



Memo

To: School Committee & Mary Gormley, Superintendent
From: Matthew J. Gillis, School Business Administrator and 
Bill Ritchie, Director of Facilities 
Date: March 25, 2011
Re: School Facilities Update

With the fiscal year nearing the close of the third quarter, and most of winter behind us, this is good time to review what has been accomplished and what still be needs to be completed to make the most of this year.

Reduction of Energy Consumption ☺

The less energy we consume, the less we have to pay. In the aggregate, we did not change hours of operation. As the charts below demonstrate, the district as a whole has consumed significantly less energy than we did the previous year; a continuation of good news story that started in FY09 with 14.8% reduction from FY08, and 7.5% reduction in FY10 when compared to FY09 total consumption. Our electricity costs are more than 2.2 times our heat (natural gas) costs. There are more practical opportunities to reduce our electricity consumption within our grasp, so we have made greater progress there compared to natural gas.

The Tucker School, a 2010 recipient of the federal Energy Star award designation, made the largest percent consumption reduction in both electricity and natural gas. Kudos to the staff and students at Tucker, their effort and habit changes really helped make this so successful to date.

*The Pierce Middle School hosted the Summer Enrichment Program, the Title One Summer Program and the Summer Music Lessons, which added to electricity consumption of approximately 50,000 kWh compared the building being closed for the Summer in FY10. If that programmatic and usage shift did not occur, Pierce would likely have a 3% reduction in electricity consumption through March and the High School' reduction probably would have been between 9 and 10%. Pierce did a nice job reducing consumption of natural gas for heat.

The High School, the district other 2010 Energy Star Recipient, did a very nice job reducing electricity consumption and a good job reducing natural gas consumption for heat. Like Tucker, the chances of receiving the Energy Star award for 2011 appear favorable at this time.

The Glover School, nearly a decade since the renovation was completed, has solidly reduced electricity consumption through the habits and efforts of the students and staff. The last quarter may still yield a total reduction in natural gas consumption for heat; let's hope for a mild spring.

Both the Cunningham and Collicot schools made steady progress in reducing electricity consumption through the first three quarters of the year. There has been a bit of increase in gym usage at the Cunningham & Collicot schools, which likely has contributed to the energy consumption of both heat and electricity. The last quarter may still yield a total reduction in natural gas consumption for heat; let's hope for a mild spring.

Electricity Consumption 1st Three quarters of the Fiscal Year				
School	% Change	FY11		FY10
TUCKER	-12.8%	318,358		365,158
HIGH SCHOOL	-12.7%	1,159,406		1,327,984
GLOVER	-6.3%	363,282		387,618
COLLICOT	-3.5%	306,052		317,244
CUNNINGHAM	-3.0%	307,578		317,244
PIERCE*	3.2%	804,129		779,469
DISTRICT TOTAL	-6.8%	3,258,805		3,494,717

Natural Gas Consumption 1st Three Quarters of the Fiscal Year				
School	% Change	FY11		FY10
TUCKER	-10.1%	14,041		15,612
PIERCE	-3.2%	39,992		41,320
HIGH SCHOOL	-2.6%	58,036		59,595
GLOVER	2.4%	26,534		25,908
CUNNINGHAM	4.4%	29,210		27,972
COLLICOT	4.4%	29,211		27,972
DISTRICT TOTAL	-0.7%	197,024		198,379

Roof Restoration Projects

The Glover School addition renovation project was completed in 2003. In 1997, before the project began, there was approximately 16,500 square feet of roof that was replaced and that section had 10-year warranty that expired in 2007. That roof section has had a few leaks, but is a good candidate for restoration to repair the trouble spots and extend the practical useful life of the roof with a new 10-year warranty. On March 14, 2011, the Facilities Sub Committee received a report and cost estimate for the ends of the spectrum two outsourced options. The consultant's report conservatively estimates we can out-source the entire project for \$110,000 and obtain the 10-year warranty from the manufacturer. Procuring the materials in house via state contract and performing the labor in-house, we could complete the project in a more timely manner than if we bid it out, for about \$40,000 and still obtain the 10-year manufacturer's warranty.

