Built-Up Roof Inspection Checklist

Building Name _____ Date: _____
Roof Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Built-Up Roof Inspection Checklist				
1. Are there holes, tears or abrasions?				
2. Are there fishmouths, buckles or wrinkles present?				
3. Is there surface coating deterioration noticed?				
4. Is membrane deterioration noticeable?				
5. Are dry side laps noticed?				
6. Is there evidence of debris, vegetation, ponding water or other contaminants?				
7. Are equipment supports inadequate?				
8. Are bare spots on aggregated surfaced roofs noticed?				
9. Is fastener backout condition noticed?				
10. Are loose or displaced wall or base flashings detected?				
11. Are flashings weather cracked or deteriorated?				
12. Are the mechanically fastened base flashings loose?				
13. Is the parapet wall cap damaged?				
14. Is the metal counter flashing damaged?				
15. Is the metal edge flashing damaged?				
16. Are damaged pitch pans noticed?				
17. Are interior drains obstructed?				
18. Are scuppers obstructed or damaged?				
19. Are expansion joint covers damaged?				
20. Are exterior gutters obstructed or damaged?				
21. Is the roof over 20 years old?				

Signature: _____ Date: _____

Single Ply Roof Inspection Checklist

Building Name _____ Date: _____
Roof Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Single-Ply Roof Inspection Checklist				
1. Are there holes, tears, abrasions cuts or punctures?				
2. Are there fishmouths, buckles, wrinkles or blisters present?				
3. Are damaged laps and splices noticed?				
4. Is localized membrane deterioration noticed?				
5. Are system securement deficiencies and unbonded areas of adhered membrane noticed?				
6. Are damaged fasteners noticed?				
7. Are deteriorated ballasts noticed?				
8. Is ballast scour noticed?				
9. Has shuffling (Shifting) of insulation below the membrane occurred?				
10. Has insulation compression or collapse occurred?				
11. Is there evidence of debris, vegetation, ponding water or other contaminants?				
12. Are equipment supports inadequate?				
13. Is membrane shrinkage noticed?				
14. Is chalking of white membranes noticed?				
15. Are loose or displaced wall or base flashings detected?				
16. Is there surface coating deterioration noticed?				
17. Are flashings weather cracked or deteriorated?				
18. Are termination bars loose or damaged?				
19. Are loose or displaced wall or base flashings detected?				

Single Ply Roof Inspection Checklist (Con't.)

Building Name _____ Date: _____
Roof Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Single-Ply Roof Inspection Checklist (con't)				
20. Are base flashings mechanically loosely attached?				
21. Is the parapet wall metal cap damaged?				
22. Is the metal counterflashing damaged?				
23. Is the metal edge flashing damaged?				
24. Are damaged pitch pans noticed?				
25. Are interior drains obstructed?				
26. Are scuppers obstructed or damaged?				
27. Are expansion joint covers damaged?				
28. Are exterior gutters obstructed or damaged?				
29. Are there walkways to all mechanical equipment?				
30. Is the roof over 10 years old?				

Signature: _____ Date: _____

Built-Up Roof Inspection Checklist Definition

1. **Holes, Tears, and abrasions**: A visual check for obvious openings that can lead to water leakage.

2. **Fishmouths and buckles**: Fishmouths are openings where two roofing membranes have separated. Ridges, buckles and wrinkles are significant raised areas or protrusions in the roof area, and are the same as blisters.

3. **Surface coating deterioration**: A visual check showing alligatoring (like the skin of an alligator), crazing (hairline cracks) or eroding of surfaces.

4. **Membrane deterioration**: deterioration of the sub-surface material.

5. **Dry side laps**: Where roofing gets lapped over. Waterproofing materials put onto the side laps is dried out and is no longer functioning.

6. **Debris vegetation and ponding water**: Is there vegetation (moss, growing things) growing in the roof? Does standing water collect on the roof?

7. **Inadequate equipment supports**: Are rooftop equipments installed on proper equipment supports?

8. **Bare spots**: Where roof gravel or pearock is moved or relocated, leaving the roof membrane exposed and subject to weather elements

9. **Fastners backed out**: Are the fasteners holding the roof flashing in place tightly?

10. **Loose/displaced wall and base flashings**: Have flashings moved from the original position and created openings? Open laps or exposed field membrane expose the field membrane to the elements.

11. **Weather cracked**: Are non-metallic flashings weather cracked or deteriorated?

12. **Loose mechanical attachment**: Have flashing fastening devices become loosened or fallen off?

13. **Damaged parapet cap**: Is the cap on building parapet wall designed to repel water removed or damaged?

14. **Damaged metal counterflashing**: The counterflashing on the wall side pulling away from the wall exposing the top of the roof membrane.

15. **Damaged metal edge flashing (drip edge or gravel stop):** Have roof edge flashings become loose or damaged allowing water penetration at the edge of roof?
16. **Pitch pan**: A pan containing pitch (a soft tar) surrounding the base of a

pole or other device that extends from the roof, designed to adapt to wind movement and remain sealed.

17. **Interior drains**: Are roof drains leading into and through the building plugged or obstructed?

18. **Scuppers**: Openings on side of parapet wall to drain roof water as overflows. Are they damaged or blocked?

19. **Expansion joint**: Cap or covering over the expansion joint intact?

20. **Exterior gutters**: Roof draining water collection system designed to channel water to a drain off the roof. Are they obstructed, damaged and leaking?

21. **Roof over 20 years old?** In general, the average life expectancy of a built up roof is 20 years.

Single-Ply Roof Inspection Checklist Definition

1. **Holes, Tears, and abrasions**: A visual check for obvious openings that can lead to water leakage.

2. **Fishmouths and buckles**: Fishmouths are openings where two roofing membranes have separated. Ridges, buckles and wrinkles are significant raised areas or protrusions in the roof area, and are the same as blisters.

3. **Damaged laps & splices**: Laps and splices are membrane seams where the roof membranes are adhered together. Are they damaged or open?

4. **Localized membrane deterioration**: Pea rock has been pushed away exposing areas where the sun has deteriorated the membrane.

5. **System securement deficiencies**: Fasteners pushing or pulling away from the roof, glued surfaces separating from the roof. Roof is curling or buckling.

6. **Damaged fasteners**: Mechanical fasteners used, not glue. Visual inspection reveals damage.

7. **Deteriorated ballast**: Round river rock becoming cracked with sharp edges due to wind and weather.

8. **Ballast scour**: Water or wind pushing pearock away, exposing the membrane to elements.

9. **Shifting of insulation**: Where insulation below is unsecured and has moved.

10. **Insulation collapse**: Insulation (usually styrofoam) is compressed, revealing an indentation or depression.

11. **Debris vegetation and ponding water**: Are there things growing in the roof? Does standing water collect on the roof?

12. **Inadequate equipment supports**: Are rooftop equipments installed on proper equip supports?

13. **Membrane shrinkage**: Membrane materials have shrunk and are pulling away from the walls and joints.

14. **Chalking**: Breakdown of the white membrane into a chalky substance, causing deterioration

15. **Loose/displaced wall and base flashings**: Have flashings moved from the original position and created openings? Open laps or exposed field membrane expose the field membrane to the elements.

16. **Surface coating deterioration**: A visual check showing alligatoring, crazing or eroding of surfaces.

17. **Weather cracked**: Are non-metallic flashings weather cracked or deterioiated?

18. **Loose or damaged termination bar**: A termination bar is a strip of metal that is fastened up on (or to) a parapit wall or the wall of a building, that secures the ends of the roofing membranes/materials.

19. **Loose/displaced wall and base flashings**: Have flashings moved from the original position and created openings? Open laps or exposed field membrane expose the field membrane to the elements.

20. **Loose mechanical attachment**: Have flashing fastening devices become loosened or fallen off?

21. **Damaged metal cap**: Is the cap on building parapet wall designed to repel water removed or damaged?

22. **Damaged metal counterflashing**: The counterflashing on the wall side pulling away from the wall exposing the top of the roof membrane.

