



# THE LAWRENCE ASSOCIATES

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January 8, 2013

Senator Steve Cassano  
Senator Gary LeBeau  
Representative Jason Rojas  
Representative Joseph Diminico  
Representative Geoff Luxenberg  
Representative Bill Aman  
Representative Timothy Larson

RE: P.A. 03-220 An Act Concerning Indoor Air Quality in Schools  
Minimum Requirement for Roof Pitch on Schools

Dear Senators and Representatives:

As the new legislative session begins there are many topics being proposed regarding the State's educational system and school buildings, many of which will undoubtedly have an increase in cost for implementation. I am writing to recommend the repeal of a portion of P.A. 03-220 which will save tens of millions of dollars per year in taxpayer's money.

Let's look at a brief history – it is my understanding this bill was introduced to improve indoor air quality in public schools. Purportedly the intrusion of water into a school building resulting from a leaking roof caused mold in a public school. This legislation requires all school roofs to have a minimum 1/2" per foot slope where industry standards for decades have allowed slopes between 1/8" to 1/4" per foot and still receive a manufacturer's twenty year bond. Granted, this requirement for the steeper pitch in new construction can be accommodated with proper design and planning. However, it applies to the re-roofing of older buildings as well and this is where the State of Connecticut is paying tens of millions of dollars per year in additional costs with no documented evidence resulting in less mold or improved indoor air quality.

At an August 15, 2012 public hearing held by the School Building Projects Advisory Council, the Town of Fairfield Director of Purchasing Twig Holland and the writer provided oral testimony (and subsequent written) documentation about these extra costs resulting from P.A. 03-220. Ms. Holland described how her town contracted to have two separate estimates prepared to determine the additional cost to replace the roof at the Fairfield Warde High School using both 1/4" per foot and 1/2" per foot slopes. The shocking difference was the higher sloped roof at 1/2" per foot resulted in an increase cost of **\$5,153,800** (see attached December 6, 2011 Memo).

This legislation does provide waivers for special conditions but, it is my understanding, these are rarely granted and require the school district to engage the services of architectural, structural and mechanical engineers at additional cost to provide the documentation necessary to submit an application for such waiver.

The Towns of South Windsor and Manchester each have three schools for which the initial planning has been started to remove and repair older roofs that will be eligible for state reimbursement. My first hand knowledge of the existing conditions at some locations on these roofs leads me to determine there will be extraordinary additional costs if the higher pitch of 1/2" per foot is required. As a design professional with over four decades of experience I will gladly support codes and legislation which have direct benefits and provide the owner with the intended results. To my knowledge, there is no scientific evidence that this particular legislation requiring 1/2" per foot slope as a minimum has a direct correlation to improved indoor air quality as originally intended and it is costing towns and the State millions of wasted dollars.

In addition to the Town of Fairfield analysis, attached is a 1/5/04 letter from Herbert B. Fishman, CEO of H.B. Fishman & Co., a well-known roof consultant. In this document he outlines the numerous items that often require changing, modifying, relocating, etc., all with extra cost as a result of being required to provide the 1/2" per foot slope.

As representatives of the towns in which these six schools are located, I respectfully request your introduction of legislation that repeals this requirement of 1/2" per foot minimum slope on all school roofs. Certainly, I will be glad to provide additional information and/or documentation as well as testify before the Legislature as a means of saving taxpayer dollars that are currently being wasted with no resulting benefit.

Sincerely,

THE LAWRENCE ASSOCIATES  
Architects/Planners, P.C.



Richard S. Lawrence, AIA  
President

Enc.

Cc: File

Representative Andrew Fleischmann  
Twig Holland, Town of Fairfield  
Diane Harp-Jones, Connecticut School Construction Coalition  
Daniel Weston, AIA, Connecticut School Construction Coalition  
John Butts, Connecticut School Construction Coalition  
Petina A. Killiany, Connecticut School Construction Coalition

ESTIMATE IF WAIVER GRANTED

December 6, 2011

Fairfield Warde High School - Roof Replacement

**Scope A:** Remove existing single-ply roofing and insulation.  
Sweep/vacuum loose gravel leaving existing coal tar roofing in place.  
Nailed base sheet.  
Adhered tapered insulation and cover board. (1/4" per foot slope)  
New drains as noted.  
Replace drain bowl assemblies as noted.  
Remove and reset existing lightning protection system  
New blocking and gravel stops.  
New counter flashing as required.  
Concrete roof deck repair 6,000 SF  
Gypsum roof deck repair 18,000 SF  
Tectum roof deck repair 3,000 SF

