



Assembly of First Nations First Nations Education Infrastructure Operation and Maintenance Needs Assessment

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Introduction

Ensuring schools and teacherages are safe and reach their maximum lifecycle potential is critical for First Nations who expect to provide healthy learning environments and living standards to their staff and students. The historical funding approach regarding operations and maintenance (O&M) from Indigenous Services Canada (ISC) and the current provincial interim funding formula approach has proven inadequate and unable to meet these objectives for First Nations schools and teacherages. To accurately estimate annual O&M funding requirements for maintaining First Nations schools and teacherages, the Assembly of First Nations (AFN) retained First Nations Engineering Services Ltd (FNESL) to conduct quantitative analysis on existing asset information and new field research to produce the *First Nations Education Infrastructure Operations and Maintenance Needs Assessment*.

This assessment considers and collects unit costs for various O&M components including repair and maintenance, preventative maintenance, general facility maintenance, heating, electricity and insurance. Further costing information is obtained from data supplied by three remote First Nations participants and contractor/supplier quotes for general maintenance costs. This analysis provides the basis for an O&M zone multiplier review and an annual O&M cost estimate for First Nations schools and teacherages. Additionally, the assessment provides a summary of existing provincial O&M formulas and a funding comparison that highlights the gaps First Nations face in some regions.

The mandate to conduct this research and to improve First Nations O&M funding in schools and teacherages is supported by the AFN Resolution 34/2019, *First Nations Education Infrastructure Review*, which supports policy and program changes that align with First Nations control of education. Furthermore, this resolution provides support to ensure that 100% of real costs are provided for O&M in First Nations education infrastructure.

Existing Assets

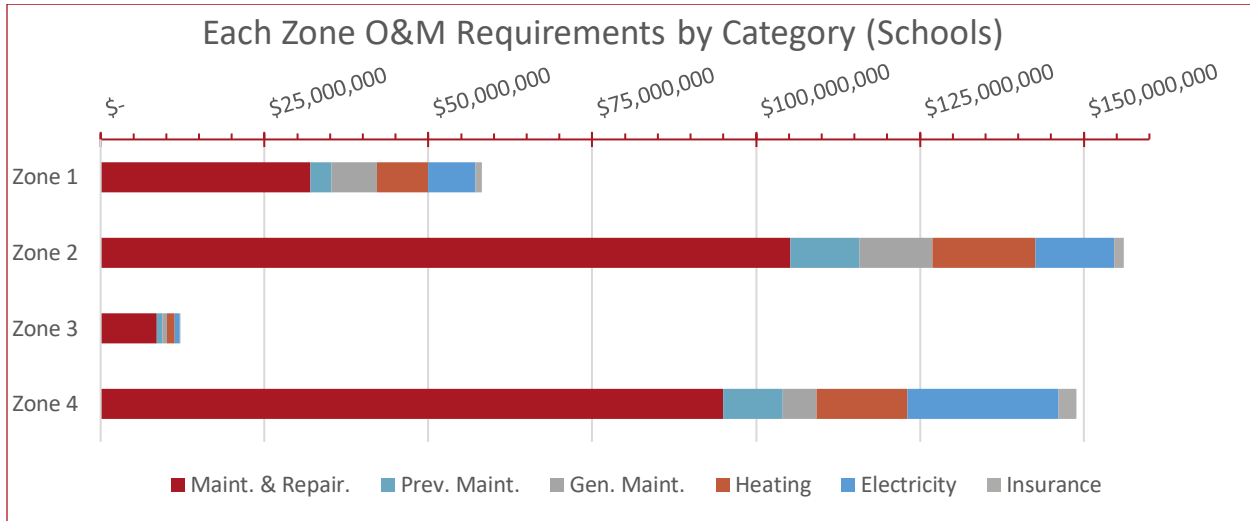
There are currently 391 existing schools and 1026 existing teacherages analyzed in this study. The average construction year for schools is 1994, with the oldest school constructed in 1925 and the newest built in 2019. The majority were constructed between 1985 and 2003. The average construction year for teacherages is 1996, with the oldest built in 1963 and the newest built in 2019. The majority of teacherages were constructed between 1989 and 2004. On average, on-reserve First Nations schools were given a General Condition Rating (GCR) of 6.47 out of 10 on the last ACRS inspection. For teacherages, the average GCR was 6.29. Of the 391 existing schools, 47 schools also have portables.

