Condominium Association, Inc.
Roofing Systems Report

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Purpose
Subsequent to severe seepage and damage due to ice damming in the winter of 2014 – 2015, Silver McGee, LLC was retained by the Condominium Association Board to report on the causes of roofing issues and corrective actions. This report has been prepared in conjunction with our proposal dated 2/9/2016 submitted to the Board to identify the causes of ice damming in the ABC Condominium complex. This report contains a general explanation of the dynamic of ice damming and the specific factors that exist at ABC. Schedules of needed immediate and short term repairs are included along with budget figures. An RFP (request for proposal) is also included along with a general specification for the roofing work and specific detailed top-down drawings. This RFP can be circulated to contractors to solicit proposals to complete corrective work.

Executive Summary
The complex experienced seepage from ice damming during extreme winters. A roofing specification has been developed to address this seepage. Ice damming seepage is unrelated to roof failure from wear and tear. There are 16 buildings that have advancing granule loss due to a manufacturing defect. This condition can result in premature roof failure. A schedule of roof replacement for these 16 buildings over the next four years will cost approximately $XXX,000 to $XXX.000 if the recommended schedule of replacement is adopted. This figure includes adjustments for yearly inflation. The remaining 10 buildings do not need to have roof replacement until approximately 2026. The cost of that project adjusted for inflation is approximately $XXX,000 to $XXX,000.

Complex Description
The complex has 26, two-story, wood-framed buildings containing either two or three attached units with some shared roof planes where the units abut. There are a total of 62 units in the complex. The roofs are covered with architectural-style, laminate shingles that vary in size and manufacturer. Some of the buildings have a metric-sized shingle; others have a standard-sized shingle. The siding is a cement product similar to Hardy Plank. The clapboard-style, imitation wood grain siding has a 4.5 inch exposure.

The exposure and length of the architectural shingles vary. The metric-sized shingles are exhibiting granule loss that ranges from mild to extreme. The standard-sized shingles have almost no granule loss. The homes in the complex were built from 2000 to 2002 according to records on real estate website Zillow.com. It is likely that the shingles used on the first homes on Sand Drive and Field Drive were made by a different manufacturer than the ones built in 2002 on Island Way where the shingles look much newer with little granule loss. The difference in condition should be negligible over a 2 – 3 year period. The shingles have a design life of 25 to 30 years depending on quality. There is noticeable granule loss on the older metric shingles and almost none on the slightly newer standard-sized shingles (12 inches by 36 inches).

Ice Dams

The following explanation of ice damming was not written specifically for the ABC Condominium Complex. This general description of ice damming contains important factors that exist at the complex. ***These factors are restated under the next heading and highlighted under this heading.***

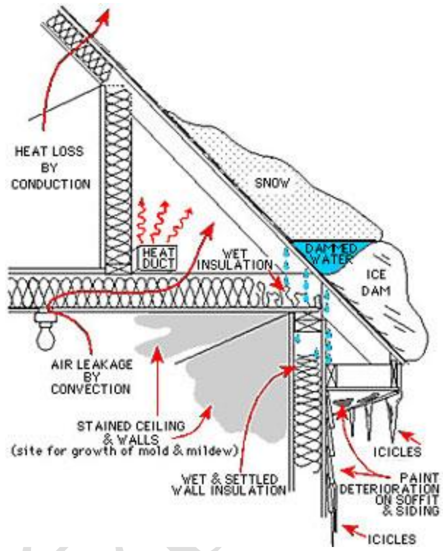

Figure 1: An ice dam diagram. Source: University of Minnesota, www.umn.edu.

An ice dam is a block of ice that forms along the eaves (lowest part/overhang) of a steeply-sloped roof, with water in liquid form behind the block of ice. Because roofing materials on steeply sloped roofs (like asphalt shingles, clay tile, slate) depend on gravity to shed water, they fail when that water cannot be shed off of the roof by gravity. When an ice dam is present, it blocks the movement of water off of the roof. The standing water then infiltrates between the seams of shingles and the overlapped courses of shingles and makes its way to the interior of the structure. The shingles themselves are waterproof slabs of asphalt, but unlike flat roofs, they are not sealed to each other in a monolithic waterproofing layer. The seal tab strips on shingles are to prevent wind uplift. Shingle seal tabs provide no protection from water seeping between shingles when submerged. Water that infiltrates a steep slope roofing system will damage interior sheetrock, paint, and possessions as it did during the winter of 2014 – 2015. However, ice dams do not damage the roofing system itself. The following analogy may help to explain why this is. Raincoats depend on gravity to shed water. A good raincoat keeps the user dry during even the heaviest rains. If a person goes outside in a heavy rain wearing a hooded raincoat and rain pants along with rain boots and all the garments are overlapped so the water can shed off them, the person will remain dry. If the person walks down the steps of a filled swimming pool the rain coat will not keep the person dry. When a raincoat is submerged in water (if it was worn in a swimming pool), it fails to keep the user waterproof. The vinyl raincoat, however, is not damaged. The rain boots and the rain pants are not damaged. All the rain gear will continue to protect the user once again from heavy rains under normal conditions if the rain gear can shed water with gravity.

There are three primary factors that are required for an ice dam to form: a significant snow blanket on the roof, ***a roof surface with a temperature above 32°F*** due to exposure to a structure's interior heat, and cold outside air, generally at or below 25°F for an extended period of time. Deep snow, high attic temperatures and cold outside temperatures will exacerbate ice dam formation and severity.

Ice dams do not occur on unheated buildings like sheds, detached garages, and gazebos. Unheated buildings can have standing winter precipitation on their roofs and be surrounded by cold outside air, but unheated buildings by definition do not have a roof field that is warmer than 32°F. Without all three primary factors, ice dams will not form.

After a snowfall, snow in contact with the roof surface melts because the plywood and the roof tiles have been warmed by a structure's interior heat. This melted snow, now as water just above freezing, runs down the slope of the roof to the eaves. This water is actually protected from refreezing by the snow blanket above it. Deep snow acts as a type of insulation allowing water to run under the blanket of snow staying near the shingles without refreezing. Once the water reaches the eaves, it refreezes. The eaves or overhangs, unlike the field of the roof, are not warmed by the structure's interior heat. Under the overhang is the cold outside air, which is at or below 25°F. Continual airflow under the overhangs keeps the eaves cold. The snow in the field of the roof continues to melt, run down the slope, and refreeze at the eaves, building the ice dam. Once the eaves are covered in ice from refrozen snow, water starts to build behind the dam at the very bottom of the roof's field because the area is above the heated attic. This water doesn't freeze because it is still in the field of the roof, which is warmer than 32°F due to the structure's interior heat. Larger eaves will create larger ice dams, as the melted snow has a greater area over which to refreeze.