23. **Damaged metal edge flashing (drip edge or gravel stop)**: Have roof edge flashings become loose or damaged allowing water penetration at the edge of roof?

24. **Pitch pan**: A pan containing pitch (a soft tar) surrounding the base of a

pole or other device that extends from the roof, designed to adapt to wind movement and remain sealed.

25. **Interior drains**: Are roof drains leading into and through the building plugged or obstructed?

26. **Scuppers**: Openings on side of parapet wall to drain roof water as overflows. Are they damaged or blocked?

27. **Expansion joint**: Cap or covering over the expansion joint intact?

28. **Exterior gutters**: Roof draining water collection system designed to channel water to a drain off the roof. Are they obstructed, damaged and leaking?

29. **Walkways**: Without walkways, persons walking on roof could cause pea gravel etc. to penetrate the roof.

30. **Roof over 10 years old:** In general, the average life expectancy of a single ply roof is 20 years.

ROOF SYSTEMS

The roof system on all buildings is the most important component in keeping water out of the building interior. The main types of installed roof systems are listed below:

A. Built-up roofs (Standard and modified) - Built-up roofs (BUR) have been used for 100 years. Recently the industry has added modifiers to the asphalt used in built-up roofs to improve performance.

B. Single-ply roofs (fully adhered, mechanically fastened, ballasted) - Single ply roofs have been used in the industry for the last 20 to 25 years and come in several varieties (EPDM rubbers, PVC, Plastic and APP, etc.)

C. Other types of roof systems that are sometimes used in school settings include metal, cedar shakes and asphalt shingles.

DESIGN OF A ROOF SYSTEM

A. Roofing systems are designed to keep moisture out of a building for 5 to 35 years depending on use, existing condition and quality of the system. A roof consultant or architect should be used when designing a roof system. Before a system is chosen, the following data should be considered and reviewed with the roof designer:

1. Budget - What is the entire cost and what is the cost per square foot per year. The total cost should be considered via value added or life cycle cost.
2. Use of building area (pool, gym, classroom, etc.)
3. Expected life of building
4. Amount of roof traffic
5. Construction of the existing building (metal deck, concrete deck, etc.)
6. Future use of building
7. Energy needs
8. Contractor availability (quality, etc.)
9. Season work is to be performed (Summer is the best time to roof)

OPERATION AND MAINTENANCE OF THE ROOF SYSTEM

A. Preventative Maintenance - The roof should be inspected at least twice per year and after any severe weather conditions to ensure that there are no obvious problems to the system. The checklists for performing these inspections can be found in the preceding checklist. Because winter is the hardest season on the roof system, biannual roof inspections should be performed in the fall just before winter to ensure the roof is in satisfactory condition, and in the spring to ensure the roof was not damaged during the winter. The biannual roof inspections should be performed by a competent person who is knowledgeable in the present roof systems. If the school district does not have a person that can perform these inspections, this service should than be contracted out.

B. Roof Management Plan - All schools in the state of Minnesota should have a Roof Management Plan in place. At a minimum the following items should be included in the Roof Management Plan:

1. Name of building
2. Type of roof systems that are present
3. Estimated square footage of each section
4. Installation date on each section of roof
5. Name of contractor that installed each section of roof
6. Warranties for each section of roof
7. Log of all roof repairs performed for each section of roof
8. Regular maintenance schedule for each section of roof
9. Estimated date of replacement for each section of roof

C. Regular Maintenance - Below is a regular maintenance schedule for various roof systems. For more specific details on this topic please, consult the School's Roof Management Plan.

1. BUR - Resurface every 12 to 25 years. Resurface flashing every 5 to 8 years
2. Single ply - Replace flashings every 5 to 10 years
3. Metal roof - Resurface seams every 5 to 8 years
4. All other types of roof systems please consult the School's Roof Management Plan

D. Repair - All roof repair work shall be performed after school hours. Roof repairs shall be performed by a qualified roofer. All roof top fan units and HVAC penetrations near the work area should be shut down and sealed with polyethylene sheeting while roof work is being performed. At the completion of the roof project, remove all polyethylene sheeting from the HVAC system and inspect each component for proper operation.

E. Leaks - Leaks can happen on all ages and on all types of roof systems. In the event of a leak, the following actions should be taken:

1. All leaks should be repaired by a qualified roofer.

2. The reason for the leak shall be determined and action should be taken to correct the problem.

3. Perform roof inspection on the affected areas using the checklist found above.

4. Once the roof is repaired, complete the maintenance service log and place in the Roof Management Plan.

5. Make sure that all stains, wet ceiling tile and other building materials are properly cleaned and dried immediately following the roof leak.

6. If in doubt about the size of the leak, perform an infrared survey of the affected area. For further information on infrared photography, see Section "F" Diagnostics.

F. Diagnostics - There are many different types of diagnostic tools that can be used to determine if a roof system is leaking. The most precise and thorough method of detecting roof failure is by infrared photography. A professional will have to perform this type of work since the cost of the equipment is high and the person running the camera requires special training. Infrared photography will show if and where there is wet roof

insulation. From this information, a determination of the location of the roof problem can be made. Moisture meters can also be used to determine if the roof system is leaking. Extreme caution should be taken when using prong moisture meters since piercing the roof membrane may void the roof warranty. Before piercing the roof membrane, please consult your roof warranty. All holes created by pronged moisture meters must be repaired immediately.

SOURCES:

1. "NRCA Roofing and Waterproofing Manual", National Roofing Contractor's Association, 1996.

2. "Manual of Roof Inspection, Maintenance and Emergency Repair for Existing Single-ply Roofing Systems", Single Ply Institute and National Roofing Contractor Association, 1992.

3. "Manual for Inspection and Maintenance of Built-up and Bitumen Roof Systems: A Guide for Building Owners", Asphalt Roofing Manufacturers Association and National Roofing Contractors Association, 1996.

Preventative Maintenance Checklist

The preceeding checklist is presented only as a guide to help the school district to develop their own checklist. Since various types of wall construction and windows and doors are used to build school facilities, the checklist will need to address the unique characteristics and requirements of each type of construction or materials used. The example checklist printed above is set up for semiannual inspections.

Interior Walls, Windows and Doors Inspection Checklist

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Window and Doors Inspection Checklist				
1. Is there water or water staining around the perimeter? If yes, indicate locations.				
2. Is there presence of moisture on glass or other windows and door surfaces? If yes, indicate locations?				
3. Are there gaps and cracks in weather stripping around doors and windows? If yes, indicate locations.				
4. Do doors and windows open and close smoothly? If no indicate locations.				
5. Is there cracking, checking or peeling of paint and/or sealant on or around doors and windows? If yes indicate locations.				
6. Are there other observations about conditions of doors and windows? If yes indicate locations.				
Interior Walls Inspection Checklist				
7. Is there presence of moisture and/or staining on wall surfaces? If so indicate locations.				
8. Is there cracking, checking or peeling of paint and/or wall coverings? If so indicate locations.				
9. Are there other visual observations about the condition of interior walls? If so indicate locations.				
10. Is there visible mold?				

Exterior Walls, Windows and Doors Inspection Checklist

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Windows and Doors Inspection Checklist				
1. Is there presence of moisture and/or staining on windows and doors? If so indicate locations.				
2. Is there cracking, checking or peeling of paint and/or sealants on or around windows and doors? If so indicate locations.				
3. Are drainage holes plugged? If so indicate locations.				
4. Are flashing and lintels (or drip cap) rusting and deteriorating? If so indicate locations.				
5. Are there other visual observations concerning the condition of windows and doors? If so indicate locations.				
Masonry Walls Inspection Checklist				
6. Are mortar and expansion joints cracked, crumbling or broken? If so indicate locations.				
7. Is there presence of staining or effervescence on the surface of the wall? If so indicate locations.				
8. Are masonry units cracked, spalling, broken or missing? If so indicate locations.				
9. Are weep holes plugged or blocked? If so indicate locations.				
10. Does grade allow rainwater to collect at or near walls? If so indicate locations.				
11. Do leaders direct water away from roofs?				
12. Is metal flashing rusting or deteriorating? If so indicate locations.				
13. Are there other visual observations concerning the condition of the exterior walls? If so indicate locations.				