Schools Operation & Maintenance Needs

An Operation & Maintenance cost estimate was developed for school facilities using RSMeans standard estimates for Maintenance & Repairs and Preventative Maintenance (RSMeans data is the industry-standard materials, labour, and equipment cost information database.). Remoteness adjustment factors were developed and validated using supplier estimates for maintenance work in Zone 4 schools. Zones 2 and 3 were validated using costs from past projects and adjusted for inflation. Historical school expense records were used to estimate general maintenance, heat, electricity, and insurance. These sources were used to develop a per-square metre model to extend the cost estimate to all 391 schools included in this study.



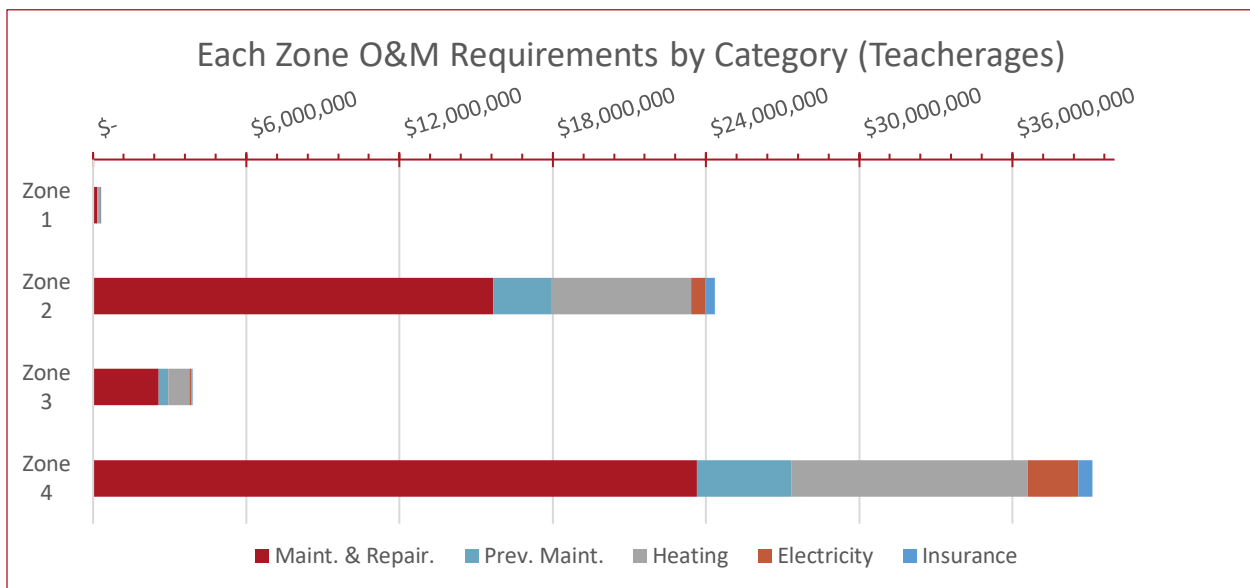
The total annual O&M requirements for all 391 schools was estimated to be \$ 375,204,786.



Teacherages O&M Needs

An annual O&M cost estimate was developed for on reserve First Nations teacherages across Canada using a similar model to the one used to estimate school O&M costs. There are a few notable exceptions that include adjustments to preventative maintenance and insurance costs to estimate annual O&M requirements for these facilities.

The total O&M requirements for all 1026 teacherages was estimated to be \$ 67,705,872. Teacherages were not included in the provincial funding estimates calculated in this study.





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1.0 Introduction

1.1 Assembly of First Nations

The Assembly of First Nations (AFN) is a national advocacy organization representing the 634 First Nation communities in Canada. The role of the National Chief and the AFN is to advocate on behalf of First Nations as directed by First Nations-in-Assembly, including facilitating and coordinating national and regional discussions and dialogue, advocacy efforts and campaigns, legal and policy analysis, and communicating with governments [1]. The AFN is dedicated to advancing the aspirations and priorities of First Nations through study, response, and advocacy on a range of policy matters [2].