To prevent ice dams from occurring on residential structures, the temperature of the roof's field must be cold; roughly the temperature of the outside air. To achieve this, the temperature of the air in the attic or the air between the roof and the living space must be close to the temperature of outside air. Proper ventilation of the attic and proper insulation of the living space are the means to realizing this objective (Figure 2). ***This requirement of a "cold" roof deck is often difficult to achieve when certain architectural designs have been employed such as cathedral ceilings.***

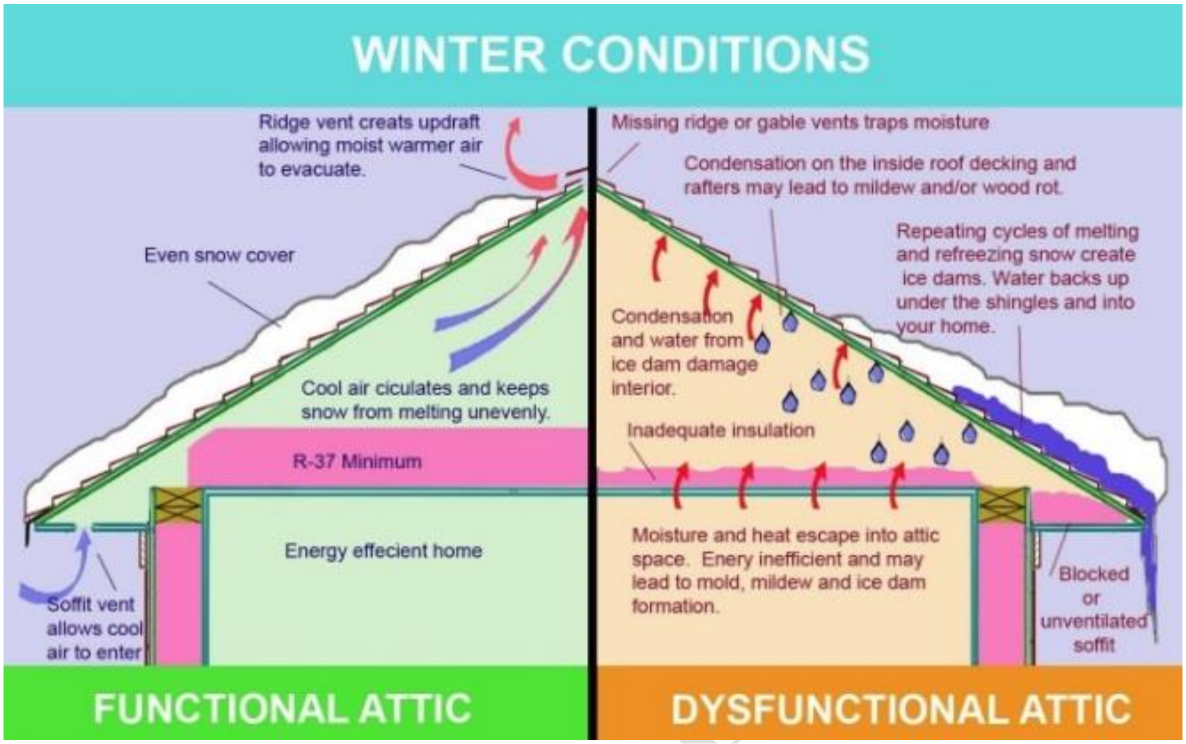

Figure 2: Proper and improper ventilation and insulation. Source: www.ready-pros.com

Ventilation of the attic space is imperative in preventing the formation of ice dams. If warm air escapes the living space into a ventilated attic, that warm air will be quickly exhausted to the outside and thus neutralized. Soffit and ridge vents are integral parts of a properly ventilated attic. Most states have adopted the International Code Council's (ICC) Building Code as their own state code with some modifications. The amount of ventilation of an attic space is usually required by code to be in a direct ratio with the square footage of attic floor space. For every 300 square feet of attic floor space, 1 square foot of attic ventilation is needed. This ventilation is typically installed at the soffits and ridges. If a residential house has continuous ridge vents and continuous soffit vents, the ratio will be met and the attic will be properly ventilated. Some codes call for more ventilation so that every 150 square feet of attic floor space requires a matching 1 square foot of ventilation in the attic. This occurs when the ridge vents and soffit vents cannot be installed in the proper balance due to the design of the structure.

Proper insulation of the living space is the complement to attic ventilation in preventing ice dams. When inadequate insulation is present in the ceiling joists, heat transfer to the attic happens more quickly. This warms the roof's field, and allows ice dams to form. The ICC Building Code requires R-values of insulation in the ceilings of residential structures to be R-38 or higher, as an approximation. An "R-value" is a scientific measurement of insulation's thermal resistance. The higher the R-value, the better the insulation will perform, keeping heat within the living space and not allowing much heat to enter the attic.

Some factors thought to cause ice dams do not cause ice dams. Gutters do not cause ice dams but they will be the first place that the ice dams form. Gutter covers will also allow the ice damming to start a bit more rapidly than if none existed but they do not cause the ice dams and ice dams will happen without them so long as the heat loss from the living space to the roof deck is present. The daytime sunlight and nighttime cooling dynamic are also not important factors in the formation of ice dams. The proof of this statement lies in observing the lack of ice dam formation on unheated buildings which are exposed to the same daytime solar heating cycles.

Many conditions make ice dams worse. Roof configuration plays a large role. Ice dams will form along the eaves of a simple gable, but the seepage associated with ice dams is less damaging than when ice dams form at locations where water gathers. Locations where water gathers on roofs include ***relatively narrow channels in the roof design between walls of adjacent gables of the second story*** or where several roof sections shed to a valley or a cricket. If the roof area is very low sloped and has a shingle covering, the seepage from ice damming will most likely be more severe than other areas where the roof has one wide, simple slope to a gutter. Here is a list of other secondary factors that exacerbate ice dam formation and severity even when a structure is built to code with required insulation and ventilation:

1. ***High hats or ceiling-mounted flush lights are a tremendous source of heat loss to the attic. Because the sheetrock and insulation are breached and a physical hole has been created, heat can escape from the living space into the attic.***
2. ***Cathedral ceilings, even in newer houses, allow for warm interior air to be in very close proximity to the roof deck.*** The rafter cavity may be only 10" or 12" deep. If this rafter cavity is poor insulated, the heat loss will be substantial and direct and melting of snow in contact with the roof will occur rapidly. If the cavity is well-insulated but not ventilated correctly, the heat loss will still occur but it will take longer for the roof deck to warm. Properly ventilating the cathedral ceiling requires great care during construction. Foam baffles must be placed in the rafter cavity prior to insulation to establish an air space that will not be blocked when the insulation is placed in the rafter bay. Often proper care is not taken and the cold air flow that keeps the roof deck cold does not occur.
3. Improper installation of fiberglass insulation in the attic can cause a ventilation problem, even in new homes. If the insulation is laid out in the attic into the overhang, it will be resting on top of and blocking the soffit vents and greatly reduce the ventilation. The insulation should not be run past the wall of the house when laid in the ceiling joist of the attic.
4. Bay windows are primary locations of ice dams, especially ones with high hats mounted in the head board. The bay window brings the heated living space close to the roof deck and often is not insulated above. Often a home that has no leaks anywhere from ice dams will have one at a bay window.
5. A deep snow fall accelerates ice dam formation in several ways:
    a. The deeper the snow, the more insulation there is in the form of snow cover between the heated roof deck and the ambient air. The snow blanket actually allows the roof deck to stay warm by acting as a type of insulation and preventing heat loss to the much colder air above.
    b. Very deep snow falls can cover ridge vents by burying them in snow. This effectively inhibits ventilation and allows heat to build in the attic space.

   c. The snow is the reservoir of melting and refreezing that causes the ice dam. Anytime a snow fall of 8" or more is married with extended cold temperatures (1 week or more) of 25°F or less, ice dams are likely.