Walls, Windows and Doors Inspection Checklist (Con't.)

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Wood or Composite Walls Inspection Checklist				
13. Is paint or sealant cracking, checking or peeling? If so indicate locations.				
14. Is there any discoloration or staining of surfaces? If so indicate locations.				
15. Is rotting or splitting of surfaces noticed? If so indicate locations.				
16. . Are there other visual observations concerning the condition of the exterior walls? If so indicate locations.				

Signature: _____ Date: _____

Semiannual Checklist ☐ Fall ☐ Spring

Preventative Maintenance Checklist

The preceding checklist is presented only as a guide to help the school district to develop their own checklist. Since various types of wall construction and windows and doors are used to build school facilities, the checklist will need to address the unique characteristics and requirements of each type of construction or materials used. The example checklist printed above is set up for semiannual inspections.

Wall Checklist Definitions

Inspection of Interior Surfaces

1&7. Water and staining: Is there visible water or evidence of water? Is there staining, discoloration?

2. Moisture on glass: Is there fogging or beading inside of glass?

3. Gaps or cracks: Does examination of weather-stripping shows cracks or gaps?

4. Window or doors opening smoothly: Are they warped or jammed due to moisture?

5&8. Cracking, checking or peeling of paint: Occurs when paint or sealant is no longer smooth or adherent as when originally applied.

6&9. Visual observations: Examine window from several angles. Don't overlook obvious deformities. Perhaps check at several times under different weather conditions.

10. Visible Mold: Coloration may be black, brown, yellow or grayish.

Inspection of Exterior Surfaces

1&14. Same as #1 above

2&13. Same as #5 above

3. Drainage holes plugged: Also called weep holes. Find them if they exist and determine if they are plugged or contain debris.

4. Flashing and lintels: A lintel is the support area above window. A drip cap is flashing at the head of the window. Flashing draws water away from top of window and door. Examine for rust and deterioration.

5. Other visual observations: e.g. rusting of door bottoms, hollow metal frames, and thresholds.

6. Mortar & expansion joints: Mortar is the area between the bricks and blocks. Expansion joints are the movable seams built into a wall. Examine for deterioration.

7. Staining or effervescence: The deterioration of the brick by leaching of limestone by water intrusion.

8. Cracked, spalling: Breakup into chips of fragments, to chip or crumble

9. Weep holes: Are the drainage holes plugged or blocked?

10. Grade: Is ground sloped toward or away from the building. Ground should be sloped away from the building to permit drainage. Is there any evidence of water collection?

11. Metal flashing: Flashing over the wall openings (e.g. air intakes, any type of wall penetration).

12. Other visual observations --e.g. are walls moving, cracking, corners coming out, building out of plumb? Building plumb should be checked at least twice a year with a transit (not just eyeball). Otherwise, small shifts (.5”-1” per year) would be missed.

15. Rotting or splitting: Evidence that paint or sealant has failed and an entry pathway for moisture.

16. Other visual observations: Irregular shape, bowing, rippling, splitting, irregular coloring, evidence of pest or rodent infestation (termites, woodpeckers, beavers).

BUILDING ENVELOPE – WALLS

- Walls and Indoor Air Quality

  The primary functions of walls are to:

  a. Support the roof and transfer the roof load to the foundation.

  b. Provide a barrier between the outdoor and indoor environments so that the indoor conditions can be controlled to satisfy human comfort levels.

  c. Protect interior spaces and building furnishings from moisture and dirt intrusion.

  d. Protect the interior spaces and property from unwanted traffic and intruders.

  e. Divide the interior spaces into functional areas.

  In order for the walls to perform the above functions, they must be designed correctly, installed properly, and be maintained as recommended. Since this document is primarily concerned with existing structure, the main focus of this document will be the maintenance and repair of walls.

  Besides maintaining the functions of a wall, proper maintenance and repair of walls will also help to reduce the number of indoor air quality incidents. This is due to the fact that a significant number of indoor air quality problems are caused by improperly or poorly maintained, designed or installed wall systems. In most cases, when a wall failure is linked to an indoor air quality problem, moisture infiltration had occurred. Therefore, the wall failed to provide the primary function of protecting the interior from moisture intrusion.

  In addition to damaging building materials and furnishings, moisture infiltration usually encourages mold growth. The mold then can affect indoor air quality to the point where building occupants may experience allergy-like symptoms or even become ill. Therefore, the school district must develop and implement a preventative maintenance (PM) program that will help to ensure wall function. In addition, the wall PM program should ensure that repairs are performed on a timely basis.

  <u>Preventive Maintenance Program</u>

  Since many types of wall systems have been installed, the focus of the document will be to provide guidelines so that the school district can develop and implement a PM program specific to each building wall system. These guidelines will include information on the most common type of walls in use, how to get PM program started, moisture infiltration paths and causes, and do's and don'ts.

  - Frequency of inspection - the frequency of PM inspections will need to determined by contacting the architect or contractor. However, the minimum number of inspections should be twice per year (Fall and Spring).

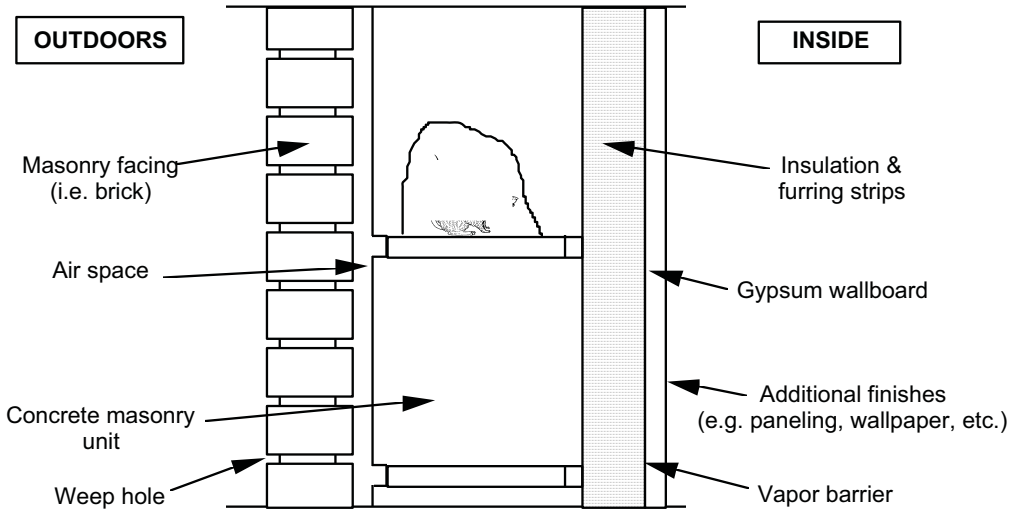
  - Moisture detection and evaluation - instrumentation is available to measure moisture levels in building materials. These instruments are helpful in diagnosing suspected moisture problems and provide information on the extent of the moisture problem.

Instrumentation available includes non-destructive conductivity meters and infrared thermography. Proper interpretations of these instruments require varying levels of expertise. Therefore, the district will need to determine if purchasing, renting, or hiring a consultant is the most practical.

