April 20, 2016

Dear Applicant:

Re: Your request for access to information under Part II of the Access to Information and Protection of Privacy Act (Our File #: EDU/020/2016)

On April 11, 2016, the Department of Education and Early Childhood Development received your request for access to the following records/information:

“I am requesting a copy of the Dillon Consulting structural engineer’s assessment report that was completed for the Argentia area schools that was completed within the past five years. The report was requested by the English School District.”

I am pleased to inform you that a decision has been made by the Deputy Minister for the Department of Education and Early Childhood Development to provide access to the requested information. In accordance with your request for a copy of the records, the appropriate copy has been attached.

The Access to Information and Protection of Privacy Act requires us to provide an advisory response within 10 days of receiving the request. As this request has been completed prior to day 10, this letter also serves as our Advisory Response.

Please be advised that this letter will be published following a 72 hour period after it is sent electronically to you or five business days in the case where records are mailed to you. It is the goal to have the letter posted to the Office of Public Engagement’s website within one business day following the applicable period of time. Please note that requests for personal information will not be posted online.

If you have any further questions, please feel free to contact the undersigned by telephone at 709-729-1841 or by e-mail at brianevans@gov.nl.ca.

Sincerely,

[Signature]

Claudette Hillier

Brian Evans
Director of Information Management & Special Projects
ATIPP Coordinator

Attachment
February 18, 2015

Department of Transportation and Works
Design and Construction Division
5th Floor, Confederation Building, West Block
St. John’s, NL A1B 4J6

Attention: Mr. Steven Forward,
Manager of Facility Planning and Architecture

Snow Load Changes in NBCC – Schools, Argentia Area

Dear Mr. Forward,

Enclosed is the report for Snow Load Changes in NBCC for schools in the Argentia area.

We trust the foregoing meets your current needs. If you have any questions, please feel free to contact us at (709) 754-2374 at your convenience.

Yours sincerely,

DILLON CONSULTING LIMITED

Krista Hancock, P. Eng.

KJH:jb
Enclosure

Our file: 14-9954-4000
Snow Load Changes in NBCC
Schools, Argentia Area
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Executive Summary

In October 2013, Dillon Consulting Limited (Dillon) was retained to perform a review of the changes made to snow loads in the National Building Code of Canada. Based on this review, it was determined that the design snow loads for the Argentia and Gander areas of the province have increased by 64% and 50% respectively. Based on this information the Department of Transportation and Works (DTW) further retained Dillon to perform visual inspections and structural analysis of roof structures for government buildings in the Gander and Argentia areas to determine the full effect of the revision in load.

From October 22 – December 10, 2014, Dillon personnel performed site investigations of the schools in the Argentia area identified by DTW as having the highest priority for review. These schools are Roncalli Central High School, Whitbourne Academy, St. Anne’s Academy, Crescent Collegiate, Holy Family Elementary (Chapel Arm, NL), Woodland Elementary, and Acreman Elementary.

In all buildings, all roof members that were accessible and reviewed appeared to be in good condition with no visible signs of damage or deformation due to overloading.

Analysis was performed on the roof structures and it is recommended that roof members be reinforced in a number of the buildings, namely St. Anne’s Academy and Whitbourne Academy. No reinforcement is required for Roncalli Central High School, Crescent Collegiate, Holy Family Elementary, Woodland Elementary, and Acreman Elementary. Whitbourne Academy should take the highest priority and be reinforced as soon as possible. St. Anne’s Academy should be considered high priority and be reinforced within the next one to three years. Until reinforcement is complete, policies currently in place for snow removal and/or roof monitoring should continue.
1.0 Introduction

In October 2013, Dillon Consulting Limited (Dillon) was engaged by the Department of Transportation and Works (DTW) to carry out a Snow Load Study for the various communities throughout Newfoundland as listed in the National Building Code of Canada (NBCC). That report analyzed changes to the design data for snow for these communities between the years 1970 and 2010. Over this time period, some areas have seen a significant increase to the design data. Our analysis identified both Argentia and Gander as the areas of the province that have experienced the largest increases in design snow load as follows:

- Argentia: Specified snow load has increased 64% between 1970 and 2010.
- Gander: Specified snow load has increased 50% between 1970 and 2010.

Based on the results of the 2013 report, DTW and Department of Education (DOE) agreed the Argentia and Gander areas would be the starting locations for visual structural investigations and analysis of roof components of buildings in these areas that were constructed in the 1970-2010 time frame.

In August 2014, Dillon were engaged by DTW to perform inspections on selected buildings in the Argentia and Gander regions. A complete inventory of buildings to be inspected can be found in Appendix A.