1.2 Study Scope

In July 2019, First Nations-in-Assembly resolved to support Resolution 2019-34, *First Nations Education Infrastructure Review*, which supports policy or program changes to First Nations education infrastructure. Furthermore, the Resolution indicates that this review would be led by the AFN, the Chiefs Committee on Education (CCOE) and the National Indian Education Council (NIEC).

To support the CCOE and the NIEC in this review, First Nations Engineering Services Ltd. (FNESL) was retained to complete a National First Nations Education Infrastructure Capital Needs Assessment. This project provided essential research to equip the AFN, CCOE, NIEC and other stakeholders in identifying existing and anticipated education infrastructure needs on-reserve across Canada. This original Education Infrastructure Capital Needs Assessment was based on the 2016 School Space Accommodation Standards (SSAS). It was subsequently updated in 2021 to reflect the new 2021 SSAS and the Level of Service Standards and Management of Teacherages on Reserve.

FNESL was retained again to complete this *First Nations Education Infrastructure O&M Needs Assessment* to ensure education infrastructure on-reserve across Canada is safe and appropriately funded to meet its design life, and to build on the Capital Needs Assessment previously completed. This objective is completed through several analyses, including:

- detailed O&M costing for three remote schools
- annual O&M costing of all (approx. 391) schools on reserve in Canada
- annual O&M costing of all (approx. 1026) teacherages on reserve in Canada; and
- a review of current First Nations O&M funding compared to provincial O&M funding.

Additionally, this assessment will provide insight into realistic O&M needs for First Nations schools and teacherages that can be used or referenced when negotiating or completing a Regional Education Agreement (REA). REAs continue to provide First Nations with the ability to formalize K-12 funding that support regional and local needs which should include accurate and needs-based O&M funding for education facilities.

This project consists of a review of existing documentation, historical O&M information, and collection of supplier cost estimate information to determine the ongoing annual infrastructure O&M needs for schools and teacherages in First Nations across the country. These needs will be based on revised remoteness multipliers for zone 2, 3, and 4 communities developed based on the actual cost



information collection for a selection of sample schools. A discussion will also be made regarding current on-reserve O&M funding compared to provincial O&M funding models.

1.3 Existing Schools

As per Assembly of First Nations records and tracking, there are approximately 524 schools on reserves in Canada. However, for the Capital Needs Assessment study, Indigenous Services Canada (ISC) compiled and shared data for First Nations on-reserve school facilities which excluded federal schools, private schools, schools in self-governing First Nations communities, and schools whose education programming is delivered by the province. With these exclusions, 391 schools remain, which were assessed for the Capital Needs Assessment study. Of these, nine have a nominal roll of zero listed, and are therefore assumed to not be in operation. These same 391 schools will be assessed for this O&M Needs Assessment study.

1.4 Existing Teacherages

Based on the anonymized data provided by Indigenous Services Canada (ISC) for the Capital Needs Assessment study, there are 1026 teacherages on reserve in Canada. Some First Nations have only one teacherage, and one has as many as 52 teacherages. These same 1026 teacherages will be assessed for this O&M Needs Assessment study.



2.0 Data Collection

2.1 Sources of Information

Various sources of information were used in preparation of this report. The following documents were provided by Assembly of First Nations for review:

1. Integrated Capital Management System (ICMS) and Nominal Roll Information Summary, compiled by ISC for all First Nations in Canada (including data from Asset Condition Reporting System (ACRS) inspections)
2. British Columbia's Operating Grants Manual 2020/21
3. Alberta's Funding Manual for School Authorities 2020/2021 School Year
4. Saskatchewan's 2020-21 Funding Manual, Prekindergarten to Grade 12 Funding Distribution Model
5. Manitoba's Funding of Schools 2020/2021 School Year
6. Ontario's Education Funding Technical Paper 2020-21
7. Quebec's Centres De Services Scolaires Et Commissions Scolaires, Regles Budgetaires de Fonctionnement Pour Les Annes Scolaires 2018-2019 à 2020-2021
8. New Brunswick First Nations 2017-2018 K-12 Funding Model Overview

Other significant sources of information accessed for this study include:

1. Construction drawings for three schools in remote First Nations communities
2. Budget information for three schools in remote First Nations communities

2.1.1 Data Collection and Compilation

The following information was accessed from the various data sources outlined above.

