m^2 paper fiber gypsum board) can be removed by properly trained persons wearing gloves and a respirator. The colonized or moldy surface can be covered with a sticky sheeting (sticky surface makes contact with colonized surface), removed in one piece, bagged, and discarded.

Any technique that reduces dust (spore) emission from the colonized surface should be considered during cleaning. Thus, application of an encapsulant to a colonized surface prior to removal may be useful. The application of a gentle water mist to colonized surfaces may be effective in dust suppression so long as hydrophobic spores are not dispersed into the air by impaction of droplets. Water mists and sprays, if used, must not wet sound infrastructure.

Spores from colonized surfaces in one area of a building may have been dispersed by air currents into areas of the building unaffected by moisture problems. A combination of damp wiping and HEPA vacuum cleaning should be adequate to remove dusts from non-porous surfaces. Professional judgment is required to determine if porous surfaces can be cleaned by HEPA vacuuming. Specific protocols have been recommended for dust removal from some porous materials such as carpet [5].

The objective of clean-up is to remove colonization and associated mold laden dusts, but not to sterilize or disinfect interior surfaces. As such the use of biocides and disinfectants is to kill cells during clean-up is unnecessary unless infection is perceived as a health concern. The use of biocides and disinfectants during cleaning may confound efforts to determine cleaning efficiency when clearance sampling is based on culture techniques [22]. The physical removal of moldy materials plus the removal of associated dusts by vacuum cleaning and damp wiping should be adequate for cleaning [4, 6] in most buildings. If disinfectants are used in the clean-up of moldy surfaces, it is essential during the final cleaning process to remove dead residues that may potentially be allergic or toxic [23].

Sampling and Mold Cleaning

Sampling for fungi during building evaluations has been reviewed elsewhere [6, 24, 25]. Sampling for fungi in buildings undergoing mold cleaning must be preceded by a clear evaluation pathway that outlines how analytical data will be interpreted. For example, when the objective of air sampling is to determine if exposure conditions after a clean-up in a building are “normal”, the collection of samples at many locations and at various times indoors as well as concurrently in the outdoor air is minimally required for data interpretation. The collection of one or a few samples seldom characterizes environmental mycological conditions [6, 24].

Comparison of air sampling data obtained both before and after clean-up with the knowledge that moisture problems have been fixed and that visually moldy materials have been physically removed adds to the strength of possible data interpretations. Awareness of limitations in sampling and analytical methodology is always important in data interpretation. For example, if the objective of sampling is to determine if Stachybotrys is present, then exclusive use of culture based methods may overlook non-culturable spores detectable only by direct microscope methods (e.g., cellotape and spore trap sampling).

During building evaluations including those involving cleaning, the results of an informed inspection are of greater value than sampling results alone obtained without the benefit of inspection. Table 1 shows the results of sampling by spore trap in a room with a history of chronic water leaks around windows. While Cladosporium accounted for the vast majority of spores collected in the room, a few Stachybotrys spores were also detected. The data might be interpreted to indicate that fungal reservoirs were present somewhere in the building. Alternatively, some investigators might interpret the sampling data as indicative of a ? normal? situation because of a predominance of Cladosporium. Subsequent destructive opening of the building envelope around windows showed that about 50% of the surface area of the hidden construction materials (e.g. wall cavity side of paper fiber gypsum board, asphaltic building paper, etc.) were colonized by fungi including Stachybotrys and Chaetomium. The sampling results in Table 1 could thus be more clearly interpreted namely that the Stachybotrys found in the room air had likely originated from reservoirs within the envelope. In addition, cleaning of room surfaces alone can not fix the mold problem in the envelope.

Table 2 presents sampling data on culturable fungi present in settled dust in a home where water damaged furniture had been stored for several weeks. Some mold had grown on the stored furniture as well as on flooring material. Cleaning of floors with a household vacuum cleaner had occurred subsequent to removal of furniture. The dominating presence of non-phylloplane fungi such as Aspergillus versicolor in settled dust indicated that cleaning for mold was ineffective.

Air sampling for fungi can be used to assist in determining if microbial particulate is being effectively kept out of occupied space during clean-up. Table 3 presents sampling data collected during removal of approximately m^3 of moldy wallboard (mostly Stachybotrys) from a water damaged envelope wall. The concentration of Stachybotrys increased by several orders of magnitude within the containment when moldy wallboard was being removed from the envelope wall. It is significant that some Stachybotrys spores were entering the occupied space indicating a deficiency in containment procedures. This finding indicated that spores were not adequately being confined within the containment during clean-up.