The Tucker School has approximately 11,000 square feet of roof in a similar to condition to that of the Glover School section stated above and that project could be done in-house for approximately \$28,000 or Approximately \$75,000 if bid the project out.

The Pierce Middle School has about 8,000 square feet of roof that was not replaced in the renovation project. That section of is on a lower level of the building and took a lot of foot, ladder and material traffic during the construction project. There are many patches and, so far, the manufacturer's sales representative has not been inclined to sell us the product because he is not confident his employer will warranty that section of roof because of the volume of patches and visual wear and tear.

Exterior Duct Insulation Projects

Last month, we presented to the Capital Planning Committee on our capital needs for the entire school district. We have a very extensive, six page capital plan document that addresses much of our capital needs for the next five years. We were asked to only list a few of the major projects due to budget restraints and the detail of the report. We decided to list our exterior duct work projects which will cost approximately \$438,000 for work at the High School, Middle and Glover

Elementary. The project scope for the exterior duct work would be to address all of the critical exterior duct work that is failing. As you recall, the Building Committee spent some \$60,000 this past year replacing the duct work on the rear of the High School auditorium that was failing.

Summer Cleaning and Building Scheduling

Each spring, we start the long process of preparing for our summer cleaning schedule. Summer cleaning is more than just daily cleaning, it is a critical part of the preventative maintenance for many of the items in the classrooms. During the summer months, all classrooms will get emptied of all chairs, desks, tables, computers and file cabinets. All walls, white boards, desks and chairs will be cleaned and all Vinyl Compound Tile (VCT) floors will be stripped and waxed. Any repairs will also be done when the rooms are emptied. All school hallways and stairwells will be stripped and waxed. We intend to use around 350 gals of wax in the hallways and approximately around 700 gals of wax for all the classrooms and offices. All auditorium carpets, library, offices will be steamed cleaned as well as all any area rugs. The Copeland Field House wooden floor will be screened and recoated with water based urethane.

This year, since the summer school program is located at our High School, our plan is the custodial staff will work the evening shift (1:00 PM until 9:00 PM) to accommodate the needs of the district. The Glover and Tucker School will work the day shift (6:00 AM until 3:00 PM) and will perform "Team Cleaning" which will also help to reduce our energy load. The Collicot/Cunningham School and the Pierce Middle School custodians will work the day shift and will clean independently due to the size of the buildings.

Maintenance Schedule

During the summer months all major equipment will be tested and certified as per manufacturer guidelines or state regulations. All boilers, RTU, generators, fire alarms, fire extinguishers, sprinkler and lighting systems are inspected and serviced appropriately. Please see attached Facilities Maintenance Plan.

Green Communities Update

Our School Facilities Sub Committee has been working in accord with the Town of Milton Alternative Energy Commommittee to establish an energy baseline for the Town of Milton. With the school department's success at consumption reduction, the entire town has since 2008 lowered our energy usage by 28%. The goal is to reduce the entire town's energy usage by another 6% by 2013. Over the last year we surveyed all town facilities and interviewed staff to understand if there were any opportunities and measurements for improvements.

The School Department has forwarded two projects for review and possible grant opportunities to the committee.

Project One:

Pierce Middle School:

Replace 170 3 lamp U lamp fixtures with 3 lamp F17 fixtures. Most of the lamps are located in the hallways. Return On Investment (ROI) also referred to as "project pay back" is approximately 4.46 years. NSTAR has an energy programs that might have some incentive to swap out the fixtures and expedite the ROI. The total project cost is \$35,000. For regulation and skill reasons, this project will probably have to be completed by a vendor.