**Estimate:**

	Area (SF)	<u>Hoffmann</u>		<u>F.J. Dahill</u>	
Phase 1	64,640	\$30.00	\$1,939,200	\$25.00	\$1,616,000
Phase 2	54,330	\$35.00	\$1,901,550	\$30.00	\$1,629,900
Phase 3	70,730	\$40.00	\$2,829,200	\$35.00	\$2,475,550
Phase 4	67,990	\$45.00	\$3,059,550	\$40.00	\$2,719,600
Total	257,690		<b>\$9,729,500</b>		<b>\$8,441,050</b>

ESTIMATE PER STATUTE (1/2" / FT.)

**Scope B:** (For reimbursement without the pitch waiver)

Scope A with the following changes/additions :

1/2" per foot insulation used in place of 1/4" per foot	257,690 SF
Existing coal tar roofing is to be removed down to existing deck (concrete, metal and tectum decks)	45,190 SF
All existing poured gypsum decking is to be removed and replaced with new metal deck	212,500 SF
Raise (or replace) existing skylight curbs	100 locations
Raise (or replace) existing fan curbs	70 locations
Remove existing roof top units to raise or replace existing curbs (including disconnection of electrical and mechanical equipment, resetting and reconnection of units)	50 locations
Remove and replace hollow metal doors and frames (standard size)	2 doors
Remove and replace aluminum framed windows	1,500 SF
Remove and replace all existing metal counter flashing at walls and chimneys	3,500 LF

**Estimate:**

	Area (SF)	<u>Hoffmann</u>		<u>F.J. Dahill</u>	
Phase 1	64,640	\$50.00	\$3,232,000	\$45.00	\$2,908,800
Phase 2	54,330	\$55.00	\$2,988,150	\$50.00	\$2,716,500
Phase 3	70,730	\$60.00	\$4,243,800	\$55.00	\$3,890,150
Phase 4	67,990	\$65.00	\$4,419,350	\$60.00	\$4,079,400
Total	257,690		<b>\$14,883,300</b>		<b>\$13,594,850</b>

Cost difference between Scope A and Scope B: \$5,153,800

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5 January 2004

Via Fax: (203) 226-4102

Ms. Lois Roberts  
Lois Roberts Consulting  
544 Riverside Avenue  
Westport, CT 06880

Dear Ms. Roberts:

Enclosed please find our comments based on real roofing problems which have been cause on various schools wherein H. B. Fishman & Co., Inc. have already encountered trying to comply with the new 1/2" slope law.

I hope this information can be properly presented to the legislature so that the design of these roofs can be implemented with the present code and comply with the intention that no ponding will be allowed.

Very truly yours,

H. B. FISHMAN & CO., INC.

Herbert B. Fishman  
Chief Executive Officer

HBF/mvl  
Enclosure

**THE EXTRA COST OF 1/2" SLOPE REQUIREMENT  
FOR LOW SLOPE ROOFING SYSTEMS IN EXCESS OF PRESENT CODE  
WHICH REQUIRES 1/4" PER FOOT SLOPE**

- 1.0 Additional Drains and Overflow Drains Will Be Required
  - 1.1 Additional drain lines.
  - 1.2 Additional leaders.
  - 1.3 Remove and reinstall ceilings. (Potential for asbestos disturbance.)
  - 1.4 Many interior locations not accessible for new piping due to existing ducts, pipes and conduit.
- 2.0 1/2" Slope will cause vastly irregular insulation thicknesses on existing roofs.
  - 2.1 Distance from drain to farthest wall not consistent.
  - 2.2 This causes disproportionate blocking thickness at eaves and results in increase in cost.
  - 2.3 Increase in cost of metal edging due to added width.
  - 2.4 Loss of existing wall flashing height at existing rising walls. Expensive wall modifications may be required including new through wall flashing (removal and replacement of brick courses).
  - 2.5 New roof flashing at walls may be higher than windowsills and door thresholds. This may require massive cost for new windows or doors or require them to be blocked off.
- 3.0 Roof Mounted Equipment will be Required to be Raised
  - 3.1 Additional new blocking.
  - 3.2 Additional new curbs.
  - 3.3 Duct extensions.
  - 3.4 Duct extensions extremely labor intensive on multi zone units.
  - 3.5 Not practical at existing water tower support systems.

