ROOF CONDITION SURVEY

For

Town of Sudbury

19 Sudbury Public Buildings
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

Russo Barr Associates, Inc.
33 Center Street, 2nd Floor
Burlington, MA 01803

781-273-1537 tel
781-273-1695 fax

February 3, 2012---2nd Revision
September 30, 2010

Mr. Michael E. Melnick
Permanent Building Committee
278 Old Sudbury Road
Sudbury, MA 01776

Re: Roof Condition Survey Report Executive Summary
19 Sudbury Public Buildings
Sudbury, Massachusetts
RBA Project No. 201056.00

Mr. Melnick:

We have completed a Roofing Evaluation Study of Town of Sudbury Public Buildings. Our findings for each of the building's roofs are briefly summarized in this Executive Summary document. The Roof Condition Survey Reports for each individual property are attached. The reports contain roofing system descriptions, conditions, corrective recommendations, construction cost estimates, photos, and schematic AutoCAD roof plans.

The Town of Sudbury has 19 public buildings (14 town buildings and 5 public school buildings) ranging in age and type. The buildings consist of institutional type construction, and the total roof areas are approximately 468,113 SF. Various roofing materials exist including EPDM, asphalt shingles, sheetmetal, slate, cedar, and built-up roofing (BUR). The building names, addresses, roof areas, and roof type are as follows:

Building Name	**Address**	**Roof Area/Roof Type**
1. Fairbank Complex	40 Fairbank Road	42,550 SF/Shingle & EPDM
2. Flynn Building	278 Old Sudbury Road	7,100 SF/Shingle & EPDM
3. Highway Office & Garage	275 Old Lancaster Road	10,060 SF/EPDM, BUR & Metal
4. North Fire Station	268 North Road	3,045 SF/EPDM
5. South Fire Station	550 Boston Road	4,135 SF/Shingle
6. Main Fire Station	77 Hudson Road	10,160 SF/Shingle
7. Haynes Meadow House	489 Peakham Road	1,350 SF/Shingle, EPDM & Greenhouse
8. Police Station	415 Boston Road	6,600 SF/Shingle
9. Carding Mill House	102 Dutton Road	3,265 SF/Slate
10. Loring Parsonage	288 Old Concord Road	2,000 SF/Cedar
11. Hosmer House	299 Concord Road	3,045 SF/Shingle
12. Town Hall	322 Concord Road	6,000 SF/Slate; 1,485 SF EPDM/BUR; 50 SF Copper; 20 SF Shingle
13. Goodnow Library	71 Concord Road	3,750 SF/Slate; 4,240 SF EPDM; 14,975 SF Shingle
14. DPW Office & Garage	275 Old Lancaster Road	28,025 SF/Shingle & Metal; 815 SF BUR
15. Noyes Elementary School	280 Old Sudbury Road	53,505 SF/EPDM
16. Nixon Elementary School	472 Concord Road	56,125 SF/EPDM; 4,075 SF Shingles; 795 SF Metal
17. Haynes Elementary School	169 Haynes Road	59,685 SF/EPDM; 8,270 SF Shingles
18. Loring Elementary School	80 Woodside Road	42,825 SF/EPDM; 8,685 SF Metal
19. Curtis Middle School	22 Pratt's Mill Road	81,578 SF/EPDM

Summary of Conditions & Recommendations

The work included performing a detailed review of the roofing systems for all nineteen (19) public buildings as follows: A detailed review of all pertinent project related information was conducted (plans, specifications, leak history, reports, and warranty information). A detailed on-site investigation was conducted, consisting of visual examination of the existing roofing and above roofline wall conditions; interior observations to view leak conditions, venting and insulating conditions, roof decking and/or ceiling assembly (where accessible) conditions; physical measurements were performed.

The following information is a quick recap/snapshot report of the roofing conditions at all nineteen buildings. Roof facts and corrective recommendations are provided**. Reference the attached spreadsheet for the recommended work year and associated construction cost estimates.** The construction cost estimates include contingency costs, ranging from 4% to 5%. The construction cost estimates do not include any Designer Costs (design, bid, construction period services) or any Owner's Project Manager (OPM) costs. Reference the roof reports for each building, for more specific information.

1. Fairbank Complex – 40 Fairbank Road

Roof Facts:

The roof area of the entire building is approximately 42,550 square feet (SF).

- Two low-sloped roof areas contain approximately 13,350 SF of stone ballasted EPDM roofing, labeled Roof Area Nos. 1 & 2 on the roof plan. Roof Area No. 1 (10,650 SF) is over the Pool. Roof Area No. 2 (2,700 SF) is over the lobby/electric rooms. Roof Area Nos. 1 & 2 reportedly was installed as new construction in 1987.

- Three low-sloped roof areas contain approximately 20,600 SF of adhered EPDM roofing, labeled Roof Area Nos. 3, 4, & 6 on the roof plan. Roof Area Nos. 3 & 4 (18,700 SF) are over the school administration & recreation department offices. Roof Area No. 6 (1,900 SF) is over the kitchen. Roof Areas 3, 4, & 6 reportedly were installed as a "go-over" application (installed over the original roofing system) in 1990.

- One general steep-sloped roof area contains approximately 8,600 SF of shingle roofing, Roof Area No. 5 labeled as Roof Area Nos. 5A, 5B, 5C and 5D on the roof plan. This roof area is over the Senior Center and Gymnasium. Roof Area 5A (4,300 SF) contains 21 year old shingle roofing applied to a 3" thick nailable rigid board roof insulation that is mechanically attached to a steel roof deck. Roof Area 5B (1,000 SF) contains 21 year old shingle roofing applied to plywood roof decking. Roof Area 5C (1,200 SF) contains 21 year old shingle roofing applied to tongue and groove wood plank roof decking. Roof Area 5D (2,100 SF) contains 5 year old shingle roofing reportedly installed over the original bituminous built-up roof membrane that is attached to the tongue and groove wood plank roof decking.

Corrective Recommendations:

1. Replace the steep-sloped shingle roofing (Roof Area No. 5 - Roof Area Nos. 5A, 5B, 5C and 5D at 8,600 SF) and the low-sloped stone ballasted EPDM roofing (Roof Area No. 2 at 2,700 SF) in **year 2010**.

   The low-sloped roof recommendation (Roof Area No. 2) is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, snow guards, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The steep-sloped recommendation (Roof Area No. 5) is to remove all shingle roofing, including the more recently installed roofing over Roof Area 5D, down to the roof deck (in the case of Roof Area 5A, down to the existing rigid board roof insulation). Roof Area 5D does not require renovation at this time but in order to improve thermal performance and avoid irregular appearance and detailing and to maintain watertightness, replacement is recommended. Roof Area 5A should receive new plywood sheathing (over the existing rigid board roof insulation) and shingle roofing. Roof Area 5B should receive new plywood sheathing and shingle roofing and should have new thermal insulation installed in the confined space below the roof deck. Roof Areas 5C and 5D should receive new nailable rigid board roof insulation and shingle roofing.

2. Replace the adhered EPDM roofs (Roof Area Nos. 3, 4 & 6 at 20,600 SF) in **year 2012**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, skylights, repairs to deteriorated roof decking, waterproofing of sheetmetal ductwork & rusted sheetmetal at rooftop units, repairs to deteriorated wood elements and a roofing manufacturer's 20-year full system labor and material warranty.

3. Replace the stone ballast EPDM roof (Roof Area No. 1 at 10,650 SF) in **year 2013**. The recommendation is a "go-over" application replacement with an adhered 60-mil reinforced PVC roof membrane system to include new overlay rigid board roof insulation (R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   Note: This roof area is a steeper low-sloped roof area (approximately 3:12 pitch) and the recommendation of a new adhered 60-mil reinforced PVC roof membrane system includes simulated standing seams (PVC material that provides a standing seam profile which mimics the look of a metal roofing system). The PVC membrane comes in many different colors. This option provides a long-term watertight roof system, has the aesthetic look of an attractive standing seam metal roof, has low maintenance requirements, and includes a manufacturer's 20-year full system labor and material warranty. Measures to deal with snow slides include snow guards over existing entrances and walkways.

2. Flynn Building – 278 Old Sudbury Road

Roof Facts:

The roof area of the entire building is approximately 7,100 square feet (SF).

- One steep-sloped roof area contains approximately 3,500 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan, reportedly installed in 1998 (currently 12 years old). Two smaller over entrance roofs also contain shingle roofing, labeled as Roof Nos. 3 & 4 on the roof plan, reportedly installed in 2006.
- One low-sloped roof area contains approximately 3,600 SF of adhered EPDM roofing, labeled Roof Area No. 2 on the roof plan, reportedly installed in 2000.

Corrective Recommendations:

1. Implement repairs to the steep-sloped roof (Roof Area No. 1 at 3,500 SF) and the low-sloped EPDM roof (Roof Area No. 2 at 3,600 SF) in year **2013**. Repair work includes stripping in EPDM seams; replace roof hatch and vent; reflash shingle roof/EPDM roof tie-in; repair defective conditions at masonry chimneys; repair splits in solder joints of the copper flashing.

3. Highway Office & Garage Building – 275 Old Lancaster Road

Roof Facts:

The roof area of the entire building is approximately 10,060 square feet (SF).

- One steep-sloped roof area contains approximately 1,650 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan. This roof area appears to have been an addition to the original building installed over a flat section of roofing (1996 installation date is reported).
- One low-sloped roof area contains approximately 2,725 SF of adhered EPDM roofing, labeled Roof Area No. 2 on the roof plan. It is not known when the EPDM roofing was installed however; it is suspected that the EPDM roofing was installed over the original built-up roofing system that was reportedly installed in 1981.
- One low-sloped roof area contains approximately 2,350 SF of gravel surfaced built-up roofing (BUR), labeled Roof Area No. 3 on the roof plan, reportedly installed in 1981 (currently 29 years old).
- One steep-sloped roof area contains approximately 2,850 SF of metal roofing, labeled Roof Area No. 4 on the roof plan, reportedly installed in 1981 (currently 29 years old). Note: A section of this roof area contains a white painted single-ply roofing patch that is approximately 425 SF, labeled as Roof Area 4A on the roof plan.
- One steep-sloped roof area (overhang) contains approximately 60 SF of shingle roofing, labeled Roof Area No. 5 on the roof plan (installation date is unknown).

Corrective Recommendations:

1. Replace the low-sloped adhered EPDM roof and BUR roof (Roof Area Nos. 2 & 3 at 5,075 SF) in **year 2012**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

2. Implement repairs to the steep-sloped metal roof (Roof Area No. 4 & 4A at 3,275 SF) in year **2014**. Repair work includes removing and replacing panel seam repair materials, reflashing rooftop penetrations, re-securing panel fasteners and installing new panel fasteners as needed, remove membrane system labeled Roof Area No. 4A, and installation of a fluid applied waterproofing membrane complete with a manufacturer's warranty (minimum 10-years).

3. Replace the steep-sloped shingle roof (Roof Area Nos. 1 & 5 at 1,710 SF) in year **2016**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

4. North Fire Station – 268 North Road

Roof Facts:

The roof area of the entire building is approximately 3,045 square feet (SF).

- Three low-sloped roof areas contains approximately 3,045 SF of adhered EPDM roofing, labeled Roof Area Nos. 1-3 on the roof plan, estimated to be approximately 15 years old.

Corrective Recommendations:

1. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1-3 at 3,045 SF) in **year 2016**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

5. South Fire Station – 550 Boston Road

Roof Facts:

The roof area of the entire building is approximately 4,135 square feet (SF).

- Two steep-sloped roof areas contains approximately 4,135 SF of shingle roofing, labeled Roof Area Nos. 1 & 2 on the roof plan, reportedly installed in 1998. These roof areas are reported to have been an addition to the original building installed over the original flat roofing (it is unknown if the original flat roofing system was removed prior to the installation of the addition).

Corrective Recommendations:

1. Implement repairs to the steep-sloped shingle roof (Roof Area Nos. 1 & 2 at 4,135 SF) in year **2010**. Repair work includes replacing deteriorated wood roof decking and missing shingles; seal voids in joints of the copper step flashing.

2. Replace the steep-sloped shingle roof (Roof Area Nos. 1 & 2 at 4,135 SF) in year **2018**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

6. Main Fire Station – 77 Hudson Road

Roof Facts:

The roof area of the entire building is approximately 10,160 square feet (SF).

- Three steep-sloped roof areas contains approximately 10,160 SF of shingle roofing, labeled Roof Area Nos. 1 - 3 on the roof plan, reportedly installed in 1991.

Corrective Recommendations:

1. Implement repairs to the steep-sloped shingle roof (Roof Area Nos. 1-3 at 10,160 SF) in year **2010**. Repair work includes replacing hot pipe vent assembly and flashing accordingly.

2. Replace the steep-sloped shingle roof (Roof Area Nos. 1-3 at 10,160 SF) in year **2015**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

7. Haynes Meadow House – 489 Peakham Road

Roof Facts:

The roof area of the entire building is approximately 1,350 square feet (SF).

- One steep-sloped roof area contains approximately 950 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan, estimated to be approximately 15-years old.

- Two low-sloped roof areas contain approximately 300 SF of adhered EPDM roofing, labeled Roof Area Nos. 2 & 3 on the roof plan. Roof Area No. 2 (250 SF) is estimated to be approximately 15 years old. Roof Area No. 3 (50 SF) is estimated to be approximately 5 years old.

- One steep sloped roof area contains approximately 100 SF of a glass greenhouse area labeled Roof Area No. 4 on the roof plan. Roof Area No. 4 (100 SF) age is unknown.

Corrective Recommendations:

No corrective repairs are recommended at this time except to remove the accumulated pine needles from the roof surfaces and gutters.

8. Police Station – 415 Boston Road

Roof Facts:

The roof area of the entire building is approximately 6,600 square feet (SF).

- One steep-sloped roof area contains approximately 6,600 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan, estimated to be approximately 20 years old.

Corrective Recommendations:

1. Replace the steep-sloped shingle roof (Roof Area Nos. 1 at 6,600 SF) in year **TBD** (Owner has decided to postpone corrective work, as the status of the building is under review). Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

9. Carding Mill House – 102 Dutton Road

Roof Facts:

The roof area of the entire building is approximately 3,265 square feet (SF).

- One Steep-sloped roof areas contains approximately 3,265 SF of slate roofing, labeled Roof Area Nos. 1 on the roof plan, estimated to be approximately 80 years old.

Corrective Recommendations:

1. Implement repairs in **year 2011**. Repairs to include selective replacement of cracked/broken slate; replacement of ridge cap; replacement of cupola structure; repairs to step flashing at chimney.

10. Loring Parsonage – 288 Old Concord Road

Roof Facts:

The roof area of the entire building is approximately 2,000 square feet (SF).

- Three steep-sloped roof area contains approximately 2,000 SF of cedar shingle roofing, labeled Roof Area Nos. 1-3 on the roof plan, reported to be 1-year old.

Corrective Recommendations:

No corrective repairs are recommended at this time except to replace the chimney cap with a proper sheetmetal cap in year **2011.**

11. Hosmer House – 299 Concord Road

Roof Facts:

The roof area of the entire building is approximately 3,045 square feet (SF).

- Six steep-sloped roof area contains approximately 3,045 SF of shingle roofing, labeled Roof Area Nos. 1-6 on the roof plan.

Corrective Recommendations:

1. Replace the steep-sloped shingle roof (Roof Area Nos. 1 & 2 at 2,040 SF) in year **2012**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, chimney repairs, and a roofing manufacturer's material warranty (minimum 40-year time frame).

12. Town Hall – 322 Concord Road

Roof Facts:

The roof area of the entire building is approximately 7,555 square feet (SF).

- One steep-sloped roof area contains approximately 6,000 SF of slate roofing, labeled Roof Area No. 1 on the roof plan (estimated to be approximately 80-years old with some deficient conditions noted, and reported leakage).

- One low-sloped roof area contains approximately 1,375 SF of EPDM roofing, labeled Roof No. 2 on the roof plan (condition of roofing is good).

- Two steep-sloped roof area contains approximately 110 SF of roll roofing, labeled Roof Area Nos. 3 & 5 on the roof plan (condition of roofing is good).

- One steep-sloped roof area contains approximately 50 SF of copper roofing, labeled Roof Area No. 4 on the roof plan (condition of roofing is good).

- One steep-sloped roof area contains approximately 20 SF of shingle roofing, labeled Roof Area No. 6 on the roof plan (condition of roofing is good).

Corrective Recommendations:

1. In an effort to extend the useful service life of the 80-year old slate roofing system (Roof No. 1) the recommendation is to implement preventive maintenance repairs in years **2011, 2015, and 2019**. Recommended repairs include removing skylight/hatch assembly and roofing over, replacing cracked/broken slate, flashing repairs, masonry repairs to the chimney, gutter repairs/replacement as necessary.

2. No corrective repairs are recommended at this time for the EPDM roofing, roll roofing, copper roofing, and shingle roofing.

13. Goodnow Library – 322 Concord Road

Roof Facts:

The roof area of the entire building is approximately 22,965 square feet (SF).

- One steep-sloped roof area contains approximately 3,750 SF of slate roofing, labeled Roof Area No. 1 on the roof plan.

- Four low-sloped roof area contains approximately 4,240 SF of EPDM roofing, labeled Roof Nos. 2, 3, 6 & 7 on the roof plan. These roof areas were reportedly installed in 1998 (currently 12-years old) and a manufacturer's (Firestone) warranty is in place (expires on 9/7/2013)

- Two steep-sloped roof area contains approximately 14,975 SF of shingle roofing, labeled Roof Area Nos. 4 & 5 on the roof plan. These roof areas were reportedly installed in 1998. No warranty information is available.

Corrective Recommendations:

1. In an effort to extend the useful service life of the slate roofing system (Roof No. 1) the recommendation is to implement preventive maintenance repairs in years **2014 and 2019.** Recommended repairs include replacing cracked/broken slate, and flashing repairs as necessary.

2. Replace the adhered EPDM roofs (Roof Area Nos. 2, 3, 6 & 7 at 4,240 SF) in **year 2014**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

3. Replace the steep-sloped shingle roof (Roof Area Nos. 4 & 5 at 14,975 SF) in year **2018**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

14. DPW Office & Garage Buildings – 275 Old Lancaster Road

Roof Facts:

The roof area of the entire building is approximately 28,840 square feet (SF).

- One steep-sloped roof area contains approximately 10,500 SF of architectural grade shingle roofing (CertainTeed Woodscape 40 Series), labeled Roof Area No. 1 on the roof plan. This roof area reportedly was constructed as new construction in 2003.

- One low-sloped roof area contains approximately 815 SF of built-up roofing (BUR), labeled Roof Area No. 2 on the roof plan. This roof area reportedly was constructed as new construction in 2003.

- One steep-sloped roof area contains approximately 17,525 SF of metal roofing, labeled Roof Area No. 3 on the roof plan. This roof area reportedly was constructed as new construction in 2003.

Corrective Recommendations:

1. Implement repairs to the steep-sloped metal roof (Roof Area No. 3 at 17,525 SF) in year **2011**. Repair work includes reflashing rooftop penetrations and associated crickets, re-securing panel fasteners and installing new panel fasteners as needed.

2. Implement repairs to the steep-sloped shingle roof (Roof Area No. 1 at 10,500 SF) in year **2011**. Repair work includes resecuring shingle nails and repairing holes as needed.

15. Peter Noyes Elementary School – 280 Old Sudbury Road

Roof Facts:

The roof area of the entire building is approximately 53,505 square feet (SF).

- Eighteen (18) low-sloped roof areas contain approximately 53,505 SF of adhered EPDM roofing, labeled Roof Area Nos. 1-18 on the roof plan. All 18 roof areas reportedly were installed as a "tear-off" application (the original roofing system was removed and replaced) in either 1982 or 1985. Roof Area Nos. 1-7, 12, & 18 were reportedly installed in 1982. Roof Area Nos. 8-11 & 13-17 reportedly was installed in 1985.

- The existing roof assembly construction reportedly consists of an adhered EPDM membrane installed over 1/2"± of rigid board (fiberboard) insulation which in turn was installed over rigid foam insulation. Fiberboard installed in the 1982 roof areas is reportedly adhered with hot asphalt. Fiberboard insulation installed in the 1985 roof areas is reportedly attached with mechanical roofing fasteners and distribution plates.

- Roof Area Nos. 1, 13, 15, 16, 17, & 18 (35,780 SF) are over classrooms. Roof Area Nos. 2, 3, 4, 5, 7, 8, 9, 11, 12, & 14 (8,115 SF) are over entry doors, lobbies, corridors, and offices. Roof Area No. 6 (7,310 SF) is over the gymnasium. Roof Area No. 10 (2,300 SF) is over the boiler room/maintenance room.

Corrective Recommendations:

1. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1-18 at 53,505 SF) in **year 2011**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, snow guards, repairs to deteriorated roof decking, repairs to suspected defective above roofline masonry wall thru-wall flashings, and a roofing manufacturer's 20-year full system labor and material warranty. Replacement of the referenced deteriorated above roofline window system and sloped glazing systems are recommended to be included in the scope of this project.

16. Nixon Elementary School – 472 Concord Road

Roof Facts:

The roof area of the entire building is approximately 61,895 square feet (SF).

- Nine (9) low-sloped roof areas contain approximately 56,125 SF of adhered EPDM roofing, labeled Roof Area Nos. 1, 2, 4-8, 10 & 11 on the roof plan. All 9 roof areas are believed to have been installed as "tear-off" applications (the original roofing system was removed and replaced). Roof Area Nos. 7, 8, 10, & 11 were reportedly installed in 1991. Roof Area Nos. 1, 2, 4, 5, & 6 reportedly were installed in 1995.

  The existing roof assembly construction of these roof areas consists of an adhered EPDM membrane installed over rigid foam insulation (thickness unknown) board. The rigid foam insulation is attached with mechanical roofing fasteners and distribution plates.

- One steep-sloped roof area contains approximately 4,975 SF of shingle roofing, labeled Roof Area No. 9 on the roof plan, reportedly installed in 1991. This roof area is over the Cafeteria and is in good condition (Celotex manufactured limited shingle warranty in effect until 2016).

- One steep-sloped roof area contains approximately 795 SF of metal roofing, labeled Roof Area No. 3 on the roof plan, reportedly installed in 1995. This roof area is over the Lobby.

- Roof Area No. 1 (4,500 SF) is over the gymnasium. Roof Area Nos. 2, 6, & 11 (42,225 SF) are over classrooms. Roof Area Nos. 3, 4, 5, & 7 (2,415 SF) are over entry doors, lobbies, and corridors. Roof Area No. 8 (7,060 SF) is over the boiler room/maintenance room.

<u>Corrective Recommendations:</u>

1. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 7, 8, 10, & 11 at 25,965 SF) in year **2012**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, new skylights, and a roofing manufacturer's 20-year full system labor and material warranty.

2. Repair the low-sloped adhered EPDM roofs (Roof Area Nos. 1, 2, 4, 5 & 6 at 30,160 SF) in year **2011**. Repair work includes stripping in EPDM seams; patching splits and holes in the EPDM roof membrane and flashing; replace deteriorated wood sleepers & install buffer sheets; remove miscellaneous debris from roof drain strainers and emergency overflow scuppers; replace above roofline deteriorated sealant control joints; replace wet roofing substrate, replace deteriorated ductwork and waterproofing.

3. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1, 2, 4, 5 & 6 at 30,160 SF) in year **2019**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, new skylights, and a roofing manufacturer's 20-year full system labor and material warranty.

4. Replace the steep-sloped shingle roof (Roof Area No. 9 at 4,975 SF) in year **2017**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

5. Implement repairs to the steep-sloped metal roof (Roof Area No. 3 at 795 SF) in year **2015**. Repair work includes reflashing rooftop penetrations and associated crickets, re-securing panel fasteners and installing new panel fasteners as needed.

17. Josiah Haynes Elementary School – 169 Haynes Road

Roof Facts:

The roof area of the entire building is approximately 67,955 square feet (SF).

- Nine (9) low-sloped roof areas contain approximately 59,685 SF of adhered EPDM roofing, labeled Roof Area Nos. 2-10 on the roof plan. Four (4) roof areas (Roof Area Nos. 5, 6, 7, & 9) are believed to have been installed as a "tear-off" application (the original roofing system was removed and replaced) in 1993. Roof Area Nos. 2, 3, 4, 8 & 10 were reportedly installed in 1999 as part of an addition to the building (Under manufacturer's (Carlisle) 15-year warranty that expires on 12/6/2014).

- Roof Area No. 1 (8,270 SF) - The existing roof assembly construction consists of asphalt shingles, building paper, ice and water shield (ridges, roof edges, and around mechanical units), nail board – plywood sheathing over 3" vent/grooved rigid insulation; or field constructed vent space and 3" thick rigid insulation. Roof Area No. 1 was installed in 1999 as part of an addition to the building (under manufacturer's (CertainTeed) 30-year warranty that expires on 10/12/2029).

- Roof Area Nos. 2, 4, 8, 9 & 10 - The existing roof assembly construction consists of an adhered EPDM membrane over tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

- Roof Area No. 3, 6, 7 & 9 - The existing roof assembly construction consists of an adhered EPDM membrane over 1/2" of wood fiberboard, set in asphalt over 3" polyisocyanurate insulation mechanically fastened to a steel roof deck. Note: A section of Roof Area No. 9 was replaced as part of the addition to the building.

- Roof Area No. 5 - The existing roof assembly construction consists of a mechanically fastened EPDM membrane over 1/2" of wood fiberboard, set in asphalt over tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

Corrective Recommendations:

1. Perform corrective repairs at the leaking skylights on the low-sloped EPDM roof (Roof Area Nos. 4 & 5) and properly resecure the lightning cable at Roof Area No. 3 in year **2011**.

2. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 5, 6, 7, & 9 at 44,600 SF) in **year 2015**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

3. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 2, 3, 4, 8 & 10 at 15,089 SF) in **year 2020**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

18. Israel Loring Elementary School – 80 Woodside Road

Roof Facts:

The roof area of the entire building is approximately 51,510 square feet (SF).

- Five (5) low-sloped roof areas contain approximately 42,825 SF of adhered EPDM roofing, labeled Roof Area Nos. 1, 4, 5, 13, & 14 on the roof plan. These roof areas reportedly were installed as new construction in 2000.
  The existing roof assembly construction consists of an adhered EPDM membrane installed over rigid foam insulation (thickness unknown) board. The rigid foam insulation is attached with mechanical roofing fasteners and distribution plates to a steel roof deck. Reportedly a 15-year manufacturer's warranty (Versico) was in place (expires in 2015).

- Nine (9) steep-sloped roof area contains approximately 8,685 SF of metal roofing, labeled Roof Area Nos. 2, 3, & 6-12, on the roof plan. These roof areas reportedly were installed as new construction in 2000.

Corrective Recommendations:

1. Implement repairs to the low-sloped EPDM roofs (Roof Area Nos. 1, 4, 5, 13, & 14 at 42,825 SF) in year **2011**. Repair work includes stripping in EPDM seams; patching splits and holes in the EPDM roof membrane; flashing repairs; remove miscellaneous debris from roof drain strainers; Reflash three curbs; replace above roofline masonry wall expansion joint; resecure unattached perimeter edge metal.

2. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1, 4, 5, 13, & 14 at 42,825 SF) in **year 2020**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

3. Perform an investigation of the referenced suspected defective conditions in the above roofline masonry walls and window system in year **2010**.

4. Implement repairs to the steep-sloped metal roof (Roof Area Nos. 2, 3 & 6-12 at 8,685 SF) in year **2018**. Repair work includes reflashing rooftop penetrations and associated crickets, re-securing panel fasteners and installing new panel fasteners as needed.

19. Ephraim Curtis Middle School – 22 Pratt's Mill Road

Roof Facts:

The roof area of the entire building is approximately 81,578 square feet (SF).

- Sixteen (16) low-sloped roof areas contain approximately 81,578 SF of adhered EPDM roofing, labeled Roof Area Nos. 1-16 on the roof plan. All sixteen low-sloped roof areas were reportedly installed in 2000 when the school was completely rebuilt (under manufacturer's (Versico) 15-year warranty; expires 12/1/2015.

- Roof Area Nos. 1, 3, 8, 10, 11, 15, 16 - The existing roof assembly construction consists of an adhered EPDM membrane over a combination of both flat and tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

- Roof Area Nos. 2, 9, 14 - The existing roof assembly construction consists of an adhered EPDM membrane over flat polyisocyanurate insulation mechanically fastened to a steel roof deck.

- Roof Area Nos. 4, 5, 6, 7, 12, & 13 - The existing roof assembly construction consists of an adhered EPDM membrane over tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

Corrective Recommendations:

1. Implement repairs to the low-sloped adhered EPDM roofs (Roof Area Nos. 1-16 at 81,578 SF) in year **2011**. Repair work includes miscellaneous repairs to include replace missing drain strainers, patching splits and holes in the EPDM roof membrane and flashing; replace missing drain strainer; properly attach perimeter edge metal; remove miscellaneous debris from roof; sealant repair at parapet wall metal panels; replace deteriorated wood sleepers.

2. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1-16 at 81,578 SF) in **year 2020**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

Roof Replacement & Repairs Discussion

We observed many deficient roofing conditions. Numerous deficiencies were noted on various roof areas. At certain locations wet and damp conditions where observed within the existing roof system components. These conditions may have deteriorated steel fasteners and other components contained within the existing roofing systems. Soft areas exist on some roof areas; indicative of wet roofing components and possible deteriorated roof decking. Ponding water on roof areas was also observed, resulting in water accumulation on the roof causing further seam membrane failure, leaking, and deterioration of the roofing systems.

Wet roofing is a serious threat to any roof system and should be removed as soon as possible. Aside from dramatically decreasing the R-value of the insulation (which results in increased energy costs), wet roofing leads to other problems including potential overloading of the structure, potential deterioration of the structural roof deck, failure of the waterproofing characteristics of the roofing components, rotted wood blocking and damage to rooftop equipment supports and curbs, to mention a few. During cold periods, wet roofing will freeze and expand causing the roofing components to fail, allowing more moisture to enter the system.