Project Two:

Collicot/Cunningham School:

Reengineer and retrofit some 65 Unit Cabinet Heaters located in the classroom spaces. The current design allows the unit heater fan to go on and off throughout the day during

occupied mode or during school schedule. By reengineering the internal controls of the unit and thermostats we would have the unit fans come on ONLY during the heating mode or when the heating valve is calling for heat. This would be a substantial reduction in both heat and motor reduction. Total project cost is \$6,000 and the pay back is 4.5 years. This project can be performed in-house by our HVAC technician.

Our Facilities Sub Committee continues to research energy grants and opportunities to help us to curve energy usage. We are currently looking at LED lighting to replace some of the auditorium incandescent light bulbs. There are many grant opportunities through NSTAR to obtain a decent (ROI) in under one year.

c. Facilities Sub Committee

c. John Phelan, Asst. Superintendent

CAPITAL FACILITIES PROJECTS FOR 2010

Draft study for review (please verify items and costs)

Milton High School

Needs

Parking Lot		
Restriping/seal coating	(3 years out)	18,000
Curbing repairs	(now)	3,800
Roadway repairs at lower portion of Gile Rd to Bluehill Parkway.		5,800
Telephone System expansion and upgrade		
	(1-5 years out)	8,200.00
Duct work repairs	(1-5 years out)	240,000.00
Ongoing Interior Painting	(3-5 years out)	10,600.00
Field House basketball safety straps on support cables	(1-5 years out)	12,000.00
Brooks Field Maintenance on sports turf	(5 years out)	475,000.00
New 10 ft fence to block off rear entrance to auto shop.	(1-5 years out)	8,000.00
New guard rail system to block off grass area to rear field entrance.	(now)	6,000.00
Brooks Field Maintenance on track	(4 years out)	23,000.00

High School Total	\$810,400.00
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Pierce School

Needs

Parking Lot		
Restriping/sealing coating	(3 years out)	9,000.00
Duct work Repairs	(1-5 years out)	160,000.00
New Science Wing roof	(1-5 years out)	90,000.00
Ongoing Interior Painting	(1-5 years out)	15,800.00
Field Maintenance at rear	(1-3 years out)	40,000.00
Planting program at front At front and side	(1-5 years out)	20,000.00

Pierce Total	\$344,800.00
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Cunningham/Collicot Schools

Needs

Parking Lot		
Restriping/sealing coating (1-3 years out) and minor patchwork		10,000.00
Roofing Repairs (shingles)	(now)	300,000.00
Duct work Repairs	(4-5 years out)	3,500.00
Ongoing Painting	(2-5 year out)	7,500.00
Playground equipment repairs	(3-5 years)	4,500.00

Cunningham Total	\$323,500.00
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Tucker School

Needs

Parking Lot		
Restriping/sealcoating	(3years out)	3,000.00
Roofing Replacement	(3-5 years out)	148,000.00
Ongoing Painting	(2-5 years out)	8,600.00
Playground equipment repairs	(2-5 years out)	3,800.00

Tucker Total	\$166,400.00
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Glover

Needs

Parking Lot		
Restriping/sealcoating	(3 years)	5,200.00
Road repairs	(2-5 years)	3,800.00
Roofing Repairs	(3-5 years out)	215,000.00
Duct work Repairs	(5 years out)	38,000.00
Ongoing Painting		8,600.00
Sprucing up	(1-3 years out)	
Playground Repairs	(2-5 years out)	7,700.00

Glover Total	\$211,300.00
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Custodial Equipment Upgrades

System wide

Three auto scrubbers	(3-4 years out)	15,000.00
Three 12 hp snow throwers	(3-4 years out)	9,000.00
Three sidewalk tractors/Plows	(1-3 years out)	20,000.00

Custodial Total	\$44,000.00
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Maintenance Department

One Sander	(2-3 years out)	4,300.00
One New H/D truck with sander	(1-3 years out)	38,000.00
One new Kubota lawn tractor (Purchases)	(3-4 years out)	20,000.00
One folk lift	(now)	12,000.00

Maintenance Total	\$69,300.00
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MEMORANDUM

TO: Department Heads

FROM: Kevin J. Mearn, Town Administrator
o/b/o The Capital Improvement Planning Committee

DATE: May 13, 2010

RE: Survey of Departmental Capital Needs

In order to start the process of updating our capital needs, the Committee requests your assistance in compiling an updated and accurate list of the capital needs of Town Departments for FY12 and FY13.