A. Illustrations of Example Wall Systems

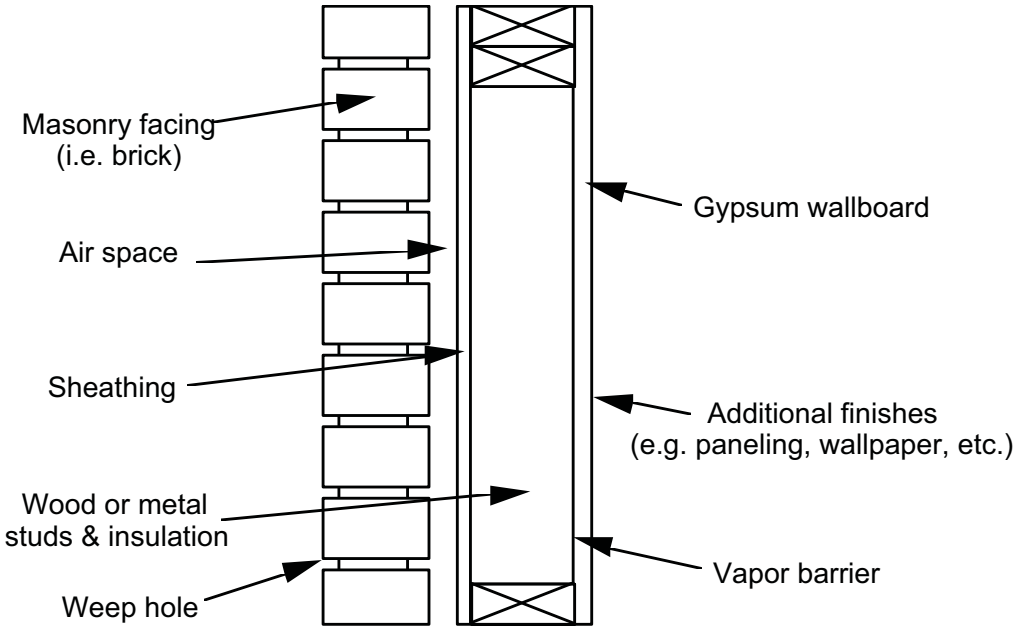
1. Masonry Walls

The most common type of wall system used today is the masonry wall. The components of a typical masonry from the outside in includes an exterior brick facing, an air space, masonry block, insulation and furring strips, and gypsum wallboard or plaster. The typical masonry wall is illustrated below:



2. Combination Walls

The combination wall usually includes an exterior masonry brick, an air space, sheathing, wood or metal studs, insulation, and gypsum wallboard. The typical combination wall is illustrated below:



3. Other Walls

Other walls can include any of the following types:

Non-load bearing walls containing load bearing metal or masonry columns. The non-load bearing portion can be constructed primarily of masonry units, metal or wood studs, or combination of the two.

Wood or metal stud walls and masonry walls with wood or composite exterior finishes

- Other Wall Components

  Besides actual construction materials, most exterior walls contain windows, doors, and other openings such as fresh air intakes and pipe penetrations.

B. Preventative Maintenance Program Start-Up

1. Determine and become familiar with the type of wall system for the building.

   a. Obtain structural and architectural drawings for the building.

   b. Locate and copy drawing details of wall construction including window, door, and other opening details. The copies of the details should be included with the PM program manual.

2. Obtain information and recommended maintenance practices from the architectural/engineering firm who designed the building.

3. Obtain information and recommended maintenance practices from window and door manufacturer(s).

4. Develop PM checklists for those components that need to be inspected. Typically, more than one checklist is developed depending on how frequently a wall component needs to be inspected. For example, a monthly, quarterly, or semi annual checklist can be developed for only those wall components that need frequent monitoring. Then an annual (or other longer period, e.g., biennial) checklist can be developed for those components that require less frequent inspections. The annual (or longer time period) checklist usually includes the wall components from the shorter term checklist.

- Additional Information on Walls

  All walls are subject to some moisture infiltration. Moisture will tend to migrate from areas of high temperatures and moisture or humidity levels to areas of lower temperature and moisture levels. Therefore, walls must be designed, constructed and maintained properly to effectively deal with the moisture load.

  The following list summarizes activities or situations that should be considered:

  1. Avoid placing impermeable materials, including vinyl wallpaper, blackboards, etc., on interior surfaces of exterior walls. This will tend to trap moisture behind the impermeable surface and lead to mold growth.

  2. Avoid the mounding of dirt up against the side of a building to improve drainage unless the landscaping change has been approved or designed by an architect or engineer. You can inadvertently cover up or block building drainage, weep holes. Trees which are too close to the building may have root systems which push through the foundation.

  3. Direct rainwater away from the side of a building.

  4. All porous materials that have been subject to water should be cleaned and dried immediately or replaced.

  5. Report and/or correct moisture problems in a timely fashion. Failure to do this will likely lead to mold growth and IAQ problems.

  6. Keep lawn sprinklers from spraying water onto the exterior walls.

Floor Inspection Checklist

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Types of Floors				
1. Is flooring type On-Grade Concrete present?				
2. Is flooring type below--grade concrete present?				
3a. Are tunnels or crawl spaces--dirt floor present?				
3b. Are tunnels or crawl spaces--concrete present?				
4a. Are above grade floors--concrete present?				
4b. Are above grade floors--wood				
5. Are vapor barriers beneath on-grade concrete present?				
6. Are seams and cracks present?				
Types of floor finishes				
7a. Is carpet with adhesive present?				
7b. Is carpet without adhesive present?				
8. Is ceramic tile present?				
9. Is Terrazzo present?				
10. Is vinyl flooring present?				
11. Is carpet present on below-grade flooring?				
Carpet Concerns				
12. Is carpet located close to the entry?				
13. Do you have floor mats at the door?				
Radon Concerns				
14. Is Radon an issue in any lower area?				

Floor Inspection Checklist

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Scheduled Maintenance/Inspections				
15a. Are there weekly inspections for water intrusion?				
15b. Are all water intrusion episodes (e.g. leaking pipes) investigated?				
16. Do maintenance staff respond to all complaints involving flooring?				
17. Are floor finishes (including underside) inspected annually?				
18a. Have all yard projects been reviewed for drainage compatibility?				
18b. Does landscaping contribute to proper water drainage?				
18c. Is drain tile installed?				
18d. Are below-grade water sources (wetlands, high water table) present near the building?				

Floor Inspection Checklist (Con't.)

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Possible Scenarios of Water Intrusion Interior Sources--leaking pipes or drains. Is the source of standing water identified?				
19. Are leaking pipes present in bathrooms?				
20. Are leaking pipes present in locker room showers?				
21. Are leaking pipes present in the swimming pool area?				
22. Are leaking pipes present in mechanical ventilation areas?				
24. Are leaking pipes present in Kitchen areas?				
25. Are leaking pipes present in Industrial Arts shop areas?				
Exterior Sources--leaking pipes or drains				
26. Does water enter the building from the surrounding landscape?				
27. Does the yard drainage system contribute to water in building?				
28. Does the roof drainage system contribute to water in building?				
29. Does below grade water contribute to water in building?				
Indicators -- Moisture. Look for evidence of water				
30. Is visible or pooling water noticed?				
31. Does tile or cement appear damp?				
32. Are there water stains on carpet?				

Floor Inspection Checklist (Con't.)

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
33. Is there present popping or curling floor tiles or sheet goods?				
Indicators -- Odors				
34. Are musty, moldy or other decay odors present?				
35. Are odors present where water is or was present?				
Indicators -- Mold				
36. Is mold noticeable or visible on or under carpeting?				
37. Are dark stains appearing in tile cracks or tile grouting?				
38. Is mold growing behind walls or above ceilings?				
Areas To Check				
Tunnels and crawl spaces				
Carpets				
Hard Floors, Terazzo				

Floor Inspection Checklist (Con't.)