The balance of this report presents the existing conditions, our findings, analysis of existing components, conclusions and recommendations.

2.0 Existing Conditions and Structural Analysis

2.1 General

Between October 22 and December 10, 2014, personnel from Dillon visited the schools in the Argentia area that were constructed prior to 2005 to perform visual inspections of the roof components. Schools that were part of the review included:

- Roncalli Central High School, Avondale
- Whitbourne Academy, Whitbourne
- St. Anne’s Academy, Dunville
- Crescent Collegiate, Blaketown
- Holy Family Elementary, Chapel Arm
- Woodland Elementary, Dildo
- Acreman Elementary, Green’s Harbour

While on site, Dillon personnel were accompanied by the maintenance supervisor or principal of each school. With the exception of Whitbourne Academy, the supervisors indicated there have been no reports of any problem with the roof systems. At Whitbourne Academy, the principal reported serious problems with roof leaks over the years. They also indicated that snow generally does not accumulate on the roofs of the buildings except in areas identified as snow drift zones.

Beams and joists were visually inspected in these areas by removing ceiling tiles where possible. In addition to confirming the as-built structural systems, the on-site inspection focused on the following items for each building:

- Deflection of structural members – any permanent deflection noted would suggest these members had been over-loaded.
Structural failure of a member – this would include web crippling, lateral deflection of top flange in beams, broken welds, broken/bent members in joists, warping/out of plumbness of joists and cracking in concrete or wood members.

After the site visits were performed, a structural analysis was carried out on the roof structures. The analysis was based on the design loads and safety factors as outlined in the NBCC 2010, with material strengths as specified on drawings where available, or using material strengths that were typical around the year of building construction, when data was not available.

For roof members identified as not having the capacity to support the full design loads identified in the NBCC 2010, further analysis was performed to determine the capacity of the member based on the original design loads. This analysis was performed for two reasons:

- It was performed to ensure the member was properly sized by the original designer.
- It was performed to find the reduction in overall safety factor

There are a number of reasons why it is possible that the roof members do not show any signs of overloading, but theoretically do not have the capacity to support the current design loads.

- It is likely the roof has never experienced a full snow load due to the windy conditions in the area.
- The roof acts as a system. When members start to yield, they deform until other members start to take the load.
- Any deformation the members have undergone is not permanent, so when there is no snow load, the member returns to its original shape.
- Wood and steel are robust materials whose overall strength is generally underestimated during design.

Based on the NBCC 2010, when the factored live and dead loads are combined, the average overall safety factor for an individual roof member in the Argentia area will be approximately 1.43.

2.2 Crescent Collegiate, Blaketown

2.2.1 Discussion

Drawings for the building were provided by DTW. These drawings can be found in Appendix ‘C’. Upon review of the drawings, it was determined that the original snow load used for design was 2.8 kPa. This is higher than the 2010 design snow load specified for the Argentia area of 2.62 kPa. Because the actual design snow load is higher, the original design meets the current National Building Code so no further structural analysis is required.

Based on this, there was no concern in regards to the existing conditions so no site visit was performed.
2.3 Holy Family Elementary, Chapel Arm

2.3.1 Existing Conditions

Personnel from Dillon visited the above-noted site on November 26, 2014 to perform a visual inspection of the various roof components.

The existing building was originally constructed in 1972 with extensions in 1976 and 2003. The building was constructed using open web steel joists supported on load bearing masonry walls. The building is one storey with an elevated roof over the gymnasium creating a snow shadow at the gymnasium wall. Refer to Photo No. 1, Appendix ‘B’, for the front elevation of the building.

From our observation of the roof structure throughout the building, there were no visible signs of overloading of structural members. Photos No. 2-5 show various members in good condition.

2.3.2 Structural Analysis and Discussion

Drawings were provided by DTW for only a portion of the school. The relevant drawing can be found in Appendix ‘C’. Due to the height of the gymnasium roof, we were unable to access the structure to determine members’ sizes so they were not included in the analysis. The roof members that could be accessed were measured and analyzed. It was found that the structure does have the capacity to support the loads as outlined by the NBCC 2010.

2.4 St. Anne’s Academy, Dunville

2.4.1 Existing Conditions

Personnel from Dillon visited the above-noted site on November 26, 2014 to perform a visual inspection of the various roof components.

The existing building was originally built in 1979 with an extension in 1994. The building was constructed using open web steel joists supported on load bearing masonry walls. The building is a two-storey structure with a one-storey canopy and mechanical room. Refer to Photo No. 6, Appendix ‘B’, for a front view of the building.