- | | |
|------------------|--|
| School Size | - The gross floor area of each school operated by First Nations |
| Building Systems | - Building system details of three schools as shown in as-built drawings (such as exterior closure, roofing, interior construction, plumbing, HVAC, fire protection, electrical, etc.) |
| O&M Budgets | - O&M budgets provided to three schools operated by First Nations for three recent fiscal year periods, or for the duration the information has been available if less than three years. |



3.0 Summary of Existing Assets

3.1 Schools

Based on a review of asset and nominal roll data supplied by ISC, there are 391 First Nations schools on reserves throughout Canada which together currently accommodate 68,737 students. The dataset contains nominal roll information from 2019 and does not capture all First Nations students due to the inefficient methods used to collect nominal roll data in First Nations schools. Further to these limitations, this dataset excludes all federal and private schools, as well as schools in self-governing First Nations communities, and schools whose education programming is delivered by the province.

These schools can be categorized according to the four zones which indicate the remoteness of the community in relation to the distance from the nearest service center. The nearest service center is defined as the nearest community where a First Nations school can access government services, banks, and suppliers. Using the above definition of a service center, First Nations schools are classified geographically into the following zones:

- Zone 1 is when the First Nation is located within 50 km of the nearest service center with year-round road access.
- Zone 2 is when the First Nation is located between 50 and 350 km from the nearest service center with year-round road access.
- Zone 3 is when the First Nation is located further than 350 km from the nearest service center with year-round road access.
- Zone 4 is when the First Nation has no year-round road access to a service center and, as a result, experiences a higher cost of transportation, administration, supplies, O&M, etc.

Of the school assets in the database prepared by ISC, there are 114 First Nations schools located in Zone 1, 183 in Zone 2, 11 in Zone 3, and 83 in Zone 4. This information is presented in Figure 3.1 below.

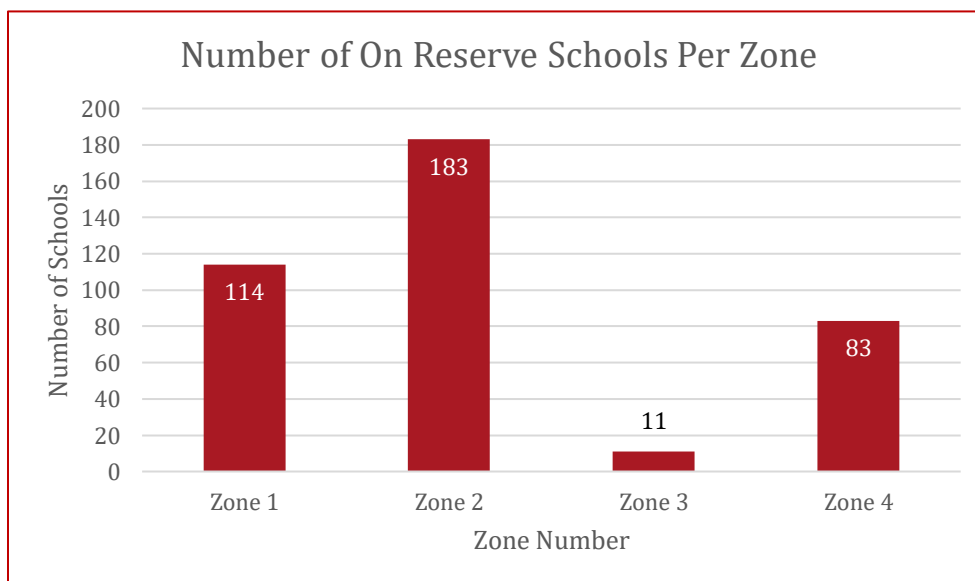




Figure 3.1: Number of Existing on Reserve Schools per Zone

The overall average number of students per First Nations school is 176. This average varies from zone to zone, as follows:

- Zone 1 schools have, on average, 135 students per school
- Zone 2 schools have, on average, 183 students per school
- Zone 3 schools have, on average, 160 students per school
- Zone 4 schools have, on average, 221 students per school

As can be observed from the statistics above, Zone 1 has the lowest average number of students per school, while Zone 4 has the greatest average number of students per school. This information is also summarized in Figure 3.2 below.