Based upon the age and condition of many of the existing roofing systems, number of previous repairs, number and types of existing deficiencies, detected wet areas and suspected wet areas, we estimate that there is little reliability remaining in these roof systems. We recommend total removal and replacement of these certain roof areas. We also recommend implementing roof repairs on many of the buildings. The recommended work has been prioritized and a 10-year phased replacement and repair document has been developed, set up in spreadsheet format broken down into 1-year increments **(Recommended Roof Repairs and Replacement Spreadsheet).** The total construction cost estimate equals **$7,235,001.** We encourage the Town to adhere to this program and not postpone or delay the recommended roof replacements and repairs.

The recommended general scope of the construction work related to the low-sloped roofing replacement consists of utilizing a “tear-off” application (completely remove all roofing down to the roof decking). The new roofing system includes 60 mil adhered single-ply roofing membrane (PVC) membrane, new rigid board roof insulation (tapered at certain areas so as to provide positive drainage), new perimeter metal, and a roofing manufacturer’s 20-year full system warranty. It is expected that the following work will also be necessary as part of the low-sloped roof replacement: repairs to deteriorated roof decking; new cast iron roof drain assemblies and clearing of drain lines so as to ensure a free flowing roof drainage system; miscellaneous repairs to above roofline elements.

The recommended general scope of the construction work related to the steep-sloped roofing replacement consists of utilizing a “tear-off” application (completely remove all roofing down to the roof decking). The new roofing system includes replacement in kind (shingles). It is expected that the following work will also be necessary as part of the steep-sloped roof replacement: repairs to deteriorated roof decking; new gutters and downspouts; miscellaneous repairs to above roofline elements.

Industry research and our own experience have shown that when a roofing system begins to leak into the building interior, the infiltrating moisture has already passed through and saturated a number of building components. We know that in many cases, leaking roofs are not detected because building materials such as roof sheathing, insulation, structural roof decks and interior finishes absorb the moisture prior to that moisture reaching the interior of the building. Left unattended to, these water saturated building materials will degrade and will support the growth of mold and mildew.

Degradation of building materials can have profound effects on schools and other facilities. For example, corroded roof decking and framing often cannot be assessed without removal of the roof system. Once a roof replacement program is initiated, the discovery of corroded roof structures can prevent efficient operation of the facilities or delay the re-opening of schools in September. These occurrences increase operating costs and can indirectly create hardships for working parents.

Degradation of structural components can obviously lead to safety hazards. Mold and mildew growth can severely affect persons with respiratory sensitivities. It has become clear that respiratory sensitivities can become active without prior indications. Lawsuits regarding mold are increasing in frequency and judgment amounts.

In summary, we do not recommend deferment of roof replacement and repairs due to: Advancement of structural degradation, Promotion of mold/mildew growth, Interruption of vital services, Potential of increased costs and litigation potential.

Annual Inspections & Preventive Maintenance Discussion

We also recommend implementing annual inspections and preventive maintenance. We encourage the Town to adhere to these recommendations and not postpone or delay the annual inspections and preventive maintenance.

Preventive maintenance is a requirement of all roof warranties and is the building owner's responsibility to perform and document. Your roof warranty can be voided by the lack of preventative maintenance. Annual inspections and preventive roof maintenance can protect buildings from damaging weather; extend the life of the roof system, and decrease building life-cycle costs. Visual inspection can reveal obvious signs of problems. The following paragraphs discuss general items that should be performed.

Complete at least four inspections annually (winter, summer, spring and fall) and following storms of extensive precipitation or wind. Inspect the roof after any sign (on the ground or in the building) of vandalism. Inspect the roof after any rooftop work is done. Follow all recommendations of the roofing systems manufacturer as stated in the warranty, or any other publication received from the manufacturer.

Do not allow tools or other sharp objects to be left on the roof for any period of time (except while being used) as they may puncture the roof membrane. Police the roof areas and remove any debris that may accumulate, such as cans, bottles, sticks, etc. This is particularly important at roof drains, gutters, downspouts and scuppers to guarantee a free flowing roof drainage system. Inspect rooftop mechanical equipment for fluid leaks (petroleum materials spilled on EPDM membrane will cause deterioration). Inspect above roofline walls and parapet walls for cracks, movement, deterioration, etc.

Inspect the flashing system at all walls, rooftop unit curbs and roof penetrations for proper adhesion and watertightness. Look for any sign of deterioration in the roofing membrane and at the seams in the membrane. .Notify all parties concerned in the advent of a leak or necessity of maintenance to the roofing or flashing membrane. Inspect caulking along flashing penetrations. Repairs of all defects or flaws found during the inspections should be implemented and documented immediately.

Roofing System Types Discussion

The following information describes the different roofing system types that exist (or are recommended to be used as replacement materials) on the referenced Town of Sudbury public buildings:

Asphalt Shingles:

Asphalt shingles can be either a standard three-tab single layer shingle or the increasingly popular laminated architectural asphalt shingle. The standard tree-tab shingles are a no-frills type; utilitarian type materials that can provide the service required but arguably add to the aesthetics of the building and are more susceptible to blow off as each tab acts independently when subjected to high winds.

The architectural type shingles are laminated to provide shadow and depth to the shingle and overall roof surface. They look like wood shingles. This type of shingle system is recommended for steep sloped roofs that have highly exposed roof surfaces. They are offered in a variety of configurations and colors, and are offered with 25, 30, 40, 50 year and life time warranties (the longer the warranty, the heavier and more expensive the shingle).

Asphalt shingles are most often applied directly to wood roof decks and in many applications are applied to nailable insulation substrates. Building codes and shingle manufacturers require that roof decks that support asphalt shingles be properly ventilated.

Slate Shingles:

Slate can be one of the most aesthetically pleasing and durable of all roofing materials. Commercial roof slate quarrying began in the U.S. around the mid 1800s. Slate is a fine-grained, homogeneous, metamorphic rock derived from an original shale-type sedimentary rock composed of clay or volcanic ash, through low-grade regional metamorphism. The slate is hand worked into manageable sizes and split into roofing shingles with hammers and chisels. The finished shingles are punched for nail holes, and the thin slabs of stone are fastened to the roof deck with nails or other fasteners. There are three different types of slate shingles; standard, textural, and graduated.

Slate roofing is a very successful system that can function as a waterproofing covering for 100 years. The durability of the system depends on four factors: the physical and mineralogical properties of the slate; the way in which it was fabricated; installation techniques employed; and, regular and timely maintenance. The primary failures of the slate system include worn out flashings and underlayments and corrosion of slate fasteners.

EPDM Roofing Systems:

EPDM is an elastomeric compound synthesized from ethylene, propylene, and a small amount of diene monomer; it is a synthetic rubber material that can be formulated with a great deal of flexibility for use in roofing. It is generally used for roofing as a vulcanized material. EPDM's membranes exhibit a high degree of ozone, ultraviolet, weathering, and abrasion resistance and good low temperature flexibility. EPDM's properties of resilience, tensile strength, elongation, and hardness are largely retained in aging tests at elevated temperatures.

EPDM has a proven track record as it has been used as a roofing material in the United States since the early 1960's. EPDM sheets range in thickness from 30 to 90 mils and are usually black in color; they can also be painted with a hypalon coating to create an aesthetically

pleasing appearance. EPDM is the most often installed single-ply roofing membrane system, accounting for about 40% of the commercial roofing market (17% thermoplastics (PVC), 15% built-up (BUR), 17% modified bitumen, 11% other-metal, PUF, etc.)

The seams of EPDM roofing systems must be adhered (glued or seam tape). Early on EPDM did experience seam problems, primarily as a result of poor field cleaning of the seams and adhesive degradation. The glue breaks down over a period of time especially under ponding water conditions. Changes in the surface preparation of sheets, new adhesive formulation and the development of tape adhesives have greatly increased the performance of EPDM seams.

EPDM membranes may be installed in four general configurations: adhered, mechanically attached, ballasted, or as a protected roof membrane assembly. In general, an adhered EPDM roofing system basically means that the EPDM roof membrane is glued to a rigid board insulation product that is mechanically attached or adhered to a structural roof deck. A ballasted EPDM roofing system basically means that the EPDM roof membrane is loose laid over a rigid board insulation product that is also loose laid over a structural roof deck; the insulation and EPDM membrane are held in place by stone ballast or pavers that typically weigh 10 lbs/SF.

EPDM membrane systems utilize sheetmetal for perimeter terminations (edge metal, gravel stop, parapet cap, etc.) and certain flashing details. It is important to note that the edge metal must be a premanufactured heavy duty system (as opposed to contractor fabricated sheetmetal) in order for it to be included as part of the EPDM manufacturer's full system warranty.

Industry research over numerous years has yielded the following useful life predictions for EPDM roofing systems. Various factors can affect the useful life that will either extend or decrease the predicted life. These factors include, but are not limited to, the maintenance of the roof, the overall slope of the roof, the design of the roof, product failure problems with the roof, weathering, and roof installation. It should be noted that failure of EPDM roof systems is not a drastic immediate occurrence but rather a gradual failure of seams and certain flashing materials.

Adhered EPDM: Minimum Useful Life = 12 years; Maximum Useful Life = 20 years.
Ballasted EPDM: Minimum Useful Life = 12 years; Maximum Useful Life = 16 years.

PVC Roofing Systems:

Polyvinyl chloride ("PVC") roofing membranes have been produced and marketed for over 40 years. Production began in Germany in the 1950's with major commercial production beginning in the early 1970's. The products evolved over the yeas. PVC sheets range in thickness from 45 to 90 mils. The success of some PVC membranes is due to thicker membrane, better quality in blending and manufacture, and reinforcement. The reinforcement is either glass fiber or polyester.

PVC roofing membranes are considered thermoplastic materials. Because of the material's chemical nature, the PVC thermoplastic membrane is seamed by heat welding (hot air as opposed to glued or seamed with tape products as the EPDM membranes are). The seam is almost indestructible when properly made and therefore it does not fail when underwater for extended periods of time. Ponding water exclusions are not part of the manufacturer's warranty. Many reinforced PVC roofing membranes perform properly with a life of 30 years and possibly more.

PVC roofing membrane sheets are produced by calendaring, spread coating, or extrusion and are typically reinforced with a fabric mat or scrim. PVC sheets contain plasticizing additives to impart flexibility to the membrane. PVC membranes are incompatible with bituminous membranes such as asphalt and coal tar. Separator sheets or felt backed or specially formulated membranes are required when incompatible products are present.

PVC membranes can be produced in numerous colors, although light colors such as gray and white (highly reflective) is the most common. Dark colored roofs such as EPDM (black color) absorb a tremendous amount of solar radiation and become extremely hot. These hot roofs essentially become sources of heat that contribute to elevated air temperatures. In many geographic areas, an air temperature increase translates into an air quality decrease. Highly reflective roofs diminish this condition and have recently been identified as the environmentally preferable roofing solution.

PVC membranes may be installed in four general configurations: adhered, mechanically attached, ballasted, or as a protected roof membrane assembly. PVC membrane systems often utilize PVC coated metal (PVC roof membrane is bonded to the PVC coated metal by hot-air welding or solvent) for perimeter terminations (edge metal, gravel stop, parapet cap, etc.) and certain flashing details. The PVC coated metal does become part of the PVC manufacturer's full system warranty.

Industry research has determined that the service life of PVC roofing can vary from 15 years for ballasted applications to over 20 years for adhered applications (we know of applications that are performing well after 30 years.) Mechanically attached PVC systems do not have as an extensive track record as the other configurations but are anticipated to include similar service lives as adhered systems. Various factors can affect the useful life that will either extend or decrease the predicted life. These factors include, but are not limited to, the maintenance of the roof, the overall slope of the roof, the design of the roof, product failure problems with the roof, weathering, and roof installation. Non-reinforced PVC membranes are no longer produced which has essentially eliminated the catastrophic shattering occurrences.

Built-up Roofing Systems:

The built-up roof (BUR) has been the traditional roofing system for flat roofs in the U.S. for approximately 100 years. BUR consists of multiple layers of roofing felt (ply sheets) applied in shingle fashion with a waterproofing material (interply adhesive) to form a 2, 3, 4 or 5 ply layer membrane over which a coating, surfacing (gravel) or cap sheet is applied to protect the membrane.

Originally the first BUR roofs were made utilizing coal tar pitch as the interply adhesive, which was heated to a liquid state. The roofing plies were organic (rag) felts. Coal tar pitch roofs were called "Self Healing Roofs" due to coal tar's tendency to flow when it gets hot (good because it flowed and sealed cracks; bad because it flowed and clogged drains, caused stains on buildings and in cold temperatures it becomes brittle and cracks).

After the 2nd World War the abundance of petroleum was responsible for asphalt (replaced coal tar pitch) as the interply adhesive and waterproofing agent. With the evolution of "asphalt based built-up roofing" fiberglass roofing felts were introduced, which are stronger than organic felts. Fiberglass felts were responsible for the industry shift towards fewer numbers of plies. This concept was primarily aimed at reducing the labor component involved with BUR installation.

Both asphalt and coal tar pitch are "hot" applied at high temperatures, which is critical to the success of the system. The adhesive qualities of asphalt and coal tar pitch rely on the temperature at which they are applied. The acceptable temperature range for installation of these materials is called the equi-viscous temperature. Basically it is the temperature range of

the bitumen where it is hot enough to adequately bond the plies together as well as provide the proper interply waterproofing characteristics.

This temperature range is still the most common problem associated with “hot” applied BUR’s. As you can imagine with a “hot” applied BUR system an asphalt kettle or tanker is required to remain on-site all day, which can pose certain safety and odor problems within occupied facilities and within neighborhood settings.

In early 1970’s several manufacturers started developing modified asphalt products, which led to “cold-process” built-up roofs. Basically the interply adhesive is cold applied (spray or squeegee), thereby eliminating kettles and tankers. The backbone of the cold-process roofing system includes the use of four (4) layers of a trilaminate (polyester/fiberglass/polyester) reinforced roofing ply sheet. This key component of the roofing assembly provides strength, waterproofing and stability to the cold-process roofing system. The reinforced composite roofing ply sheet is set in cold process interply adhesive. Gravel surfacing is then set in a protective flood coat of cold process interply adhesive. This proposed roof system has many layers of protection and installed properly is extremely durable and long lasting.

Some pros of BUR: Traditional, proven system (100+ years for hot applied, 20+ years for cold applied);High impact resistance, almost vandal proof; Skid and fire resistant, when graveled; Redundant system, leaks are very unlikely when carefully installed; Hot kettles are not involved in cold process built-up roofing process, thereby eliminating safety and odor issues.

Some cons of BUR: Generally much more expensive than single-ply roofing; Labor intensive requiring constant quality assurance & longer time to install; Fewer qualified applicators; Leak chasing difficult due to gravel; Asphalt, roofing cement is messy - not advisable if light-colored walls are adjacent to work; Adding penetrations more involved than with other systems; Structural limitations may exist as system weights 8 to 10 lbs/SF.

<u>Sheet Metal Roofing Systems:</u>

Sheet metal roofing systems have been used successfully for hundreds of years. Typical sheet metal materials include steel, aluminum, copper, lead and other metals. The older sheet metal systems were formed of copper and were successful due to the soldering capability of seams and other details. Sheet metal systems are typically intended to shed but not hold water.

Sheet metal roofing can be applied in many configurations including standing seams where potential moisture infiltration paths are located up out of the level of shedding water. Some copper systems include flat soldered seams. Properly constructed, including provisions for expansion and contraction, sheet metal roofing systems can perform well for up to 50 years depending upon many factors.

We appreciate the opportunity to have provided this Roof Evaluation Study. After your review please call to further discuss the strategy moving forward.

Very truly yours,

James M. Russo, RRC
President

Roof Evaluation Project

19 Public Buildings in Sudbury, MA
Recommended Roof Repair and Replacement Spreadsheet
RBA Job No. 201056.00
September 30, 2010
February 3, 2012---2nd Revision

	Town Building Name	Roof Type	Roof Area (SF)	Work Item	2010 Cost	Recommended Work Year	Estimated Construction Cost - Adjusted for 4% annual increase in construction costs, compounded annually										
							2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
							FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	Fairbank Complex - Area Nos. 5 & 2	Shingle/EPDM	11,300	Replace	$186,250	2010	$186,250										
	Fairbank Complex - Area Nos. 3, 4, 6	EPDM	20,600	Replace	$454,050	2012			$491,100								
	Fairbank Complex - Area 1	EPDM	10,650	Replace	$161,800	2013				$182,003							
2	Flynn Building - Areas 1& 2	Shingle/EPDM	7,100	Repairs	$30,000	2013				$33,746							
3	Hway Office & Garage - Area Nos. 2 & 3	EPDM/BUR	5,075	Replace	$93,700	2012			$101,346								
	Hway Office & Garage - Area 4 & 4A	Metal	3,275	Repairs	$20,000	2014					$23,397						
	Hway Office & Garage - Areas 1 & 5	Shingle	1,710	Replace	$12,500	2016							$15,816				
4	North Fire Station - Areas 1-3	EPDM	3,045	Replace	$50,130	2016							$63,430				
5	South Fire Station - Areas 1 & 2	Shingle	4,135	Repairs	$2,000	2010	$2,000										
	South Fire Station - Areas 1 & 2	Shingle	4,135	Replace	$30,000	2018									$41,057		
6	Main Fire Station - Areas 1-3	Shingle	10,160	Repairs	$1,800	2010	$1,800										
	Main Fire Station - Areas 1-3	Shingle	10,160	Replace	$61,000	2015						$74,216					
7	Haynes House - Areas 1-3	Shingle/EPDM	1,250	NA	$0	2010	$0										
8	Police Station - Area 1	Shingle	6,600	Replace	$46,000	TBD											
9	Carding Mill House - Area 1	Slate	3,265	Repairs	$15,000	2011		$15,600									
10	Loring Parsonage - Area 1	Cedar	2,000	Repairs	$2,000	2011	$2,080										
11	Hosmer House - Areas 1 & 2	Shingle	2,040	Replace	$35,000	2012			$37,856								
12	Town Hall - Area 1	Slate	6,000	Repairs	$15,000	2011		$15,600									
	Town Hall - Area 1	Slate	6,000	Repairs	$15,000	2015						$18,250					
	Town Hall - Area 1	Slate	6,000	Repairs	$15,000	2019										$21,350	
13	Goodnow Library - Area 1	Slate	3,750	Repairs	$15,000	2014					$17,548						
	Goodnow Library - Area 1	Slate	3,750	Repairs	$15,000	2019										$21,350	
	Goodnow Library - Area Nos 2, 3, 6 & 7	EPDM	4,240	Replace	$91,320	2014					$106,831						
	Goodnow Library - Area Nos 4 & 5	Shingle	14,975	Replace	$105,000	2018									$143,700		
14	DPW Office & Garage - Area 3	Metal	17,525	Repairs	$20,000	2011		$20,800									
	DPW Office & Garage - Area 1	Shingle	10,500	Repairs	$7,000	2011		$7,280									
					Total	***$1,644,407***	***$192,130***	***$59,280***	***$630,302***	***$215,749***	***$147,777***	***$92,466***	***$79,247***	***$0***	***$184,757***	***$42,699***	***$0***

	School Building Name	Roof Type	Roof Area (SF)	Work Item	2010 Cost	Recommended Work Year	Estimated Construction Cost - Adjusted for 4% annual increase in construction costs, compounded annually										
							2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
15	Noyes School - Areas 1-18	EPDM	53,505	Replace	$1,054,082	2011		$1,096,245									
16	Nixon School - Areas 7, 8, 10 & 11	EPDM	25,965	Replace	$484,972	2012			$524,546								
	Nixon School - Areas 1, 2, 4, 5 & 6	EPDM	30,160	Repairs	$45,000	2011		$46,800									
	Nixon School - Areas 1, 2, 4, 5 & 6	EPDM	30,160	Replace	$526,540	2019										$810,584	
	Nixon School - Area 9	Shingle	4,975	Replace	$39,800	2017								$56,648			
	Nixon School - Area 3	Metal	795	Repairs	$2,500	2015						$3,290					
17	Haynes School - Areas 3, 4 & 5	EPDM	NA	Repairs	$15,000	2011		$15,600									
	Haynes School - Areas 5, 6, 7 & 9	EPDM	44,596	Replace	$784,900	2015						$954,951					
	Haynes School - Areas 2, 3, 4, 8 &10	EPDM	15,089	Replace	$283,718	2020											$419,972
18	Loring School - Areas 1, 4, 5, 13, 14	EPDM	42,825	Repairs	$25,000	2011		$26,000									
	Loring School - Areas 1, 4, 5, 13, 14	EPDM	42,825	Replace	$780,113	2020											$1,154,758
	Loring School - Areas 2, 3 & 6-12	Metal	8,685	Repairs	$18,000	2018									$24,634		
19	Curtis School - Areas 1-16	EPDM	81,578	Repairs	$20,000	2011		$20,800									
	Curtis School - Areas 1-16	EPDM	81,578	Replace	$1,299,270	2020											$2,080,173
					Total	***$7,235,001***	***$0***	***$1,205,445***	***$524,546***	***$0***	***$0***	***$958,241***	***$0***	***$56,648***	***$24,634***	***$810,584***	***$3,654,903***

ROOF CONDITION SURVEY

For

Town of Sudbury

Fairbank Complex
40 Fairbank Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Fairbank Complex Roof
40 Fairbank Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 42,550 square feet (SF).

- Two low-sloped roof areas contain approximately 13,350 SF of stone ballasted EPDM roofing, labeled Roof Area Nos. 1 & 2 on the roof plan. Roof Area No. 1 (10,650 SF) is over the Pool. Roof Area No. 2 (2,700 SF) is over the lobby/electric rooms. Roof Area Nos. 1 & 2 reportedly was installed as new construction in 1987.

- Three low-sloped roof areas contain approximately 20,600 SF of adhered EPDM roofing, labeled Roof Area Nos. 3, 4, & 6 on the roof plan. Roof Area Nos. 3 & 4 (18,700 SF) is over the school administration & recreation department offices. Roof Area No. 6 (1,900 SF) is over the kitchen. Roof Areas 3, 4, & 6 reportedly were installed as a “go-over” application (installed over the original roofing system) in 1990.

- One general steep-sloped roof area contains approximately 8,600 SF of shingle roofing, Roof Area No. 5 labeled as Roof Area Nos. 5A, 5B, 5C and 5D on the roof plan. This roof area is over the Senior Center and Gymnasium. Roof Area 5A (4,300 SF) contains 21 year old shingle roofing applied to a 3” thick nailable rigid board roof insulation that is mechanically attached to a steel roof deck. Roof Area 5B (1,000 SF) contains 21 year old shingle roofing applied to plywood roof decking. Roof Area 5C (1,200 SF) contains 21 year old shingle roofing applied to tongue and groove wood plank roof decking. Roof Area 5D (2,100 SF) contains 5 year old shingle roofing reportedly installed over the original bituminous built-up roof membrane that is attached to the tongue and groove wood plank roof decking.

Roof Observations/Issues

The roofing systems that exist at this location are in good to fair to poor condition. Leaks are reported to occur in various locations; water stains were observed on ceiling tiles and at exposed undersides of roof decking. Numerous previous repairs to the roofing systems were observed; some are failing. Numerous areas of ponding water on the EPDM roof surfaces were observed. Various locations of soft/spongy conditions were observed on the EPDM roof areas (when walked upon), indicating the possibility that the underlying rigid board roof insulation and associated components (fasteners & wood blocking) are wet. Deterioration of EPDM seams was observed. Flashing deterioration was observed. Low base flashing height was observed. Fragmented and cracked stone ballast was observed. Deterioration of shingles was observed along with many previous repairs implemented with roofing cement (now cracked and split open). Portions of plywood roof decking at the shingle roofing have failed and have popped-up exposing the roof deck.

The Town hopes to improve the thermal resistance of the sloped shingle roof areas. Currently, Roof Area 5A, an obvious addition to the building, includes rigid board roof insulation above the roof deck bringing the thermal resistance of that area of roof to approximately R=20. Roof Area 5B, part of the addition intended to blend Roof 5A into 5C, includes an estimated thermal resistance rating of approximately R=6. Roof Areas 5C and 5D, part of the original gymnasium building, includes an estimated thermal resistance rating of approximately R=6.

Additional Observations/Issues

Rusting was observed at the exposed sheetmetal ductwork and sheetmetal curbs of some rooftop units. Deteriorated conditions of wood elements (fascia, soffit, siding, window frames) were observed including peeling paint and rot. Cracks were observed in the masonry chimney. Deteriorated conditions of the acrylic domes of some skylights were observed. Deteriorated conditions of the insulated translucent panel skylights (at the shingle Roof Area 5A and over the main entrance) were observed. The roof hatch located on Roof No. 2 is very close to the roof edge, presenting a safety issue.

Corrective Recommendations

The following recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Replace the steep-sloped shingle roofing (Roof Area No. 5 - Roof Area Nos. 5A, 5B, 5C and 5D at 8,600 SF) and the low-sloped stone ballasted EPDM roofing (Roof Area No. 2 at 2,700 SF) in **year 2010**.

   The low-sloped roof recommendation (Roof Area No. 2) is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, snow guards, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The steep-sloped recommendation (Roof Area No. 5) is to remove all shingle roofing, including the more recently installed roofing over Roof Area 5D, down to the roof deck (in the case of Roof Area 5A, down to the existing rigid board roof insulation). Roof Area 5D does not require renovation at this time but in order to improve thermal performance and avoid irregular appearance and detailing and to maintain watertightness, replacement is recommended. Roof Area 5A should receive new plywood sheathing (over the existing rigid board roof insulation) and shingle roofing. Roof Area 5B should receive new plywood sheathing and shingle roofing and should have new thermal insulation installed in the confined space below the roof deck. Roof Areas 5C and 5D should receive new nailable rigid board roof insulation and shingle roofing.

The recommended work is broken down as follows.

- Replace 8,600 SF of roof area (Roof No. 5) broken down as follows:
  5A: Replace shingles, add sheathing: 4,300 SF.
  5B: Replace shingles, add sheathing: 1,000 SF.
  Insulate space below 5B roof decking: 1,300 SF.
  5C: Replace shingles, add nailable insulation: 1,200 SF.
  5D: Replace shingles, add nailable insulation: 2,100 SF.
- Replace 2,700 SF of roof area (Roof No. 2).
- Repair 2,500 SF of roof decking.
- Fascia and soffit repairs.
- Replace gutters & downspouts.
- Replace insulated translucent panel skylights (2 total).
- Install safety railing around roof hatch at Roof No. 2.

2. Replace the adhered EPDM roofs (Roof Area Nos. 3, 4 & 6 at 20,600 SF) in **year 2012**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, skylights, repairs to deteriorated roof decking, waterproofing of sheetmetal ductwork & rusted sheetmetal at rooftop units, repairs to deteriorated wood elements and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 20,600 SF of roof area.
   - Repair 4,000 SF of roof decking.
   - Fascia, soffit & window frame repairs.
   - Replace scuppers & downspouts.
   - Replace acrylic dome skylight assemblies (7 total).
   - Repair masonry chimney.

- Waterproof sheetmetal ductwork & rusted sheetmetal at rooftop units.

3. Replace the stone ballast EPDM roof (Roof Area No. 1 at 10,650 SF) in **year 2013**. The recommendation is a "go-over" application replacement with an adhered 60-mil reinforced PVC roof membrane system to include new overlay rigid board roof insulation (R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   Note: This roof area is a steeper low-sloped roof area (approximately 3:12 pitch) and the recommendation of a new adhered 60-mil reinforced PVC roof membrane system includes simulated standing seams (PVC material that provides a standing seam profile which mimics the look of a metal roofing system). The PVC membrane comes in many different colors. This option provides a long-term watertight roof system, has the aesthetic look of an attractive standing seam metal roof, has low maintenance requirements, and includes a manufacturer's 20-year full system labor and material warranty. Measures to deal with snow slides include snow guards over existing entrances and walkways.

   The recommended work is broken down as follows.

   - Replace 10,650 SF of roof area (Roof No. 1).
   - Replace gutters & downspouts.
   - Install snow guard assemblies.

I. IDENTIFICATION

Subject:	Fairbank Complex Roof
Location:	40 Fairbank Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of July 2010 & September 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Gifford Perry, Sudbury PBC

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Fairbank Complex located in Sudbury, Massachusetts. The Fairbank Complex contains EPDM roofing and shingle roofing systems with cementitious wood fiber, steel and wood roof decking. The roof area of the entire building is approximately 42,550 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, exhaust fans, chimney, HVAC units with associated ductwork, and skylights.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Est. Age	Condition
Roof Area No. 1 (Elev. 23' ±) *Pool*	10,650	Ballasted EPDM (new construction in 1987) with tongue and groove wood roof decking. Roof is sloped (approx. 3:12 pitch). Roof drains via gutters and downspouts.	23 Years	Good
Roof Area No. 2 (Elev. 14' ±) *Lobby/Electric Rooms*	2,700	Ballasted EPDM (new construction in 1987) with steel roof decking. Roof is low-sloped (flat with little or no slope). Roof drains via gutters and downspouts.	23 Years	Poor
Roof Area No. 3 (Elev. 11' ±) *School Administration & Recreation Dept. offices*	18,350	Adhered EPDM (reportedly installed over original built-up roofing system) with cementitious wood fiber roof decking. Roof is low-sloped (flat with little or no slope). Roof drains via scuppers (spill out type and downspout type).	20 Years	Fair
Roof Area No. 4 (Elev. 13' ±) *Same as No. 3*	350	Adhered EPDM (reportedly installed over original built-up roofing system) with cementitious wood fiber roof decking. Roof is low-sloped (flat with little or no slope). Roof drains directly onto Roof Area No. 3.	20 Years	Fair
Roof Area No. 5 (Elev. 25' ±) *Senior Center & Gymnasium*	8,600	Shingles with steel, plywood and T&G wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof primarily drains direct to ground and also flows onto Roof Area No. 3.		
5A	4,300	Shingles on insulation and steel roof deck.	21 yrs	poor
5B	1,000	Shingles on plywood roof deck – no insulation	21 yrs	poor
5C	1,200	Shingles on wood plank roof deck – no insulation	21 yrs	poor
5D	2,100	Shingles on wood plank roof deck – no insulation	5 yrs	good
Roof Area No. 6 (Elev. 12' ±) *Kitchen*	1,900	Adhered EPDM (reportedly installed over original built-up roofing system) with steel roof decking. Roof is low-sloped (flat with little or no slope). Roof drains via scuppers (downspout type).	20 Years	Fair

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place for the various roof areas.