From our observation of the roof structure throughout the building, there were no visible signs of overloading of structural members. Photos No. 7-10 show various members in good condition.

2.4.2 Structural Analysis

No drawings were available for the original building. Drawings for the extension construction in 1994 were provided by DTW and can be found in Appendix ‘C’. Due to the height of the gymnasium room, we were unable to access the structure to determine member sizes. As well, due to finishes, the canopy structure could not be accessed. Because of this, the gymnasium roof and canopy structure were not included in the analysis.

The roof components were analyzed based on the loads outlined by the NBCC 2010. Based on our analysis we found the following:

- Joists over corridors have adequate capacity to support the current design loads.
• Joists over classrooms do not have adequate capacity to support the loads outlined in the NBCC 2010.

Further analysis based on 1970 snow loads showed all joists were designed with adequate capacity to support original design loads.

### 2.4.3 Discussion

Based on our analysis, the reduction in safety factor for the joists over the classrooms is as follows:

- Safety factor was reduced from 1.45 to 1.01.

### 2.5 Whitbourne Academy, Whitbourne

#### 2.5.1 Existing Conditions

Personnel from Dillon visited the above-noted site on December 10, 2014 to perform a visual inspection of the various roof components.

The existing building was originally constructed in 1968 with an extension in 1976. The original building was constructed using wood frame while the extension was constructed using open web steel joists supported on wood load bearing walls. The building is a one-storey structure with an elevated roof at the gymnasium creating a snow shadow on a portion of the building. Refer to Photo No. 11, Appendix ‘B’, for a front view of the building.

From our observation of the roof structure throughout the building, there were no visible signs of overloading of structural members. One thing that was noted during the visual inspection was the original wood structural had skylights. Photos No. 12-16 show various roof members in good condition. Photo No. 17 shows one of the skylight found in the roof of the original building. While there was no visible signs of overloading, the principal did note that they have had serious issues over the years with leaks in the roof. This may be related to the presence of skylight in the roof.

#### 2.5.2 Structural Analysis

The only drawings available for the building were for some repairs performed on a steel joist. These drawings can be found in Appendix ‘C’. Due to the height of the gymnasium roof, we were unable to access the structure to determine the member sizes. As well, due to the ceiling finishes, we were not able to determine the sizes of the joists supported by the glulam beams. For these reasons the joists in the gymnasium and joists supported by glulam beams in the original building were not included in the analysis.

The original wood frame construction and open web steel joists were analyzed based on the snow loads outlined in the NBCC 2010 with the following results:

- The wood purlins in the original construction as well as the glulam beams have adequate capacity to support the snow loads.
- The beams supporting the purlins over the corridors in the original building do not have adequate capacity.
- The glulam beams in the drift load area do not have adequate capacity.
- The open web steel joists over the corridor in the extension are adequate.
• The open web steel joists over the classrooms in the extension cannot support the NBCC 2010 snow loads.

The roof members were further analyzed using 1970 snow loads. Based on this analysis, all members have the capacity to support the original design snow loads, except the glulam beams in the drift load area.

2.5.3 Discussion

Based on our analysis, the safety factor for the areas of concern have been reduced as follows:

• For the beams supporting the wood purlins over the corridor in the original construction, the safety factor was reduced from 1.4 to a safety factor of less than 1.0.
• For the glulam beams in drift area, the safety factor was reduced from 1.1 to a safety factor less than 1.0.
• For the open web steel joists over the classrooms in the extension, the safety factor was reduced from 1.72 to 1.24.

2.6 Acreman Elementary, Green’s Harbour

2.6.1 Discussion

Personnel from Dillon visited the above-noted site on December 2, 2014 to perform a visual inspection of the various roof components.

During the visit it was determined that a new wood truss structure was constructed on top of the existing roof structure approximately ten years ago. DTW and DOE were unable to produce drawings for the new or existing structures and Dillon was unable to gain access so no visual inspection or analysis could be performed. The principal noted that to her knowledge, there have been no issues with the roof.

2.7 Roncalli Central High School, Avondale

2.7.1 Existing Conditions

Personnel from Dillon visited the above-noted site on December 2, 2014 to perform a visual inspection of the various roof components.

The existing building was originally constructed in 1968 with an extension in 1992. The original building was constructed using wood purlins and joists supported by steel beams. The extension was constructed using open web steel joists supported on load bearing masonry walls. The original construction was a three-storey building. The extension is a one-storey structure connected to the original building via a wood framed pedestrian bridge. As part of the extension, an additional storey was built on top of the existing gymnasium. Refer to Photos No. 18 and 19 for a front view of the building. Photo No. 20 shows a view of the pedestrian bridge and the front view of the extension.