6. Large overhangs, especially ones of low slopes, are more susceptible to the formation of ice dams as the area where the melted water has a chance to refreeze is greater and the runoff is slower.
7. Bathroom vents or dryer vents which are improperly exhausted directly into the attic will greatly increase attic temperatures and accelerate ice dam formation.
8. Uninsulated, pull-down attic stairs or uninsulated attic scuttle hatches allow greater heat loss to the attic.
9. The unknowing application of plastic covers over attic gable vents by the homeowner in a misguided attempt to stop heat loss will cause attic temperatures to rise and accelerate ice dam formation.
10. Keeping the thermostat at 72°F creates a higher likelihood of heat loss to the attic than one set at 68°F.
11. An attic fan with a humidistat will sometimes activate in the winter if the air lost to the attic has a high humidity content, whereas a thermostat alone will not.
12. Multiple skylights direct the heat of the living space closer to the roof deck and can cause upslope, secondary ice dams. Furnace flues and chimneys can also have this effect.
13. Roof configurations that include funneling water to narrow channels where valleys meet walls or nearly meet walls, or where valleys join at their bases, ***or where large square footages of roofing are directed into small areas of roofing***, are highly susceptible to ice dam formation. Tudor-style homes are particularly susceptible if these conditions exist. Larger areas of shingle roofing directed to small areas of flat roofing are more susceptible. Ranch-style homes with large cantilevered overhangs of more than 24" are susceptible to ice dam formation, especially ones with low angle roof slopes when the attic ventilation is poor. Condominiums structures with many roof breaks and transitions, especially like the ones listed above, are highly susceptible.
14. Contrary to popular belief, gutters are not the cause of ice dams. Gutters will always freeze and cease to function when outside temperatures are below 32°F.

There are a number of ways to mitigate the formation and/or the severity of ice dams:

1. There is no substitution for a properly-insulated and well-ventilated attic. Ice dams do not occur when the roof deck is cold. **Superior ventilation of the attic is the primary way to ensure that ice dams do not form.** An attic that has superior ventilation but poor insulation will prevent ice dam formation better than one that has excellent insulation but no ventilation.
2. The proper installation of ice and watershield membrane (a.k.a. leak barrier) during a comprehensive roof replacement <u>will not prevent the formation of ice dams</u> but will mitigate seepage. Proper installation includes:
   a. Wrapping the membrane over the roof edge and behind the gutter. Installing the membrane by sticking it to the top of the roof drip edge or ending it at the edge of the plywood roof deck greatly undermines the application and effectiveness of the product by leaving areas prone to seepage.
   b. Extending the membrane from the roof deck up the adjacent sidewalls a minimum of 8".

c. Installing a stretched collar of membrane over vent pipes especially when they are located with 36" of the exterior wall.
d. Install the ice shield membrane at heat-carrying protrusions such as furnace flues, skylights and chimneys.
e. Standard good practices include installing 6' wide strips at the eaves instead of 3' and 3' in the valleys. Going well beyond the code required 24" inside the line of the exterior wall is prudent.

3. ***Snow removal from roofs after a substantial snowfall on structures with historical ice dam problems must be done prior to days of cold temperatures.*** Snow is easily removed with snow rakes within 24 hours after a snowfall. Snow removal should only be done by roofing contractors, especially when the removal process includes the laborer leaving the ground. Roofs are dangerous enough without standing winter precipitation. Winter roofs are especially dangerous. Snow removal that requires the removal of ice dams must never be done by persons not in the roofing industry as the likelihood of damage to the roof assembly is great and the likelihood of injury to the person is also great. Experienced roofers will normally exercise far more care in ice dam removal than most other people, or even general contractors.
4. Heating cables that cause ice to melt at the eaves are rarely effective unless they are premium systems that are properly designed, properly installed, and properly maintained. Even then, the systems tend not to be able to overcome the most severe conditions.

Specific Ice Dam Factors at ABC

On 4/22/2016, I conducted an interior inspection of a number of units in the complex with Ben Bradley of Property Managers Inc. Ben arranged the appointments based on my request to see the units with the most severe interior damage according to the Insurance Company damage report dated 3/5/2015. A list of the damaged units using the dollar figures for "Net Claim if Depreciation is Recovered" in order of severity appears below. Dollar figures are rounded down to the nearest whole dollar.

Address	Damage Total Insurance Co.	Type	4/22/2016 Inspection
55 Dune	$XX,XXX	Bristol	
170 Sand	$XX,XXX	Rockland	Interior
50 Dune	$XX,XXX	Bristol	Interior
20 Sand	$XX,XXX	Victorian	Interior
30 Field	$X,XXX	Bristol	Interior
40 Field	$X,XXX	Rockland	
290 Sand	$X,XXX	Victorian	Interior
190 Sand	$X,XXX	Victorian	Interior
70 Dune	$X,XXX	Bristol	
200 Sand	$X,XXX	Bristol	
10 Dune	$X,XXX	Bristol	
310 Sand	$X,XXX	Bristol	
30 Sand	$X,XXX	Bristol	
55 Field	$X,XXX	Bristol	Exterior
30 Dune	$X,XXX	Bristol	
285 Sand	$X,XXX	Grandview	
15 Island	$X,XXX	Grandview	
35 Island	$X,XXX	Bristol	
40 Dune	$X,XXX	Bristol	
40 Island	$X,XXX	Bristol	
180 Sand	$X,XXX	Grandview	

The purpose of the 4/22/2016 inspection was to determine what, if any, architectural elements or reoccurring conditions in similar unit styles could be promoting the formation of ice dams. The six units where interior inspections were made are highlighted in yellow. Unit 290 Sand Drive was inspected in the garage only. The other five units were inspected in the living space.