History of Repairs:

Not Known. There have been many repair attempts throughout all roof areas. Roof Area 5D shingles were replaced 5 years ago.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Fairbank Complex

Description: Aerial View of Roof. Roof Area No. 1 is at the top of the picture.

Photo No. 02

Location: Fairbank Complex

Description: Overview of Roof Area No. 1. Note that stone ballast has migrated away from the roof ridge.

Photo No. 03

Location: Fairbank Complex

Description: Overview of Roof Area No. 2

Photo No. 04

Location: Fairbank Complex

Description: Partial overview of Roof Area No. 3

Photo No. 05

Location: Fairbank Complex

Description: Partial overview of Roof Area No. 4

Photo No. 06

Location: Fairbank Complex

Description: Overview of Roof Area Nos. 5A, 5B and 5C.

Photo No. 07

Location: Fairbank Complex

Description: Overview of Roof Area No. 6.

Photo No. 08

Location: Fairbank Complex

Description: Ballast retention bar of Roof Area No. 1 is loose.

Photo No. 09

Location: Fairbank Complex

Description: Roof hatch on Roof Area No. 2 opens towards the roof edge creating a safety concern.

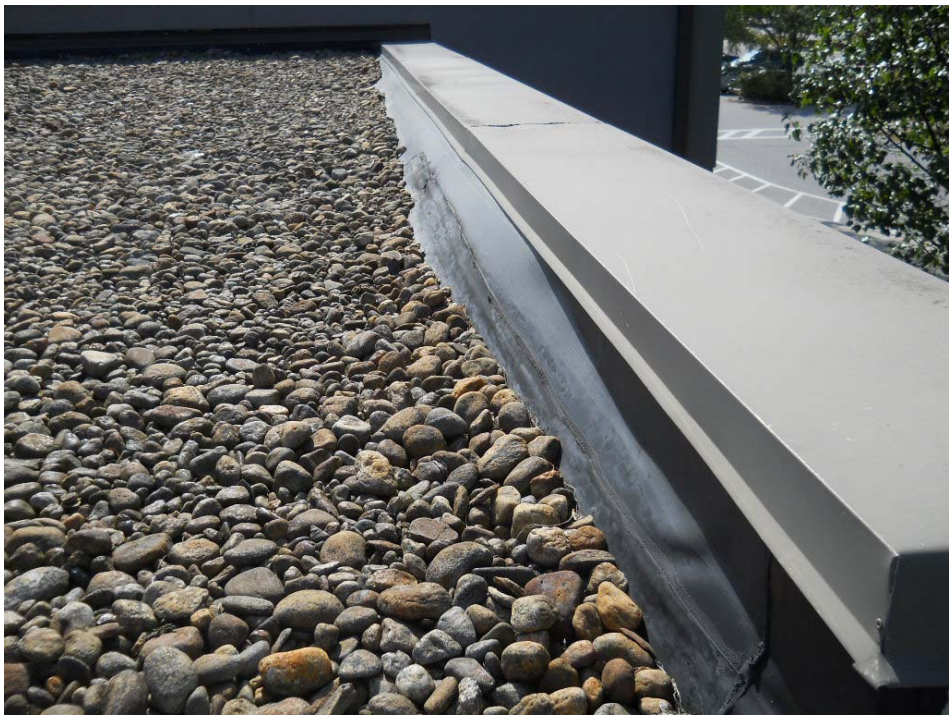


Photo No. 10

Location: Fairbank Complex

Description: EPDM base flashings of Roof Area No. 2 are pulling away from the parapet due to membrane shrinkage.

Photo No. 11

Location: Fairbank Complex

Description: Roof Area No. 3: Enclosed skylight curb has had numerous EPDM repairs.

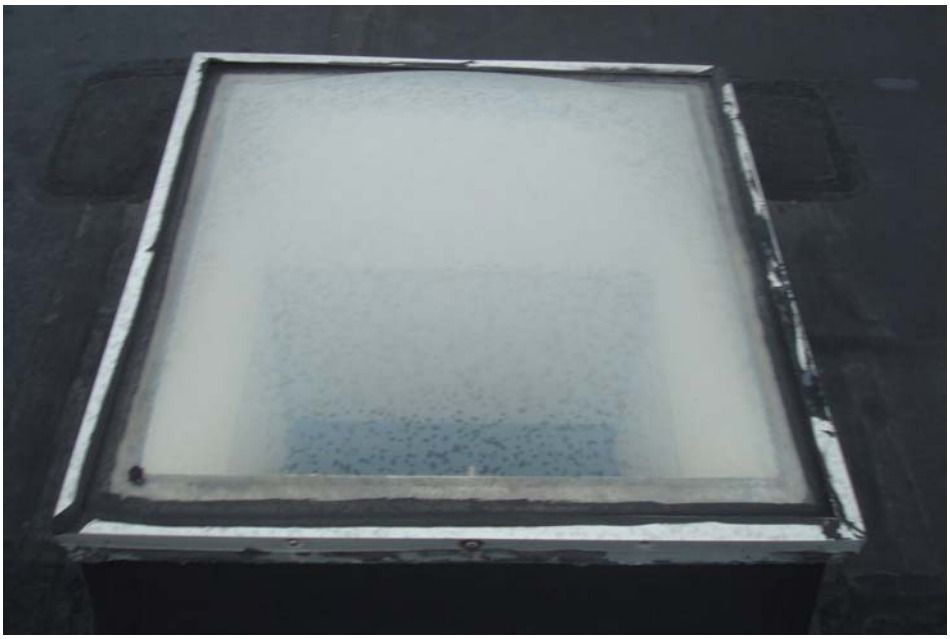


Photo No. 12

Location: Fairbank Complex

Description: Roof Area No. 3: Skylight domes are weathered and brittle.

Photo No. 13

Location: Fairbank Complex

Description: Roof Area No. 3 drains poorly. Mechanical equipment is rusting.

Photo No. 14

Location: Fairbank Complex

Description: Plywood roof decking on Roof Area No. 5B has popped up.

Photo No. 15

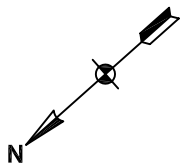
Location: Fairbank Complex

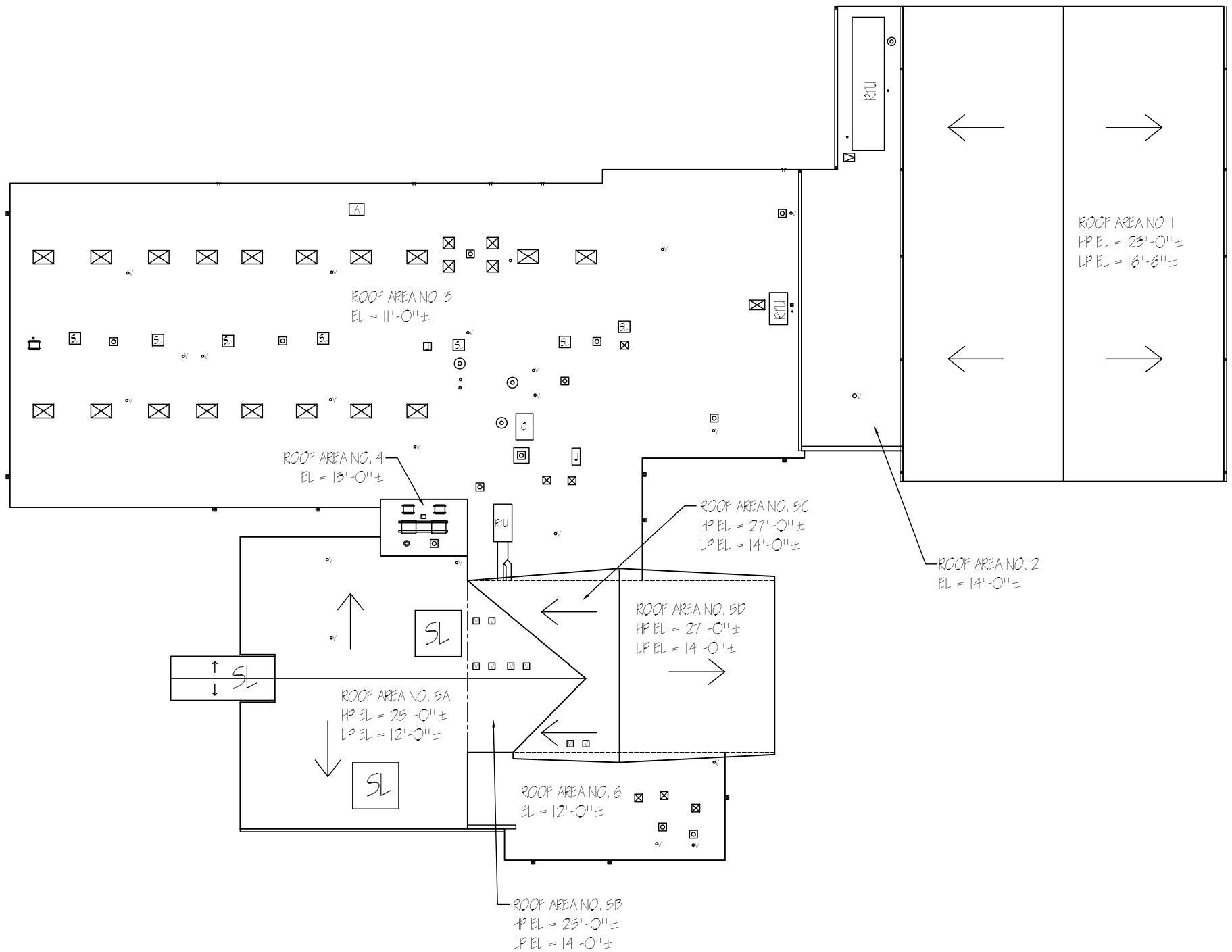
Description: Shingle valley between Roof Areas 5B and 5C is irregular due to loose or poorly applied plywood roof decking.

Photo No. 16

Location: Fairbank Complex

Description: Ridge between Roof Area Nos. 5C and 5D (5D has the newer/darker shingle roof covering). The older shingles are cracked throughout. The newer shingles are in good condition.





FAIRBANK COMPLEX - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
OV	VENT PIPE
	ROOF DRAIN
	PIPE PENETRATION
	HOT PIPE
	PITCH POCKET
	EXHAUST FAN
	ROOF HATCH
	UNIT SLEEPER SUPPORTS
	ABANDONED PENETRATION
SL	SKYLIGHT
V	GRAVITY VENT
A	ANTENNA
J	J VENT
C	CHIMNEY
RTU	ROOF TOP UNIT
	OVERFLOW SCUPPER
	SCUPPER BOX
	GUTTER & DOWNSPOUT
	EXPANSION JOINT
	ROOF OVERHANG
	SLOPE DIRECTION: DOWN

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
FAIRBANK COMPLEX
40 FAIRBANK ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Flynn Building
278 Old Sudbury Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Flynn Building Roof
278 Old Sudbury Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 7,100 square feet (SF).

- One steep-sloped roof area contains approximately 3,500 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan, reportedly installed in 1998. Two smaller over entrance roofs also contain shingle roofing, labeled as Roof Nos. 3 & 4 on the roof plan, reportedly installed in 2006.
- One low-sloped roof area contains approximately 3,600 SF of adhered EPDM roofing, labeled Roof Area No. 2 on the roof plan, reportedly installed in 2000.

Roof Observations/Issues

The roofing systems that exist at this location are in good condition. No leaks are reported to occur. Some deficient conditions were observed and include EPDM seam deterioration; at shingle roof/EPDM roof tie-in the EPDM flashing membrane is unadhered in some locations; the roof hatch (located on the EPDM roof) is very difficult to open as a vent pipe exits the rear of the hatch; deteriorated conditions were observed at the masonry chimneys (located on the shingle roofs) including open mortar joints, cracked capstone, and roof cement repairs at step flashing (cracked and split); minor ponding water was observed on the EPDM roof; some cracked/split shingles were observed; splits in the solder joints of the copper flashing, that exists below roof line around the perimeter rain table, were observed.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the “Recommended Roof Repair and Replacement Spreadsheet” located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs to the steep-sloped roof (Roof Area No. 1 at 3,500 SF) and the low-sloped EPDM roof (Roof Area No. 2 at 3,600 SF) in year **2013**. Repair work includes stripping in EPDM seams; replace roof hatch and vent; reflash shingle roof/EPDM roof tie-in; repair defective conditions at masonry chimneys; repair splits in solder joints of the copper flashing.

I. IDENTIFICATION

Subject:	Flynn Building Roof
Location:	278 Old Sudbury Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Flynn Building located in Sudbury, Massachusetts. The Flynn Building contains EPDM roofing and shingle roofing systems. The roof area of the entire building is approximately 7,100 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, roof hatch, and chimney.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 38' ±)	3,500	Shingles with wood roof decking. Roof is sloped (approx. 6:12 pitch). Roof drains via free flow onto ground and also free flows onto Roof Area No. 2.	12 Years	Good
Roof Area No. 2 (Elev. 32' ±)	3,600	Adhered EPDM. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	15 Years	Good
Roof Area No. 3 (Elev. 10' ±)	Negligible	Shingles with wood roof decking. Roof is sloped (approx. 6:12 pitch).	12 Years	Good
Roof Area No. 4 (Elev. 10' ±)	Negligible	Shingles with wood roof decking. Roof is sloped (approx. 6:12 pitch).	12 Years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Flynn Building

Description: Aerial View of Roof.

Photo No. 02

Location: Flynn Building

Description: Partial Overview of Roof Area No. 1

Photo No. 03

Location: Flynn Building

Description: Overview of Roof Area No. 1

Photo No. 04

Location: Flynn Building

Description: Partial overview of Roof Area Nos. 1 & 2

Photo No. 05

Location: Flynn Building

Description: Partial overview of Roof Area Nos. 1 & 2

Photo No. 06

Location: Flynn Building

Description: Partial overview of Roof Area No. 2

Photo No. 07

Location: Flynn Building

Description: Overview of Roof Area No. 3

Photo No. 08

Location: Flynn Building

Description: Overview of Roof Area No. 4

Photo No. 09

Location: Flynn Building

Description: Deteriorated Chimney Cap

Photo No. 10

Location: Flynn Building

Description: Deteriorated Chimney Cap & Brick Mortar

Photo No. 11

Location: Flynn Building

Description: Deteriorated Brick Mortar

Photo No. 12

Location: Flynn Building

Description: Improper Chimney Flashing

Photo No. 13

Location: Flynn Building

Description: Improper Roof Hatch With Vent

Photo No. 14

Location: Flynn Building

Description: Ponding Water at Roof Drain

Photo No. 15

Location: Flynn Building

Description: Deteriorated Copper Shelf

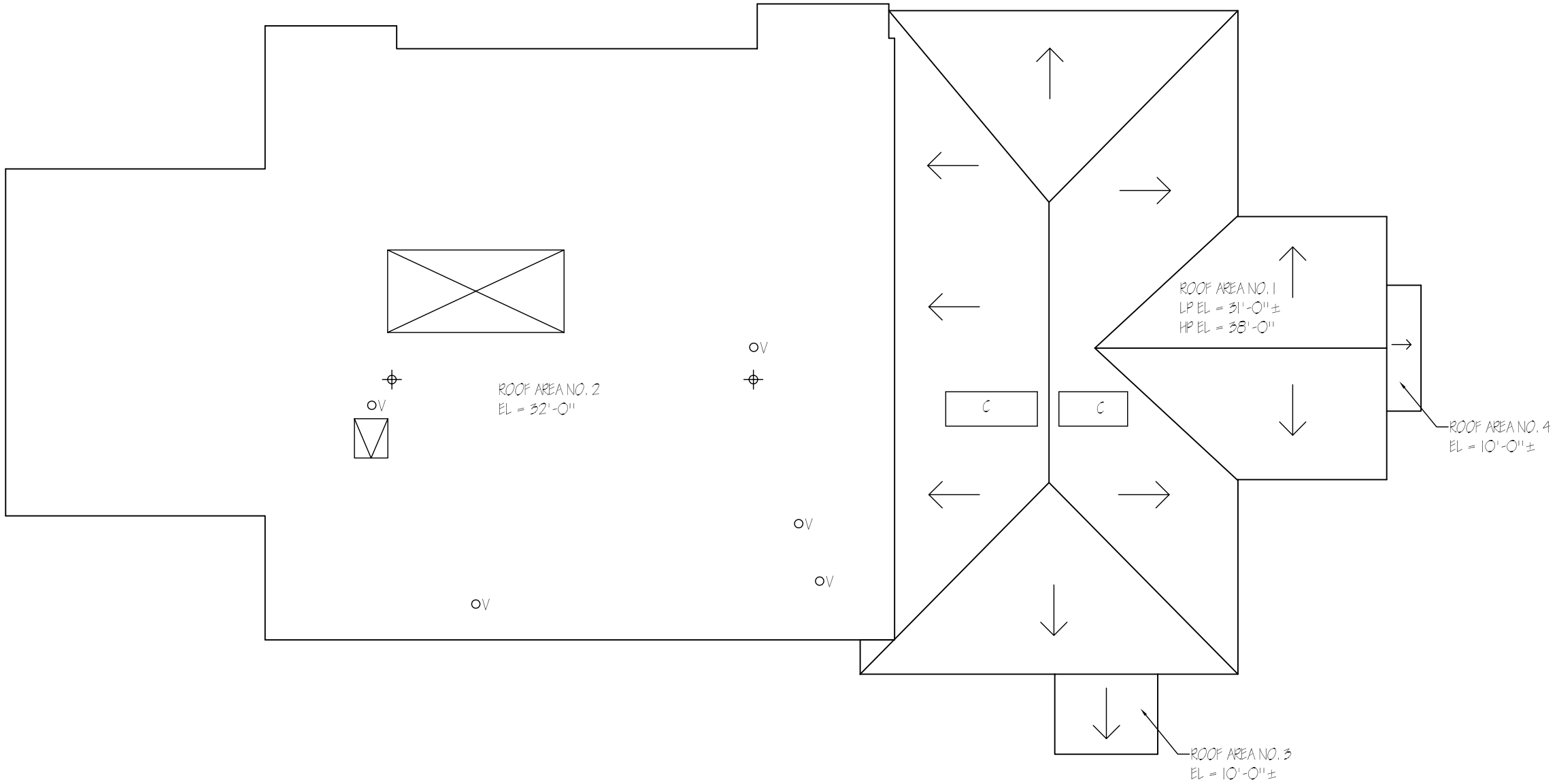
Photo No. 16

Location: Flynn Building

Description: Deteriorated Copper Seam on Copper Shelf

N

LEGEND	
○V	VENT PIPE
⌖	ROOF DRAIN
C	CHIMNEY
⊠	ABANDONED PENETRATION
→	SLOPE DIRECTION: DOWN
⊠	ROOF HATCH



FLYNN BUILDING - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
FLYNN BUILDING
278 OLD SUDBURY ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Highway Office & Garage Buildings
275 Old Lancaster Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Highway Office & Garage Buildings Roofs
278 Old Lancaster Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 10,060 square feet (SF).

- One steep-sloped roof area contains approximately 1,650 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan. This roof area appears to have been an addition to the original building installed over a flat section of roofing (1996 installation date is reported).

- One low-sloped roof area contains approximately 2,725 SF of adhered EPDM roofing, labeled Roof Area No. 2 on the roof plan. It is not known when the EPDM roofing was installed however; it is suspected that the EPDM roofing was installed over the original built-up roofing system that was reportedly installed in 1981.

- One low-sloped roof area contains approximately 2,350 SF of gravel surfaced built-up roofing (BUR), labeled Roof Area No. 3 on the roof plan, reportedly installed in 1981 (currently 29 years old).

- One steep-sloped roof area contains approximately 2,850 SF of metal roofing, labeled Roof Area No. 4 on the roof plan, reportedly installed in 1981 (currently 29 years old). Note: A section of this roof area contains a white painted single-ply roofing patch that is approximately 425 SF, labeled as Roof Area 4A on the roof plan.

- One steep-sloped roof area (overhang) contains approximately 60 SF of shingle roofing, labeled Roof Area No. 5 on the roof plan (installation date is unknown).

Roof Observations/Issues

The shingle roofing system (Roof Area No. 1) appears to be in good condition. The shingle roofing system (Roof Area No. 5) appears to be in good to fair condition; curling of shingles was observed.

The EPDM and BUR roofing systems (Roof Area Nos. 2 & 3) appear to be in fair to poor condition. Leaks are reported to occur at these areas and deficient conditions were observed including numerous previous repairs (some are failing); numerous areas of ponding water on the roof surfaces; various locations of soft/spongy conditions (when walked upon), indicating the possibility that the underlying rigid board roof insulation and associated components (fasteners & wood blocking) are wet; deterioration of EPDM seam; flashing deterioration; low base flashing height; splits and blisters in the BUR; and deteriorated wood fascia boards.

The sloped metal roofing system (Roof Area No. 4) appears to be in good to fair condition. Slight pitting and corrosion were observed on some of the panels; otherwise, on the whole, the panels appear to be in good condition. Previous repairs were observed including a large

white painted single-ply roofing patch (Roof Area 4A); a white emulsion type coating exists on the panels and some repairs to the panel fasteners were observed (sealant and emulsion coating). Unattached sheetmetal at the gutters was observed along with a missing downspout.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Estimate.

1. Replace the low-sloped adhered EPDM roof and BUR roof (Roof Area Nos. 2 & 3 at 5,075 SF) in **year 2012**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 5,075 SF of roof area.
   - Repair 500 SF of roof decking.
   - Replace 2 cast iron roof drains.
   - Replace gutter and downspouts.

2. Implement repairs to the steep-sloped metal roof (Roof Area Nos. 4 & 4A at 3,275 SF) in year **2014**. Repair work includes removing and replacing panel seam repair materials, reflashing rooftop penetrations, re-securing panel fasteners and installing new panel fasteners as needed, remove membrane system labeled Roof Area No. 4A, and installation of a fluid applied waterproofing membrane complete with a manufacturer's warranty (minimum 10-years).

3. Replace the steep-sloped shingle roof (Roof Area Nos. 1 & 5 at 1,710 SF) in year **2016**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

I. IDENTIFICATION

Subject:	Highway Office & Garage Building Roof
Location:	275 Old Landcaster Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition of the Highway Office & Garage Building located in Sudbury, Massachusetts. The Highway Office & Garage Building contains EPDM roofing, Built-up Roofing, Metal roofing, and shingle roofing systems. The roof area of the entire building is approximately 10,060 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, roof hatch, and chimney.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 28' ±)	1,650	Shingle roofing system. Roof is sloped (approx. 5:12 pitch). Roof drains via free flow onto ground.	20 Years	Good
Roof Area No. 2 (Elev. 19' ±)	2,725	Adhered EPDM (suspected to have been installed over original built-up roofing system). Roof is low-sloped (flat with little slope). Roof drains via gutters and downspouts.	15 Years	Fair to Poor
Roof Area No. 3 (Elev. 16' ±)	2,350	Gravel surfaced built-up roofing. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	29 Years	Fair to Poor
Roof Area Nos. 4 & 4A (Elev. 21' ±)	3,275	Metal roofing system. Roof is sloped (approx. 3:12 pitch). Roof drains via gutters and downspouts.	29 Years	Good to Fair
Roof Area No. 5 (Elev. 9' ±)	60	Shingle roofing system. Roof is sloped (approx. 4:12 pitch). Roof drains via free flow onto ground.	20 Years	Good to Fair

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Highway Office & Garage Building

Description: Aerial View of Roof.

Photo No. 02

Location: Highway Office & Garage Building

Description: Overview of Roof.

Photo No. 03

Location: Highway Office & Garage Building

Description: Overview of Roof Area No. 1

Photo No. 04

Location: Highway Office & Garage Building

Description: Partial overview of Roof Area Nos. 2, 3, & 4

Photo No. 05

Location: Highway Office & Garage Building

Description: Partial overview of Roof Area No. 5

Photo No. 06

Location: Highway Office & Garage Building

Description: Partial overview of Roof Area No. 2

Photo No. 07

Location: Highway Office & Garage Building

Description: Partial overview of Roof Area No. 3

Photo No. 08

Location: Highway Office & Garage Building

Description: Partial overview of Roof Area No. 4

Photo No. 09

Location: Highway Office & Garage Building

Description: Ponding Water on Roof Area No. 2

Photo No. 10

Location: Highway Office & Garage Building

Description: Improper Basewall Flashing on Roof Area No. 2

Photo No. 11

Location: Highway Office & Garage Building

Description: Ponding Water on Roof Area No. 2

Photo No. 12

Location: Highway Office & Garage Building

Description: Rusted Hot Pipe Rain Collar on Roof Area No. 4

Photo No. 13

Location: Highway Office & Garage Building

Description: Rust Penetrating Through Coating on Roof Area No. 4

Photo No. 14

Location: Highway Office & Garage Building

Description: Deteriorated Metal Roof Panel & Open Seam at Roof Area No. 4 & 4A Intersection

Photo No. 15

Location: Highway Office & Garage Building

Description: Flashing Cement Cracking on Roof Area No. 3

Photo No. 16

Location: Highway Office & Garage Building

Description: Deteriorated Wood Fascia on Roof Area No. 3

Photo No. 17

Location: Highway Office & Garage Building

Description: Gutter Falling Off Building On Roof Area No. 1

Photo No. 18

Location: Highway Office & Garage Building

Description: Deteriorated Edge Metal & Wood Fascia

Photo No. 19

Location: Highway Office & Garage Building

Description: Missing Downspout & Cracked Mortar Joints

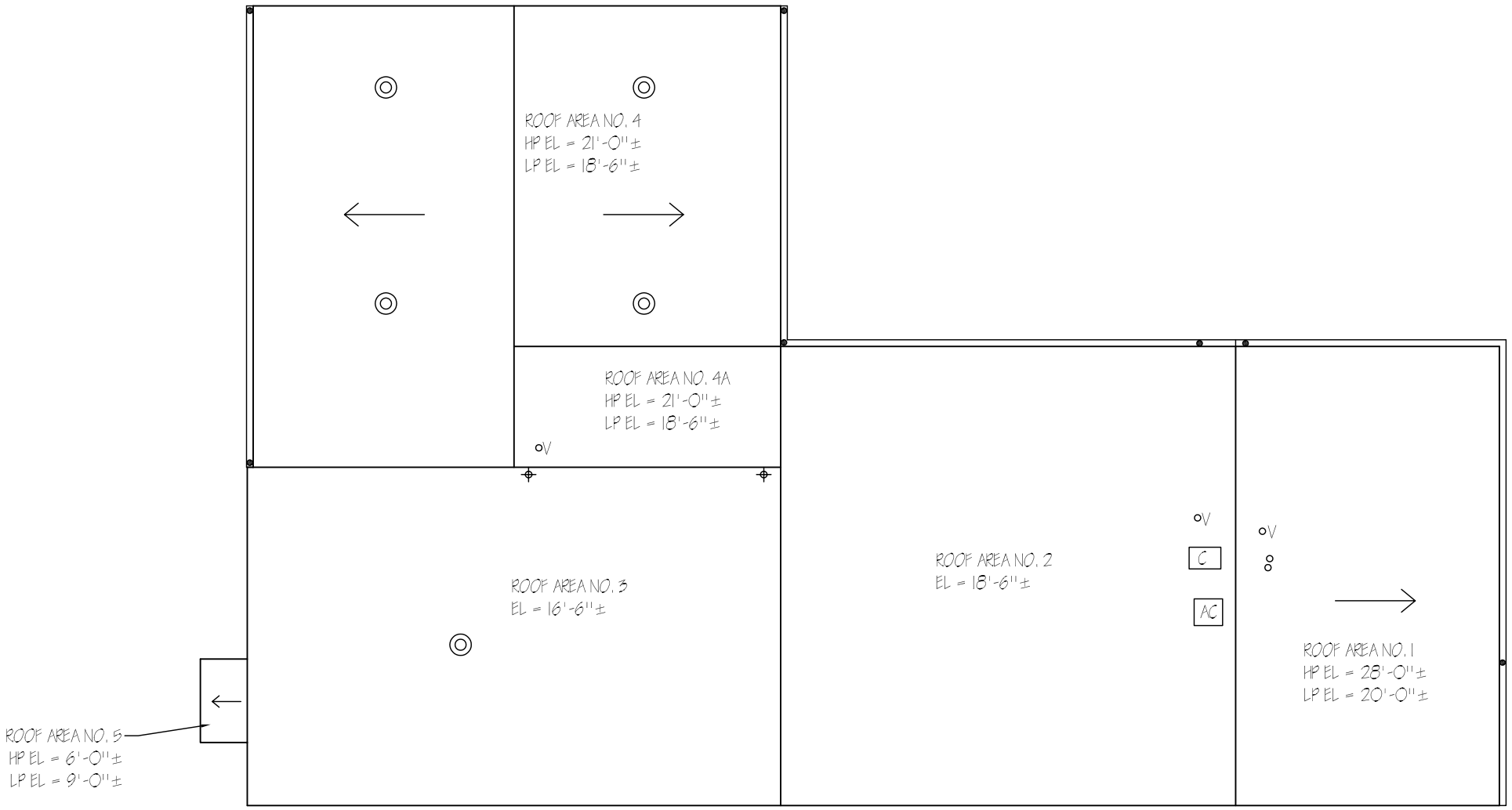
Photo No. 20

Location: Highway Office & Garage Building

Description: Stained Ceiling From Roof Leak

N

LEGEND	
○V	VENT PIPE
⌖	ROOF DRAIN
○	PIPE PENETRATION
◎	HOT PIPE
AC	AIR CONDITIONER
C	CHIMNEY
▬●	GUTTER & DOWNSPOUT
→	SLOPE DIRECTION: DOWN



HIGHWAY OFFICE & GARAGE - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumber Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
HIGHWAY OFFICE & GARAGE
275 OLD LANCASTER ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12
SCALE AS NOTED
DRAWN BY / CHECKED BY jrw/RJG
PROJECT NO 201056.00
DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

North Fire Station
268 North Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

North Fire Station Roof
268 North Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 3,045 square feet (SF).