Please complete the enclosed Capital Budget forms and return via email no later than June 18, 2010. It is understood that the FY11 budget was approved by Town Meeting with no appropriation for capital projects. However, the purpose of this request is to get a sense of pending capital needs.

You may simply choose to re-submit your capital requests from previous years or if your capital needs have changed, you should make those needs known.

Your cooperation in this process is greatly appreciated.

cc: Capital Improvements Planning Committee

Enclosure(s)

Schedule G-1 for Capital Equipment Capital Equipment Purchase Request Form

1. Department: _____ 2. Sub-Department: _____ 3. Date: _____

4. Contact Person: _____ 5. Title: _____ 6. Phone: _____

7. Project Name: _____

8. Number of Units Requested: _____ 9. Number of Similar Items in Inventory: _____

10. Purpose of Expenditure (check as appropriate):

- | | |
|---|---|
| <input type="checkbox"/> Scheduled Replacement
<input type="checkbox"/> Replace Worn-out Equipment
<input type="checkbox"/> Expanded Service
<input type="checkbox"/> Increased Safety | <input type="checkbox"/> Present Equipment Obsolete
<input type="checkbox"/> Reduce Personnel Time
<input type="checkbox"/> New Operation
<input type="checkbox"/> Improve procedures, records, etc. |
|---|---|

11. Estimated Use of Requested Item(s) per year: _____ (Approximated months if seasonal)
 Estimated Useful Life in years: _____ Average days used per week: _____

12. Cost: _____	<u>Per Unit:</u> _____	<u>Total:</u> _____
Purchase price or annual rental	_____	_____
Plus: Installation or other costs	_____	_____
Less: Trade-in, other discount	_____	_____
Net: Purchase or annual rental	_____	_____

13. Replaced Equipment:

<u>Item</u>	<u>Make</u>	<u>Age</u>	<u>Maintenance Costs</u>	<u>Prior Year's Breakdowns</u>	<u>Rental Costs</u>
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14. Recommended disposal of Replaced Item(s):

____ Trade-in ____ Sale ____ Possible use by other departments ____ Other (please specify)

15. Available Aid or Grants (specify):

16. Comments:

17. Submitted by: _____ Title: _____ Date: _____

18. Priority _____ Department: _____

Page ____ of ____

Schedule G-2 for Construction/Renovation
Capital Improvement Project Request Form

Facilities

3. Date: 3/6/2011 2. Sub-Department: _____ 1. Department:

School Department

4. Contact Person: Bill Ritchie 5. Title: Director of Facilities 6. Phone:

617-696-5040 ext 5570

7. Project Name: Pierce Middle School, Milton High and Glover Elementary

Costs: All three projects 438,000 Expenditure Schedule: FY 12

Planning & Design: Design and specifications will be done as prior to project start.

Site Improvements & Utilities: N/A

Construction/renovation: Remove and replace all failing duct work located on the exterior of ventilation systems (RTU) located on roof. Project scope would be to replace all critical areas first and then to repair the not so bad areas. These conditions exist at the High School, Middle School and Glover Elementary. Please see estimated project cost on schedule H form.

Other (Specify):

Cost Totals: \$438,000

15. Available Aid or Grants (specify): None Known

16. Description and Justification:

Most of the duct work is around 5-7 years old and was installed when the school buildings were updated. The duct work that was installed during the time of the construction project at these three schools was not the best insulation and exterior coating material of choice at the time. Due to value engineering, a better mechanical duct work system was overlooked in order to complete construction project on time and within budget. Please note that the Building Committee has funded \$70,000 in the summer of 2010 to replace the failed exterior duct insulation/coating located on the High School auditorium. This material would be similar to what would be used at the three schools if and when funding comes available.