Prior to the 4/22/2016 inspection we created 16 pages of floor plans using the original unit plans provided by Ben Bradley. Each unit type (Bristol, Grandview, Rockland and Victorian) and its mirror image had a two-page floor plan drawn prior to the scheduling of interior inspections. The room-by-room damage figures from the Insurance Company report were noted on these floor plans for the six units where interior inspections had been arranged. The remaining 15 units that sustained damage had the same analysis of damage locations room-by-room by obtaining the damage amounts from the Insurance Company report and transferring those amounts onto the sketches for each damaged unit. The resultant "damage map" was compared to our roof schematics created for the original report completed for ABC Insurance. The mapping out of damage amounts and locations on the floor plans allowed for conclusions to be made using the known causes of ice dams as described above. The interior damaged locations in the six units where interior inspections were conducted were also compared to the roof designs and the interior conditions. My determinations from this site inspection and the review of the Insurance Company report with respect to the floor plans has several conclusions:

- Ice dam formation is being exacerbated by a particular design element in some Bristol style units that have large areas of interior cathedral ceilings that also contain skylights and high-hat light fixtures. This holds true in units similar to 30 Field, a Bristol unit, on the rear roof slope above the living room where a large expanse of roofing is “heated” by the volume of the two-story living space below the rear slope. The one skylight and several high-hats bring the interior heat of the living space very close to the roof deck. This dynamic of a large two-story reservoir of interior heated space is typical of Bristol units. In typical construction a well ventilated attic would exist above the living space. The cathedral ceiling means that the heat that escapes into the rafter cavity cannot be quickly ventilated. There is a limited air space in the rafter cavity above the insulation. Often the improper installation of the insulation in the cathedral ceiling restricts any ventilation. This cathedral condition occurs in all of Bristol style units. The most severely damaged unit in the complex, 55 Dune, is also a Bristol unit with this same dynamic present on the rear slope. The rear slope on 55 Dune ($XX,XXX) has two skylights. Skylights, like high-hat lights, bring the interior heat of the living space to the roof deck. The framing of skylights in a cathedral ceiling also insures that the ventilation is blocked by the structural header that spans between rafters. These factors all combine to accelerate snow melt on the roof and the refreezing of that melted snow along the eaves. Another unit with the same Bristol configuration is 10 Dune which sustained $X,XXX in total damage. 55 Field ($X,XXX) with the same cathedral configuration, high-hats and skylights has a newly installed roof (less than 5 years old) on the rear slope but still experienced seepage from ice dams in the rear room (Master Bedroom) and two closets under that slope. This seepage from ice dams on 55 Field, irrespective of the age of the roofing, further underscores that ***the roof condition has very little to do with seepage from ice dams.*** This is also the reason that these roofs are not presently leaking in the rain. The Bristol unit at 200 Sand with $X,XXX in damages has the same cathedral ceiling configuration resulting in eaves seepage, as does 40 Island, 35 Island, and 30 & 40 Dune and 30 & 310 Sand.

- Ice dam formation is severe in locations where two adjacent units intersect and the walls of adjacent dormers create narrow channels of roofing that accept large amounts of run-off from the roof areas upslope. Examples of these locations are the very narrow strips of roofing between the Victorian style unit’s front gable dormer and the adjacent unit when the Victorian unit is in the center unit of a three-unit building. This condition occurs at 20 Sand, 290 Sand, 190 Sand and also at 160 Sand. 160 Sand is a center unit and a Victorian style but did not have interior seepage according to the Insurance Company report. 170 Sand, however, the Rockland style unit to the left of 160 Sand did have interior seepage that is most likely resultant from this narrow channel between 160 and 170 Sand. 160 Sand has had roof repairs done in this narrow channel above the front garage. The work was completed by Apple Roofing after the ice damming, possibly to address damage from chopping in the channel area, or to install a new ice and watershield underlayment at this area.

- A number of other units had seepage from ice damming due to busy roof geometry that includes large areas of roofing flowing into “pinch points” or “bottlenecks” at the near convergence of adjacent valleys. Most of these conditions occur on Grandview style units such as 285 Sand, 180 Sand, and 15 Island, but this situation also occurs on 50 Dune and 70 Dune which are Bristol style units. One Rockland style unit, 40 Field, has a convergent roof geometry where the low slope central section of the roof meets two adjacent steeply sloped gables. The central roof has a 9-degree slope and should not have been covered in shingles. The roof configuration results in 500 square feet of roof area flowing into a 6-inch wide point at the base of the valleys. This occurs on the front and rear of the building.

Preventing the formation of ice dams is a matter of ventilation and insulation. The expansive cathedral ceilings found in the Bristol units do not easily allow for the correction of poor ventilation. This results in the emphasis on preventing seepage when ice dams form, which is unavoidable in some locations. These reoccurring seepage problems in areas with the same architectural elements will advise the specifications for reroofing with respect to the placement and extent of ice and watershield underlayment.

Immediate Repairs

A number of immediate repairs need to be made to address failed vent pipe flashings, improper furnace flue flashings, and shingles damaged from ice chopping. The immediate repair needs are minimal compared to the scope and cost or roof replacement. The following spreadsheet includes the needed repairs. The most immediate of these repairs is the failed vent pipe collars. These rubber gaskets have cracked and shrunk. Many of these locations are allowing small amounts of water to enter the dwelling every time it rains. The vent pipes flanges can be removed and replaced with new flanges. In some cases where the failure consists of minimal splitting, the flanges can be resealed. This less involved and less costly method is also less long lasting and should be considered along with the plan for roof replacements when deciding which vent pipes to reseal and which to replace. Furnace flue flanges do not incorporate a rubber gasket and should be dealt with on a case-by-case basis.

Schedule of Immediate Repairs				
Building Number	**Street Address**	**Vent Pipes**	**Furnace Flue**	**Nail Pops**
25	5, 15 Island Way	3	0	0
8	30, 40 Island Way	0	0	0
24	25, 35 Island Way	1	1	0
11	5, 15 Dune Lane	2	0	0
10	45, 55 Dune Lane	2	0	0
26	115, 125 Sand Drive	4	0	0
13	120, 130, 140 Sand Drive	0	0	0
14	150, 160, 170 Sand Drive	5	0	0
15	180, 190, 200 Sand Drive	2	0	0
16	210, 220 Sand Drive	2	0	0
17	230, 240 Sand Drive	0	0	0
18	250, 260, 270 Sand Drive	1	0	0
20	285, 295, 305 Sand Drive	1	0	4
19	280, 290, 300 Sand Drive	2	0	9
6	5, 15 Field Lane	3	0	0
2	20, 30 Field Lane	2	0	0
5	25, 35, 45 Field Lane	2	0	0
	Totals	**32**	**1**	**13**