Table 1. Airborne fungal spores in room with a history of chronic leaks around windows

Spore Type	Spores/m?
Cladosporium	2,900
Penicillium/ Aspergillus	650
Stachybotrys	70

Collected by spore trap with a flow rate of 0.01 m? /minute

Table 2. Culturable fungi in settled dust in house where water damaged furniture had been temporarily stored

Predominant species	Frequency (%)

Aspergillus versicolor	50
Penicillium citrinum	26
Cladosporium cladosporioides	4
Aspergillus niger	3
Aspergillus ustus	3
other species	14

Rank order frequency of species recovered on malt extract agar by dilution plating

Table 3. Airborne Stachybotrys spores inside and outside a containment during clean-up

Location	Stachybotrys	Total Spores
	(spores/m^3)	
Inside containment, moldy materials not being handled	340	2,700
Inside containment, during handling of moldy materials	69,000	70,000
Outside containment	15	400

CLEANING OF MOLD - SPECIAL SITUATIONS

Hospitals. For more than two decades it has been known that incidence of infection (aspergillosis) among immunosuppressed patients is reduced when air entering a building is filtered [26]. Epidemics of aspergillosis in immunocompromised patients have been associated with the presence of fungal growth on surfaces in HVAC systems and with dust emissions associated with soil excavation, new construction, and interior renovations [21, 27].

Very conservative guidelines have been recommended to control and prevent exposure of immunocompromised patients to essentially all culturable fungal spores [21]. Procedures such as the following are recommended during renovation and clean-up work in hospitals: (a) isolate and negatively pressurize the remediation/clean-up area; rigid floor to ceiling, critical barriers are used to isolate patient areas from potential sources of culturable fungi, (b) administrative procedures are used to prohibit tracking of dusts into patient areas, (c) high quality air (spores absent) is provided to highly susceptible patients by point of discharge filtration in supply air ductwork, and (d) patient rooms are positively pressurized relative to areas containing fungal colonization and dusts aerosolized during cleaning and renovation. The conservative actions used to reduce incidence of fungal infection among immunocompromised patients provide a framework for guidelines that may be necessary in clean-up situations when highly susceptible people may be present in non-medical facilities.

Books, Paper, and Archives. The clean-up of books, paper, and archives damaged by floods and dampness involves a combination of discarding moldy items, drying out of wet materials, and removal of settled dusts. Fungi can grow rapidly on many of these materials because of the adhesives, gums, starch, etc., often present in book jackets and bindings and also because of the presence of delignified cellulose substrate.

Because of the susceptibility of books, paper, and archives to biodeterioration, the drying of

water damaged or damp materials is of critical importance. Freeze drying of water soaked material can be used in restoration because low temperatures arrest fungal colonization and evaporation of water molecules (subliming) lowers available moisture so that growth can not recur [28, 29]. A goal of restoration is to lower the moisture content of paper to its normal range, 5 - 7%, [30] where fungal growth does not occur.

Several simple techniques are available for removing superficial colonization from valuable materials. Miniature aspirators capable of applying a gentle suction to surfaces by a pipette nozzle can be used to carefully remove spores [28]. A small vacuum cleaner can be used to remove spores where a fine screen is placed firmly over the fragile material being cleaned [28]. All cleaning activities involving manual removal of colonization should be performed by persons with adequate personal protective equipment and preferably in a biosafety cabinet.

The cleaning of library materials which are not visually colonized but which were stored in buildings with mold growth problems is a challenge because of the enormous amount of paper surface potentially involved. The following activities can be effective in cleaning dusty library materials that had been stored in a moldy environment: (a) Vacuum (HEPA instrument) the top, bottom, and sides of books and files to remove settled dusts. (b) Vacuum and damp wipe the surfaces of shelves, file cabinets, desks and other non-porous fixtures. The visual presence of dust on books and on non-porous surfaces (e.g., shelves) in the library indicates unsuccessful cleaning. (c) Fan the pages of the books, files, and other archives in the immediate vicinity of the suction orifice of a HEPA vacuum. The objective is to reduce the amount of dust present on surfaces of library materials.

Residences. As a general principle, it is recognized that people should not live in moldy homes [5]. Clean-up of fungal colonization in residences differs from that in most large buildings because of occupancy and construction reasons. Occupants may be present 24 hours a day, 7 days per week in homes. Occupants of residences may also be specially sensitive or susceptible to fungal exposure (e.g., persons with immunosuppression diseases).

Most residences are smaller in volume than commercial and public buildings. In comparison to a large office building, a residence has a greater ratio of envelope surface (roof, exterior walls, basement) to air volume. There is a greater envelope surface where moisture may enter from precipitation or from the soil. Fungal growth problems in residences are increased by the use of porous biodegradable materials in damp locations such as basements.

Residences differ from office buildings because of the greater use of wood framing and pressed wood products in the former. Consequently wood rot fungi are more likely to be present in a residence with persistent moisture problems. Cleaning of mold in residences is often logistically difficult because of problems with access to biodeteriorated wood structural members in crawl spaces and attics.

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