17. Submitted by: Bill Ritchie Title Director of Facilities Date 3/8/11

18. Priority High

14. Department: School Facilities

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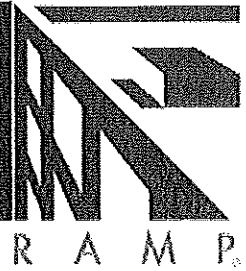
SCHEDULE H: SUMMARY OF CAPITAL BUDGET REQUESTS - BOTH CAPITAL PROJECTS & CAPITAL EQUIPMENT:

PART A: CAPITAL EXPENDITURES - SUMMARY SHEET - SEE SEPARATE CAPITAL

PROJECT/ITEM	FY2012	FY2013	FY2014	FY2015	FY2016
Pierce Middle School	160,000				
Milton High School	240,000				
Glover School	38,000				
Estimated total of all three projects.	438,000				

The Garland Company, Inc.

Roof Asset Management Program



Glover Elementary School

Prepared By:
Ed McCabe

Prepared For:
Bill Ritchie

March 08, 2011

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Facility Summary

Client: Milton Schools
 Facility: Glover Elementary School



Facility Data

Address 1:	255 Canton Ave
Address 2:	-
City:	Milton
State:	MA
ZIP:	02186
Type of Facility:	School
Square Footage:	70,347
Contact Person:	Bill Ritchie

Notes

255 Canton Ave
 Milton, MA 02186
 (p) 617-696-4288
 (f) 617-698-2346
 Ms. Stephanie Nephew, Principal
 Main Office
 617-696-4288
 Ms. Susan Doyle, Administrative Assistant x1101

Roof Sections

Name	Date Installed	Square Footage	Roof Access
Old Flat Roof	2002	16,500	Internal Roof Hatch



Construction Details

Client: Milton Schools

Facility: Glover Elementary School

Roof Section: Old Flat Roof

Roof Info

Year Installed:	2002	Square Footage:	16,500
Slope Dimension:	1/1:12	Roof Height:	20'
Roof Access:	Internal Roof Hatch	System Type:	EPDM
Architect:	n/a n/a n/a n/a (Office) n/a (Mobile) n/a	Contractor:	n/a n/a n/a n/a (Office) n/a (Mobile) n/a

Notes

We have an EPDM [rubber] roof fully adhered to a layer of polyisocyanurate insulation board. The EPDM is a single ply roofing system that is very popular in construction these days due to being inexpensive compared to other commercial roofing systems and fast to install. The roof is coming out of its warranty and should be addressed thru replacement or restoration options. Depending on how long the town intends to use this building should dictate which course of action is selected.



Roof Drawing

Client: Milton Schools

Facility: Glover Elementary School

Roof Section: Old Flat Roof

255 Canton Ave. Milton, MA 02186

February 7, 2011

Notes Diagram

Roof facets are labeled from smallest to largest (A to Z) for easy reference.

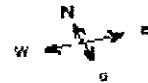
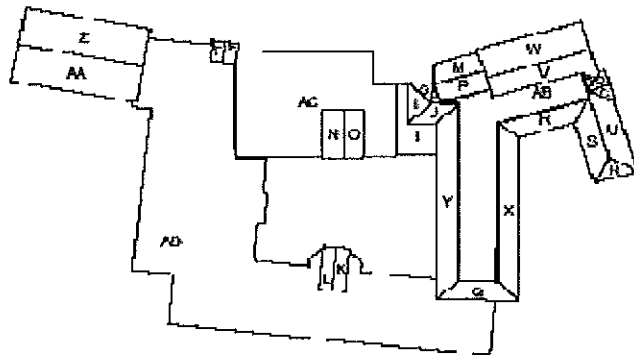