Figure 1: Application of Nails

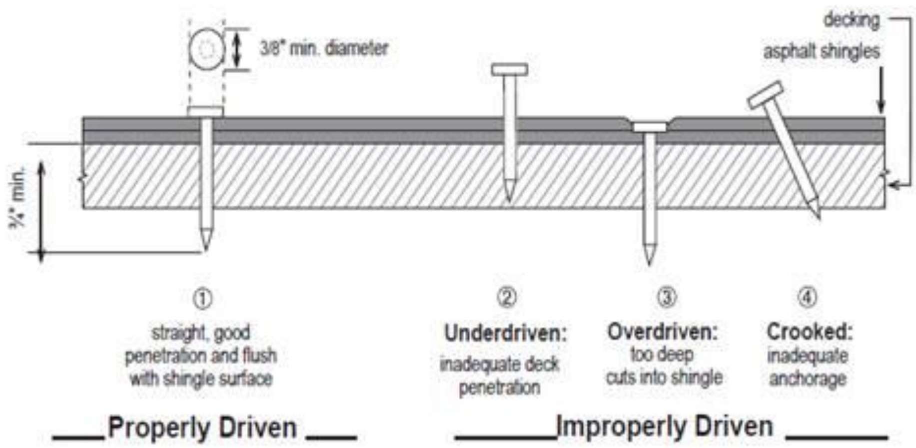

Figure 3: Nails #2 and #4 are both "popped nails". Asphalt Roofing Manufacturers Association, "Nail Application of Asphalt Shingles for New and Re-cover Roofing, Technical Bulletin".

"Nail pops" is usually a misnomer. Often an exposed nail head can be seen when it makes a hole through the shingle above. When a nail head protrudes up through the shingle above it is termed a "nail pop" but the nail has most likely not moved at all. The nail pop is a result of nails not being driven all the way in. When a nail is not driven with the nail head flush against the shingle it is being used to secure, it will eventually create a hole in the shingle above over time. Nails are driven into shingles using pneumatic guns at a rapid pace when shingles are installed. It is common for a shingle installer to shoot 5 nails into adjacent shingles in less than 2 seconds. If the correct amount of air pressure is not activated for each fastener and the fasteners are not checked a resultant amount of "popped nails" will occur. In time with gravity and heat the shingles over the popped nail will work down over the head and create a hole. This is a workmanship issue associated with improper installation and not a result of wind or structural movement. A popped nail can also occur if a pneumatic gun is not held square to the roof surface and part of the head contacts the roof but the other edge of the nail head sticks up like a knife edge against the underside of the shingle above. Nail pops can be addressed by removing the popped nail and installing a new nail adjacent to the original location after the seal tab on the shingle is separated and the shingle is lifted. This work requires skill and experience in the separation of the seal tabs so as not to damage the existing shingle. Separating the seal tab requires that the shingle be "hand sealed" with a caulking or mastic after the popped nail is removed. The location of the original hole must also be sealed.

The roofs sustained a limited amount of damage due to snow removal efforts in the winter of 2014 to 2015 or possibly in the years prior. Some of the damage does not entirely breach all layers of shingles and the underlying felts so seepage is not occurring. Other locations where the chop marks extend through all layers of the roofing system are most likely resulting in wetting of the plywood roof deck and perhaps some seepage into the framing. These locations, while not resulting necessarily in apparent water damage inside the living spaces, should be addressed before the slow, chronic, insidious seepage causes plywood, fascia, and possibly insulation and interior sheetrock and paint damage.

The method of repair for shingles with chopping damage is to break the seal on the damaged shingle and the shingles overlapping it immediately above it, remove the fasteners and the damaged shingle, install a new shingle of similar style, size, and color, and refasten and reseal the new shingle.

The table below indicates the number of locations per building where damaged shingles exists. The costs for all of the immediate repair items are discussed in the budget section within the context of the overall schedule for roof replacements.

Building Number	Street Address	Chopping (# of shingles) Damaged
1	10, 20 , 30 Sand Drive	11
2	20, 30 Field Drive	8
3	40, 50 Field Drive	5
4	55, 60, 65 Field Drive	7
5	25, 35, 45 Field Lane	4
6	5, 15 Field Lane	5
7	10, 20 Dune	0
8	30, 40 Island Way	8
9	50, 60, 70 Dune Lane	0
10	45, 55 Dune Lane	2
11	5, 15 Dune Lane	2
12	100, 110 Sand Drive	2
13	120, 130, 140 Sand Drive	0
14	150, 160, 170 Sand Drive	0
15	180, 190, 200 Sand Drive	3
16	210, 220 Sand Drive	0
17	230, 240 Sand Drive	0
18	250, 260, 270 Sand Drive	6
19	280, 290, 300 Sand Drive	4
20	285, 295, 305 Sand Drive	8
21	310, 320 Sand Drive	0
22	10, 20 Island Way	0
23	30, 40 Island Way	0
24	25, 35 Island Way	11
25	5, 15 Island Way	0
26	115, 125 Sand Drive	3
		89

Long Term Roof Replacement

It is important to understand that the question of when to replace entire roof coverings on any building is actually a separate issue than the extensive seepage due to ice damming. The roof replacement decision should not be driven by ice damming problems alone. Roof replacement does not prevent the formation of ice dams. Roof replacements, if done in a mindful way, will prevent seepage from ice dams but not their formation. This is especially true when the ventilation and insulation of the air space under the roof deck cannot be upgraded. The seepage will be limited by the incorporation of more ice and watershield when the roofs are replaced. Premature replacement of the roofs also has a cost, especially if the remaining service life of the current system is significant. A thoughtful plan that considers both the roof condition, replacement cost, and the risk of seepage from ice dams is the best approach. The table on the next page ranks the roofs on each building according to the accumulated wear and deterioration. The front and rear slopes where each given a grade from A+ to C-. The term “front” also includes either the right or left side (the roof exposure with the closest sun exposure to the front). The term “rear” also includes one side with a similar sun exposure to the rear. As an example, if the front of the building faces SE, the term “front” also includes the left side which faces SW. The roof slopes on many buildings are suffering mild to extreme granule loss. This is an atypical manufacturing defect and is not consistent with normal wear. While the colored ceramic granules serve no direct waterproofing purpose, they protect the asphalt that does. The granules reflect the damaging ultraviolet solar light that degrades the petroleum-based asphalt. They serve a purpose similar to paint on wood siding. When the granules are lost, the roof shingles deteriorate more rapidly. The deterioration eventually results in shrinkage, cracking, cupping, clawing and curling of the shingles. All these conditions put the watertight integrity of the roof at risk.