- Three low-sloped roof areas contains approximately 3,045 SF of adhered EPDM roofing, labeled Roof Area Nos. 1-3 on the roof plan, estimated to be approximately 15 years old.

Roof Observations/Issues

The roofing systems that exist at this location are in good to fair condition. No leaks are reported to occur. Some of the EPDM seams have been stripped in and are in good condition; others are not and are showing signs of age. Ponding water on the roof surface exists in various locations. The mortar joints of the chimney are deteriorated.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1-3 at 3,045 SF) in **year 2016**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 3,045 SF of roof area.
   - Repair 500 SF of roof decking.
   - Replace 2 cast iron roof drains.
   - Repoint masonry chimney.

I. IDENTIFICATION

Subject:	North Fire Station Roof
Location:	268 North Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the North Fire Station located in Sudbury, Massachusetts. The North Fire Station contains EPDM roofing. The roof area of the entire building is approximately 3,045 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes and chimney.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 16' ±)	2,200	Adhered EPDM. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	15 Years	Good to Fair
Roof Area No. 2 (Elev. 13' ±)	835	Adhered EPDM. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	15 Years	Good to Fair
Roof Area No. 3 (Elev. 10' ±)	10	Adhered EPDM. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	15 Years	Good to Fair

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: North Fire Station

Description: Aerial View of Roof.

Photo No. 02

Location: North Fire Station

Description: Overview of main roof level.

Photo No. 03

Location: North Fire Station

Description: Overview of Roof Area No. 2

Photo No. 04

Location: North Fire Station

Description: Some roof drains include sheet metal sleeves with original cast iron strainers

Photo No. 05

Location: North Fire Station

Description: Other drains are constructed of heavy wall aluminum with aluminum strainers.

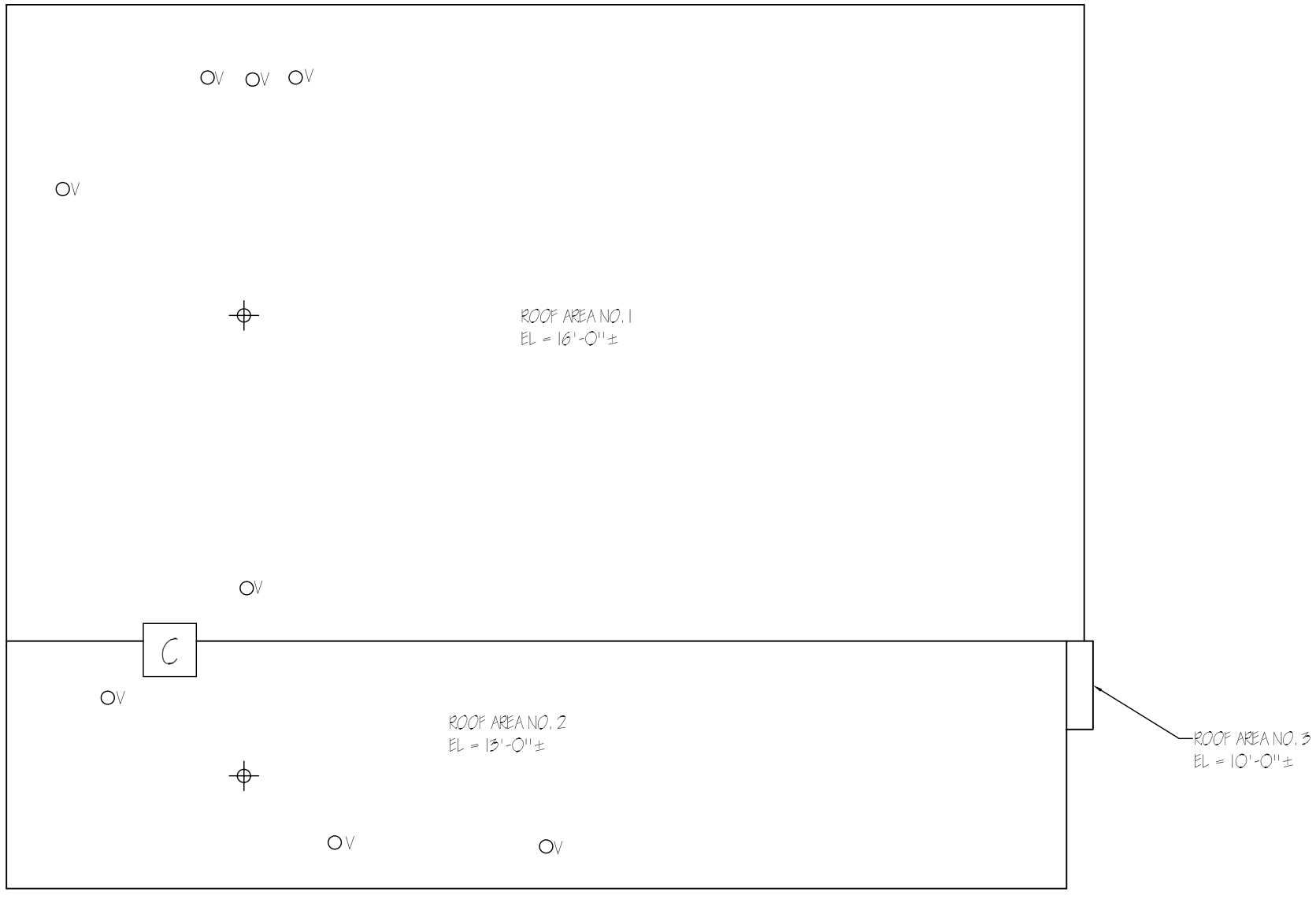
Photo No. 06

Location: North Fire Station

Description: Masonry chimney requires repairs.

N

LEGEND	
○V	VENT PIPE
⊕	ROOF DRAIN
C	CHIMNEY



NORTH FIRE STATION - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumberland Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
NORTH FIRE STATION
268 NORTH ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

South Fire Station
550 Boston Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

South Fire Station Roof
550 Boston Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 4,135 square feet (SF).

- Two steep-sloped roof area contains approximately 4,135 SF of shingle roofing, labeled Roof Area Nos. 1 & 2 on the roof plan, reportedly installed in 1998. These roof areas are reported to have been an addition to the original building installed over the original flat roofing (it is unknown if the original flat roofing system was removed prior to the installation of the addition).

Roof Observations/Issues

The shingle roofing system that exists at this location is in good condition. One leak is reported to occur and it directly correlates to a section of shingles that are missing (wood decking is exposed and deteriorated). Some voids were observed at the copper step flashing of the chimney.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs to the steep-sloped shingle roof (Roof Area Nos. 1 & 2 at 4,135 SF) in year **2010**. Repair work includes replacing deteriorated wood roof decking and missing shingles; seal voids in joints of the copper step flashing.

2. Replace the steep-sloped shingle roof (Roof Area Nos. 1 & 2 at 4,135 SF) in year **2018**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

.

I. IDENTIFICATION

Subject:	South Fire Station Roof
Location:	550 Boston Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were not available for review.

III. DESCRIPTION

The subject of this report is the roof condition the South Fire Station located in Sudbury, Massachusetts. The South Fire Station contains shingle roofing systems. The roof area of the entire building is approximately 4135 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, and chimney.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 20' ±)	2,575	Shingles with wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof drains via gutter and downspouts.	12 Years	Good
Roof Area No. 2 (Elev. 17' ±)	1,560	Shingles with wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof drains via gutter and downspouts.	12 Years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location South Fire Station

Description: Aerial View of Roof.

Photo No. 02

Location: South Fire Station

Description: Overview of Roof. Overall, the shingle roof material is in good condition.

Photo No. 03

Location: South Fire Station

Description: Asphalt shingles have been missing for years – note the weathered plywood sheathing.

Photo No. 04

Location: South Fire Station

Description: Rake edge returns were never fully clad with sheet metal resulting in exposed and weathered wood trim.

Photo No. 05

Location: South Fire Station

Description: Open transition between shingles and lead counterflashing.

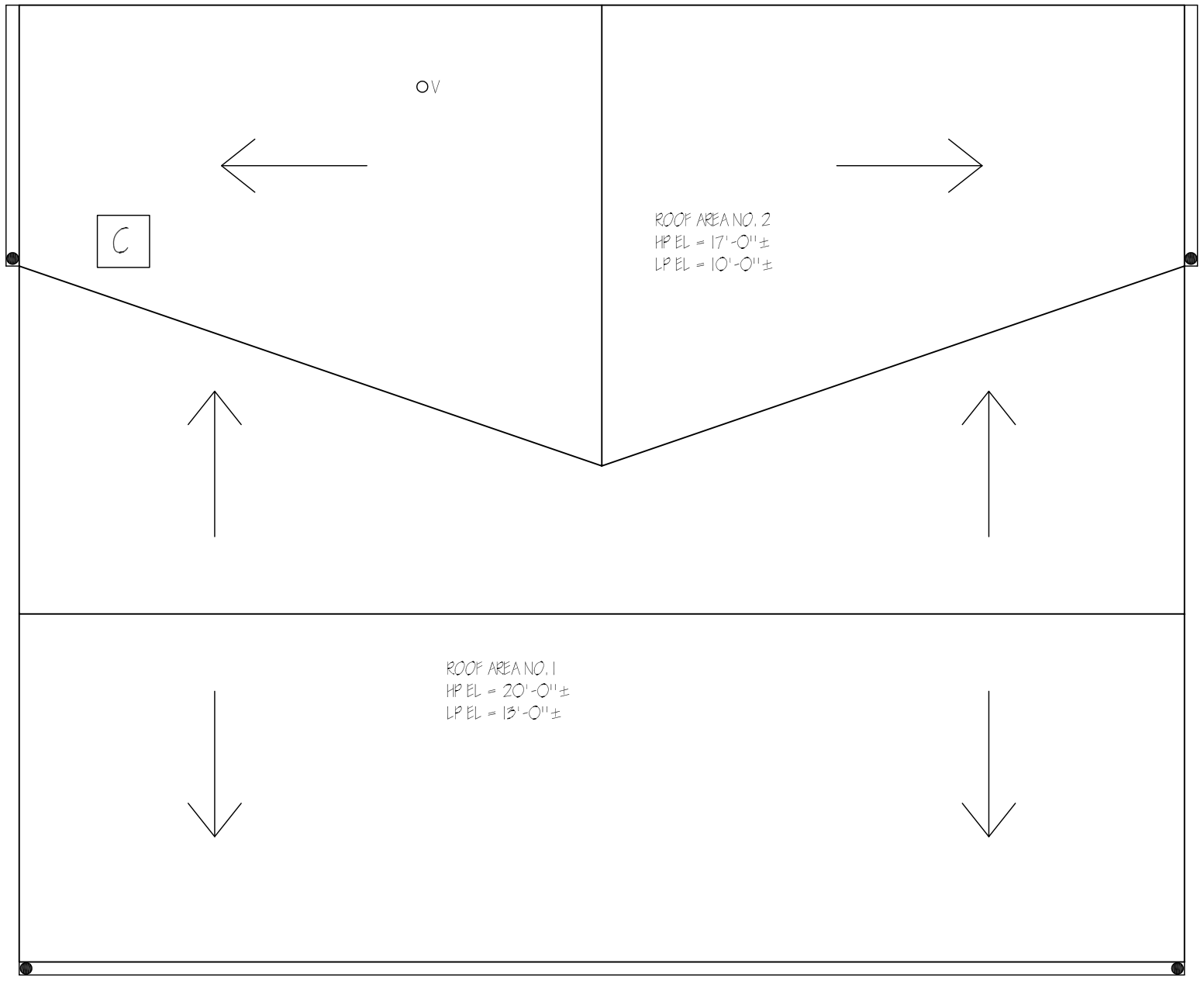
Photo No. 06

Location: South Fire Station

Description: The cause(s) of minor leaks into the apparatus bays is unclear as the low-sloped roofing below the shingle roofing conceals the leak path.

N

LEGEND	
OV	VENT PIPE
	GUTTER & DOWNSPOUT
C	CHIMNEY



SOUTH FIRE STATION - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumber Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
SOUTH FIRE STATION
550 BOSTON ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Main Fire Station
77 Hudson Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Main Fire Station Roof
77 Hudson Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 10,160 square feet (SF).

- Three steep-sloped roof areas contains approximately 10,160 SF of shingle roofing, labeled Roof Area Nos. 1 - 3 on the roof plan, reportedly installed in 1991.

Roof Observations/Issues

The shingle roofing system that exists at this location is in good condition. One leak is reported to occur and it directly correlates to a rusted hot pipe vent pipe assembly (associated sealant is also deteriorated). The cupola contains shingle roofing and appears in good condition. A small section of EPDM roofing is in place at the flat exposed section of the cupola, which is in good condition.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs to the steep-sloped shingle roof (Roof Area Nos. 1-3 at 10,160 SF) in year **2010**. Repair work includes replacing hot pipe vent assembly and flashing accordingly.

2. Replace the steep-sloped shingle roof (Roof Area Nos. 1-3 at 10,160 SF) in year **2015**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

I. IDENTIFICATION

Subject:	Main Fire Station Roof
Location:	77 Hudson Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were not available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Main Fire Station located in Sudbury, Massachusetts. The Main Fire Station contains shingle roofing systems. The roof area of the entire building is approximately 10,160 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, exhaust fans, and cupola.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 35' ±)	3,500	3-tab Shingles with wood roof decking. Roof is sloped (approx. 10:12 pitch). Roof drains via gutter and downspouts.	12 Years	Good
Roof Area No. 2 (Elev. 31' ±)	1,475	3-tab Shingles with wood roof decking. Roof is sloped (approx. 4:12 pitch). Roof drains via gutter and downspouts.	12 Years	Good
Roof Area No. 3 (Elev. 32' ±)	5,185	3-tab Shingles with wood roof decking. Roof is sloped (approx. 10:12 pitch). Roof drains via gutter and downspouts.	12 Years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Main Fire Station

Description: Aerial View of Roof.

Photo No. 02

Location: Main Fire Station

Description: Overview of Roof. Overall, the roof is in good condition.

Photo No. 03

Location Main Fire Station

Description: Generator exhaust stack is the apparent source of at least one leak.

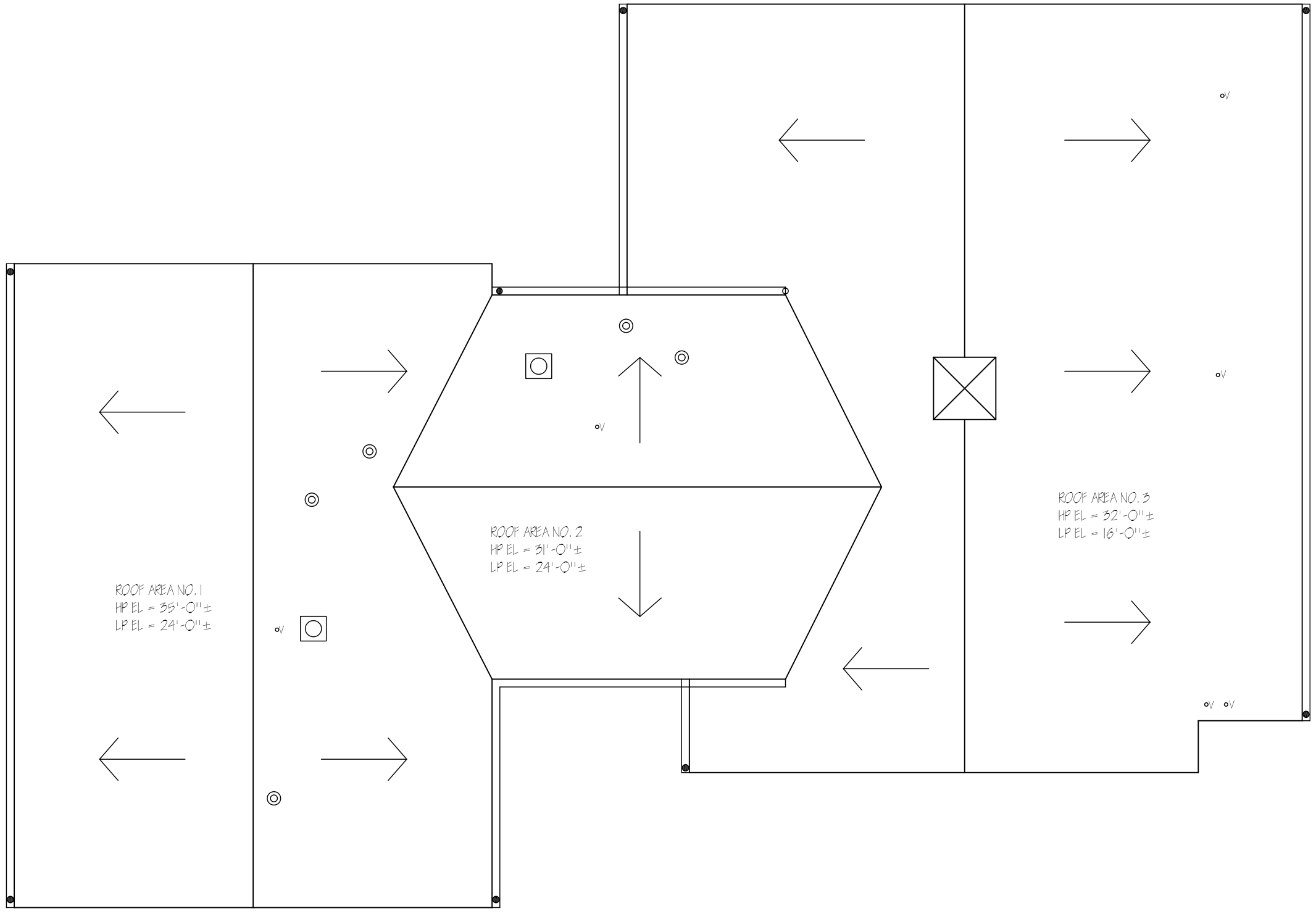
Photo No. 04

Location: Main Fire Station

Description: Cupola structure of apparatus bays appears in good condition.

N

LEGEND	
○V	VENT PIPE
◎	HOT PIPE
⊠	CUPOLA
▣	EXHAUST FAN
———	GUTTER & DOWNSPOUT
——→	SLOPE DIRECTION: DOWN



MAIN FIRE STATION - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumberland Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
MAIN FIRE STATION
77 HUDSON ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

Haynes Meadow House
489 Peakham Road
Sudbury, Massachusetts

February, 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Haynes Meadow House Roof
489 Peakham Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 1,350 square feet (SF).

- One steep-sloped roof area contains approximately 950 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan, estimated to be approximately 15-years old.

- Two low-sloped roof areas contain approximately 300 SF of adhered EPDM roofing, labeled Roof Area Nos. 2 & 3 on the roof plan. Roof Area No. 2 (250 SF) is estimated to be approximately 15 years old. Roof Area No. 3 (50 SF) is estimated to be approximately 5 years old.

- One steep sloped roof area contains approximately 100 SF of a glass greenhouse area labeled Roof Area No. 4 on the roof plan. Roof Area No. 4 age is unknown.

Roof Observations/Issues

The roofing systems that exist at this location are in good condition. No leaks are reported. A significant amount of pine needles exist throughout the roof surfaces and in the gutter. Roof cement exists at the base of the chimney covering any step flashing metal that may be in place.

Corrective Recommendations

No corrective repairs are recommended at this time except to remove the accumulated pine needles from the roof surfaces and gutters.

I. IDENTIFICATION

Subject:	Haynes Meadow House Roof
Location:	489 Peakham Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were not available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Haynes Meadow House located in Sudbury, Massachusetts. The Haynes Meadow House contains EPDM roofing, shingle roofing systems with wood roof decking and a glass greenhouse area. The roof area of the entire building is approximately 1,350 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, exhaust fans, chimney, HVAC units with associated ductwork, and skylights.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 22' ±)	950	Shingles wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof drains via gutters and downspouts.	15 Years	Good
Roof Area No. 2 (Elev. 20' ±)	250	Adhered EPDM with wood roof decking. Roof is low-sloped. Roof drains onto shingle roof.	15 Years	Good
Roof Area No. 3 (Elev. 10' ±)	50	Adhered EPDM with wood roof decking. Roof is low-sloped. Roof drains onto greenhouse.	5 Years	Good
Roof Area No. 4 (Elev. 10' ±)	100	Glass Greenhouse	10 years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place for the various roof areas.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

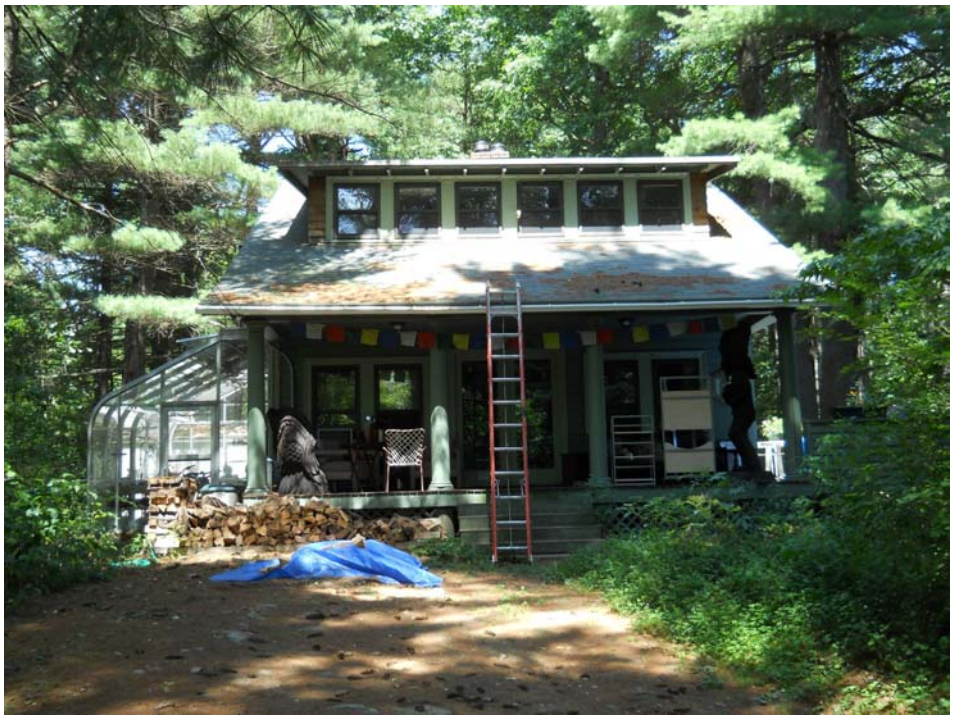


Photo No. 01

Location: Haynes Meadow House

Description: Partial Overview of Roof Area No. 1

Photo No. 02

Location: Haynes Meadow House

Description: Partial Overview of Roof Area No. 1

Photo No. 03

Location: Haynes Meadow House

Description: Partial Overview of Roof Area No. 2

Photo No. 04

Location: Haynes Meadow House

Description: Partial overview of Roof Area No. 3

Photo No. 05

Location: Haynes Meadow House

Description: Gutter Backed Up With Pine Needles

Photo No. 06

Location: Haynes Meadow House

Description: Improperly Flashed Chimney

Photo No. 07

Location: Haynes Meadow House

Description: Moss & Pine Needle Accumulation

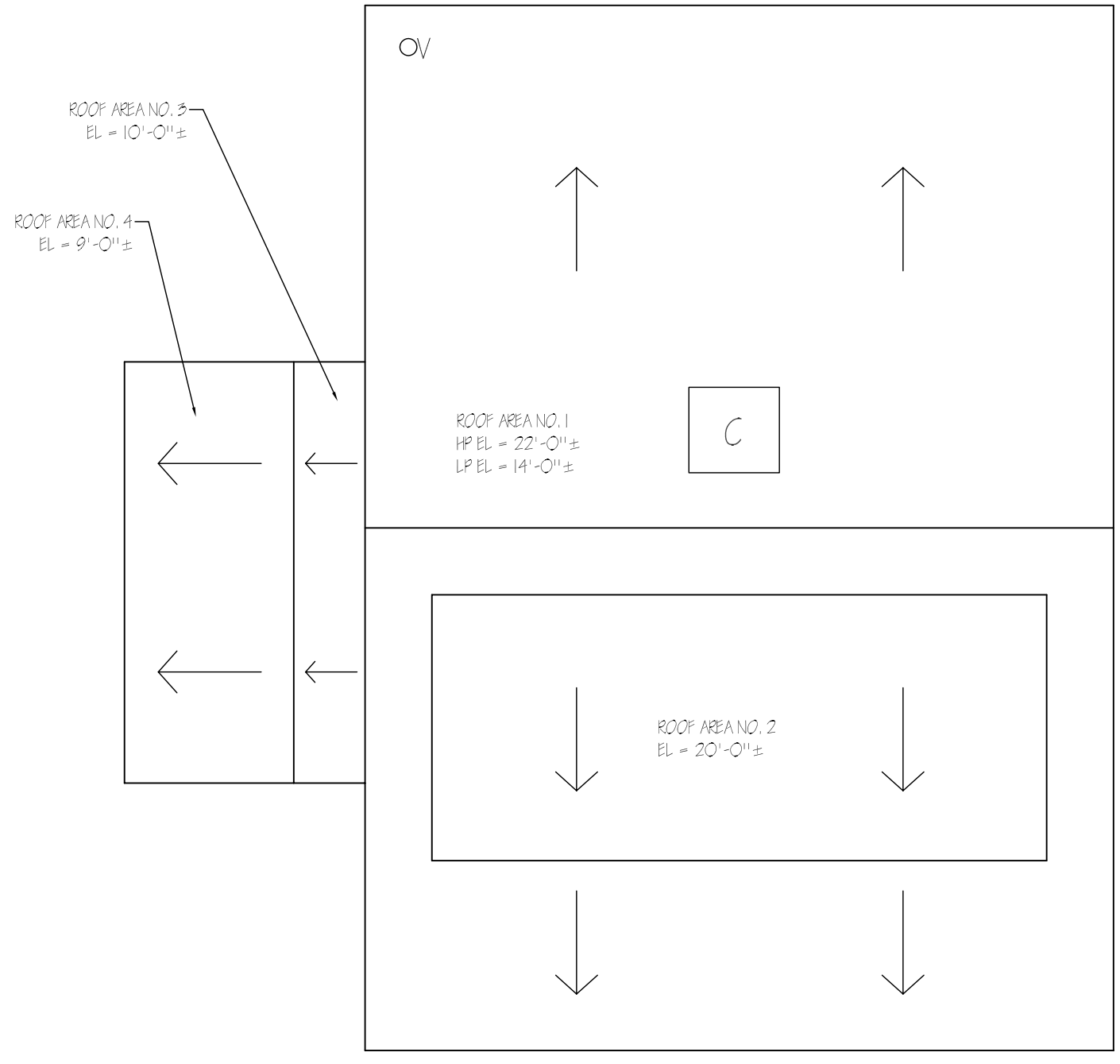
Photo No. 08

Location: Haynes Meadow House

Description: Roof Area #3 is a very recent installation.

N

LEGEND	
OV	VENT PIPE
C	CHIMNEY
→	SLOPE DIRECTION: DOWN



HAYNES MEADOW HOUSE - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumberland Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
HAYNES MEADOW HOUSE
489 PEAKHAM ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Police Station
415 Boston Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Police Station Roof
415 Boston Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 6,600 square feet (SF).

- One steep-sloped roof area contains approximately 6,600 SF of shingle roofing, labeled Roof Area No. 1 on the roof plan, estimated to be approximately 20 years old.

Roof Observations/Issues

The shingle roofing system that exists at this location is in fair to poor condition. Sporadic leakage is reported to occur in various locations. The granular surfacing of the shingles is worn and eroded in many areas. The copper flashing in the valleys is worn and pitted. The copper gutters are worn and pitted. A solar thermal rooftop unit exists and the flashing of such is split open.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Replace the steep-sloped shingle roof (Roof Area No. 1 at 6,600 SF) in year **TBD**. (Owner has decided to postpone corrective work, as the status of the building is under review). Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

I. IDENTIFICATION

Subject:	Police Station Roof
Location:	415 Boston Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Police Station located in Sudbury, Massachusetts. The Police Station contains shingle roofing systems. The roof area of the entire building is approximately 6,600 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, exhaust fans, gravity vents, and a solar thermal unit.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 18' ±)	6,600	3-tab Shingles with wood roof decking. Roof is sloped (approx. 4:12 pitch). Roof drains via gutter and downspouts.	20 Years	Fair to Poor

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Police Station

Description: Aerial View of Roof.

Photo No. 02

Location: Police Station

Description: Overview of Roof. Area shown is fairly typical of the many roof slopes.

Photo No. 03

Location: Police Station

Description: All downspouts have been fitted with a downspout collar to allow mechanical attachment.

Photo No. 04

Location: Police Station

Description: Air conditioner fits wall opening poorly.

Photo No. 05

Location: Police Station

Description: Roof vents are rusted.