From our observation of the roof structure throughout the building, there were no visible signs of overloading of structural members. Photos No. 21-27 show various members in good condition.
2.7.2 Structural Analysis and Discussion

No drawings were available for the building. During the visual inspection, roof members were measured. These measurements were used as the basis of our analysis. It was found that all roof members have the capacity to support the snow loads as outlined by the NBCC 2010. Considering the building’s proximity to other climatic zones such as Bell Island, it is possible the original building designer used climatic data from another area.

2.8 Woodland Elementary, Dildo

2.8.1 Existing Conditions

Personnel from Dillon visited the above-noted site on October 22, 2014 and again on December 10, 2014 to perform a visual inspection and measure various roof components.

The original building was constructed in 1961 with extensions in 1972 and 1987. The original building was constructed using wood trusses supported by wood stud walls. The extensions were constructed using open web steel joists supported by wood load bearing walls. The building is a one-storey structure. The extensions are flat roof while the original building was a peaked roof causing a snow shadow between the original and the first extension. As well, the roof elevation was different for the different extensions with the gymnasium creating snow shadows where the different roofs meet. Refer to Photo No. 28 for a front view of the building.

From our observation of the roof structure throughout the building, there were no visible signs of overloading of structural members. Photos No. 29-32 show various members in good condition.

2.8.2 Structural Analysis and Discussion

No drawings were available for the original building. Drawings for the extensions were provided by DTW as seen in Appendix ‘C’. We were unable to determine the truss components for the wooden trusses of the original building due to lack of accessibility. As well, we were unable to gain access to the joists over the gymnasium due to the roof height. For these reasons, the original roof structure and gymnasium were not included in our analysis.

On the drawings received from DTW, there was no information on the actual open web steel joists used. Therefore the joists were measured during the visual inspection and analyzed. It was found that the structure does have the capacity to support the loads as outlined by the NBCC 2010.

3.0 Conclusions and Recommendations

3.1 General

All of the schools that were part of this review were located in towns surrounding Argentia, not in Argentia itself. When a building is constructed in an area that does not have specified climatic data in the National Building Code, it is left to the designers’ discretion what load should be used. Some of the other towns close to Argentia that have climatic data have specified snow loads that are larger (e.g. Bell Island, St. John’s, etc.). It would appear that for some of the schools that were part of this review, larger snow loads from centres other than Argentia may have been used.
Based on our analysis for the roof components that were reviewed, the following schools have no issues and have the capacity to adequately support the full loads outlined in the NBCC 2010.

- Crescent Collegiate, Blaketown
- Holy Family Elementary, Chapel Arm
- Roncalli Central High School, Avondale
- Woodland Elementary, Dildo

In Holy Family Elementary and Woodland Elementary, there are a number of areas that were inaccessible during the site investigations. Based on the condition of the remainder of the buildings’ roofs, there is no further action pending discussion with DTW and DOE. The following sections outline the specifics for each building.

### 3.2 Acreman Elementary, Green’s Harbour

Due to lack of access, the capacity of this roof could not be verified. According to the principal and maintenance staff, the new roof was constructed in the last ten years. This new roof is a peaked roof (Photo No. 33) and the trusses likely span from load bearing wall to load bearing wall. Being so recently designed and constructed, current loads were likely used. Since the snow shadow area is not a concern, we conclude that no further action is required.

### 3.3 St. Anne’s Academy, Dunville

Based on the reduction in safety factor, we recommend reinforcing the open web steel joists over the classrooms.

We also recommend further assessment of the canopy and gymnasium once access is provided.

### 3.4 Whitbourne Academy, Whitbourne

Based on our analysis, we have the following recommendations:

- We recommend reinforcement of all beams and joists in the snow shadow area.
- We recommend reinforcing the wood beams in the corridor of the original building.
- We recommend reinforcing open web steel joists over the classrooms in the extensions.
- We recommend closing in the existing skylights. The skylights have a high potential for leakage and have been covered in by a T-bar ceiling.
- Once access has been provided, the gymnasium joists and wood joists supported by the glulam beams should be assessed.
Appendix A

Inventory of Buildings Inspected
In October 2013 a review of revisions to snow load design requirements was performed by Dillon Consulting Limited. Based on this report, the Department of Transportation and Works decided to perform a review of the roof structures of government buildings in the Gander and Argentia areas to determine the effect the revised snow load has on the overall capacities of existing roof structures. The following is a list of buildings that were reviewed and analyzed under this phase of the work.