Building Number	Street Address Damaged Units are in Bold	Seepage Damage Entire Bldg.	Overall Condition	Front Slope Grade	Rear Slope Grade
1	10, 20 , 30 Sand Drive	$XX,XXX.XX	2.875	B	B-
2	20, 30 Field Drive	$X,XXX	2.875	B-	B
3	40, 50 Field Drive	$X,XXX	2.875	B-	B
4	55, 60, 65 Field Drive	$X,XXX	2.75	B-	B-
5	25, 35, 45 Field Lane	$ -	3.125	B	B+
6	5, 15 Field Lane	$ -	2.75	B+	C
7	10, 20 Dune	$X,XXX	2.5	C	B-
8	30, 40 Dune	$X,XXX	3.25	B+	B+
9	50, 60, 70 Dune Lane	$XX,XXX.XX	2.625	B-	C+
10	45, 55 Dune Lane	$XX,XXX.XX	3.5	A-	A-
11	5, 15 Dune Lane	$ -	3	B-	B+
12	100, 110 Sand Drive	$ -	3	B-	B+
13	120, 130, 140 Sand Drive	$ -	2.5	C-	B
14	150, 160, 170 Sand Drive	$XX,XXX.XX	3.75	A	A
15	180, 190, 200 Sand Drive	$XX,XXX.XX	3.75	A	A
16	210, 220 Sand Drive	$ -	3.75	A	A
17	230, 240 Sand Drive	$ -	3.75	A	A
18	250, 260, 270 Sand Drive	$ -	3.75	A	A
19	280, 290, 300 Sand Drive	$X,XXX	3.75	A	A
20	285, 295, 305 Sand Drive	$X,XXX	3.75	A	A
21	310, 320 Sand Drive	$X,XXX	3.75	A	A
22	10, 20 Island Way	$ -	3.125	B+	B
23	30, 40 Island Way	$X,XXX	3	B	B
24	25, 35 Island Way	$X,XXX	3.875	A+	A
25	5, 15 Island Way	$X,XXX	2.5	C-	B
26	115, 125 Sand Drive	$ -	3	B+	B-
	Total	$ -			

Of the 26 Buildings in the complex 16 (1-9, 11-13, 22, 23, 25 and 26) have varying degrees of granule loss. Ten buildings (10, 14-21, and 24) have no granule loss. The metric shingles are losing their granules due to an adhesion problem with the granules in the asphalt surface of the shingles. There is a simple explanation for this. The two groups have different roof coverings. The 16 buildings have “metric sized” architectural shingles. The 10 have “standard size” architectural shingles. The metric shingles are almost certainly made by a different manufacturer than the standard size shingles. A metric shingle is a meter long (39.37 inches) and has an exposure of approximately 5.625 inches. A standard shingle is a yard long (36 inches) and has a 5 inch exposure. The size has nothing to do with the granule loss. The different sizes simply indicate a different manufacturer.

Deterioration of shingle roofs tends to be exponential. Very small changes in shingle condition can be seen in the formative years but extreme changes are apparent in the last few years of the life of the roof. It is my recommendation, given the condition of the 16 buildings that have metric shingles and granule loss, that a schedule of replacement of these buildings be undertaken within the next 4 years. The managers of the complex can wait 4 years and replace all 16 buildings at once; however, I believe it is more prudent to begin to replace the roofs this year. I have marked the chart in different colors to represent my recommended replacement schedule. The buildings marked in red would be replaced this year, then orange in year two and so on. A chart with buildings ordered by "year-roof-to-be-replaced" appears below. The last ten buildings marked in blue do not need roof replacement for approximately ten years. The managers of the ABC complex can proceed with roof replacement work according to whatever schedule they adopt, but doing 16 buildings in one year may require more than one contractor for the work.

Considering that the complex was built circa 2000 – 2002 and that the metric shingles would have carried a minimum warranty of 25 years, the present condition with advanced granule loss represents a likely premature failure. It is not uncommon for well-installed and well-maintained roofs to perform for at least as long as the warranty period if not longer. There may be the possibility of some minimal settlement with the manufacturer due to material failure. The shingles have not failed yet, but premature failure seems imminent. A settlement would be pro-rated (based on the unexpired portion of the warranty, i.e. 9/25ths) and would only be based on the original material cost, not the labor. The settlement would require identifying the manufacturer and removing and sending shingles to them under their warranty claim process. Since the cost of material was a fraction of the cost of material today (due to increase in the price of oil, the input material for asphalt) the settlement would be quite minor compared to the replacement cost of the roofs. There are also certain restrictions on who is eligible for a payout under a warranty claim. Often a warranty is extended only to the original owner of the unit and not any new owner if the unit was sold. These terms vary from manufacturer to manufacturer. It is likely that if a claim were successful and the material cost $XX per square (a "square" is a roofing term that means an area of 100 sq. ft.) in 2000, the settlement might be $XX.00 per square. Each three-unit building contains approximately 83 to 95 sqs. A two-unit building contains approximately 56 to 63 sqs. The 16 buildings with the granule loss problem contain a total of approximately 1,200 sqs. The potential settlement if successful and all unit owners are original could be about $XX,000.

Remediation of Winter Conditions

An effective and low cost method of dealing with the potential seepage from ice damming at any building whose roof is not scheduled for replacement this year is to enter into a snow removal contract with a reliable roofer. The removal of snow, unlike the removal of ice by chopping, is far easier and therefore less costly. Snow removal should be undertaken, at a minimum, on the buildings that suffered prior seepage. Those buildings are included in the chart on the pages above. Removal should be undertaken whenever the snow fall is 8 inches or more and temperatures at or below 25°F are expected for an extended period (three or more days). This removal should be done by a licensed roofer under a pre-arranged contract.

Roofing Repair Budget

The cost of immediate repairs is estimated to be between $X,XXX and $XX,XXX. This number includes a two-man crew for a period of 6.5 days to address the vent pipes, nail pops, furnace collar, and damaged shingle repairs. If the complex managers decide to complete 4 roofs this years, those buildings would not need immediate repairs and the cost of the immediate repairs would be reduced by approximately $XXX per building or $X,XXX.

Roofing Replacement Budget

The cost of the long term repairs was calculated using a square foot replacement cost using a range. The variation in pricing is dependent on roof slope, number of skylights, and the existence of low sloped roof areas that will require a different type of material. The square footage of each unit type was estimated. In most cases the square footage was approximated by compiling the square footage of the different unit types in that building. No field measurements were taken. Estimates were completed using measuring tools available from our subscription to Pictometry.com. These estimates may not match every building precisely due to the existence of sunrooms on some buildings and other variations in the framing where units come together.

The cost of long term roof replacement appears in the chart below for the first 16 buildings over the next 4 years. The roof replacements were escalated each year by 5% to reflect price increases in materials and labor. The cost of shingles and accessories is by no means linear. During my 35-year tenure in the contracting industry, material costs on shingles remained relatively unchanged year-to-year for 20 or so years with increases of 1% to 3% per year. After that, a doubling of shingle prices occurred in a three-year period with steady increases until 2007. Shingle prices are virtually unchanged in the last three years. Large increases in the price of oil will result in commensurate price increases in the cost of shingles so long as construction demand remains constant. If the housing market rebounds strongly along with an increase in the price of oil, the cost of roof replacement mostly likely will be increase closer to 5% to 10% year-over-year.