Photo No. 06

Location: Police Station

Description: Unusual flashing configurations at the brick chimney suggest that the chimney was extended when the addition was built.

Photo No. 07

Location: Police Station

Description: Piping leading from the roof-mounted solar panels is probable source of water entry.

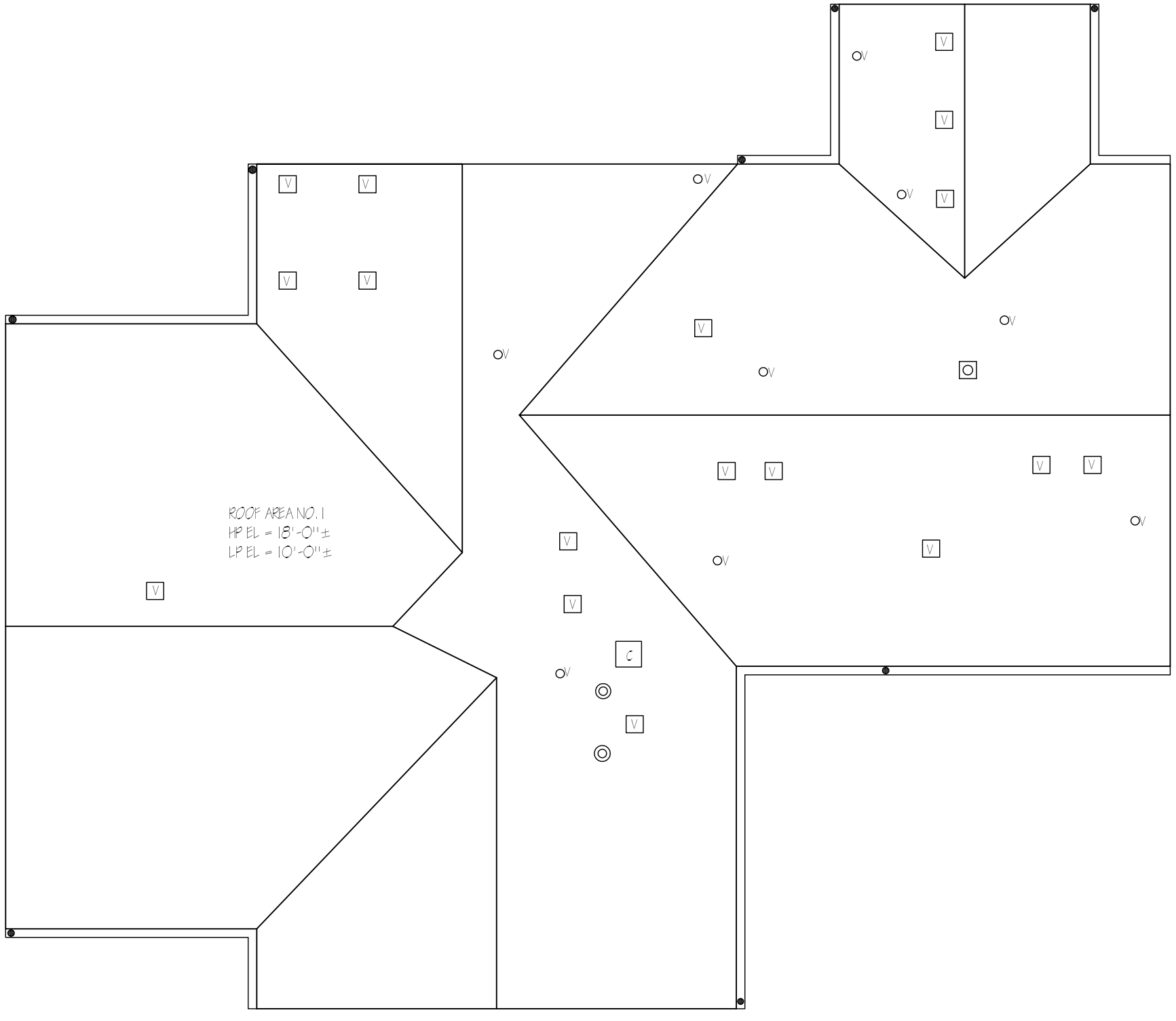
Photo No. 08

Location: Police Station

Description: Shingle surfaces are worn.

N

LEGEND	
V	VENT PIPE
◎	HOT PIPE
V	GRAVITY VENT
C	CHIMNEY
◯	EXHAUST FAN
	GUTTER & DOWNSPOUT
→	SLOPE DIRECTION: DOWN



POLICE STATION - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumberland Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
POLICE STATION
415 BOSTON ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

Carding Mill House
102 Dutton Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Carding Mill House Roof
102 Dutton Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 3,265 square feet (SF).

- One Steep-sloped roof areas contains approximately 3,265 SF of slate roofing, labeled Roof Area No. 1 on the roof plan, estimated to be approximately 80 years old.

Roof Observations/Issues

The slate shingles are in good to fair condition. Over the years random slates have been replaced, and many cracked slates were observed. Water staining on the underside of the wood decking was observed. Leaks are reported to occur. The sheetmetal ridge cap is in poor condition with fasteners backing out and loose sections. The cupola is an open style wood structure with cedar shakes and a sheetmetal cap, which are all in poor condition. Step flashing repairs at the chimney are split and open.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs in **year 2011**. Repairs to include random replacement of cracked/broken slate; replacement of ridge cap; replacement of cupola structure; repairs to step flashing at chimney.

I. IDENTIFICATION

Subject:	Carding Mill House Roof
Location:	102 Dutton Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were not available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Carding Mill House located in Sudbury, Massachusetts. The Carding Mill House contains slate roofing. The roof area of the entire building is approximately 3,265 square feet (SF).

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 20' ±)	3,265	Slate roofing, approximate 10:12 pitch. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	80 Years	Good to Fair

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Carding Mill House

Description: Aerial View of Roof.

Photo No. 02

Location: Carding Mill House

Description: Overview of Roof.

Photo No. 03

Location: Carding Mill House

Description: Overview of Roof

Photo No. 04

Location: Carding Mill House

Description: Partial overview of Roof

Photo No. 05

Location: Carding Mill House

Description: Water Stained Ridge Beam

Photo No. 06

Location: Carding Mill House

Description: Water Stained Ceiling

Photo No. 07

Location: Carding Mill House

Description: Chimney Flashing in Poor Condition & Broken Slate

Photo No. 08

Location: Carding Mill House

Description: Metal Ridge Cap in Poor Condition.

Photo No. 09

Location: Carding Mill House

Description: Metal Ridge Cap in Poor Condition.

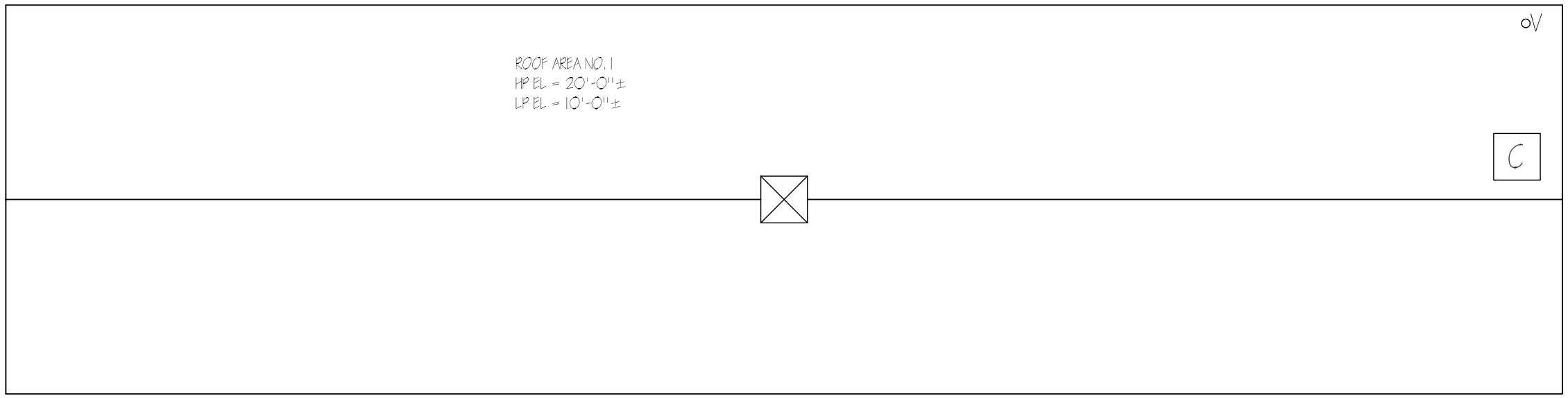
Photo No. 10

Location: Carding Mill House

Description: Cedar Shingles In Poor Condition.

N

LEGEND	
oV	VENT PIPE
C	CHIMNEY
⊠	CUPOLA
→	SLOPE DIRECTION: DOWN



CARDING MILL HOUSE - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cumber Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
CARDING MILL HOUSE
102 DUTTON ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Loring Parsonage
288 Old Concord Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Loring Parsonage Roof
288 Old Concord Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 2,000 square feet (SF).

- Three steep-sloped roof area contains approximately 2,000 SF of cedar shingle roofing, labeled Roof Area No. 1-3 on the roof plan, reported to be 1-year old.

Roof Observations/Issues

The roofing systems that exist at this location are in good condition. No leaks are reported. One of the chimneys is capped off with what appears to be a roll roofing type of product that is nailed to the bricks at the perimeter (loose areas were observed).

Corrective Recommendations

No corrective repairs are recommended at this time except to replace the chimney cap with a proper sheetmetal cap in year **2011.**

I. IDENTIFICATION

Subject:	Loring Parsonage Roof
Location:	288 old Concord Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were not available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Loring Parsonage located in Sudbury, Massachusetts. The Loring Parsonage contains cedar shingle roofing with wood roof decking. The roof area of the entire building is approximately 2,000 square feet (SF).

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 25' ±)	2,000	Cedar Shingles, wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof drains via free flow onto the ground.	1 Year	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No t known if any warranty is currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Loring Parsonage

Description: Aerial View of Roof.

Photo No. 02

Location: Loring Parsonage

Description: Overview of Roof Area Nos. 1 & 2

Photo No. 03

Location: Loring Parsonage

Description: Overview of Roof Area Nos. 1-3

Photo No. 04

Location: Loring Parsonage

Description: Partial overview of Roof Area Nos. 1-3

Photo No. 05

Location: Loring Parsonage

Description: Partial overview of Roof Area Nos. 1-3

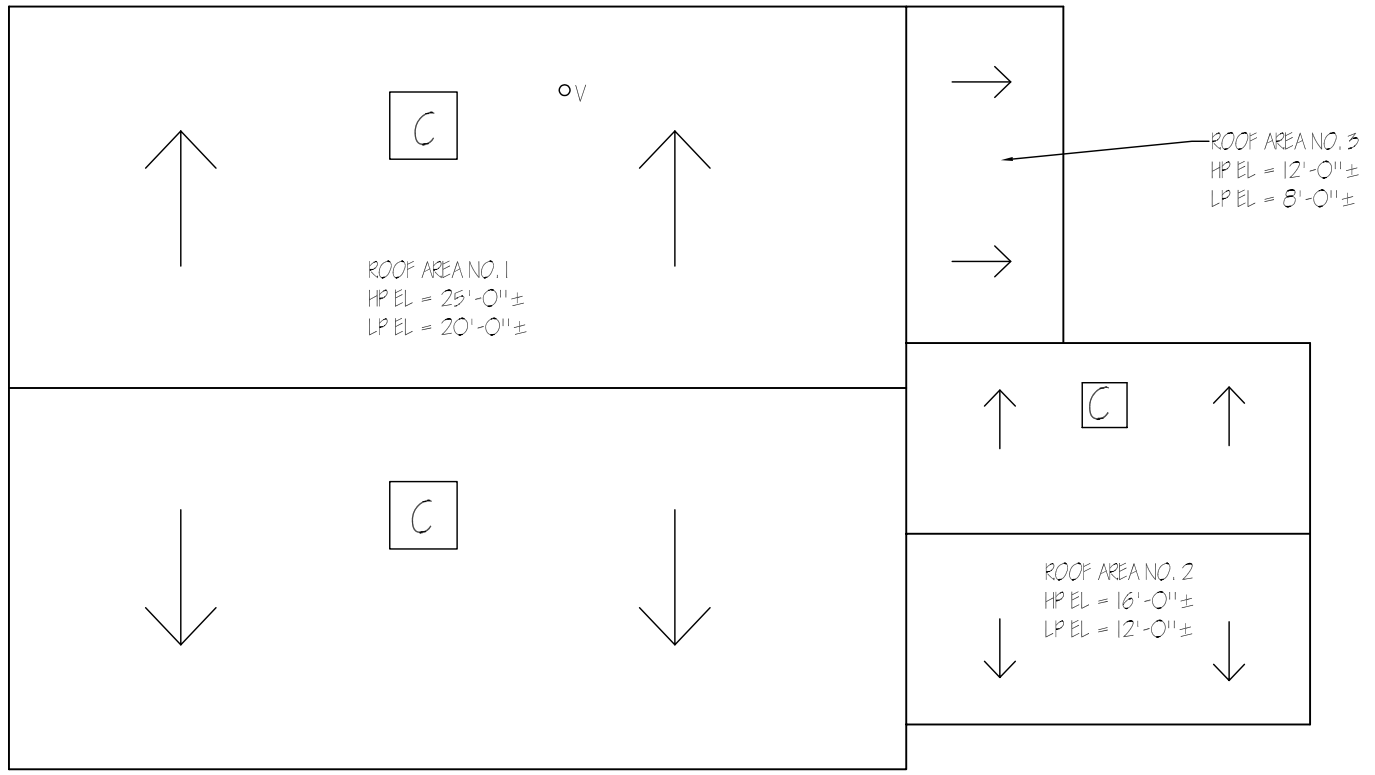
Photo No. 06

Location: Loring Parsonage

Description: Improper Chimney Cap Flashing

N

LEGEND	
○V	VENT PIPE
C	CHIMNEY
→	SLOPE DIRECTION: DOWN



LORING PARSONAGE - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cantor Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
LORING PARSONAGE
288 OLD CONCORD ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

Hosmer House
299 Concord Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Hosmer House Roof
299 Concord Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 3,045 square feet (SF).

- Six steep-sloped roof area contains approximately 3,045 SF of shingle roofing, labeled Roof Area Nos. 1 thru 6 on the roof plan.

Roof Observations/Issues

The shingle roofing system that exists on Roof Nos. 1 and 2 are 3-tab style, are the oldest shingle system on the building (estimated to be in excess of 20-years old) and are in fair to poor condition (approx. 2,040 SF). Sporadic leakage is reported to occur in various locations.

The shingle systems on the remaining roof areas (Roof Nos. 3 thru 6 at approx. 1,005 SF) are newer (estimated to be approximately 5 to 7 years old and 7 to 10 years old) and are in good condition.

Four of the six chimneys are in various stages of deterioration (deteriorated mortar joints, bricks, and chimney caps).

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Replace the steep-sloped shingle roof (Roof Area Nos. 1 & 2 at 2,040 SF) in year **2012**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, chimney repairs, and a roofing manufacturer's material warranty (minimum 40-year time frame).

I. IDENTIFICATION

Subject:	Hosmer House Roof
Location:	299 Concord Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Hosmer House located in Sudbury, Massachusetts. The Hosmer House contains shingle roofing systems. The roof area of the entire building is approximately 3,045 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, skylight, gravity vents, and chimneys.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 12' ±)	250	3-tab Shingles with wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof drains via free flow onto the ground.	20+ years	Fair to Poor
Roof Area No. 2 (Elev. 28' ±)	1,790	3-tab Shingles with wood roof decking. Roof is sloped (approx. 5:12 pitch). Roof drains via gutter and downspouts, and also free flows onto Roof Nos. 3 & 4 and the ground.	20+ years	Fair to Poor
Roof Area Nos. 3 & 4 (Elev. 19' ±)	485	Architectural grade shingles with wood roof decking. Roof is sloped (approx. 4:12 pitch). Roof drains via free flow onto the ground.	7 to 10 years	Good
Roof Area No. 5 (Elev. 15' ±)	500	3-tab Shingles with wood roof decking. Roof is sloped (approx. 7:12 pitch). Roof drains via free flow onto the ground.	5 to 7 years	Good
Roof Area No. 6 (Elev. 10' ±)	20	3-tab Shingles with wood roof decking. Roof is sloped (approx. 6:12 pitch). Roof drains via free flow onto the ground.	5 to 7 years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Hosmer House

Description: Aerial View of Roof.

Photo No. 02

Location: Hosmer House

Description: Overview of Roof.

Photo No. 03

Location: Hosmer House

Description: Partial Overview of Roof Area No. 1. Note the loose counterflashing and hip shingles.

Photo No. 04

Location: Hosmer House

Description: Partial overview of Roof Area No. 2. Brick masonry chimneys require repointing.

Photo No. 05

Location: Hosmer House

Description: Partial overview of Roof Area No. 2. Shingles are buckling.

Photo No. 06

Location: Hosmer House

Description: Partial overview of Roof Area No. 3. Squirrels gain access to the main attic beneath the eave in the foreground.

Photo No. 07

Location: Hosmer House

Description: Partial overview of Roof Area No. 5. This roof is a recent installation.

Photo No. 08

Location: Hosmer House

Description: Partial overview of Roof Area Nos. 2 & 6

Photo No. 09

Location: Hosmer House

Description: Deteriorated Shingles on Roof Area No. 2

Photo No. 10

Location: Hosmer House

Description: Deteriorated Shingles on Roof Area No. 2. This roof leaks in the vicinity of the two chimneys.

Photo No. 11

Location: Hosmer House

Description: Deteriorated Shingles on Roof Area No. 2

Photo No. 12

Location: Hosmer House

Description: Roof Decking Curling

Photo No. 13

Location: Hosmer House

Description: Deteriorated Chimney Cap

Photo No. 14

Location: Hosmer House

Description: Deteriorated Mortar in Chimney

Photo No. 15

Location: Hosmer House

Description: Improper Chimney Flashing on Roof Area No. 4

Photo No. 16

Location: Hosmer House

Description: Loose Hip Cap on Roof Area No. 1

Photo No. 17

Location: Hosmer House

Description: Nail Back-out on Roof Area No. 1

Photo No. 18

Location: Hosmer House

Description: Deteriorated Step Flashing On Roof Area No.1

Photo No. 19

Location: Hosmer House

Description: Deteriorated Window Frame

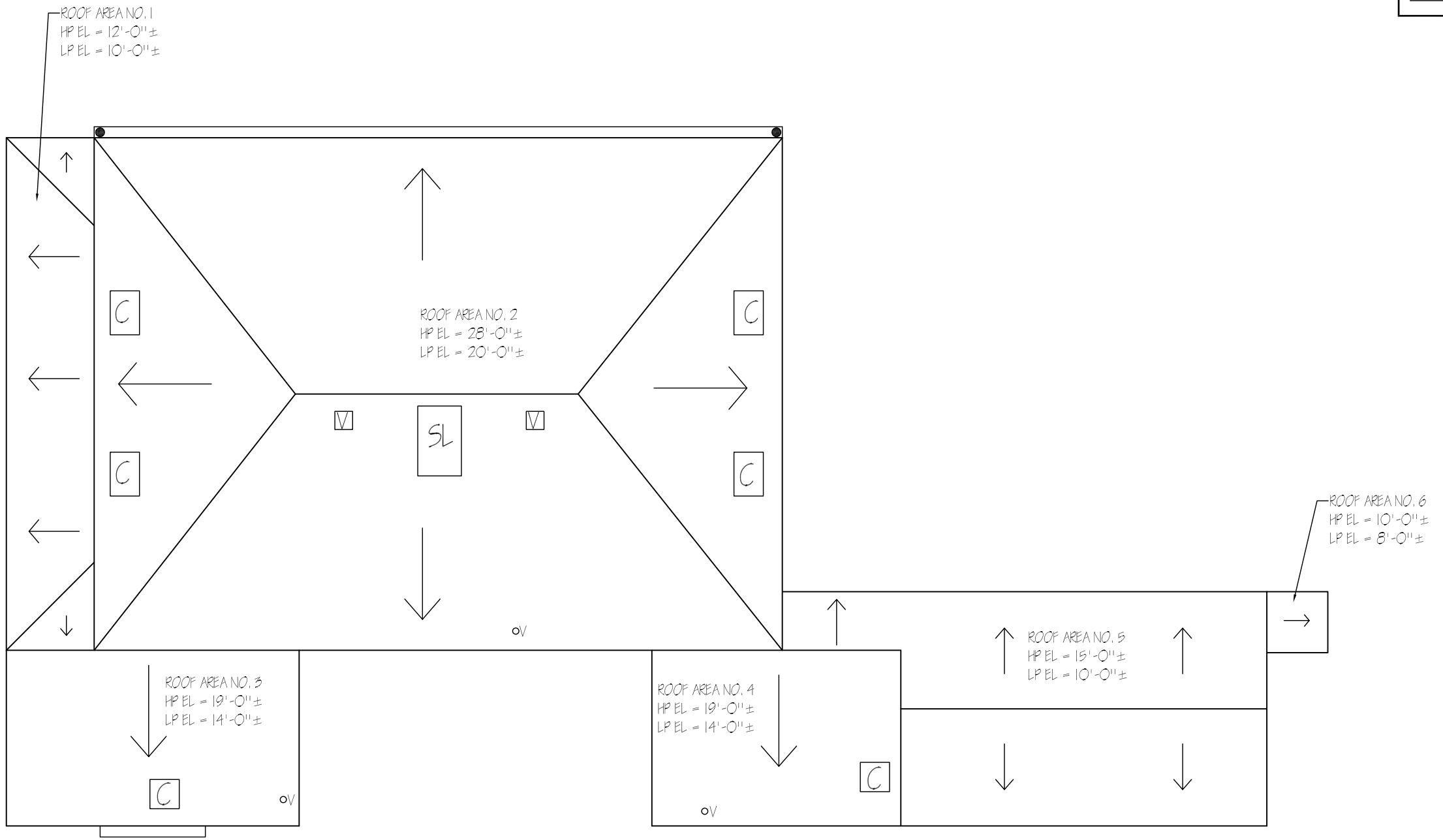
Photo No. 20

Location: Hosmer House

Description: Deteriorated Wood Fascia On Roof Area No. 2

N

LEGEND	
○V	VENT PIPE
	GUTTER & DOWNSPOUT
C	CHIMNEY
SL	SKYLIGHT
V	GRAVITY VENT
→	SLOPE DIRECTION: DOWN



HOSMER HOUSE - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Cantor Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
HOSMER HOUSE
299 CONCORD ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

Town Hall
322 Concord Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Town Hall Roof
322 Concord Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 7,555 square feet (SF).

- One steep-sloped roof area contains approximately 6,000 SF of slate roofing, labeled Roof Area No. 1 on the roof plan.
- One low-sloped roof area contains approximately 1,375 SF of EPDM roofing, labeled Roof No. 2 on the roof plan.
- Two steep-sloped roof area contains approximately 110 SF of roll roofing, labeled Roof Area Nos. 3 & 5 on the roof plan.
- One steep-sloped roof area contains approximately 50 SF of copper roofing, labeled Roof Area No. 4 on the roof plan.
- One steep-sloped roof area contains approximately 20 SF of shingle roofing, labeled Roof Area No. 6 on the roof plan.

Roof Observations/Issues

The slate roofing system that exists on Roof No. 1 is estimated to be approximately 80-years old. Leakage is reported to occur at the skylight/hatch assembly (tarp collection system is in place). The slate shingles are in good to fair condition. Over the years random slates have been replaced. Many cracked/broken slates were observed. Water staining on the underside of the wood decking was observed. The copper sheetmetal has been resecured with fasteners that are now rusted. Deteriorated masonry was observed at the chimney. Gutter repairs with roofing cement were observed in the copper gutters.

The EPDM roofing system that exists on Roof No. 2 reportedly was installed in 2008 and appears in good condition. No warranties are currently in place.

The roofing systems on the remaining roof areas (Roof Nos. 3-6 at approx. 180 SF) are in good condition.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. In an effort to extend the useful service life of the 80-year old slate roofing system (Roof No. 1) the recommendation is to implement preventive maintenance repairs in years **2011, 2015, and 2019.** Recommended repairs include removing skylight/hatch assembly and roofing over, replacing cracked/broken slate, flashing repairs, masonry repairs to the chimney, gutter repairs/replacement as necessary.

2. No corrective repairs are recommended at this time for the EPDM roofing, roll roofing, copper roofing, and shingle roofing.

I. IDENTIFICATION

Subject:	Town Hall Roof
Location:	322 Concord Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Town Hall located in Sudbury, Massachusetts. The Town Hall contains slate, EPDM, shingle, copper and roll roofing systems. The roof area of the entire building is approximately 7,557 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, skylight, rooftop unit, skylight/roof hatch assembly, and chimneys.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 38' ±)	6,000	Slate with wood roof decking. Roof is sloped (approx. 9:12 pitch). Roof drains via gutters and downspouts.	80+ years	Good to Fair
Roof Area No. 2 (Elev. 15' ±)	1,375	Adhered EPDM. Roof is low-sloped.	2 years	Good
Roof Area Nos. 3 (Elev. 13' ±)	80	Roll roofing. Roof drains via gutters and downspouts	unknown	Good
Roof Area No. 4 (Elev. 7' ±)	50	Copper. Roof drains via free flow onto the ground.	unknown	Good
Roof Area No. 6 (Elev. 10' ±)	20	3-tab Shingles with wood roof decking. Roof is sloped. Roof drains via free flow onto the ground.	unknown	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Sudbury Town Hall

Description: Aerial View of Roof.

Photo No. 02

Location: Sudbury Town Hall

Description: Overview of slate roof.

Photo No. 03

Location: Sudbury Town Hall

Description: Overview of low slope roof. EPDM roof is in good condition.

Photo No. 04

Location: Sudbury Town Hall

Description: Slate roofing is aged but apparently intact.

Photo No. 05

Location: Sudbury Town Hall

Description: Copper ridge cap has been fastened with steel roofing nails rusting in corrosion of the steel fasteners.

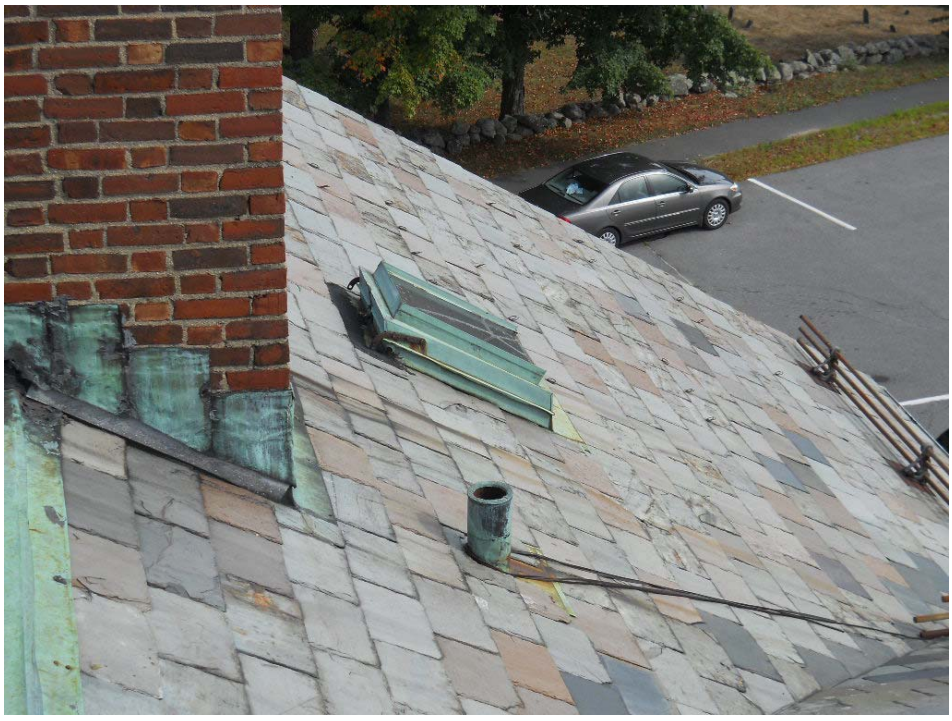


Photo No. 06

Location: Sudbury Town Hall

Description: Aged skylight/access hatch is the apparent source of leaks.

Photo No. 07

Location: Sudbury Town Hall

Description: Blue tarps installed below the skylight shown above direct water to trash barrels.

Photo No. 08

Location: Sudbury Town Hall

Description: Masonry chimney requires repairs.

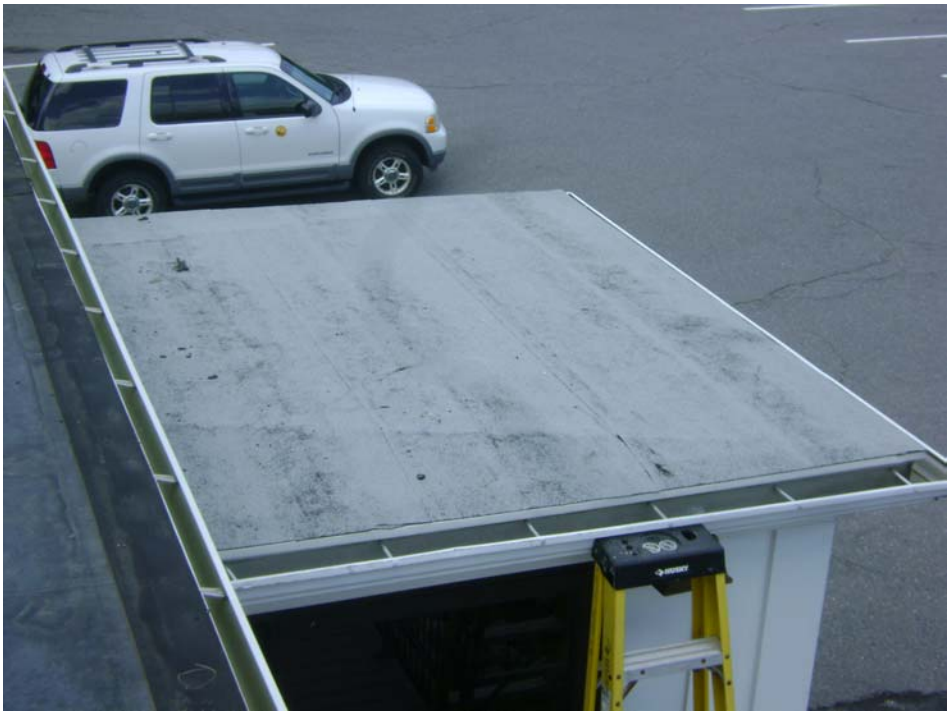


Photo No. 09

Location: Sudbury Town Hall

Description: Roll roofing is worn.