- **Gander Area**
  - Gander Academy, Gander, NL
  - Gander Collegiate, Gander, NL
  - St. Paul’s Intermediate School, Gander, NL
  - Arts and Culture Centre, Gander, NL
  - College of the North Atlantic, Gander Campus, Gander, NL
  - Gander Courthouse, Gander, NL
  - Natural Resources Building, Gander, NL
  - Forest Protection Centre, Gander, NL
  - Hanger 21, Gander, NL

- **Placentia Area**
  - College of the North Atlantic, Placentia Campus, Placentia, NL
  - St. Bride’s Clinic, St. Bride’s, NL
  - Visitors Centre, Salmonier Nature Park, Salmonier, NL
  - Young Offender’s Institute Cottage, Whitbourne, NL
  - Cape St. Mary’s Interpretation Centre, Cape St. Mary’s, NL
  - Roncalli Central High School, Avondale, NL
  - Holy Family Elementary, Chapel Arm, NL
  - Woodland Elementary, Dildo, NL
  - St. Anne’s Academy, Dunville, NL
  - Whitbourne Academy, Whitbourne, NL
  - Crescent Collegiate, Blaketown, NL
Appendix B

Photographs
Photo No. 1 – Holy Family Elementary – Front Elevation

Photo No. 2 – Holy Family Elementary - Long Span Joists Over Gymnasium
Photo No. 3 – Holy Family Elementary – Typical Open Web Steel Joists at Gymnasium Wall

Photo No. 4 – Holy Family Elementary – Typical Open Web Steel Joists
Photo No. 5 – Holy Family Elementary – Steel Beam Supporting Open Web Steel Joists over Hallway

Photo No. 6 – St. Anne’s Academy – Front View of Building
Photo No. 7 – St. Anne's Academy – Long Span Open Web Steel Joists over Gymnasium

Photo No. 8 – St. Anne’s Academy – Typical Open Web Steel Joists over Classrooms
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Photo No. 9 – St. Anne’s Academy - Typical Open Web Steel Joists over Classrooms

Photo No. 10 – St. Anne’s Academy - Typical Open Web Steel Joists over Corridor
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Photo No. 11 – Whitbourne Academy – Front View of Building

Photo No. 12 – Whitbourne Academy – Long Span Open Web Steel Joists Over Gymnasium
Photo No. 13 - Whitbourne Academy – Glulam Beams over Classrooms in Original Construction

Photo No. 14 – Whitbourne Academy – Sawn Timber Joists and Beams over Corridor in Original Construction
Photo No. 15 – Whitbourne Academy – Typical Open Web Steel Joist in Extension

Photo No. 16 – Whitbourne Academy – Typical Open Web Steel Joist in Extension
Photo No. 17 – Whitbourne Academy – Skylight in Roof of Original Building

Photo No. 18 – Roncalli Central High – Front View of Building
Photo No. 19 – Roncalli Central High – Front View of Building

Photo No. 20 – Roncalli Central High – Pedestrian Bridge and Front View of Extension
Photo No. 21 – Roncalli Central High – Typical Wood Purlins over Corridor

Photo No. 22 – Roncalli Central High – Wood Purlins at Steel Beam over Classrooms
Photo No. 23 – Roncalli Central High – Typical Wood Purlins over Classrooms

Photo No. 24 – Roncalli Central High – Open Web Steel Joists over Gymnasium Extension
Photo No. 25 – Roncalli Central High – Wood Purlins in Roof over Pedestrian Bridge

Photo No. 26 – Roncalli Central High – Open Web Steel Joists over Corridor in Extension
Photo No. 27 - Roncalli Central High – Open Web Steel Joists over Classrooms in Extension

Photo No. 28 – Woodland Elementary – Front View of Building
Photo No. 29 – Woodland Elementary – Long Span Robb Joists over Gymnasium

Photo No. 30 – Woodland Elementary – Robb Open Web Steel Joists in First Extension
Photo No. 31 – Woodland Elementary – Robb Open Web Steel Joists in First Extension

Photo No. 32 – Woodland Elementary – Open Web Steel Joists in Second Extension
Photo No. 33 – Acreman Elementary – Front View of Building
CRESCENT COLLEGIATE, BLAKETOWN
STRUCTURAL CONNECTION SHOP DRAWINGS
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SS- 5 OF 8
SS- 6 OF 8
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DRAWING NO. SC01 OF 1
WHITBOURNE ACADEMY, WHITBOURNE
DRAWING NO. S1
DRAWING NO. S2
DRAWING NO. SD1
DRAWING NO. SD2
DRAWING NO. SD3