Building Name _____ Date: _____
Area Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
Corrective Action Checklist -- May be prudent to have outside professionals do work.				
Pipe or Drain Leak Identified				
1. Fix leaking pipe or drains				
2. Thoroughly dry water damaged carpeting.				
3. Inspect flooring (plywood, etc.) for damage and replace as necessary.				
4. If sewage or other contaminants are present in the water, then replace damaged carpet.				
Review water intrusion on on-grade or below- grade flooring, other than pipes or drains.				
5. Replace carpeting. Review need for carpet.				
6. Review mechanical ventilation systems and investigate their ability to exhaust moisture.				
7. Review yard and roof drainage systems.				
Evaluate condensation on flooring				
8. Review housekeeping practices.				
9. Review mechanical ventilation system and investigate its ability to exhaust moisture.				
10. Remove any sources of humidity.				
11. Using a moisture meter, check for sub-surface (below finish) water intrusion.				
12. Review operational sources of moisture (e.g. kitchen, shower, pool, laundry)				

Signature: _____ Date: _____

Definitions and Comments

1. On-grade concrete: Slab on grade. Concrete is level with grade, and there is no excavation.

2. Below grade concrete: Concrete slab is below grade. There is a basement floor. Excavation is involved.

3. Tunnels are present, with either a dirt or cement flooring material.

4. Flooring that you must step up to reach, with either cement or wood base.

5. Layer of poly or equivalent material beneath flooring?

6. Are seams and cracks sealed? Is there a continuous vapor barrier?

7. Carpet will be fastened by either an adhesive or by being tacked down at the edges.

8-10. Request verification of types of floor coverings: ceramic tile, Terrazzo or vinyl flooring.

11. If carpet is present below grade, recommend review of its potential contribution to indoor air quality. If being considered for installation, recommend review of potential moisture sources that can contaminate the carpet and lifecycle maintenance needs.

12-13. Carpet located close to entry may never dry properly, leading to mold growth. Floor mats at doors will help prevent dirt distribution throughout the building--useful since “sneaker” style shoe soles capture more dirt than yesterday’s flat soles.

14. Radon can enter areas where there are internal openings to the ground. Best to check for levels.

15. Thoroughness in inspecting for water intrusion and the investigation of discovered events cannot be overemphasized. A policy of “zero-tolerance” for moisture should be adopted and carried out.

16. All reports should be evaluated and discrepancies followed up on.

17. A critical examination of all floor finishes, at least annually, is a very important element of preventive maintenance.

18. A source which must be continually evaluated is surface and sub-surface water. All evidence of water intrusion from these sources should be followed up on aggressively.

19-25. Leaking pipes can be found in functional areas where water is used?

6-29. Contributions can be made from several drainage and water sources.

30-33. Searching for physical evidence of water--past and present.

34-35. Searching for olfactory evidence of water.

36-38. Searching for indirect evidence of water through mold growth.

Building Envelope – Flooring Systems

The flooring system serves as a barrier between the building interior and the ground the building is constructed upon. There are four main types of flooring (1) on-grade concrete, (2) below grade concrete, (3) tunnels or crawl spaces, and (4) above grade floors. These floors are often finished with a system designed for comfort and aesthetics. The system can be carpeting with adhesive, carpeting without adhesive, ceramic tile, terrazzo, or vinyl flooring. It is this complete system which has the potential to play a significant role in indoor air quality.

The flooring system is an often overlooked component of the building envelope regarding indoor air quality. Direct contact with the ground allows for a pathway for moisture to move into the building. If water infiltration does occur, the flooring finishes can become a site for microbial growth.

Careful planning, preventive maintenance and periodic inspections can all help limit the amount of moisture entering a building, and if infiltration does occur, limit the amount of microbial growth.

Preventive maintenance and inspections should be conducted at least twice a year or in response to any complaint or accident. These inspections should include visually reviewing the school yard drainage systems, the roof drainage systems, all piping systems indoors (see mechanical section), and all on-grade or below grade concrete or dirt surfaces. Identification of any standing water or damp materials should initiate action to identify the source and make necessary repairs. Moldy and musty odors or visual identification of moldy or stained flooring are indicators of a possible problem.

Diagnostic procedures include tracking any water to its source, or finding the nutrient source of any microbial growth. When flooring systems are involved, diagnostic procedures should include some professional assistance by the appropriate experts (e.g. IAQ specialist, landscape architect, HVAC Engineer, etc.). However, some investigation can be conducted without direct assistance. For instance, maintenance personnel can use their nose to track the approximate locations of microbial growth, or a conductivity (moisture) meter can be used to identify the location of "wet" materials.

Specialists may use any of the following methods for diagnosis: (1) microbial sampling, (2) concrete/soil core samples, (3) water vapor transmission analysis, and (4) conductivity meters. Many other diagnostic methods exist which are used when different situations exist, and usually any one method will not be enough to identify the source of a problem. It is this wide array of methods and their complexity which often require the appropriate specialist or team of specialists.

Corrective actions must be taken immediately upon identifying the source of a problem. It is important to realize that simply "cleaning up" microbial growth or replacing damaged flooring isn't enough. The root-causes of the problem must be identified and corrected or the problem can potentially return.

New construction or renovation must include a thorough review of the surrounding landscape and the specific construction of the flooring systems. When constructing an addition or new building, changes to the school yard drainage system need to be addressed. Further, additions to a building may lead to changes in the roof drainage system which could affect drainage around the school building. When concrete is planned, all concrete must be separated from the ground by a proper vapor barrier. Flooring finishes should be selected with consideration of the concrete and yard drainage system. For example, carpet should not be placed on below grade concrete or on concrete located on ground with areas of poor drainage.

Use the previous checklist to periodically inspect all flooring systems. Checklists sections are also included for inspecting the roof drainage system and indoor plumbing in the event that a complaint is filed or a water "event" has occurred. Any "needs attention" responses on any checklist should lead to further investigation. Some suggestions for assistance and possible scenarios are provided on the checklist in the event that a problem is discovered. Keep a revert of all inspections as well as any corrective actions that were taken.

References

National Concrete Masonry Association (NCMA); 2302 Horse Pen Road Herndon VA 20171-3499; Phone 703/713-1900

American Floor Covering Association; 2211 E. Howell Ave., Anaheim CA; Phone 714/978-6440

Upper Midwest Floor Covering Association; 6110 Hodson Road, Lino Lakes MN 55014; Phone 612/481-0440

American Concrete Institute; P.O. Box 19150, Redford Station, Detroit MI 48219; Phone 313/532-2600

American Society of Landscape Architects; 636 Eye Street N.W., Washington D.C. 20001-3736; Phone 202/898-2444

Housekeeping Inspection Checklist

Building Name _____ Date: _____
Housekeeping Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
1. Dust and Dirt Control--Carpeted Surfaces				
Traffic, use and location in building evaluated to determine frequency of cleaning?				
Vacuumed at least every other day?				
Areas where food consumed vacuumed daily?				
Areas where students read, sit and recline on the floor vacuumed daily?				
Special education activity areas vacuumed daily?				
Areas where heavy soiling occurs vacuumed daily?				
Aggressive vacuuming done?				
2. Dust and Dirt Control--Non-Carpeted Surfaces				
Traffic, use and location in building evaluated to determine frequency of cleaning?				
Stairways evaluated for vacuuming?				
Shops evaluated for vacuuming?				
3. Dry Vacuum Equipment				
Filtration of 99% of one-micron particles?				
Does it have two stages--cloth and paper?				
Disassembly and Cleaning of Vacuum				
Traffic, use and location in building evaluated to determine frequency of cleaning?				
Is equipment cleaned and maintained per manufacturer's instructions after use?				
4. Wet Vacuum Equipment				
Is equipment cleaned and maintained per manufacturer's instructions after use?				

Housekeeping Inspection Checklist (Con't)

Building Name _____ Date: _____
Housekeeping Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
5. Wet Extraction (steam cleaning) - Carpet Cleaning				
Traffic, use and location in building evaluated to determine frequency of carpet cleaning?				
Water removed by the wet-vac or evaporation within 24 hours?				
Carpet dried within 24 hours?				
Is there low relative humidity in building or air exhaust and makeup air to dispose of evaporated moisture?				
Is heat and/or air conditioning used to remove moisture?				
Is cleaning scheduled during cold weather or low outside humidity?				
Is carpet dry before replacing furnishings?				
Is equipment cleaned and maintained per manufacturer's instructions after use?				
6. Dry Shampooing-Carpet Cleaning -- For lightly soiled areas				
Traffic, use and location in building evaluated to determine frequency of carpet cleaning?				
Filtering associated with vacuuming installed and working correctly ?				
Is equipment cleaned and maintained per manufacturer's instructions after use?				
7. Buffing and Burnishing				
Has proper floor preparation been done?				
Burnishing gear checked periodically for excessive emissions?				
Collection bag and dust shroud not leaking and is tight to the floor?				
Is equipment cleaned and maintained per manufacturer's instructions after use?				