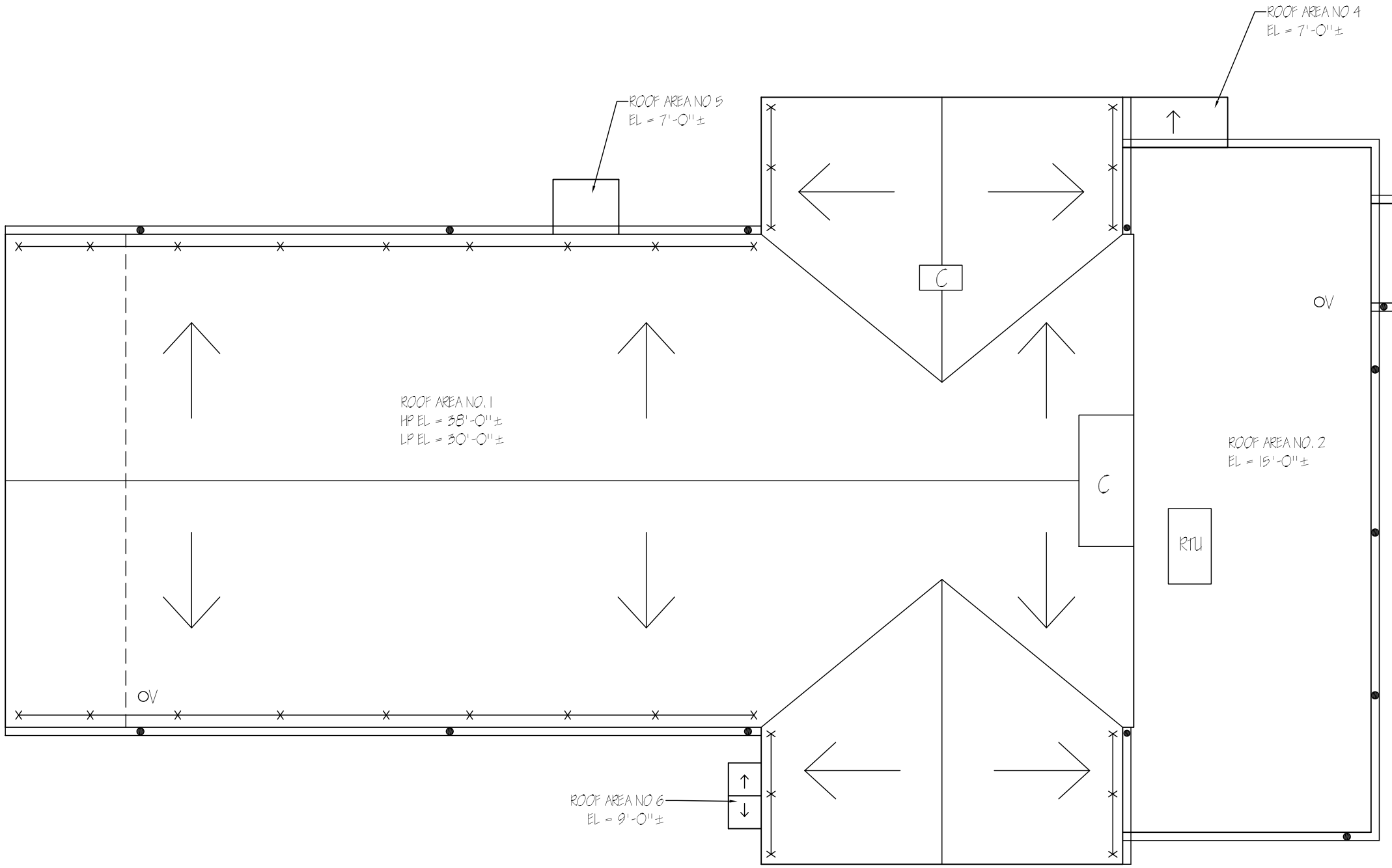
Photo No. 10

Location: DPW Highway Office & Garage

Description: Soldered flat seam copper roofing is in fair condition.

N

LEGEND	
OV	VENT PIPE
C	CHIMNEY
————	LINE OF OVERHANG
	GUTTER & DOWNSPOUT
→	SLOPE DIRECTION: DOWN
RTU	ROOF TOP UNIT
×——×	SNOW GUARDS



TOWN HALL - ROOF AREA PLAN

SCALE: NOT TO SCALE

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
TOWN HALL
322 CONCORD ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R–1

ROOF CONDITION SURVEY

For

Town of Sudbury

Goodnow Library
21 Concord Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Goodnow Library Roof
322 Concord Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 22,965 square feet (SF).

- One steep-sloped roof area contains approximately 3,750 SF of slate roofing, labeled Roof Area No. 1 on the roof plan.

- Four low-sloped roof area contains approximately 4,240 SF of EPDM roofing, labeled Roof Nos. 2, 3, 6 & 7 on the roof plan. These roof areas were reportedly installed in 1998 and a manufacturer's (Firestone) warranty is in place (expires on 9/7/2013)

- Two steep-sloped roof area contains approximately 14,975 SF of shingle roofing, labeled Roof Area Nos. 4 & 5 on the roof plan. These roof areas were reportedly installed in 1998. No warranty information is available.

Roof Observations/Issues

The age of the slate roofing system that exists on Roof No. 1 is unknown. No leakage is reported to occur. The slate shingles are in good overall condition. Some cracked/broken slates were observed.

The 12-year old EPDM roofing system that exists on Roof Nos. 2, 3, 6 & 7 appears in good condition. However leaks are reported to occur and deficiencies seam and flashing conditions were observed and are marked out on the roof (presumably marked during an inspection by Firestone) and have yet to be repaired. The flashing of the EPDM roofs (No. 6 & 7) into the shingle roof system are suspect as there is no sheetmetal counterflashing present.

The 12-year old shingle roofing systems on the remaining roof areas (Roof Nos. 4 & 5 at approx. 180 SF) are in good condition.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. In an effort to extend the useful service life of the slate roofing system (Roof No. 1) the recommendation is to implement preventive maintenance repairs in years **2014 and 2019**. Recommended repairs include replacing cracked/broken slate, and flashing repairs as necessary.

2. Replace the adhered EPDM roofs (Roof Area Nos. 2, 3, 6 & 7 at 4,240 SF) in **year 2014**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

3. Replace the steep-sloped shingle roof (Roof Area Nos. 4 & 5 at 14,975 SF) in year **2018**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

I. IDENTIFICATION

Subject:	Goodnow Library Roof
Location:	21 Concord Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the Goodnow Library located in Sudbury, Massachusetts. The Goodnow Library contains slate, EPDM, and shingle roofing systems. The roof area of the entire building is approximately 22,965 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, skylight, rooftop unit, and chimneys.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 32' ±)	3,750	Slate with wood roof decking. Roof is sloped (approx. 8:12 pitch). Roof drains via gutters and downspouts and free flows onto the ground.	unknown	Good
Roof Area No. 2 (Elev. 25' ±)	1,075	Adhered EPDM. Roof is low-sloped. Roof drains via gutters and downspouts.	12 years	Good
Roof Area Nos. 3 (Elev. 28' ±)	2,625	Adhered EPDM. Roof is low-sloped. Roof drains via cast iron roof drains.	12 years	Good
Roof Area Nos. 4 & 5 (Elev. 35' ± and 38' ±)	14,975	Shingle with wood roof decking. Roof is sloped (approx. 10:12 pitch). Roof drains via gutters and downspouts, and free flows onto the ground.	12 years	Good
Roof Area Nos. 6 & 7 (Elev. 28' ±)	540	Adhered EPDM. Roof is low-sloped. Roof drains onto shingle roofs below.	12 years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

EPDM roofs: Firestone warranty is in place (expires on 9/7/2013).

No warranty information for 12-year old shingle roofing system.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location:
Goodnow Library

Description: Aerial View of Roof.

Photo No. 02

Location:
Goodnow Library

Description:
Partial Overview of Roof Area No. 1

Photo No. 03

Location:
Goodnow Library

Description:
Partial Overview of Roof Area No. 1

Photo No. 04

Location:
Goodnow Library

Description:
Partial overview of Roof Area No. 4

Photo No. 05

Location:
Goodnow Library

Description:
Partial overview of Roof Area No. 4

Photo No. 06

Location:
Goodnow Library

Description:
Partial overview of Roof Area No. 7

Photo No. 07

Location:
Goodnow Library

Description:
Partial overview of Roof Area No. 6

Photo No. 08

Location:
Goodnow Library

Description:
Partial overview of Roof Area Nos. 4 & 7

Photo No. 09

Location:
Goodnow Library

Description:
Partial Overview of Roof Area No. 3

Photo No. 10

Location:
Goodnow Library

Description:
Partial Overview of Roof Area Nos. 1 & 2

Photo No. 11

Location:
Goodnow Library

Description: Water Stained Ceiling Tile Under Roof Area No. 1

Photo No. 12

Location:
Goodnow Library

Description:
Clogged Roof Drain Strainer on Roof Area No. 3

Photo No. 13

Location:
Goodnow Library

Description:
Delaminated EPDM Membrane on Roof Area No. 3

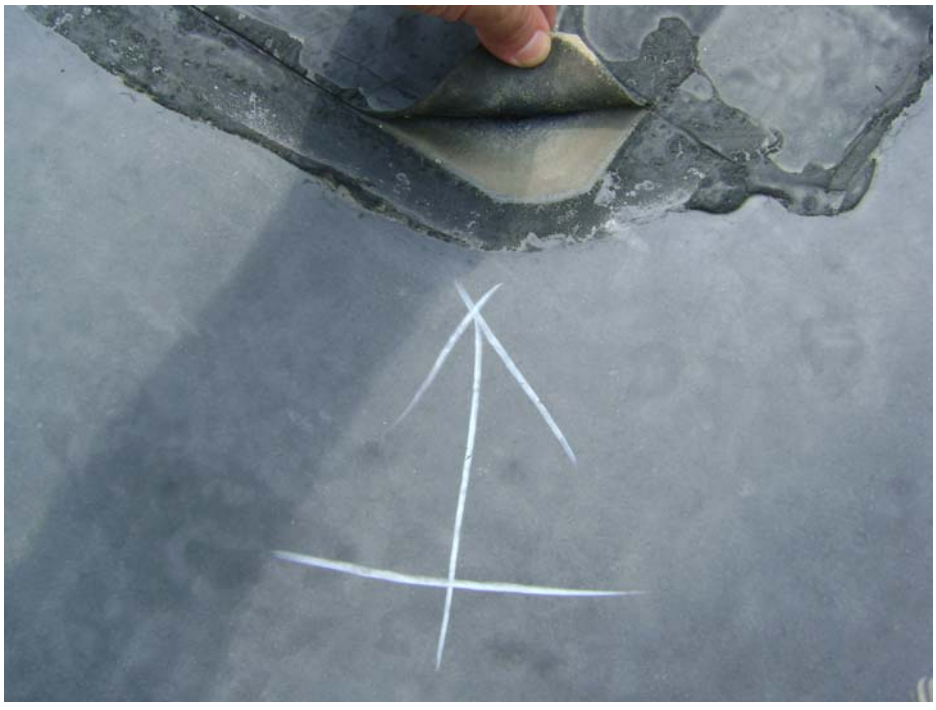


Photo No. 14

Location:
Goodnow Library

Description:
Previously Marked Deficiency on Roof Area No. 3

Photo No. 15

Location:
Goodnow Library

Description:
Previously Marked Deficency on Roof Area No. 3

Photo No. 16

Location:
Goodnow Library

Description:
Delaminated EPDM Membrane on Roof Area No. 3

Photo No. 17

Location:
Goodnow Library

Description:
Deteriorated Wood Fascia on Roof Area No. 1

Photo No. 18

Location:
Goodnow Library

Description:
Deteriorated Masonry Column

Photo No. 19

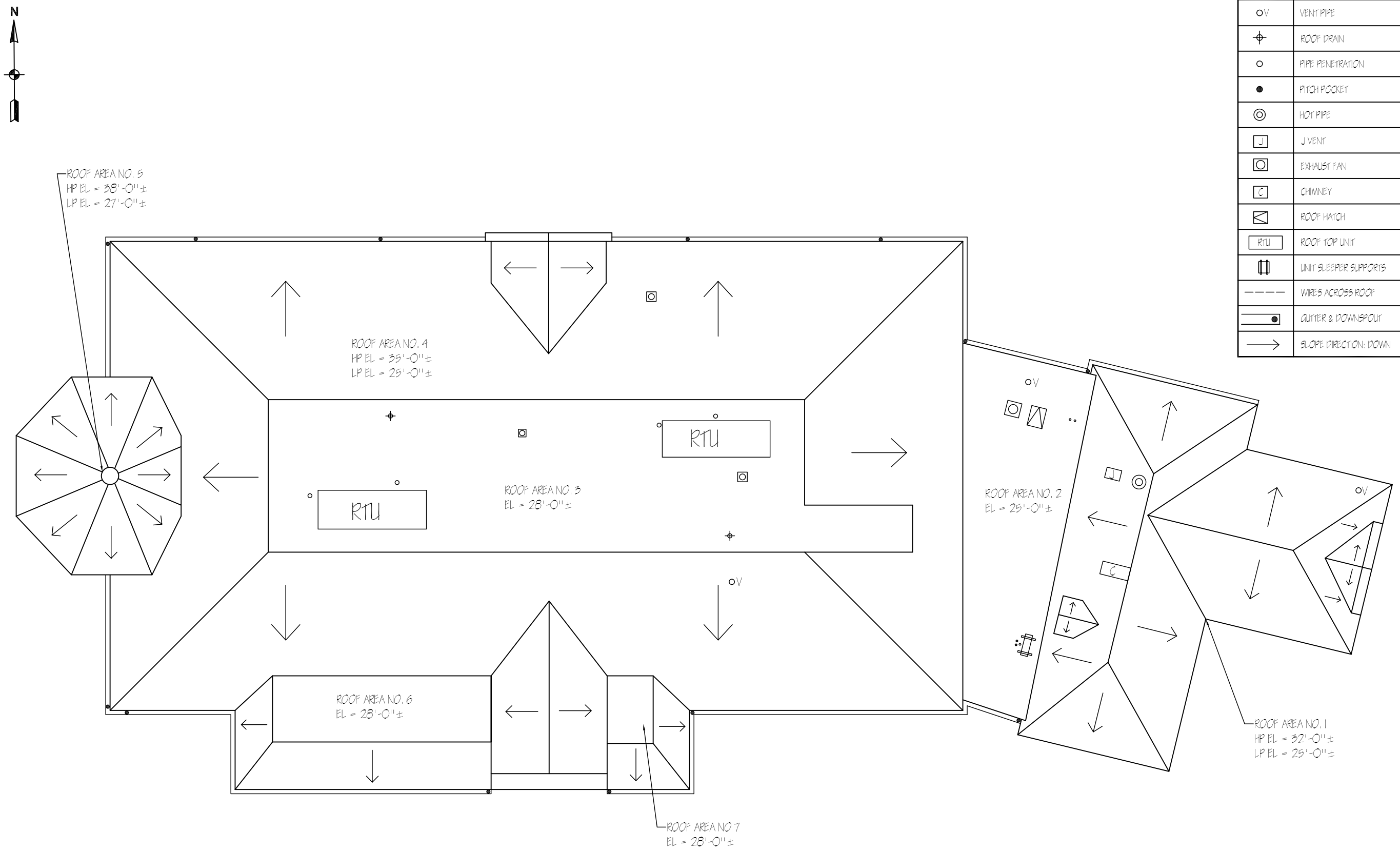
Location:
Goodnow Library

Description:
Efflorescence Caused by Water Run-Off from Roof Area
No. 2

Photo No. 20

Location:
Goodnow Library

Description:
Efflorescence & Cracked Masonry on Roof Area No. 4



GOODNOW LIBRARY - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
V	VENT PIPE
	ROOF DRAIN
	PIPE PENETRATION
	PITCH POCKET
	HOT PIPE
J	J VENT
	EXHAUST FAN
C	CHIMNEY
	ROOF HATCH
RTU	ROOF TOP UNIT
	UNIT SLEEPER SUPPORTS
	WIRES ACROSS ROOF
	GUTTER & DOWNSPOUT
	SLOPE DIRECTION: DOWN

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
GOODNOW LIBRARY
21 CONCORD ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

DPW Office & Garage Buildings
275 Old Lancaster Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

DPW Office & Garage Buildings Roofs
275 Old Lancaster Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 28,840 square feet (SF).

- One steep-sloped roof area contains approximately 10,500 SF of architectural grade shingle roofing (CertainTeed Woodscape 40 Series), labeled Roof Area No. 1 on the roof plan. This roof area reportedly was constructed as new construction in 2003.

- One low-sloped roof area contains approximately 815 SF of built-up roofing (BUR), labeled Roof Area No. 2 on the roof plan. This roof area reportedly was constructed as new construction in 2003.

- One steep-sloped roof area contains approximately 17,525 SF of metal roofing, labeled Roof Area No. 3 on the roof plan. This roof area reportedly was constructed as new construction in 2003.

Roof Observations/Issues

The shingle roofing system (Roof Area No. 1) appears to be in good condition. However nails securing the shingles at several locations are backing out and creating holes in the shingles.

The BUR roofing system (Roof Area Nos. 2) appears to be in good condition.

The sloped metal roofing system (Roof Area No. 3) appears to be in good to fair condition. Rusting was observed on some of the panels; otherwise, on the whole, the panels appear to be in good condition. Rooftop units and associated crickets are flashed with EPDM membrane and some deterioration was observed (unadhered and deteriorated seams). A significant number of panel fasteners have backed out and in some cases a gap exists at the end panels.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs to the steep-sloped metal roof (Roof Area No. 3 at 17,525 SF) in year **2011**. Repair work includes reflashing rooftop penetrations and associated crickets, re-securing panel fasteners and installing new panel fasteners as needed.

2. Implement repairs to the steep-sloped shingle roof (Roof Area No. 1 at 10,500 SF) in year **2011**. Repair work includes resecuring shingle nails and repairing holes as needed.

I. IDENTIFICATION

Subject:	DPW Office & Garage Building Roof
Location:	275 Old Lancaster Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Art Richards, Electrical Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition the DPW Office & Garage Building located in Sudbury, Massachusetts. The DPW Office & Garage Building contains Built-up Roofing, Metal roofing, and shingle roofing systems. The roof area of the entire building is approximately 28,840 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, roof hatch, and rooftop units.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 26' ±)	10,500	Shingle roofing system. Roof is sloped (approx. 4:12 pitch). Roof drains via free flow onto ground.	7 Years	Good
Roof Area No. 2 (Elev. 26' ±)	815	Gravel surfaced built-up roofing. Roof is low-sloped (flat with little slope). Roof drains via cast iron roof drains.	7 Years	Good
Roof Area No. 3 (Elev. 36' ±)	17,525	Metal roofing system. Roof is sloped (approx. 3:12 pitch). Roof drains via gutters and downspouts.	7 Years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranty information is available.

History of Repairs:

Not Known.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: DPW Office & Garage

Description: Aerial View of Building.

Photo No. 02

Location: DPW Office & Garage

Description: Overview of Roof Area No. 1 & 2

Photo No. 03

Location: DPW Office & Garage

Description: Partial overview Roof Area No. 1

Photo No. 04

Location: DPW Office & Garage

Description: Partial overview of Roof Area no. 2

Photo No. 05

Location: DPW Office & Garage

Description: Partial overview of Roof Area No. 2

Photo No. 06

Location: DPW Office & Garage

Description: Partial overview of Roof Area No. 2

Photo No. 07

Location: DPW Office & Garage

Description: Partial overview of Roof Area No. 3

Photo No. 08

Location: DPW Office & Garage

Description: Partial overview of Roof Area No. 3

Photo No. 09

Location: DPW Office & Garage

Description: Partial Overview of Roof Area No. 3

Photo No. 10

Location: DPW Office & Garage

Description: Nail Backing Out (1 of 70 Count) on Roof Area No. 1

Photo No. 11

Location: DPW Office & Garage

Description: Ridge Shingle Cracked on Roof Area No. 1

Photo No. 12

Location DPW Office & Garage

:
Description: Debris in Gutter on Roof Area No. 1

Photo No. 13

Location: DPW Office & Garage

Description: Roof Seam Opening & Screws Popping Out on Roof Area No. 3

Photo No. 14

Location: DPW Office & Garage

Description: Screws Missing & Popping Out on Roof Area No. 3

Photo No. 15

Location: DPW Office & Garage

Description: Screws Missing & Popping Out on Roof Area No. 3

Photo No. 16

Location: DPW Office & Garage

Description: Popped Out Screw

Photo No. 17

Location: DPW Office & Garage

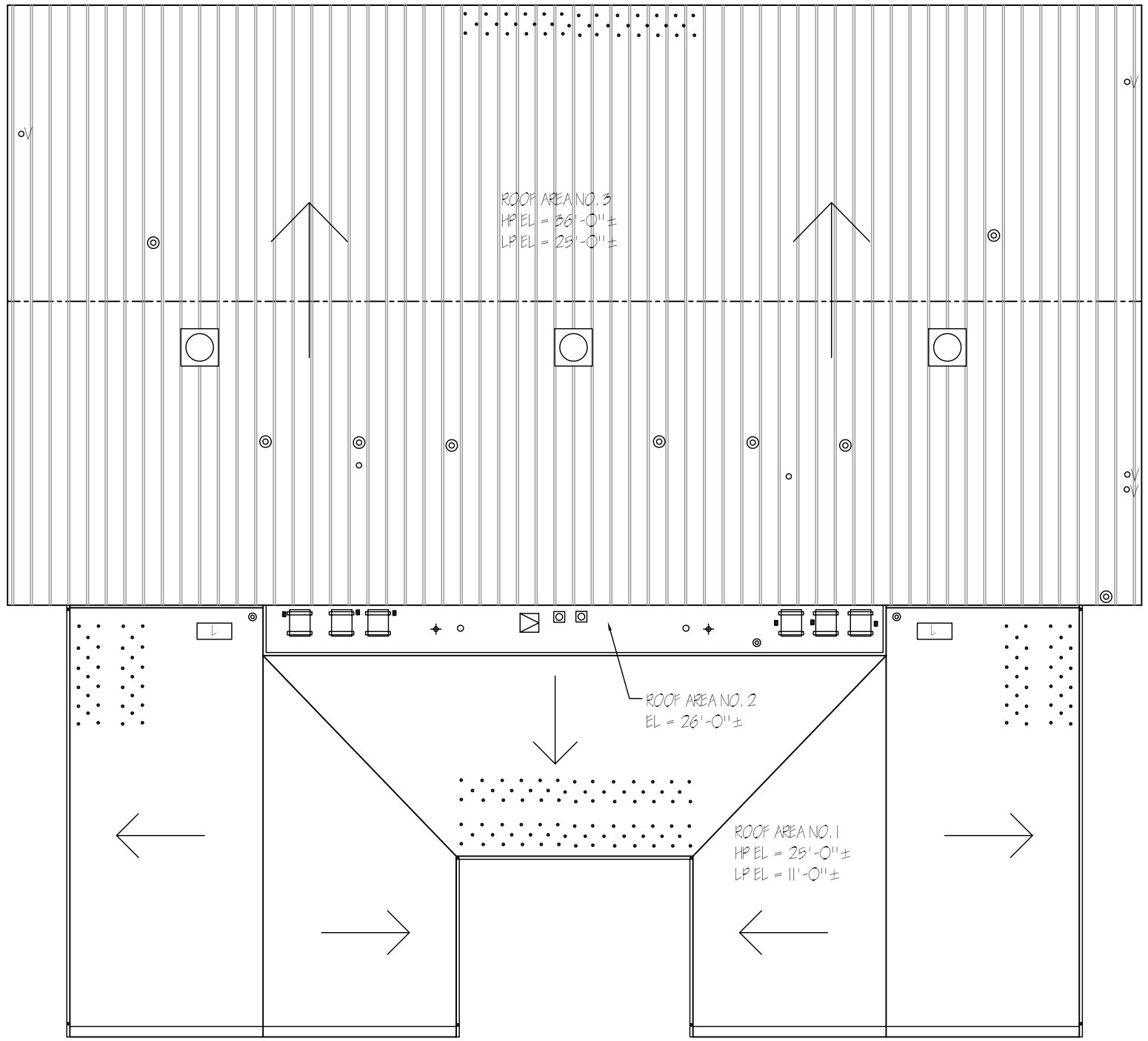
Description: Rust Spot on Roof Area No. 3

Photo No. 18

Location: DPW Office & Garage

Description: Rust Spot on Roof Area No. 3

N



DPW OFFICE & GARAGE - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
○V	VENT PIPE
⊕	ROOF DRAIN
○	PIPE PENETRATION
●	SNOW BRACKET
◎	HOT PIPE
L	LOUVER
▣	EXHAUST FAN
▬	PITCH POCKET
⊠	ROOF HATCH
▯	UNIT SLEEPER SUPPORTS
———	METAL ROOF SEAM
——●	GUTTER & DOWNSPOUT
→	SLOPE DIRECTION: DOWN

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
DPW OFFICE & GARAGE
275 OLD LANCASTER ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Peter Noyes Elementary School
280 Old Sudbury Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Peter Noyes Elementary School
280 Old Sudbury Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 53,505 square feet (SF).

- Eighteen (18) low-sloped roof areas contain approximately 53,505 SF of adhered EPDM roofing, labeled Roof Area Nos. 1-18 on the roof plan. All 18 roof areas reportedly were installed as a "tear-off" application (the original roofing system was removed and replaced) in either 1982 or 1985. Roof Area Nos. 1-7, 12, & 18 were reportedly installed in 1982. Roof Area Nos. 8-11 & 13-17 reportedly was installed in 1985.

- The existing roof assembly construction reportedly consists of an adhered EPDM membrane installed over 1/2"± of rigid board (fiberboard) insulation which in turn was installed over rigid foam insulation. Fiberboard installed in the 1982 roof areas is reportedly adhered with hot asphalt. Fiberboard insulation installed in the 1985 roof areas is reportedly attached with mechanical roofing fasteners and distribution plates.
- Roof Area Nos. 1, 13, 15, 16, 17, & 18 (35,780 SF) are over classrooms. Roof Area Nos. 2, 3, 4, 5, 7, 8, 9, 11, 12, & 14 (8,115 SF) are over entry doors, lobbies, corridors, and offices. Roof Area No. 6 (7,310 SF) is over the gymnasium. Roof Area No. 10 (2,300 SF) is over the boiler room/maintenance room.

Roof Observations/Issues

The roofing systems that exist at this location are in poor condition. Leaks are reported to occur in various locations; water stains were observed on ceiling tiles, interior walls, and at exposed undersides of roof decking. Numerous previous repairs to the roofing systems were observed; some are failing. Numerous areas of ponding water on the EPDM roof surfaces were observed. Various locations of soft/spongy conditions were observed on the EPDM roof areas (when walked upon), indicating the possibility that the underlying rigid board roof insulation and associated components (fasteners & wood blocking) are wet. Deterioration of EPDM seams was observed. Flashing deterioration was observed. Low base flashing height was observed. Splits and punctures were observed at several locations.

Additional Observations/Issues

Deteriorated mortar joints were observed in the above roofline wall of the Gym (Roof Area No. 6). Certain roof areas (**8 total**) contain low base wall flashing height conditions, and caulked weep holes at the above roofline masonry walls were observed. The caulked weep hole situation leads us to believe that defective through-wall flashing conditions exist. A number of roofs have no access. The sloped glazing system adjacent to upper and lower roof areas 9 & 12 and 15 & 16 is deteriorated. The windows above Roof Area No. 18 are low to the existing roof and are not weather tight (deteriorated caulking, glazing and wood components).

Corrective Recommendations

The recommended work Estimated Construction Costs is broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1-18 at 53,505 SF) in **year 2011**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, snow guards, repairs to deteriorated roof decking, repairs to suspected defective above roofline masonry wall thru-wall flashings, and a roofing manufacturer's 20-year full system labor and material warranty. Replacement of the referenced deteriorated above roofline window system and sloped glazing systems are recommended to be included in the scope of this project.

   The recommended work is broken down as follows.

   - Replace 53,505 SF of roof area.
   - Repair 3,000 SF of steel roof decking.
   - Repair 2,000 SF of gypsum plank roof decking.
   - Replace 21 cast iron roof drains.
   - Remove and replace windows above Roof Area No. 18.
   - Remove and replace above roofline sloped glazing systems.
   - Remove and replace 350 LF of defective above roofline masonry wall thru-wall flashing.