Photo Report

Client: Milton Schools

Facility: Glover Elementary School

Report Date: 03/01/2011

Roof Section: Old Flat Roof





Solution Options

Client: Milton Schools

Facility: Glover Elementary School

Roof Section: Old Flat Roof

Restore Options

Solution Option:	Restore	Action Year:	2011
Estimated Cost:	\$110,000.00	Expected Life (Years):	15
Scope of Work:	<p>The oldest roof system on the Glover School is coming out of warranty and should be addressed when budgets allow. There has been roof leaks the last few years and most of which are not covered under warranty. Warranty claims on single ply roofs are very narrow in scope and really come down to manufacturers error or seams separating prematurely. The most common cause of roof leaks with single ply roofing systems is punctures and slices in the membrane from foot traffic or maintenance on mechanical units. Roofing contractors only have a two year obligation due to workmanship and are free and clear after this window closes.</p> <p>A fast and simple approach to dealing with single ply roofing system is to restore the membrane with a product like White Knight. The original membrane is typically 40mm or 60mm thick [0.040 - 0.060]. Not to be rude, but its a glorified bicycle tire. Doing a restoration coating system would double the thickness of the membrane and reinforce all seams with a base coat application before the entire roof is coated with a liquid membrane. It cures as a single monolithic layer. The large scale repairs are fast and relatively inexpensive compared to a complete roof replacement.</p> <p>I'd set the budget at \$110,000 and we should net bids to come under this number. You have the ability to purchase materials directly and save on contractor market up. EPP State contract FAC27 for Environmentally Protective Products is available and also the US Communities Contract can be utilized. We can also break the job into three pieces and address each roof individually to help defer costs.</p>		

Replace Options

Solution Option:	Replace	Action Year:	2011
Estimated Cost:	\$297,000.00	Expected Life (Years):	50
Scope of Work:	<p>If and when there's an issue with the roof after installation who are you going to call?</p> <ol style="list-style-type: none"> 1) The design firms are involved till the job is completed 2) Roofers have a two year commitment, if any, after the installation is completed 3) The manufacturer carries the long term obligation, who is your contact? <hr/> <p>Assess - Design - Implement - Warranty - Annual Inspections</p> <hr/> <p>ASSESSMENT: The installed rubber roof is coming out of warranty and the question I ask is how long will this building be utilized by the Milton School system? If you can answer twenty years without finching we can look at replacement options. replacement is the last option to explore, but if you intend to keep this building 20-50 years its a good option to look at. We can entertain a retro fit over the existing roof system if Infra red scans show dry insulation. This can net a savings of \$2 per square foot or more. The existing roof needs help and restoration will buy us time. A replacement will put all headaches to bed for a long time as long as we look at long term options.</p> <p>BUDGETS: In putting budgets together we'll look at a long term option with multi ply roofing. Its the best return on investment in the industry. The first budget number is to remove everything down to the deck and start over again. Remove all drains and install new drain assemblies with sumps to enhance drainage. Lead joints get old and crack over time, plus I see to many drain inserts fail. We'll go with two layers of insulation to reach current building code and stagger the seams to minimize thermal bridging, aka heat loss. The multi ply roof installed and finish with a gravel finish to reduce roof top temperatures, maximize drainage, keep the sun off the roof to slowing the aging process and minimize maintenance for years to come. The budget will be set at \$297,000.</p>		

I think we have the option of a retro fitting over the existing roof if scans come back dry. This is re-using the existing insulation to reduce costs. We could realize a \$2 a foot savings bringing our roof bids under \$250,000 for starters.

ROOF SYSTEM:

The system I recommend is a 3-ply Mod Bit using a Cold process. Cold adhesive is a polymer modified liquid asphalt that is sprayed or squeegeed into place, with the base sheets rolled out with 50% redundancy and the modified cap with lap redundancy. Cold process has replaced the hot kettles of old due to current fire codes and safety concerns. A few bad eggs have ruined it for the many. The roofing system itself looks exactly like hot once in place and performs better with the same long term benefits. The modified cap sheets incorporate dual scrims that have better resistance to punctures and tears. They are also polymer modified to age better and deal with the four seasons of New England. The flood and gravel finish makes it one of the easiest roofing systems to maintain. This system carries a 30 year water tight warranty.