Housekeeping Inspection Checklist (Con't.)

Building Name _____ Date: _____
Housekeeping Identification: _____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other: _____

Component	OK	Needs Attention	Not Applicable	Comments
8. Wall Washers				
Does high water pressure force water into hidden recesses (e.g. behind walls and into carpets)?				
9. Dusting, Dust Mopping and Sweeping				
Are surfaces dusted frequently, especially in computer areas?				
Are dusting methods used to reduce airborne dust?				
10. Dust Mops				
Are dust mops maintained correctly?				
Are mops shaken outside near entryways or air intakes?				
Treatment applied to capture tiny particles?				
11. Sweeping				
Is a sweeping compound being use?				
Is compound water-based and disposable?				
12. Fumes-Waxing and Finishing Flooring				
Is there adequate ventilation?				
Has product VOC's been checked?				
Is sufficient time allowed to draw off fumes?				
Can work be performed on non-occupied days?				
Are MSDS's available and onsite for all chemicals?				
13. Housekeeping Cleaning				
Are environmentally friendly chemicals being used?				
Is there adequate ventilation?				
Is product properly diluted?				
Is sufficient time allowed to draw off fumes prior to occupancy?				

Signature: _____ Date: _____

Housekeeping Checklist (Con't.)

Building Name _____ Date: _____
Housekeeping Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
14. Air Fresheners				
Are air fresheners used?				
Is thorough cleaning being done?				
Is there adequate ventilation?				
Is the product properly diluted?				
Can a non-smelling cleaning product be substituted?				
15. Pesticides				
Is U.S. EPA's Integrated Pest Management plan in place?				
Is the correct pest control method being used?				
Is a trained, responsible person administering the pest management plan?				
16. Exterior Duties--Herbicide, Fungicide and Fertilizer Applications				
Is there a management application plan in place?				
Has the applicator received the proper training?				
If necessary, is the applicator licensed?				
Are rules in place to minimize/eliminate student contact and building contamination?				
17. Chemical Storage				
Are containers clean and tightly sealed?				
Is there a storage management plan in place?				
Are containers checked for leaks?				
Is there adequate ventilation?				
Are MSDS's onsite and available?				

Signature: _____ Date: _____

Housekeeping Checklist (Con't.)

Building Name _____ Date: _____
Housekeeping Identification:_____
Reason for Inspection ☐ Biannual ☐ Complaint ☐ Other:_____

Component	OK	Needs Attention	Not Applicable	Comments
18. Mold				
Has the building been inspected for water intrusion?				
Has mold been found in wet areas?				
Has the mold been tested?				
Can the mold be cleaned and disinfected by staff?				
Is remediation needed?				
Has the water intrusion been stopped?				
Have water damaged materials been removed?				
Is encapsulation needed?				
Have steps been taken to prevent recurrence?				

Signature: _____ Date: _____

Building Name_____
Date_____

From a housekeeping point of view, there are four major areas of concern that affect indoor air quality. They are:

* Dust: (including paper, wood, house, cleaning source)
* Fumes
* Chemical vapors, and
* Mold

Dust:

Dust is controlled by several methods. It is hoped that the reader will find the following comments on each variety of dust capturing system listed below useful.

1. Dust and Dirt Control - Carpeted Surfaces: It is recommended that carpeted surfaces be vacuumed at least every other day and preferably each day for contaminants that fall into the carpet, such as food, outside dirt, and work-generated materials like art supplies, industrial art materials, photocopy materials and similar items.

In some cases, vacuuming each day is inescapable. These areas include
* food-consumption areas (even if a one time event),
* areas where kids are on the floor
* special education activities areas, and
* areas where carpet is installed and heavy soiling occurs (routinely or one time), like art rooms, shops, kitchen, cafeteria, labs, as well as some administrative areas.

The recommendation of how often to vacuum should rest on local conditions. If when vacuuming an area aggressive methods must be used (e.g. going over the same spot several times, listening for the sound of material being drawn up to subside) then a more frequent schedule should be adopted. Other factors like traffic, use, and location in the building should help determine frequency too.

2. Dust and Dirt Control - Non-Carpeted Surfaces: Consideration may be given to vacuuming non-carpeted surfaces too, like stairways and shops, if vacuuming will successfully draw the material up from the floor. Thus, house and construction dust are minimized.

3. Makeup of Vacuum: The vacuum used should have at least two filtering stages: cloth and disposable paper. The paper filter must be used--vacuuming with only the cloth stage will defeat efforts to collect the tiniest particles. The final filter does not have to be a HEPA filter (expensive), since the tiniest particles are about 1 micron in size. A disposable paper final filter will trap out 99% of 1 micron filters, and many down to 0.1 micron in size too. It's easier on the budget, too, since machine turnover due to heavy duty usage is often the real cost issue.

Vacuums should be disassembled and properly cleaned per manufacturer's specifications after use. Paper (disposable) collection bags should be checked both before and after use, and replaced when dirt reaches the fill-line.

The recent popularity of the sports tennis shoe has made an impact on the migration of dirt throughout buildings. Smooth-soled shoes carry almost no dirt. The sport tennis shoe, on the other hand, captures and holds the dirt, releasing it well within entry ports.

Everyone realizes that carpets have many advantages, but it should also be realized that carpet use results in additional demands on housekeeping time and dollars. If carpets are the flooring of choice, the commitment to follow through with its support should be acknowledged and followed through with also.

4. Wet Vacuum: When operated as a dry vacuum, use the same cautions as described above. When operated as a wet-vac, from an IAQ perspective, it is important to properly disassemble and thoroughly clean the unit, and allow it to dry thoroughly before reassembling. This prevents odor buildup. Use of the machine will not generate IAQ pollutants but improper storage will.

5. Wet Extraction - Carpet Cleaning: Primarily for cleaning carpet. A cleaning solution is injected into the carpet and then immediately extracted by a built in wet-vac. One should make sure there is adequate ventilation when doing this work so evaporating moisture can be drawn out of the building.

Carpet cleaned by this process should not be allowed to remain wet for more than 24 hours. Do whatever is necessary to dry the carpet within 24 hours or otherwise consider replacing it if you are unsuccessful. There are two ways to remove the water: (1) the wet-vac itself and (2) evaporation. The two "needs" to obtain adequate evaporation are (1) low relative humidity (inside the cleaning area) and (2) air exhaust and makeup air (to dispose of the evaporated moisture). Use of heat and/or air conditioning, air exchanges and dehumidifiers are ways of accomplishing this.

A suggestion of doing carpet wet extraction in months other than May-September might be beneficial due to the comparatively low outside humidity. When drawn inside and exhausted it may speed up carpet drying compared to summer. This may be attractive for schools with year-round programs.

Before doing wet extraction, "aggressive vacuuming" is necessary to thoroughly clean the carpet to the point where wet extraction is beneficial.

Last (and definitely important), make sure the carpet is DRY before replacing furnishings (not just "sort of" dry). If you have to place waxed paper beneath desks and cabinets to prevent rust, more time is needed for drying. Otherwise, mold could start beneath these furnishings and other issues result.

6. Dry shampooing - Carpet Cleaning: Also for cleaning carpet, primarily. A "damp powder" cleaning substance is applied onto the carpet and then later vacuumed in a two step process. Brushes scrub the carpet, working the fine particles to the imbedded dirt level. They attach themselves to the dirt and are lifted out together.