I. IDENTIFICATION

Subject:	Peter Noyes Elementary School Roof
Location:	280 Old Sudbury Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector
Joseph Kupczewski, Sudbury Public Schools

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition at the Peter Noyes Elementary School located in Sudbury, Massachusetts. The Peter Noyes Elementary School contains EPDM roofing with tongue and groove gypsum plank, and steel roof decking. The roof area of the entire building is approximately 53,505 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, exhaust fans, chimney, with associated sloped glazing system.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 15' ±) *Classroom*	13,775	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: 2"±:12"). Roof drains over perimeter edge.	28 Years	Poor
Roof Area No. 2 (Elev. 14' ±) *Offices*	1,550	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 3 (Elev. 14' ±) *Offices*	375	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 4 (Elev. 19' ±) *Lobby*	415	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 5 (Elev. 14' ±) *Offices*	340	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 6 (Elev. 37' ±) *Gymnasium*	7,310	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 7 (Elev. 15' ±) *Offices & Classrooms*	3,515	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 8 (Elev. 10' ±) *Entry Door*	60	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 9 (Elev. 23' ±) *Entry Door, & Corridor*	1,100	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	25 Years	Poor
Roof Area No. 10 (Elev. 23' ±) *Boiler Room*	2,300	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	25 Years	Poor
Roof Area No. 11 (Elev. 10' ±) *Entry Door*	60	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	25 Years	Poor
Roof Area No. 12 (Elev. 25' ±) *Boiler Room*	640	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	28 Years	Poor
Roof Area No. 13 (Elev. 25' ±) *Classrooms*	12,850	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof cast iron drains via roof drains.	25 Years	Poor
Roof Area No. 14 (Elev. 10' ±) *Entry Door*	60	Adhered EPDM with tongue and groove gypsum plank roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via roof drains.	25 Years	Poor
Roof Area No. 15 (Elev. 25' ±) *Classrooms*	1,420	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof cast iron drains via roof drains.	25 Years	Poor
Roof Area No. 16 (Elev. 13' ±) *Classrooms*	420	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof cast iron drains via roof drains.	25 Years	Poor

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 17 (Elev. 13' ±) *Classrooms*	6000	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof cast iron drains via roof drains.	25 Years	Poor
Roof Area No. 18 (Elev. 37' ±) *Classrooms*	1,315	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof cast iron drains via roof drains.	28 Years	Poor

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No warranties are currently in place for the various roof areas.

History of Repairs:

Gale Associates 1997 Roof Repair Specification Documents. There have been many repair attempts throughout all roof areas.

History of Roof Studies/Inspections:

Gale Associates Roof Condition Report, Dated June 5, 1997
Gale Associates 5-Year Maintenance Program, Dated June 30, 1992

Photo No. 01

Location: Peter Noyes Elementary School

Description: Aerial View of Roof.

Photo No. 02

Location: Peter Noyes Elementary School

Description: Overview of Roof Area #1 and is typical for the 18 various roof levels.

Photo No. 03

Location: Peter Noyes Elementary School

Description: Overview of Roof Area# 9. Note repairs at exhaust stacks.

Photo No. 04

Location: Peter Noyes Elementary School

Description: Damaged roof deck plank at roof area #17.

Photo No. 05

Location: Peter Noyes Elementary School

Description: Numerous sealant repairs at monitor windows.

Photo No. 06

Location: Peter Noyes Elementary School

Description: Typical failed seam.

Photo No. 07

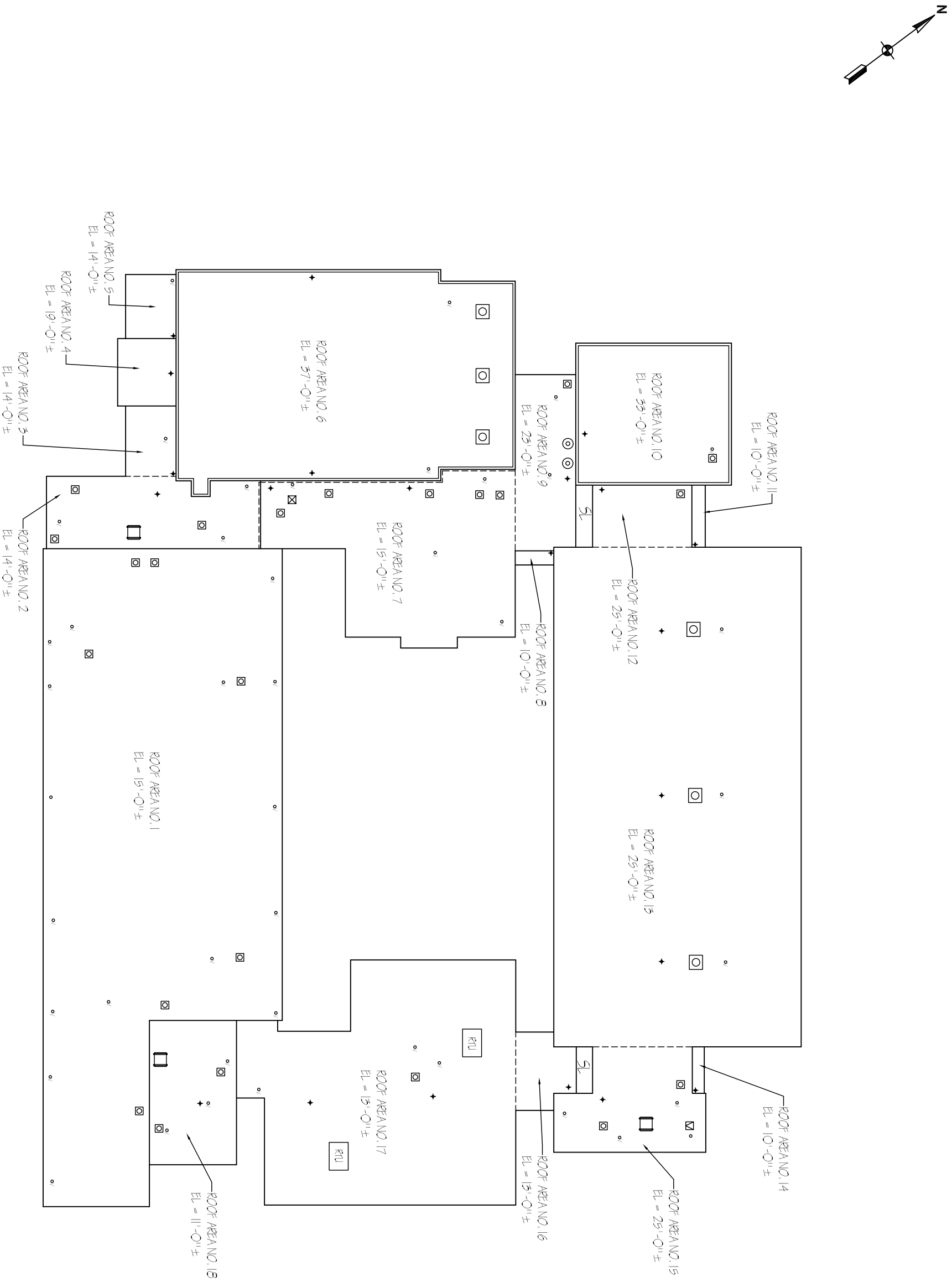
Location: Peter Noyes Elementary School

Description: Puncture in roof membrane.

Photo No. 08

Location: Peter Noyes Elementary School

Description: Neoprene base flashings are aged and cracked.



NOYES ELEMENTARY SCHOOL - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND

V	VENT PIPE
	ROOF DRAIN
	PIPE PENETRATION
SL	SKYLIGHT
	ROOF HATCH
	EXHAUST FAN
	ABANDONED PENETRATION
RTU	ROOF TOP UNIT
	UNIT SLEEPER SUPPORTS
	EXPANSION JOINT

TOWN OF SUDBURY

PETER NOYES ELEMENTARY SCHOOL
280 OLD SUDBURY ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

NO	DATE	BY	DESCRIPTION

DATE 02.03.12
SCALE AS NOTED
DRAWN BY / CHECKED BY jrw/RJG
PROJECT NO 201056.00
DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Nixon Elementary School
472 Concord Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Nixon Elementary School
472 Concord Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 61,895 square feet (SF).

- Nine (9) low-sloped roof areas contain approximately 56,125 SF of adhered EPDM roofing, labeled Roof Area Nos. 1, 2, 4-8, 10 & 11 on the roof plan. All 9 roof areas are believed to have been installed as "tear-off" applications (the original roofing system was removed and replaced). Roof Area Nos. 7, 8, 10, & 11 were reportedly installed in 1991. Roof Area Nos. 1, 2, 4, 5, & 6 reportedly were installed in 1995.

  The existing roof assembly construction of these roof areas consists of an adhered EPDM membrane installed over rigid foam insulation (thickness unknown) board. The rigid foam insulation is attached with mechanical roofing fasteners and distribution plates.

- One steep-sloped roof area contains approximately 4,975 SF of shingle roofing, labeled Roof Area No. 9 on the roof plan, reportedly installed in 1991. This roof area is over the Cafeteria and is in good condition (Celotex manufactured limited shingle warranty in effect until 2016).

- One steep-sloped roof area contains approximately 795 SF of metal roofing, labeled Roof Area No. 3 on the roof plan, reportedly installed in 1995. This roof area is over the Lobby.

- Roof Area No. 1 (4,500 SF) is over the gymnasium. Roof Area Nos. 2, 6, & 11 (42,225 SF) are over classrooms. Roof Area Nos. 3, 4, 5, & 7 (2,415 SF) are over entry doors, lobbies, and corridors. Roof Area No. 8 (7,060 SF) is over the boiler room/maintenance room.

Roof Observations/Issues

The oldest EPDM roofing systems (Roof Area Nos. 7, 8, 10, & 11) are in fair to poor condition. The next oldest EPDM roofing systems (Roof Areas1, 2, 4, 5 & 6) are in good to fair condition. The custodial staff has indicated that the facility has experienced leaks in the past but there are no leaks presently. Numerous previous repairs to the roofing systems were observed; some are failing. Numerous areas of ponding water on the EPDM roof surfaces were observed. Various locations of soft/spongy conditions were observed on the EPDM roof areas (when walked upon), indicating the possibility that the underlying rigid board roof insulation and associated components (fasteners & wood blocking) are wet. Deterioration of EPDM seams was observed. Flashing deterioration was observed. Low base flashing height was observed. Splits and punctures were observed. Some roof drain strainers and emergency overflow scuppers are blocked with miscellaneous debris. The lining of the insert roof drains has worn through creating holes in the lining.

Additional Observations/Issues

Deteriorated sealant control joints were observed in the above roofline wall of the Gym (Roof Area No. 1). Roof Area No. 3 has no access but visibly appeared in good condition. Cracks and condensation was observed in the skylight domes. Holes and tears were observed in the duct and waterproofing located on Roof Area No. 2. Wood sleepers that support the existing ductwork are rotting. Deteriorated mortar joints and cracked brick masonry was observed at the chimney located on Roof Area No. 8. Paint was observed to be peeling at the wood fascia located on Roof Area Nos. 8 and 9.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 7, 8, 10, & 11 at 25,965 SF) in year **2012**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, new skylights, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 25,965 SF of roof area.
   - Repair 2,000 SF of cementitious wood fiber roof decking.
   - Repair 500 SF of tongue and groove wood roof decking.
   - Replace 11 cast iron roof drains.
   - Remove and replace 11 skylight domes.

2. Repair the low-sloped adhered EPDM roofs (Roof Area Nos. 1, 2, 4, 5 & 6 at 30,160 SF) in year **2011**. Repair work includes stripping in EPDM seams; patching splits and holes in the EPDM roof membrane and flashing; replace deteriorated wood sleepers & install buffer sheets; remove miscellaneous debris from roof drain strainers and emergency overflow scuppers; replace above roofline deteriorated sealant control joints; replace wet roofing substrate, replace deteriorated ductwork and waterproofing.

3. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1, 2, 4, 5 & 6 at 30,160 SF) in year **2019**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, new skylights, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 30,160 SF of roof area.
   - Repair 2,000 SF of cementitious wood fiber roof decking.
   - Replace 8 cast iron roof drains.
   - Remove and replace 3 skylight domes.

4. Replace the steep-sloped shingle roof (Roof Area No. 9 at 4,975 SF) in year **2017**. Replacement includes installation of a new heavy duty architectural asphalt shingle system complete with felt underlayment, ice and water barrier membrane, ventilation improvements, gutters and downspouts, and a roofing manufacturer's material warranty (minimum 40-year time frame).

5. Implement repairs to the steep-sloped metal roof (Roof Area No. 3 at 795 SF) in year **2015**. Repair work includes reflashing rooftop penetrations and associated crickets, re-securing panel fasteners and installing new panel fasteners as needed.

I. IDENTIFICATION

Subject:	Nixon Elementary School Roof
Location:	472 Concord Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition at the Nixon Elementary School located in Sudbury, Massachusetts. The Nixon Elementary School contains EPDM roofing with tongue and groove gypsum plank, and cementitious wood fiber decking. The roof area of the entire building is approximately 61,901 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, HVAC units, exhaust fans, and chimney,

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 29' ±) *Gymnasium*	4,500	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	17 Years	Good to Fair
Roof Area No. 2 (Elev. 14' ±) *Classrooms*	14,160	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	17 Years	Good to Fair
Roof Area No. 3 (Elev. 32' ±) *Lobby*	800	Standing seam metal roof over steel decking. Roof is steep-sloped (slope: 8"±:12"). Roof drains via through wall spill out scuppers.	17 Years	Good
Roof Area No. 4 (Elev. 13' ±) *Entry Way*	275	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via spill out scuppers.	17 Years	Good to Fair
Roof Area No. 5 (Elev. 13' ±) *Entry Way*	565	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via spill out scuppers.	17 Years	Good to Fair
Roof Area No. 6 (Elev. 13' ±) *Classrooms*	10,660	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	17 Years	Good to Fair
Roof Area No. 7 (Elev. 12' ±) *Corridor*	775	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via roof drains.	21 Years	Fair to Poor

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 8 (Elev. 12' ±) *Boiler Room/Maintenance*	7,060	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	21 Years	Fair to Poor
Roof Area No. 9 (Elev. 35' ±) *Cafeteria*	4,975	3-tab asphalt shingle roof with tongue and groove wood roof decking. Roof is steep-sloped (slope: 3"±:12"). Roof drains via gutters.	21 Years	Good
Roof Area No. 10 (Elev. 12' ±) *Entry Way*	725	Adhered EPDM with tongue and groove wood roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains onto Roof Area No. 8	21 Years	Fair to Poor
Roof Area No. 11 (Elev. 13' ±) *Classroom*	17,405	Adhered EPDM with cementitious wood fiber roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	21 Years	Fair to Poor

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

Celotex Warranty (Storm King 25), Warranty Expires on June 13, 2016.

History of Repairs:

B.H. Cutler Roofing Repairs Conducted Repairs on February 9, 1998.
Firestone Building Repairs At Various Times From February 5, 1997 to January 28, 1998.
Titan Roofing Repairs Conducted Repairs on March 30, 1999.

History of Roof Studies/Inspections:

Gale Associates Letter, Dated December 2, 1997
Gale Associates 5-Year Maintenance Program, Dated June 30, 1992

Photo No. 01

Location: Nixon Elementary School

Description: Aerial View of Roof.

Photo No. 02

Location: Nixon Elementary School

Description: Overview of Roof Areas 2 and 11 (typical roofs).

Photo No. 03

Location: Nixon Elementary School

Description: Overview of Roof Area No. 6 (typical roof).

Photo No. 04

Location: Nixon Elementary School

Description: Partial overview of Roof Area No's 7 & 8. (Typical older roofs).

Photo No. 05

Location: Nixon Elementary School

Description: Typical deteriorated wood sleeper support.

Photo No. 06

Location: Nixon Elementary School

Description: Walkway pads are loose.

Photo No. 07

Location: Nixon Elementary School

Description: EPDM flashing is loose.

Photo No. 08

Location: Nixon Elementary School

Description: Typical failed seam.

Photo No. 09

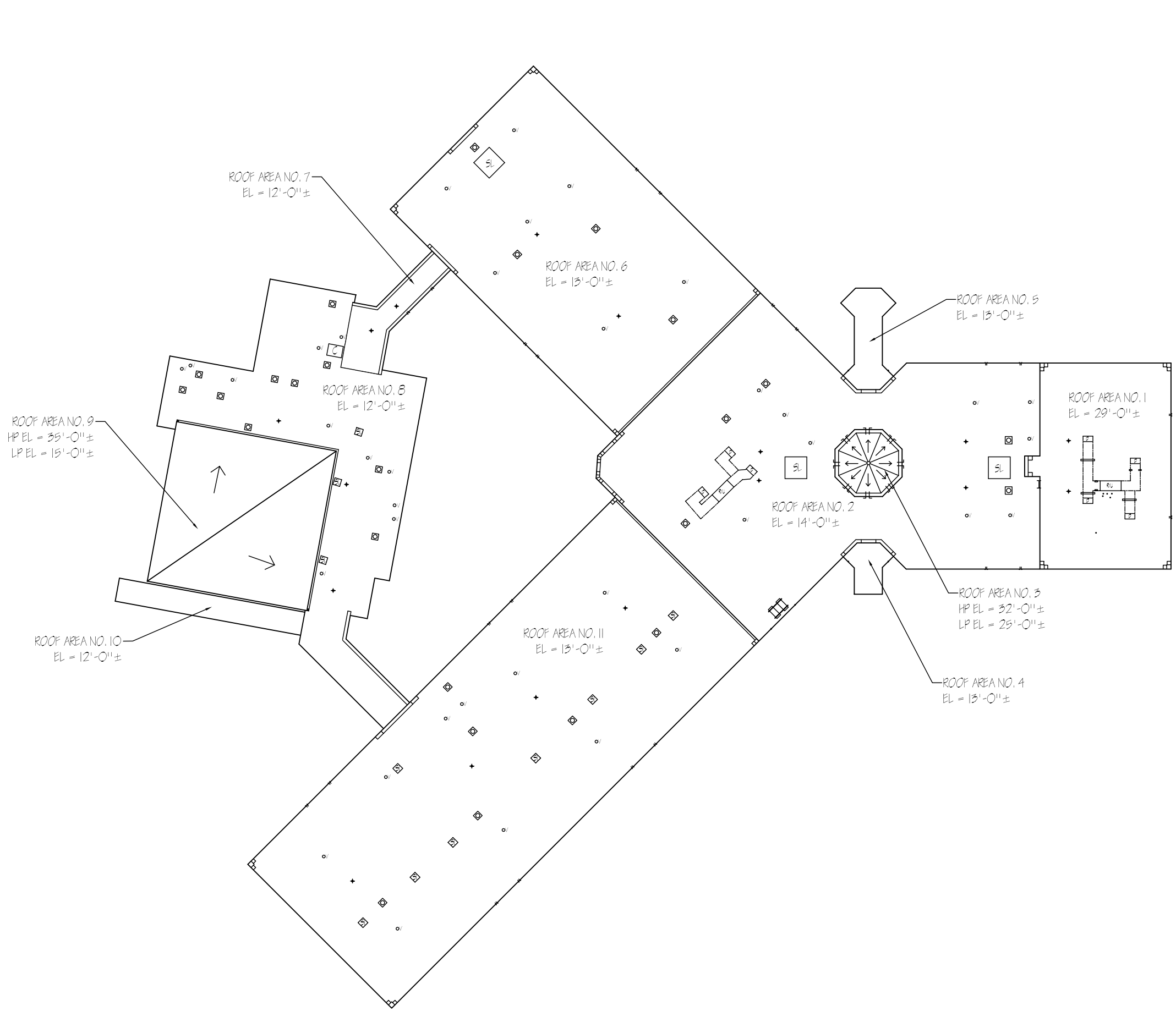
Location: Nixon Elementary School

Description: Scuppers are blocked.

Photo No. 10

Location: Nixon Elementary School

Description: Weatherproof duct coverings are damaged.



NIXON ELEMENTARY SCHOOL - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
V	VENT PIPE
	ROOF DRAIN
	PIPE PENETRATION
SL	SKYLIGHT
	EXHAUST FAN
C	CHIMNEY
D	DUCTWORK PENETRATION
RTU	ROOF TOP UNIT
	UNIT SLEEPER SUPPORTS
	DUCTWORK ACROSS ROOF
	EXPANSION JOINT
	GUTTER & DOWNSPOUT
	SLOPE DIRECTION: DOWN

NO	DATE	BY	DESCRIPTION

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

TOWN OF SUDBURY
NIXON ELEMENTARY SCHOOL
472 CONCORD ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

DATE 02.03.12

SCALE AS NOTED

DRAWN BY / CHECKED BY jrw/RJG

PROJECT NO 201056.00

DRAWING NO R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Josiah Haynes Elementary School
169 Haynes Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Josiah Haynes Elementary School
169 Haynes Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 67,955 square feet (SF).

- Nine (9) low-sloped roof areas contain approximately 59,685 SF of adhered EPDM roofing, labeled Roof Area Nos. 2-10 on the roof plan. Four (4) roof areas (Roof Area Nos. 5, 6, 7, & 9) are believed to have been installed as a "tear-off" application (the original roofing system was removed and replaced) in either 1993. Roof Area Nos. 2, 3, 4, 8 & 10 were reportedly installed in 1999 as part of an addition to the building (Under manufacturer's (Carlisle) 15-year warranty that expires on 12/6/2014).

- Roof Area No. 1 (8,270 SF) - The existing roof assembly construction consists of asphalt shingles, building paper, ice and water shield (ridges, roof edges, and around mechanical units), nail board – plywood sheathing over 3" vent/grooved rigid insulation; or field constructed vent space and 3" thick rigid insulation. Roof Area No. 1 was installed in 1999 as part of an addition to the building (Under manufacturer's (CertainTeed) 30-year warranty that expires on 10/12/2029).

- Roof Area Nos. 2, 4, 8, 9 & 10 - The existing roof assembly construction consists of an adhered EPDM membrane over tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

- Roof Area No. 3, 6, 7 & 9 - The existing roof assembly construction consists of an adhered EPDM membrane over 1/2" of wood fiberboard, set in asphalt over 3" polyisocyanurate insulation mechanically fastened to a steel roof deck. Note: A section of Roof Area No. 9 was replaced as part of the addition to the building.

- Roof Area No. 5 - The existing roof assembly construction consists of a mechanically fastened EPDM membrane over 1/2" of wood fiberboard, set in asphalt over tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

Roof Observations/Issues

Roof Area No. 1 (shingles) is in good condition. The roofing systems at Roof Area Nos. 5, 6, 7, & 9 (17-year old EPDM) are in fair to poor condition. Roof Area Nos. 2, 3, 4, 8, & 10 (11-year old EPDM) are in good to fair condition. The custodial staff has indicated that the facility has experienced leaks at several of the existing skylights. Numerous previous repairs to the roofing systems were observed; some are failing. Numerous areas of ponding water on the EPDM roof surfaces were observed. Various locations of soft/spongy conditions were observed on the EPDM roof areas (when walked upon), indicating the possibility that the underlying rigid board roof insulation and associated components (fasteners & wood blocking) are wet. Deterioration of EPDM seams was observed. Flashing membrane deterioration was observed. Low base flashing height was observed. Splits and punctures were observed. Roof drain strainers are blocked with miscellaneous debris.

Additional Observations/Issues

Deteriorated elements of the skylight domes were observed on Roof Area Nos. 4 & 5 (leaks are reported to occur at these areas). The existing lightning cable system is not properly attached to the adhered EPDM roof membrane at Roof Area 3.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Perform corrective repairs at the leaking skylights on the low-sloped EPDM roof (Roof Area Nos. 4 & 5) and properly resecure the lightning cable at Roof Area No. 3 in year **2011**.

2. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 5, 6, 7, & 9 at 44,600 SF) in **year 2015**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 44,600 SF of roof area.
   - Repair 3,000 SF of steel roof decking.
   - Replace 8 cast iron roof drains.

3. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 2, 3, 4, 8 & 10 at 15,089 SF) in **year 2020**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

The recommended work is broken down as follows.

- Replace 15,089 SF of roof area.
- Repair 3,000 SF of steel roof decking.
- Replace 9 cast iron roof drains.

I. IDENTIFICATION

Subject:	Josiah Haynes Elementary School Roof
Location:	169 Haynes Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition at the Josiah Haynes Elementary School located in Sudbury, Massachusetts. The Josiah Haynes Elementary School contains EPDM roofing with steel roof decking. The roof area of the entire building is approximately 67,935 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, HVAC units, exhaust fans, and chimney,

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 31' ±) *Gymnasium*	8,270	Shingle roofing system. Roof drains via roof gutters and downspouts.	13 Years	Good
Roof Area No. 2 (Elev. 11' ±) *Classrooms*	3,115	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	13 Years	Good to Fair
Roof Area No. 3 (Elev. 21' ±) *Lobby*	1,751	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: 2"±:12"). Roof drains via gutters and downspouts.	13 Years	Good to Fair
Roof Area No. 4 (Elev. 11' ±) *Classrooms*	8,768	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains. .	13 Years	Good to Fair
Roof Area No. 5 (Elev. 11' ±) *Classrooms/Kitchen Maintenance*	33,112	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	19 Years	Fair to Poor
Roof Area No. 6 (Elev. 24' ±) *Cafeteria*	6,751	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains over metal edge.	19 Years	Fair to Poor
Roof Area No. 7 (Elev. 15' ±) *Offices*	1,741	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: 3"±:12"). Roof drains over metal edge.	19 Years	Fair to Poor
Roof Area No. 8 (Elev. 11' ±) *Offices/Classrooms*	818	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains over metal edge.	13 Years	Good to Fair

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 9 (Elev. 15' ±) *Offices/Classrooms*	2,992	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: 3"±:12"). Roof drains over metal edge.	19 Years	Fair to Poor
Roof Area No. 10 (Elev. 11' ±) *Offices/Classrooms*	637	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	13 Years	Good to Fair

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

Carlisle 15-Year Roofing System Warranty, Expires On December 6, 2014
Certainteed Warranty (XT 30).

History of Repairs:

No Information Available

History of Roof Studies/Inspections:

Gale Associates Roof Condition Report, Dated January 28, 1992
Peterson Associates Consulting Engineers, Inc., Dated October 25, 1999

Photo No. 01

Location: Josiah Haynes Elementary School

Description: Aerial View of Roof.

Photo No. 02

Location: Josiah Haynes Elementary School

Description: Overview of shingled Roof Area No.1 in good condition.

Photo No. 03

Location: Josiah Haynes Elementary School

Description: Overview of typical EPDM Roof (Roof Areas No. 4 and 5).

Photo No. 04

Location: Josiah Haynes Elementary School

Description: Overview of Roof Area No. 6

Photo No. 05

Location: Josiah Haynes Elementary School

Description: Lightning protection system of Roof Area No. 6 is damaged and disconnected.

Photo No. 06

Location: Josiah Haynes Elementary School

Description: Many seams and flashings over snow guard bases are failed.

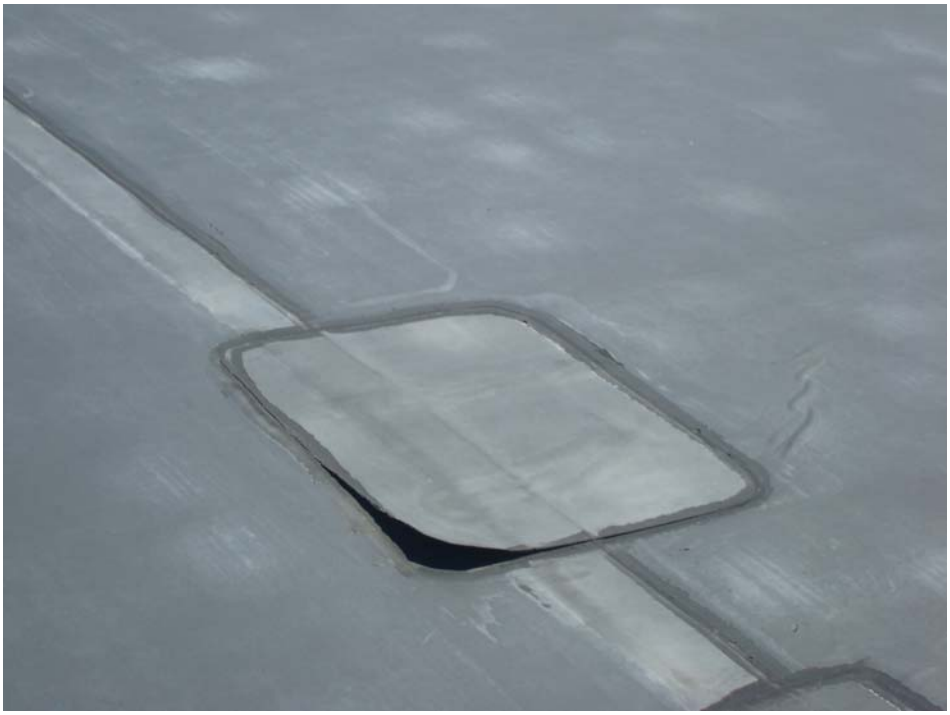


Photo No. 07

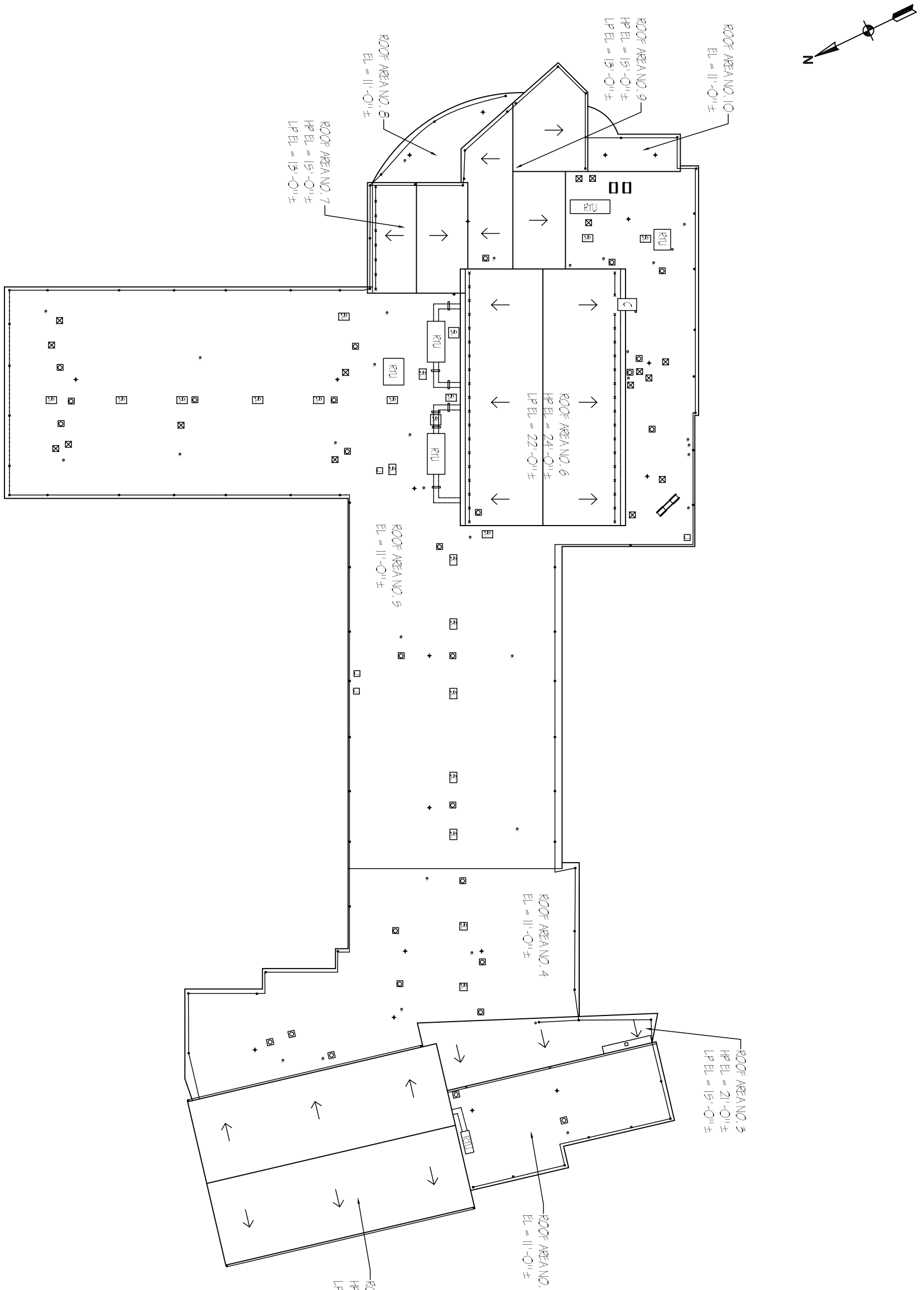
Location: Josiah Haynes Elementary School

Description: Delaminating seam.