Year Roof to be Replaced	Building Number	Street Address Damaged Units are in Bold	Overall Condition	Replacement Budget (Present Value)	Yearly Group Cost with 3% per year increase
2016	13	120, 130, 140 Sand Drive	2.5	$XX,XXX	$XXX,XXX - $XXX,XXX
	25	5, 15 Island Way	2.5	$XX,XXX	
	7	10, 20 Dune Lane	2.5	$XX,XXX	
	9	50, 60, 70 Dune Lane	2.625	$XX,XXX	
2017	4	55, 60, 65 Field Drive	2.75	$XX,XXX	$XXX,XXX - $XXX,XXX
	6	5, 15 Field Lane	2.75	$XX,XXX	
	2	20, 30 Field Drive	2.875	$XX,XXX	
	3	40, 50 Field Drive	2.875	$XX,XXX	
	1	10, 20 , 30 Sand Drive	2.875	$XX,XXX	
2018	11	5, 15 Dune Lane	3	$XX,XXX	$XX,XXX - $XX,XXX
	12	100, 110 Sand Drive	3	$XX,XXX	
	23	30, 40 Island Way	3	$XX,XXX	
	26	115, 125 Sand Drive	3	$XX,XXX	
2019	5	25, 35, 45 Field Lane	3.125	$XX,XXX	$XX,XXX - $XX,XXX
	22	10, 20 Island Way	3.125	$XX,XXX	
	8	30, 40 Dune Lane	3.25	$XX,XXX	
Start in 2026	10	45, 55 Dune Lane	3.5	$XX,XXX	$XXX,XXX - $XXX,XXX
	14	150, 160, 170 Sand Drive	3.75	$XX,XXX	
	15	180, 190, 200 Sand Drive	3.75	$XX,XXX	
	16	210, 220 Sand Drive	3.75	$XX,XXX	
	17	230, 240 Sand Drive	3.75	$XX,XXX	
	18	250, 260, 270 Sand Drive	3.75	$XX,XXX	
	19	280, 290, 300 Sand Drive	3.75	$XX,XXX	
	20	285, 295, 305 Sand Drive	3.75	$XX,XXX	
	21	310, 320 Sand Drive	3.75	$XX,XXX	
	24	25, 35 Island Way	3.875	$XX,XXX	
				$X,XXX,XXX	**$X,XXX,XXX**
				Total Cost (Present Value)	Projected Total Actual Cost

*. Cost estimates have been rounded and expanded to a range for the purposes of this report.

Request For Proposal

Specification for Roof Replacement

The scope of work provided below has a list of general conditions that are applicable to all roof areas. The notes and diagrams that follow the general conditions render both written and visual representation of the areas to be addressed and the description of work to be done that is specific to the unit heading.

Designated Representative

1. The designated representative for the management of the work under this contract is Ben Bradley of Property Managers Inc. His contact information is PMI, 1 Main Street, Town, RI 02000
   Email Ben@propertymanager.com Phone 401-000-0000 x200

Scope of Work

2. The scope of work, hereinafter referred to as "the work" or the "scope of work" is: (To be determined).

Start and Completion Dates

3. The work will begin on or about ______________ and be completed within __________ days of commencement, weather permitting. The contractor will work with a skilled full crew suitable for the scope of the work. (Please fill in the blanks).

The Client

4. The ABC Condominium Association, Inc is the client's legal name. The Association will hereinafter known as "ABC" or "the client". ABC incorporates dwellings on Sand Drive, Field Drive, and Dune Lane, Island Way, Town, R.I. 02000.

General Conditions

5. The contractor will familiarize themselves with the 2012 Residential Building Code of the State of RI adopted from the ICC 2012 version adopted on 7/1/2013 with all amendments and comply with all applicable tenants of the code. The contractor will familiarize themselves with any and all other state and local codes that govern the work. If any conflict arises between this specification and any code it will be brought to the attention of the designated representative for the work. This notification is not to be construed as authorization to ignore any building code.

6. The contractor shall pay the cost of all permits, licenses, and fees associated with the work, and obtain all necessary licenses and permits to perform the work prior to commencement of the work.

7. The contractor shall provide all necessary labor and materials to perform the work and be responsible for the cost of such.

8. The contractor will abide by all local, state, and federal regulations that govern the work including, but not limited to, OSHA rules and regulations.

9. The contractor shall maintain insurance for both Workmen's Compensation and General Liability in the following amounts:

   Workmen's Compensation: Statutory

   General Liability $1,000.000.00 (one million dollars)

   The contractor will be required to name the ABC Condominium as additionally insured under its General Liability policy and execute a reasonable hold harmless agreement that pledges the contractor's General Liability policy to defend the condominium from lawsuits arising out of the completion of the work by the contractor from its employees, vendors, agents, and any other third party in connection with acts of negligence that are at least partially the fault of the contractor or its agents.

10. The contractor shall maintain sanitary facilities onsite, in good condition, for the use of the people associated with the work.

11. ABC Condominiums, herein after referred to as "ABC", will allow for the use of outside electrical outlets on a casual basis so long as use by the contractor does not unduly inconvenience the unit owners. The ultimate responsibility of providing electrical power for the completion of the work rests with the contractor.

12. All work will be coordinated with the management company and/or unit owners.

13. All work is to be completed using proper workmanship by skilled employees of properly insured and licensed contractors while obeying all OSHA standards.

Shingle Roofing Work

1. Protect all interior surfaces or wear disposable protective foot covers needed to gain interior access to the units for any reason. All interior access, if needed, will be coordinated with the Designated Representative. The replacement of skylights may make interior access necessary for protection of interior from minor dust and granules.
2. Protect all exterior landscaping, walkways, siding, and surfaces from falling debris.