The primary IAQ issue is to ensure the filtering associated with vacuuming is installed and working correctly. Otherwise, airborne contaminants may result. The other issue is to ensure that the unit is disassembled and cleaned properly so it won't become a source of odors.

7. Buffing and Burnishing: Essentially similar, but burnishing involves a high speed brush rotation (typically greater than 1,500 RPMs). The primary IAQ issues for this process are the generation of dust and the chance of inducing objectionable odors. Proper floor preparation is important--pre cleaning using an auto scrubber must have just been accomplished, leaving the floor moist. This makes the floor pliable to buffing/burnishing and less subject to abrasion, less brittle.

With burnishing gear, it should be checked periodically for excess emissions. The electric units have a dust collection bag and shroud (that covers the work area, like a "hovercraft"). If the bag leaks or the shroud is not tight to the floor, dust can escape.

8. Wall washers: High pressure, low water volume method for cleaning ceramic and porcelain surfaces (like bathrooms, showers, etc.). Often wall washers are mis-used on brick and other walls, and for cleaning unit ventilators. IAQ issue is the potential for high water pressure to force water into hidden recesses, like behind walls, where mold could develop.

9. Dusting, Dust Mopping and Sweeping: The most typical examples are cleaning chalk tray dust and ordinary house dust. From an IAQ perspective, minimize dust travel by employing innovative methods of capture (e.g. vacuum wherever possible, then wet wipe).

10. Dust mops: Dust mops should have the accumulated materials carefully removed, combed out and placed in waste receptacles. Sometimes, the employee shakes the dust mop just outside the building opening, where often there is an air intake. Dust mops should have treatment applied to capture tiny particles. Static mops are being evaluated as options, too.

11. Sweeping: Sweeping without using a compound is not advised. This may be occurring because the old types contained VOCs, which cannot be landfilled except as hazardous waste, encouraging some to not use compounds when sweeping. New water-based compounds can be disposed of in the regular trash. Compounds capture and hold the tiniest particles and thus is encouraged from an IAQ perspective.

12. Fumes - Waxing and Finishing Flooring: Sources of fumes from a housekeeping concern perspective are varied. Waxing and finishing flooring, ordinary cleaning activities and product storage are considered the major housekeeping contributors to poor indoor air quality. To a lesser extent, intentional introduction of perfumes to mask odors is an IAQ issue, also. Adequate ventilation and proper product dilution are key issues from an IAQ perspective. The user should determine whether or not the product contains VOCs. If so, an alternative without VOCs should be sought out.

Any product which contains VOCs should meet an emission rate standard that will not produce an air concentration level greater than 1/10 the Threshold Limit Value (TLV) industrial workplace standard when the area is made ready for occupancy. (Reference: American Congress of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati Ohio 45240).

Non-VOC floor-finishing containing products should be adequately ventilated to draw off noxious fumes, protecting the worker and (later) student. Length of time may vary, but it is estimated that 75% of curing or evaporation will occur within 6-8 hours. Lacking manufacturer instructions to the contrary, this rule of thumb might be a good starting planning figure. Adjust as necessary for local conditions and always listen to occupant concerns. Material Safety Data Sheets should be available to staff for all custodial products.

13. Housekeeping cleaning: Cleaning, especially with the use of "strong" chemicals should not be done with building occupants present. Again, adequate room or area ventilation and proper dilution are crucial from an IAQ perspective.

Proper product dilution is important (mixture proportion of product to water). If one "glug" is good, two "glugs" are not necessarily better (they may be worse from an IAQ perspective). Correct dilution is key to proper dilution rates of the airborne contaminants.

With cleaning products containing VOC's the above admonition bears repeating:

Any product which contains VOCs should meet an emission rate standard that will not produce an air concentration level greater than 1/10 the Threshold Limit Value (TLV) industrial workplace standard when the area is made ready for occupancy. (Reference: American Congress of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati Ohio 45240).

For non-VOC containing cleaning supplies, an adequate ventilation schedule needs to be established, so the worker will be protected and cleaning odors and fragrances can be purged from the building before occupancy. Some wrong ways of doing this are: (1) shut off ventilation at 4:00 p.m. and leave off while cleaning is occurring and (2) shut off ventilation immediately after cleaner leaves the room. Some recommendations are: (1) run ventilation until just before all work is finished, then turn off, and (2) turn off ventilation when cleaning surface is dried or cured.

14. Air Fresheners: Air fresheners are introduced to mask scents, create a substitute for good cleaning (which removes odors). Most air fresheners "work on the sinuses not the soils." From an IAQ perspective, these “cleaning replacements” trigger reactions that can make breathing difficult and cause persons to exhibit other symptoms, so their intentional introduction is discouraged. Air fresheners might be environmental triggers for respiratory problems.

Natural scents may be present in cleaning materials. When using these, make sure ventilation is adequate and dilution proportions are followed. Insofar as is possible, ensure the product does not leave a residual odor.

15. Pesticides: Ant and roach killing. U.S. EPA's Integrated Pest Management is the preferred method of controlling site pests. It calls for (1) checking for pests first, not treating first and (2) looking for alternative ways, not just pesticides for population control. A trained, responsible person should be administering the pest management plan.

16. Herbicide, Fungicide and Fertilizer Applications: A management plan should be in place for these applications. A trained person should be in charge of application. Applying these in such a manner that (1) chemicals don't make their way into buildings and (2) students outdoors engaged in sports or related activities are not unduly exposed. Check manufacturer's storage and application instructions, weather conditions and anticipated student activities for potential contamination.

17. Chemical Storage: Use good general housekeeping practices in chemical storage areas. These include making sure containers are clean and tightly sealed, and that the areas smell clean, otherwise odors can make their way into occupied spaces. There should be a storage management plan in place. There should also be adequate ventilation. Smells indicate that materials are evaporating and source(s) must be located and corrected. Material Safety Data Sheets should be onsite and available.

18. Mold: Buildings should be checked for moisture intrusion. Most common areas are roofs, walls and below-grade areas. If mold is found in these areas, air and material testing should be conducted and plan developed if remediation is necessary. In some instances the staff can remove the water damaged product and disinfect the area. In other cases, professional remediation may be required. In all cases, the moisture intrusion must be stopped before major remediation is performed. All water damaged materials should be removed from the school

building. In some cases, encapsulation may be required when removal cannot be done. After completion, steps should be taken to prevent recurrence of the problem.

Note: For further information on mold, you may wish to contact University of Minnesota's Neil Carlson and access their website for more information ******* (insert locations here) ********** Also, Canadian information.

Discussion:

The concept of baseline survey (or inspection) and evaluation has been difficult to define in the past. However, it is being marketed aggressively to school districts as a powerful tool in combating IAQ (indoor air quality) issues, both as an actual means of determining the district's status and as a means of influencing the perceptions of concerned persons. Either way, many districts have learned of its existence and are asking many questions about it, like: "What questions does a baseline answer?," "Do I require one under law?" and "How much should one cost?" The below discussion is intended to shed light on the concept. The MDE has assembled several experts in the field, including leading consultants and labs and used their observations and recommendations in the development of this section.

What is a "baseline"?

First, it is useful to distinguish a baseline report from other types of reports. IAQ investigations and reports are generally ordered out for three reasons: (1) a complaint has been noted and it is important to find the contaminant source(s), (2) no complaint has been noted but the organization wishes to be pro-active in identifying and correcting IAQ problems and (3) a district wishes to qualify for health and safety funding. Generally a baseline report is created for the second purpose. It may assist in achieving goals (1) and (3) depending on how it is structured. A baseline investigation is not required for health and safety funding. Projects leading to health & safety funding (3) must be supported by an IAQ investigation.

Baselines can be seen as an investigation and report on building conditions and people activities which contribute to indoor air quality problems. In one sense, a baseline sets out to state and then answer questions about "systems" within a facility which affect indoor air quality. These include roofs, walls, flooring (including carpet), the ventilation system (air intakes and exhausts), maintenance and housekeeping, academic subjects, chemical use and storage, vehicle fumes, people activities and more. In another sense, a baseline sets out to state and then answer questions about these systems **to a particular date or point in time**. A baseline survey (or inspection) should have some of each component incorporated into its report.