Photo No. 08

Location: Josiah Haynes Elementary School

Description: EPDM flashing at sheet metal edges is failing.



JOSIAH HAYNES ELEMENTARY SCHOOL - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
V	VENT PIPE
⌖	ROOF DRAIN
○	PIPE PENETRATION
SL	SKYLIGHT
EF	EXHAUST FAN
⊠	ABANDONED PENETRATION
C	CHIMNEY
J	J VENT
RTU	ROOF TOP UNIT
▭	UNIT SLEEPER SUPPORTS
———	DUCTWORK ACROSS ROOF
– – – –	EXPANSION JOINT
——□——	GUTTER & DOWNSPOUT
→	SLOPE DIRECTION: DOWN
——●——	LIGHTNING PROTECTION SYSTEM
×——×	SNOW GUARDS

TOWN OF SUDBURY
JOSIAH HAYNES ELEMENTARY SCHOOL
169 HAYNES ROAD
ROOF CONDITION SURVEY
ROOF AREA PLAN

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

NO	DATE	BY	DESCRIPTION

DRAWING NO: R-1
PROJECT NO: 201056.00
DRAWN BY / CHECKED BY: jrw/RJG
SCALE: AS NOTED
DATE: 02.03.12

ROOF CONDITION SURVEY

For

Town of Sudbury

Israel Loring Elementary School
80 Woodside Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Israel Loring Elementary School
80 Woodside Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 51,510 square feet (SF).

- Five (5) low-sloped roof areas contain approximately 42,825 SF of adhered EPDM roofing, labeled Roof Area Nos. 1, 4, 5, 13, & 14 on the roof plan. These roof areas reportedly were installed as new construction in 2000.

  The existing roof assembly construction consists of an adhered EPDM membrane installed over rigid foam insulation (thickness unknown) board. The rigid foam insulation is attached with mechanical roofing fasteners and distribution plates to a steel roof deck. Reportedly a 15-year manufacturer's warranty (Versico) was in place (expires in 2015).

- Nine (9) steep-sloped roof area contains approximately 8,685 SF of metal roofing, labeled Roof Area Nos. 2, 3, & 6-12, on the roof plan. These roof areas reportedly were installed as new construction in 2000.

Roof Observations/Issues

The metal roofing systems (Roof Area Nos. 2, 3, & 6-12) are in good condition. The EPDM roofing systems (Roof Areas 1, 4, 5, 13, & 14) are in good condition. The custodial staff has indicated that the facility has experienced leaks in the Men's Bathroom & the Art Room. Previous repairs to the roofing systems were observed; some are failing. Splits and holes in the EPDM membrane were observed. Some deterioration of EPDM seams was and flashings were observed. The drain strainer is missing at one location. Curb flashing is improperly terminated at three curb locations. Perimeter edge metal is not adequately attached to the continuous cleat at one location. Improperly flashed conduit lines were observed at one location.

Additional Observations/Issues

At two above roofline masonry walls (at the intersection of Roof Nos. 1 & 4 and Roof Nos. 14 & 4) missing weep holes were observed and through wall flashing appear to be non-continuous. This situation leads us to believe that defective through wall flashing conditions exist. Further investigation of this condition is recommended.

The sealant has split where above roofline windows and aluminum counterflashing intersects each other (at Roof No. 8). There is also an approximate 1/2" gap where the aluminum counterflashing stops and the window starts exposing the wood framing underneath. The window gaskets appear to be failing as well. Further investigation of this condition is recommended.

At the above roofline masonry wall (at the intersection Roof Nos. 14 & 4), the expansion joint is split and open in various locations.

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs to the low-sloped EPDM roofs (Roof Area Nos. 1, 4, 5, 13, & 14 at 42,825 SF) in year **2011**. Repair work includes stripping in EPDM seams; patching splits and holes in the EPDM roof membrane; flashing repairs; remove miscellaneous debris from roof drain strainers; Reflash three curbs; replace above roofline masonry wall expansion joint; resecure unattached perimeter edge metal.

2. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1, 4, 5, 13, & 14 at 42,825 SF) in **year 2020**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 42,825 SF of roof area.
   - Repair 3,000 SF of steel roof decking.
   - Replace 34 cast iron roof drains.

3. Perform an investigation of the referenced suspected defective conditions in the above roofline masonry walls and window system in year **2010**.

4. Implement repairs to the steep-sloped metal roof (Roof Area Nos. 2, 3 & 6-12 at 8,685 SF) in year **2018**. Repair work includes reflashing rooftop penetrations and associated crickets, re-securing panel fasteners and installing new panel fasteners as needed.

I. IDENTIFICATION

Subject:	Israel Loring Elementary School Roof
Location:	80 Woodside Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition at the Israel Loring Elementary School located in Sudbury, Massachusetts. The Israel Loring Elementary School contains both EPDM roofing and standing seam metal roofing. The roof area of the entire building is approximately 51,510 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, pipe penetrations, HVAC units, and exhaust fans.

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 17' ±) *Cafeteria/Kitchen*	7,390	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 2 (Elev. 29' ±) *Cafeteria/Kitchen*	2,266	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 5"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 3 (Elev. 14' ±) *Entry Way*	380	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 4 (Elev. 27' ±) *Classrooms*	13,530	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 5 (Elev. 27' ±) *Classrooms*	14,875	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 6 (Elev. 14' ±) *Entryway/Canopy Roof*	2,026	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 7 (Elev. 27' ±) *Classrooms*	895	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 8 (Elev. 37' ±) *Classrooms*	164	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 12"±:12"). Roof drains over perimeter edge.	12 Years	Good

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 9 (Elev. 14' ±) *Entryway/Canopy Roof*	486	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 10 (Elev. 14' ±) *Entryway/Canopy Roof*	1,050	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 11 (Elev. 14' ±) *Entryway/Canopy Roof*	203	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 12 (Elev. 14' ±) *Classrooms*	1,216	Standing seam metal with steel roof decking. Roof is low-sloped (slope: 4"±:12"). Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 13 (Elev. 27' ±) *Gymnasium*	5,960	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 14 (Elev. 16' ±) *Classrooms*	1,070	Adhered EPDM with steel roof decking. Roof is low-sloped (slope: ¼"±:12"). Roof drains via cast iron roof drains.	12 Years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

For the EPDM roofs, reportedly a 15-year manufacturer's warranty (Versico) was in place (expired in 2015).

History of Repairs:

Not Known. There have been many repair attempts throughout all roof areas.

History of Roof Studies/Inspections:

There have been no previous roof studies performed.

Photo No. 01

Location: Israel Loring Elementary School

Description: Aerial View of Roof.

Photo No. 02

Location: Israel Loring Elementary School

Description: Overview of typical EPDM roof. (Roof Area No. 5).

Photo No. 03

Location: Israel Loring Elementary School

Description: Overview of Roof Area No. 14. The ponded water observed indicates slow drainage.

Photo No. 04

Location: Israel Loring Elementary School

Description: Roof Area No. 8.

Photo No. 05

Location: Israel Loring Elementary School

Description: Overview of typical metal roof (Roof Area No. 12).

Photo No. 06

Location: Israel Loring Elementary School

Description: Seams are beginning to delaminate.

Photo No. 07

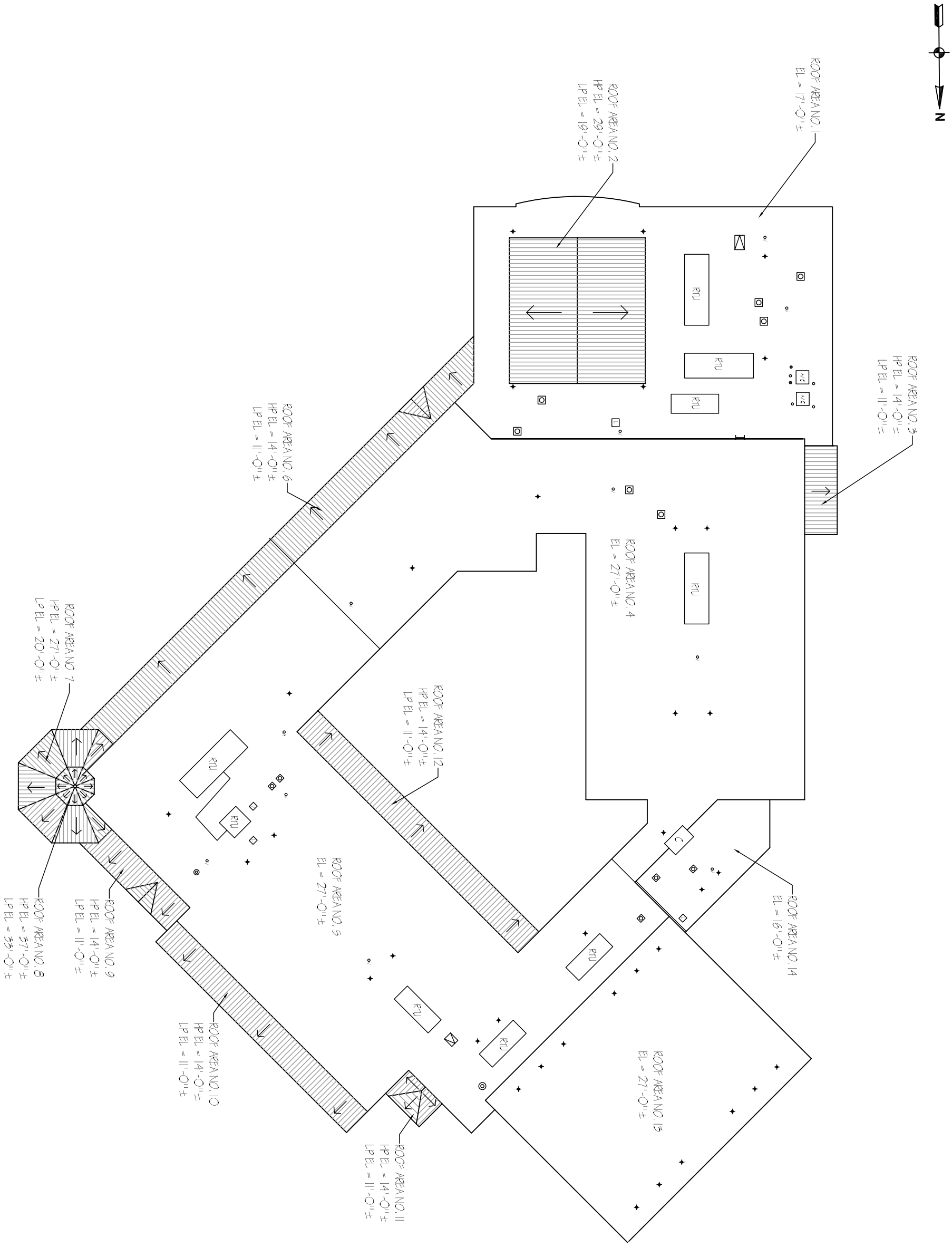
Location: Israel Loring Elementary School

Description: Drain strainers required maintenance.

Photo No. 08

Location: Israel Loring Elementary School

Description: Questionable throughwall flashing configurations exist.



ISRAEL LORING ELEMENTARY SCHOOL - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
V	VENT PIPE
A	ANTENNA
	ROOF DRAIN
	PIPE PENETRATION
	HOT PIPE
	PITCH POCKET
	ROOF HATCH
	EXHAUST FAN
C	CHIMNEY
L	LOUVER
V	ELEVATOR VENT SHAFT
RTU	ROOF TOP UNIT
	UNIT SLEEPER SUPPORTS
	SLOPE DIRECTION: DOWN
	CONDUIT ACROSS ROOF
	EXPANSION JOINT

TOWN OF SUDBURY

ISRAEL LORING ELEMENTARY SCHOOL
80 WOODSIDE ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

NO	DATE	BY	DESCRIPTION

DATE: 02.03.12
SCALE: AS NOTED
DRAWN BY / CHECKED BY: jrw/RJG
PROJECT NO: 201056.00
DRAWING NO: R-1

ROOF CONDITION SURVEY

For

Town of Sudbury

Ephraim Curtis Middle School
22 Pratt's Mill Road
Sudbury, Massachusetts

February 3, 2012

RBA Project No. 201056.00

Prepared by:

33 Center Street, 2nd Floor
Burlington, MA
tel: 781-273-1537
fax: 781-273-1695

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Ephraim Curtis Middle School
22 Pratt's Mill Road
Sudbury, Massachusetts

General Roof Description

The roof area of the entire building is approximately 81,578 square feet (SF).

- Sixteen (16) low-sloped roof areas contain approximately 81,578 SF of adhered EPDM roofing, labeled Roof Area Nos. 1-16 on the roof plan. All sixteen low-sloped roof areas were reportedly installed in 2000 when the school was completely rebuilt (under manufacturer's (Versico) 15-year warranty; expires 12/1/2015).

  Roof Area Nos. 1, 3, 8, 10, 11, 15, 16 - The existing roof assembly construction consists of an adhered EPDM membrane over a combination of both flat and tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

  Roof Area Nos. 2, 9, 14 - The existing roof assembly construction consists of an adhered EPDM membrane over flat polyisocyanurate insulation mechanically fastened to a steel roof deck.

  Roof Area Nos. 4, 5, 6, 7, 12, & 13 - The existing roof assembly construction consists of an adhered EPDM membrane over tapered polyisocyanurate insulation mechanically fastened to a steel roof deck.

Roof Observations/Issues

The EPDM roofing systems at Roof Area Nos. 1-16 are in good condition. The custodial staff has indicated that the facility is experiencing only one leak at the present time. Minor ponding water on the EPDM roof surfaces was observed. Some deterioration of the EPDM seams and patches was observed. Low base flashing height was observed. Some splits/holes in the EPDM membrane were observed. The perimeter edge metal does not come down far enough over the masonry block wall on Roof Area No. 7. In one location the perimeter edge metal is not properly attached. Roof drain strainer is missing at one drain location. Miscellaneous debris was observed lying on the roof.

Additional Observations/Issues

At the above roofline masonry walls (intersection of Roof Area Nos. 15 to 16 and 12 to 9) the weep holes in the through wall flashing were observed to be partially blocked with sealant and/or mortar. Deteriorated elements of the skylight domes were observed on Roof Area No. 1 (no leaks are reported to occur at these areas). Above roofline sealant control joints were observed to be splitting at Roof Area Nos. 12 & 13. Step cracking of the above roofline masonry wall was observed (Roof Area No. 5). Some deteriorated mortar joints were observed at the above roofline masonry wall (Roof Area No. 1). There is a rusted roof hatch. The sealant joints of the parapet wall metal panels (that exist at Roof Nos. 10 & 16) are cracked/split in various locations. Minor vertical cracking in the above roofline masonry wall was observed (Roof Nos. 14 & 15). The sealant at above roofline windows (Roof Area No.

9) is shows signs of aging and deterioration. There is a chiller located on Roof Area No. 13 that is not adequately supported by the wood sleepers (deteriorated)

Corrective Recommendations

The recommended work Estimated Construction Costs are broken down as follows. Reference is made to the "Recommended Roof Repair and Replacement Spreadsheet" located in the in the Master Executive Summary Report, for the recommended work year Estimated Construction Costs.

1. Implement repairs to the low-sloped adhered EPDM roofs (Roof Area Nos. 1-16 at 81,578 SF) in year **2011**. Repair work includes miscellaneous repairs to include replace missing drain strainers, patching splits and holes in the EPDM roof membrane and flashing; replace missing drain strainer; properly attach perimeter edge metal; remove miscellaneous debris from roof; sealant repair at parapet wall metal panels; replace deteriorated wood sleepers.

2. Replace the low-sloped adhered EPDM roofs (Roof Area Nos. 1-16 at 81,578 SF) in **year 2020**. The recommendation is complete removal ("tear-off" application) and replacement with an adhered 60-mil reinforced PVC roof membrane system to include new rigid board roof insulation (tapered as necessary so as to achieve positive drainage; R-value to meet stretch energy code), flashings, replacement skylight domes, edge metal, roof drainage system, repairs to deteriorated roof decking, and a roofing manufacturer's 20-year full system labor and material warranty.

   The recommended work is broken down as follows.

   - Replace 81,578 SF of roof area.
   - Repair 4,000 SF of steel roof decking.
   - Replace 53 cast iron roof drains.

I. IDENTIFICATION

Subject:	Ephraim Curtis Middle School Roof
Location:	22 Pratt's Mill Road Sudbury, Massachusetts
Observation Date:	Inspected during the month of August 2010
Site Contact:	James F. Kelly, Building Inspector 978-443-2209 ext 1361
Client:	Town of Sudbury, Massachusetts
Reliance:	This report is for exclusive use and may be relied upon by the Town of Sudbury, MA. No parties or persons other than those identified as authorized users may use or rely on the information or opinions in this report without the express written consent of Russo Barr Associates, Inc.

II. OBJECTIVE

Objective

This report has been prepared according to the accepted proposal between the Town of Sudbury, MA (Client) and Russo Barr Associates, Inc. (RBA).

The purpose of this report is to provide a description of roof conditions, consisting of the roof surfacing with associated flashing and roof drainage systems, and an evaluation of their general physical condition for the Town of Sudbury, MA. This report includes a schematic roof plan and photo documentation of existing conditions and observed deficiencies.

This report is based on observations made during a walk-through visual survey of the roof areas and accessible interior areas, readily available documents pertaining to roof conditions, information provided by interested parties, and interviews. Roof test cuts and an infrared moisture survey were not performed.

The report identifies physical deficiencies and for each, provides a corrective recommendation action and a corresponding estimate of probable construction cost. Any estimates of construction cost prepared by RBA are intended as an aid in budgeting. They are not quotations, or proposals to do the work for that price, and their accuracy is not guaranteed.

Interviews

James F. Kelley, Building Inspector

Readily Available Documents

Roof plans were available for review.

III. DESCRIPTION

The subject of this report is the roof condition at the Ephraim Curtis Middle School located in Sudbury, Massachusetts. The Ephraim Curtis Middle School contains EPDM roofing with steel roof decking. The roof area of the entire building is approximately 81,578 square feet (SF). There exist various typical penetrations throughout the roof area such as vent pipes, HVAC units, pipe penetrations, exhaust fans, and chimney,

Roofing System Details

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 1 (Elev. 39' ±)	27,968	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 2 (Elev. 42' ±)	838	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains over perimeter edge.	12 Years	Good
Roof Area No. 3 (Elev. 15' ±)	121	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via spill out scuppers.	12 Years	Good
Roof Area No. 4 (Elev. 27' ±)	1,239	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 5 (Elev. 17' ±)	1,667	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 6 (Elev. 17' ±)	1,771	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 7 (Elev. 24' ±)	3,117	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 8 (Elev. 27' ±)	9,835	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 9 (Elev. 29' ±)	6,875	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good

Identification	Area (SF)	Roofing System Type	Estimated Age	Condition
Roof Area No. 10 (Elev. 35' ±)	284	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via spill out scuppers.	12 Years	Good
Roof Area No. 11 (Elev. 12' ±)	163	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via spill out scuppers.	12 Years	Good
Roof Area No. 12 (Elev. 13' ±)	1,398	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 13 (Elev. 13' ±)	4,403	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 14 (Elev. 27' ±)	8,172	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 15 (Elev. 17' ±)	6,262	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good
Roof Area No. 16 (Elev. 27' ±)	7,465	Adhered EPDM with steel roof decking. Roof is low-sloped. Roof drains via cast iron roof drains.	12 Years	Good

IV. MAINTENANCE & WARRANTY INFORMATION

Roof Warranty:

No information available.

History of Repairs:

No Information Available.

History of Roof Studies/Inspections:

No Information Available.

Photo No. 01

Location: Ephraim Curtis Middle School

Description: Aerial View of Roof.

Photo No. 02

Location: Ephraim Curtis Middle School

Description: Overview of typical EPDM roofs (Roof Area 8 in foreground looking out over Roof Area 16 in the background).

Photo No. 03

Location: Ephraim Curtis Middle School

Description: Inadequate sheet metal overlaps onto masonry wall.

Photo No. 04

Location: Ephraim Curtis Middle School

Description: EPDM membrane puncture.

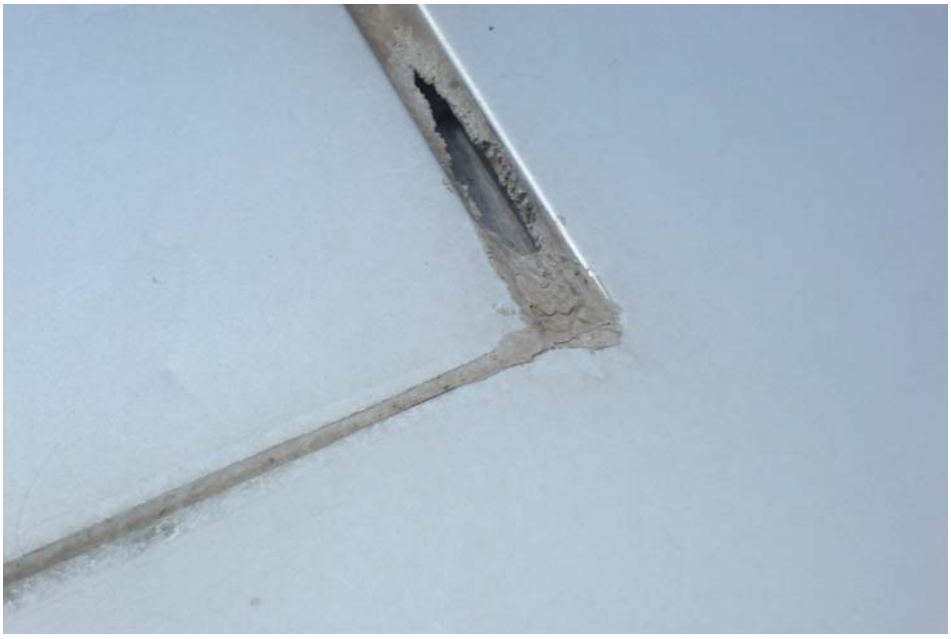


Photo No. 05

Location: Ephraim Curtis Middle School

Description: Failed sealant joint.

Photo No. 06

Location: Ephraim Curtis Middle School

Description: Low flashing height.

Photo No. 07

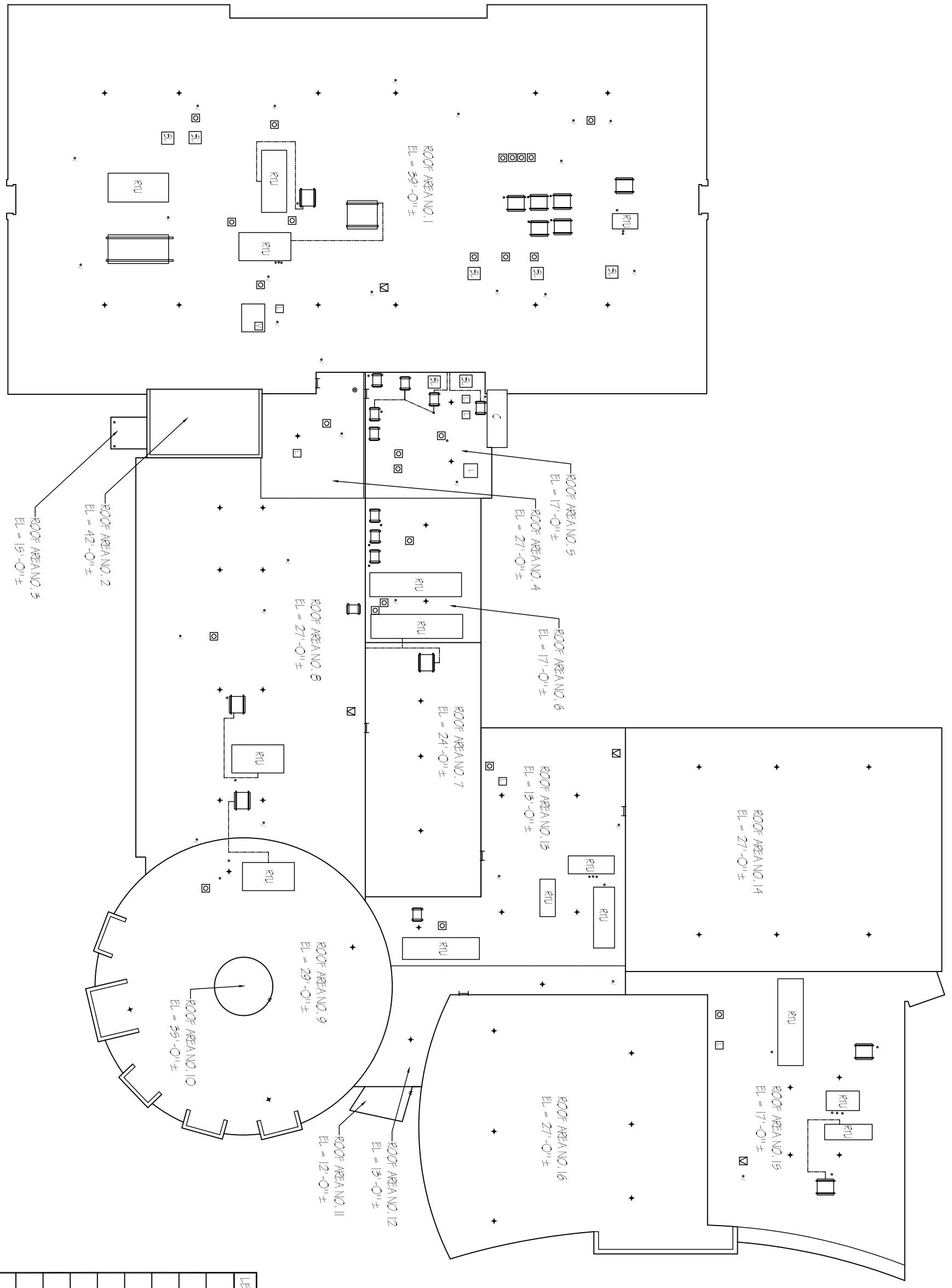
Location: Ephraim Curtis Middle School

Description: Partially blocked weep hole.

Photo No. 08

Location: Ephraim Curtis Middle School

Description: Failing EPDM seam.



EPHRAIM CURTIS MIDDLE SCHOOL - ROOF AREA PLAN

SCALE: NOT TO SCALE

LEGEND	
V	VENT PIPE
⌖	ROOF DRAIN
○	PIPE PENETRATION
SK	SKYLIGHT
▨	ROOF HATCH
◎	EXHAUST FAN
C	CHIMNEY
L	LOUVER
V	ELEVATOR VENT SHAFT
RTU	ROOF TOP UNIT
▭	UNIT SLEEPER SUPPORTS
———	CONDUIT ACROSS ROOF
– – – –	EXPANSION JOINT

TOWN OF SUDBURY

EPHRAIM CURTIS MIDDLE SCHOOL
22 PRATT'S MILL ROAD
ROOF CONDITION SURVEY

ROOF AREA PLAN

RUSSO·BARR ASSOCIATES
33 Center Street, 2nd Floor, Burlington, MA 01803

NO	DATE	BY	DESCRIPTION

DRAWING NO: R-1
PROJECT NO: 201056.00
DRAWN BY / CHECKED BY: jrw/RJG
SCALE: AS NOTED
DATE: 02.03.12