3. Take necessary measures to inform and protect unit owners at ABC including but not limited to cordoning off areas and tarping siding and landscaping. Avoid damage to lawns and landscaping from heat build-up under tarps in summertime conditions.
4. Remove all shingles and associated flashing (step, apron, kick-out, and drip edges) and dispose of same.
5. Remove ice shield attached to flashings. Any ice shield that is firmly attached to the roof sheathing or wall sheathing can remain. Loose ice shield will be removed.
6. Cut and remove Hardy Plank Siding in an area measuring 9 inches above the slope of the roof at all areas where step flashing exists to allow for the extension of ice and watershield membrane up all walls that intersect the roof. Ice and watershield will be installed according to the GAF Material Corporation specifications for a Golden Pledge warranty or equal by Owens Corning or CertainTeed. At areas where step flashing exists install new pre-painted Azek Trim and "Z" molding in accordance with the detail drawing provided with this specification. At areas where apron flashings exist remove Hardy Plank siding courses in an area that allows for the installation of ice shield to a height of 8 inches above the roof surface or as specified by GAF under their requirements for a Golden Pledge warranty (whichever is greater) and install new Hardy Plank siding when roofing work is completed. All Azek trim, metal Z molding, and Hardy Plank siding will be pre-painted using color-matched paint by others. The roofing contractor will provide these components prior to the commencement of the work in a designated location onsite at ABC to a painting contractor so that a separate painting contractor, hired by ABC, at their sole expense, can pre-paint these components. Finish touch up painting is not the responsibility of the roofing contractor so long as no undue marring of the new siding and trim occurs. All cutting of existing cement siding must be done in recognition of the recently promulgated OSHA standards for Silica Dust.
7. In areas were vinyl siding exists, if any, remove enough vinyl siding and channels to allow for the proper installation of ice shield underlayment up onto walls a minimum of 8 inches. This means that in most areas all siding and especially corner posts must be removed or loosened to a height of at least 12 inches. Siding can be carefully unlocked using a zip tool, labeled on the back of the panel and set aside for reinstallation. Any damaged siding must be replaced with new siding of the same color, type, style and manufacturers. Siding fades with time and every effort should be made to reuse the removed siding. Siding removal should not proceed when temperatures makes siding brittle.
8. Install ice and water shield membrane on areas where roofing was removed in accordance with the following instructions. These instructions are in addition to any requirements by GAF for a Golden Pledge Warranty, or the 2015 Residential Building code for the State of Rhode Island.
   a. Six feet width at all eaves

b. Complete coverage of the narrow channels that exist on three building units between center Victorians style units and the adjacent gable wall of the next unit. The ice shield will be applied to fully cover the deck and run the entire height of the channel to a point where it meets the six foot width.
c. Wrap ice shield membrane over the fascia a minimum of 2 inches and a maximum of 3 inches and fasten to fascia at locations that will be covered by new edge metal. Remove or loosen gutter brackets to allow for the installation of ice shield behind gutter. Cover ice shield membrane with right angle or drip edge at eaves. If drip edge is used the angle kick at the base of the front of the drip edge must be straightened or removed so as not to interfere with the remounting/refastening of the gutters. Sticking the ice shield to the top of the metal is forbidden irrespective of any specification by GAF or others to do so. Any work done in this manner will be corrected at the contractor's sole expense.
d. Ice shield must be extended up all walls, where roofing is removed, <u>a minimum of 8 inches including behind the corner posts of the vinyl or Hardy Plank siding</u>. At vent pipes a "donut" of ice shield with a 2.75 inch diameter interior open area and a 12 inch exterior must be stretched over the protruding PVC pipe before the aluminum collar is installed. An additional hidden horseshoe piece of ice shield must be installed over the hidden part of the vent pipe flange after it is installed to sandwich the upper part of the flange between the primary layer of ice shield adhered to the sheathing and the horseshoe piece installed over the metal flange.
e. Ice shield will be installed along eaves at Bristol style units in a 9 foot width.
f. Ice shield will be installed at furnace flues to insure extension of the membrane over the unexposed shingle below the flashing and a minimum of three feet above. The above sheet will be adhered to the top of the metal flashing.
g. Ice shield will be wrapped carefully at dormer corners to insure the elimination of any pin hole opening where the membrane is cut and fit.
h. Ice shield will be installed at skylights in a manner similar to that of furnace flue to insure an extension of three feet in all directions. At Velux wood framed units the wood frame will be fully covered in ice shield prior to the installation of the flashing kit.
i. At areas where shingle roofs intersect low sloped membrane areas the low sloped membrane will extend 12 inches up under the area to receive shingles. This 12 inch extension will be further extended with a three foot width of ice and watershield overlapped onto the modified bitumen membrane. Any granular surfaces of the low sloped roofing will be primed with asphalt primer prior to the application of ice shield and drying of the primer.

9. Install new Velux skylights and flashings or same or very similar size at each location where skylights presently exist. Contractor is responsible for cleanly removing existing unit without any undue disturbance of interior paint or trim whenever

possible. Contractor will notify the Designated Representative of any deviations in the size of skylights of more than one inch total in clear glass area in either width or height along with their bid. Contractor will specify the new unit model numbers for the various openings.

10. Install new architectural laminate style shingles according to manufacturer's (GAF or equal) published instructions for Golden Pledge Warranty (or equal). New flashings shall be no smaller than manufacturer's minimum size for all flashings. All flashings colors are to be submitted prior to commencement of work. Kick out flashing shall be carefully fabricated to the roof slope, pop riveted and sealed with urethane caulk or other high grade sealant prior to installation. The purchase and use of a vinyl "kick out" flashing is also permissible. A sample shall be submitted for review and approval prior to commencement of roofing work. A similar "inside and outside corner flashing for use at transition from step flashing to apron flashing shall be fabricated and submitted for approval prior to the commencement of roofing work.
11. Install new ridge vents similar to GAF Snow Country in accordance with manufacturer's recommendations. Insure that openings exist in plywood at ridge in a sufficient width.
12. Install new eaves metal (drip edge or right angle) and rake edging (drip edge) in accordance with GAF (or equal) and the building code.
13. Install new step flashing. Carefully cut, fit and secure step flashing to apron flashing at dormer corners to insure a solid flashing at corners.
14. Remove all job related debris.
15. Provide manufacturer's Golden Pledge Warranty (or equal) on all newly installed roofing work in accordance with the contractor's status as an approved and authorized applicator eligible to deliver a non-prorated system warranty on both labor and materials.
16. Contractor will include in their bid the cost to replace any damaged or deteriorated plywood on a per piece basis including all labor and material for removal, installation and disposal.

Low Sloped Roofing Work

1. Upon removal of shingle roofing the contractor will install a new low sloped membrane by the same manufacturer, if possible, as the shingle warranty. In the case of a GAF system, a color matched two-ply GAF Liberty membrane with a base layer of self-adhered smooth modified bitumen nailed to or adhered directly to the plywood deck, and a top layer of granulated modified bitumen.
2. The two-ply roof system will extend 12 inches up under area to receive shingles. Shingle will begin a minimum of three inches above the "valley line" formed by the low sloped area and the steep sloped area.

3. All perimeter metal is to be a minimum of .032 aluminum, nailed 4 inches on center in a zig zag pattern and primed prior to being overlaid with membrane or flashing strips.
4. Alternates for submission on the low sloped areas, such as EPDM or TPO, are allowable subject to approval and must include a suitable transition material to which ice shield can be installed where the low sloped membrane extends under the steep slope roofing areas.

Bid Sheet

for

Roofing Work

at

ABC Condominium Association, Inc.

Total Labor and Material $___________________________________

Cost per piece for ½" nominal 4/5 ply fir plywood $________________

Velux Model Sizes ____

Low sloped membrane alternative spec number or description ____________

_______________________ ________________________ ___________________

Company Name Signature Title

________________________ _______________

Printed Name Date

References of Similar Projects (use separate paper if needed)

Name	Description	Dollar Amount	Contact for Project	Phone	Date Completed

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