- Baselines are pro-active, not reactive,
- Baselines are comprehensive in scope, comprising all building and people systems that could affect IAQ,
- They should include both a comprehensive qualitative walkthrough and quantitative measurements,
- Baselines result is a report which (1) gives the building owner an accurate status of the facility and (2) clearly lays out needed follow-up testing and remedial work. The building owner either knows the building's status or understands what further steps are needed, so each major element of every system is sufficiently covered in the report.
- Ensure that a baseline's cost is competitive for what you get. When considering the relative cost of baselines from several vendors, insofar as is possible do a side-by-side evaluation of services provided when considering costs.
- Baselines are only as good as the company which provides them. Use a trusted vendor or check them out -- never rely entirely on sales literature.

Baselines can be valuable tools for a number of reasons. However, baselines should not be looked upon as a comprehensive engineering study of the facility but should point out and help prioritize areas of the buildings and systems that need to be investigated further.
In order for a baseline investigation to be useful, it should contain elements of investigation.

Some uses for baselines include:

- Useful for giving management an overall picture of the status of facilities and people activities which may contribute to IAQ problems.
- Can result in good-practices policies implementable by the district's IAQ Manager.
- Can be helpful in identifying facilities and health and safety projects to improving Indoor Air Quality.
- Can provide information useful by school staff, parents and physicians in assisting them in tracking down issues affecting building occupants.
- Can point in the direction of additional needed research and actions.
- Can provide peace of mind to staff, parents and the community by providing factual information for counteracting rumors.
- Provides management with a reasonable foundation on which to base future decisions.

Some cautions on the use of baselines:

- The scope and thoroughness of the baseline will determine, to an extent, the uses and usefulness of the baseline. An inexpensive, cursory baseline may have limited applications.
- The baseline is an investigation and report prepared by other persons. Ask questions of the history and reputation of the service providers, and of the methodology to be used.
- Make sure the information in the baseline can be explained in plain language concepts and that you take the time and effort to understand (or have explained) all parts of the report, even the footnotes. Make sure you understand what is included and what is not included.

Baseline Evaluation Questionnaire	Yes	No	Comments
1. Does the baseline survey identify the building or facility to be evaluated?			
2. Does the baseline survey describe the building or facility "systems" to be evaluated? a. Building construction b. Building envelope c. Flooring d. Mechanical systems e. Area space utilization f. Housekeeping practices g. Maintenance practices h. Chemical usage and storage i. Air intakes/exhaust j. Academic subjects k. Vehicle operations l. Grounds (Pesticides/herbicides) m. Review of design, construction and operating documents n. Check mechanical systems maintenance records against equipment lists			
3. Does the baseline survey include walk-through inspection of the building? a. Collect health-concern data from building occupants, nurses, etc.? b. Talk with staff and other occupants c. Review complaint record			
4. Is there visual and sensory inspection of the facility's systems? a. Building construction b. Building envelope c. Flooring (including carpet) d. Mechanical systems e. Area space utilization f. Housekeeping practices g. Maintenance practices h. Chemical usage and storage i. Air intakes/exhaust j. Academic subjects k. Vehicle operations l. Grounds (Pesticides/herbicides)			
5. Is there sampling done of the environmental conditions in specific areas of concern (to include under worst-case or fully operational conditions)? a. CO_2 b. CO (areas of combustion and exhaust fumes) c. temperature d. relative humidity e. microbiology (areas of moisture infiltration)			

6. Does the baseline inspection collect detailed information about Ventilation Systems? a. Tie back of ventilation system to the area it serves, by diagram or chart. b. Inventory of ventilation system components needing cleaning, repair, adjustment or replacement c. Testing of ventilation system under minimum outside air conditions to determine cubic feet per minute of outside air per person for each occupied area.			
7. Does the baseline collect detailed information about possible pollutant pathways, to include an inventory of significant pollutant sources and their locations?			
8. Does the baseline collect detailed information about roofs, walls, tunnels and other likely sources of water intrusion? a. Tie back of roofs, walls, tunnels & flooring to inside areas, by diagram or chart. b. Roofs - evidence of water/moisture entry into building (visual, records, moisture meters). c. Walls - evidence of water/moisture entry into building (visual, records) Does the baseline collect detailed information about roofs, walls, tunnels and other likely sources of water intrusion (continued)? d. Tunnels -evidence of water/moisture entry into building (visual, records, moisture meters). e. Flooring -evidence of water/moisture entry into building (visual, records, moisture meters). f. Plumbing leak--evidence of water caused by plumbing, piping, fixtures, roof drains, storm water piping, etc.			
9. Does the baseline collect detailed information about carpet, moisture build-up and mold (past and present)?			
10. Does the baseline collect detailed information about internal building materials, moisture buildup and mold (past and present)?			

In order for a “baseline report” to be useful, it should answer vital questions.

Baseline Report Questions	Yes	No	Comments
1. Will this report give the current status of the building or facility to date, in the following areas? a. Building construction b. Building envelope c. Flooring (including carpet) d. Mechanical systems e. Area space utilization f. Housekeeping practices g. Maintenance practices h. Chemical usage and storage i. Air intakes/exhaust j. Academic subjects k. Vehicle operations l. Grounds (Pesticides/herbicides) m. Status of design, construction and operating documents n. Ventilation system maintenance records against equipment lists			
2. Is there any element of information important to IAQ that will be omitted from this description of the current status of the building or facility to date, in the following areas? a. Building construction b. Building envelope c. Flooring (including carpet) d. Mechanical systems e. Area space utilization f. Housekeeping practices g. Maintenance practices h. Chemical usage and storage i. Air intakes/exhaust j. Academic subjects k. Vehicle operations l. Grounds (Pesticides/herbicides) m. Status of design, construction and operating documents n. Ventilation system maintenance records against equipment lists			
3. If this report is not intended to be complete with regard to the current status of the building or facility to date in the following areas, will additional investigation be recommended? Give details. a. Building construction b. Building envelope c. Flooring (including carpet) d. Mechanical systems e. Area space utilization f. Housekeeping practices			

g. Maintenance practices h. Chemical usage and storage i. Air intakes/exhaust j. Academic subjects k. Vehicle operations l. Grounds (Pesticides/herbicides) m. Status of design, construction and operating documents n. Ventilation system maintenance records against equipment lists			
4. What are the policies and procedures of the district to respond to the identified IAQ problems? a. IAQ Management Plan b. Health & Safety Projects c. Timelines d. Responsible Person(s) e. Reporting to Occupants			

Final Report Checklist in Punch list Format

1. The construction of my building does not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

2. The building envelope of my building does not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

3. The flooring of my building does not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

4. The mechanical systems of my building do not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

5. The area space utilization of my building do not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

6. The housekeeping practices of my building do not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

7. The maintenance practices of my building do not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

8. The chemical usage and storage of my building do not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

9. The air intakes and exhausts of my building do not contribute to indoor air quality problems with the following exceptions:
   Area Exception ☐Needs Further Work Describe:

10. The academic subjects of my building do not contribute to indoor air quality problems with the following exceptions:
    Area Exception ☐Needs Further Work Describe:

Final Report Checklist in Punch list Format (Con't.)

11. The vehicular operations in or near my building do not contribute to indoor air quality problems with the following exceptions:
    Area Exception ☐Needs Further Work Describe:

12. The grounds maintenance (pesticides/herbicides) of my site do not contribute to indoor air quality problems with the following exceptions:
    Area Exception ☐Needs Further Work Describe:

13. The below is an inventory of IAQ problem areas and the problems found there:

Area	Problem

Final Report Checklist (alternative format)			
Area	Overall Condition of Area	Problem Areas (use code number from prior pages)	Explanation (Give Details)