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- 3.6 Gas lines for HVAC will require reworking.
- 3.7 Electric lines for HVAC will require reworking.
- 3.8 Large skylights will have to be rebuilt to maintain flashing heights. See Photos.

#### 4.0 Slippage and Self Healing

- 4.1 Coal tar built up roofs will be eliminated as the best roof option. (Maximum slope for this roof type is 1/4" per foot.)
- 4.2 Self healing properties of BUR will allow slippage to occur at 1/2" slope or back nailing will be required, not practical.
- 4.3 1/2" slope requires the use of steep asphalt and/or adhesives with softening points above 190°F. This reduces the self healing ability of many roof systems.

#### 5.0 Stabilization

- 5.1 Thicker insulation packs . A 50' run from perimeter to drain would require 20 plus inches of insulation thickness on a structurally flat roof.
- 5.2 Fasteners that long are not readily available nor are they practical.
  - 5.2.1 Fastener lengths will require variations in length. This will cause complicated installations and increase in workmanship errors.
- 5.3 Long fasteners can tip when the roof membrane expands or contracts with ambient changes.
- 5.4 This causes diagonal wrinkles in flashing.
- 5.5 Tipping of long fasteners could also cause bulging of the roof assembly.
- 5.6 Thicker layers of insulation are subject to "cupping" and distortion.

#### 6.0 Drainage Capacity

- 6.1 The steeper slope combined with more auxiliary drains will cause the drainage lines and leaders to run full; drainage will occur more quickly, taxing the entire drainage system.

- 6.2 Short term ponding may occur during severe rainstorms.
- 6.3 Combined sanitary/storm lines may not have sufficient short-term capacity and may back up.
- 6.4 Movement between the drain bowl and leader may cause them to open. When the lines run full or back up, larger leaks can occur.
- 7.0 Many schools with steep shingle roofs have had mold problems. Bethel Middle School for example. Slope does not cause or eliminate mold.
- 8.0 Masonry Chimneys
  - 8.1 Through wall flashings at chimneys will be too low. Water entering through the masonry or cap above will outflank new surface mounted terminations.
  - 8.2 New through wall flashing will have to be raised at substantial cost (masonry and sheet metal work).
- 9.0 Snow
  - 9.1 Roofs with substantial added insulation may no longer have structural residual capacity at shadow (drift) areas adjacent to higher roofs.
  - 9.2 This may require reinforcement of structural components and the roof deck at substantial extra cost.
  - 9.3 Structural renovation will extend the time the roof is open to the weather and may increase the construction time of the roof replacement beyond the summer recess.
- 10.0 1/4"/Ft. is Sufficient Slope and is Now Required by Code
  - 10.1 Minor bird baths usually evaporate within 48 hours.
  - 10.2 If ponding occurs it can be eliminated in the design specification on an occurrence-by-occurrence basis.
  - 10.3 The law should state the intent that no ponding water is allowed, rather than specify minimum 1/2" per foot slope.

11.0 Roof Leaks Can Occur on Any Roof with Any Slope.

- 11.1 The response to a leak is the important factor.
- 11.2 Leaks should not be allowed to fester.
- 11.3 Repairs should be prompt.
- 11.4 Semi-annual or at least annual inspections would be appropriate.
- 11.5 Inspection and repairs would be less costly and more affective.

12.0 Cost of Sample Middle School Roof

- 12.1 This estimate is not presented as being exact for market conditions and other variable costs but is considered to be a reasonable comparison for this comparative study.
- 12.2 "B" lists the task to be performed.
- 12.3 "C" lists the quantity of the task.
- 12.4 "D" lists the unit of measure.
- 12.5 "F" lists the labor unit.
- 12.6 "G" lists the estimated hours to perform the task.
- 12.7 "J" lists the material unit cost to perform the task.
- 12.8 "I" lists the labor cost and cost to perform the task.
- 12.9 "K" lists the material cost to perform the task.
- 12.10 "L" lists the subtotal cost to perform the task.
- 12.11 "M" lists the subtotal unit cost.
- 12.12 "N" (the last column) shows the extra cost allocated to the increase of slope to 1/2".
- 12.13 The cost of this project has increased from approximately \$1,035,000 for the 1/4" per foot sloped roof to \$1,500,000 for the 1/2" per foot sloped roof.

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12.14 The construction period will also increase by one month thus requiring overtime work in order to complete during summer recess.

Respectfully Submitted,

H. B. FISHMAN & CO., INC.

Herbert B. Fishman  
Chief Executive Officer

HBF/mvl