GREEN ROOFING:

The roof systems we've been doing in the Greter Boston area for the past ten years incorporate recycled materials in the modified cap sheet and I've attached the new Eco Data Sheet in the back. These modified sheets incorporate recycled crumb rubber from discarded tires, recycled glass as the silica parting agents and recycled boiler slag for the sheets under coating. I have more green products we can incorporate if your interested? The roofing system we've been installing are very good long term roof assemblies that will have excellent return on investment for local schools, towns and cities. We're not installing a Mercedes Benz here. This is a good sturdy Taurus, we can get much more elaborate if needed but I see no reason to get extravagant with your roofs.

Note: We have several issue that will drive the budget:

1. FM is our biggest wild card in what they'll require us to do beyond a normal roof design.
2. Access around building?
3. Asbestos in roof?
4. Drains and litres need to be replaced
5. Staging looks easy but coordinating with daily activity
6. Rip is easy with an insulation board under the roof

At no additional cost I will:

- Assist in the design of the roof replacement
- Attend pre-bid & pre-construction meeting to answer questions
- Daily job site inspections to insure the proper materials are used and procedures are followed
- Run final inspections and punch list follow up
- Provide a 20 or 30 year warranty on the roofing system
- Perform annual follow-up inspections

-
- 1 Every project you design in house is a savings of 10-25% on designer fees
 - 2 When a roof project is done the contractor has a 2 year obligation [if any]
 - 3 When the project is completed the membrane manufacturer has a 20-30 year obligation

Over the years there are ongoing studies looking at commercial roofing. Including the Army Core of Engineers, NRCA, the Ducker Study and plenty more. Year after year it clearly shows that multi-ply built-up roofing is the best performing systems for longevity and life cycle costs. In the BUR family the modified BUR systems, which utilize a modified cap sheet, are the highest performing group concerning puncture resistance and fatigue.

The modified built-up system is a three ply system with the top ply being a modified cap sheet. The cap sheet (a modified felt) can be the last layer of protection or it can be followed up with a flood and gravel. Each felt has a layer of bitumen below and above it to adhere the layers giving you more layers of added protection. The flashing are the weakest point of all roofing systems and is why another two layers are added to give the field termination five layers of protection. While the built-up system is more expensive than an EPDM to start, it's low maintenance over it's 30 year life cycle make it the cheapest and least time consuming roofing system available. With proper maintenance these systems can last past their 30 year projection.

The average life span of single-ply system is 8-12 years. They're the least expensive roofing system for up-front costs, but demand high annual maintenance and the high life cycle cost makes them the more expensive system. The EPDM membrane is approximately 40-60mm thick, the same as a bicycle tire. It is easily punctured or damaged and requires high year round monitoring/maintenance with allot more headaches.

PVC [Polyvinyl Chloride] roofing systems are a stronger single-ply system than EPDM, but still suffer the same short comings. Puncture resistance and seam splitting are the leading short comings in a single membrane. Like EPDM it requires year round monitoring and maintenance. The PVC roof is more expensive than the EPDM, often equivalent to the built-up system. At the end of it's life span you have spent more than most roofing systems available.

A long term problem coming to light with the PVC material is the environmental impact in recycling after the roof is removed. Europe made PVC roofing material popular and it was finally introduced to the United States. Europe is now in

the process of eliminating PVC material as a whole and many countries have already banned it as a roofing membrane. Leading manufacturers like Nike, Mattel, Baxter International, Lego and IKEA have also eliminated PVC material from all their products. A focus for the 2000 Sydney, Australia Olympic games were to minimize PVC as a whole. Many Fire Depts. dislike PVC roofing due to the chlorine gases released in a fire. From the cradle to the grave, PVC is not an environmentally friendly product.