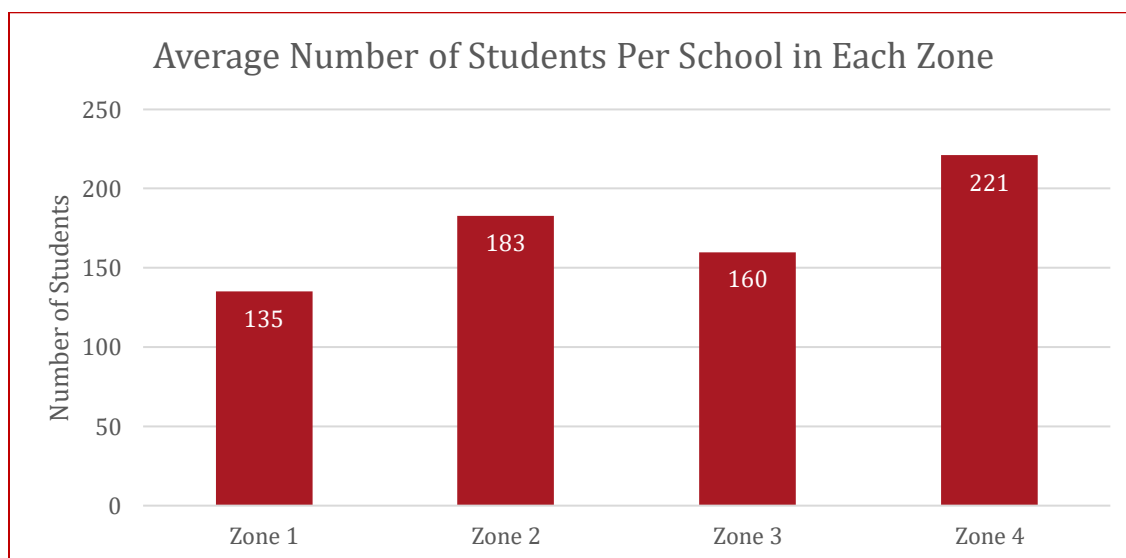


Figure 3.2: Average Number of Students Per School in Each Zone

Of the 391 schools included in this study, 47 schools have portables, with an average of 1.96 portables (per school with one or more portable). On average, portables are approximately 14 years old, as the average construction year of portable education structures is 2006. The average General Condition Rating (GCR) of portables accordingly to the latest Asset Condition Reporting System (ACRS) inspection is 6.53. The average O&M rating for the portable assets was Fair. Seven of the portables on reserves in Canada are understood to be currently used as the main building for the school (as evidenced by the subcategory which denotes them as 'PORTABLEMain Building').

The average year of construction of on reserve First Nations schools was found to be 1994. The average year of construction in Zone 1 for First Nations schools is 1993, Zone 2 is 1995, Zone 3 is 1995, and Zone 4 is 1996. On average, the schools that are in Zone 1 have the oldest average construction year, and the schools that are in Zone 4 have the newest average construction year. The distribution of school age is the widest in Zone 2, while Zone 3 has the narrowest distribution.



According to the most recent ACRS inspection information, the average estimated remaining life of all schools is 23.7 years. In Zone 1, the average estimated life remaining is 23.6 years, in Zone 2 it is 22.4 years, Zone 3 it is 29.5 years, and in Zone 4 it is 25.9 years. The school buildings in Zone 2 have the least average estimated life remaining, while the schools in Zone 3 have the most average estimated life remaining.

The overall average GCR for on reserve schools in all zones was determined to be 6.47 (which correlates to a “Fair” rating). Each of the four zones also independently had an average school GCR rating of “Fair”, as follows:

- Zone 1 schools had an average GCR of 6.61
- Zone 2 schools had an average GCR of 6.41
- Zone 3 schools had an average GCR of 6.82
- Zone 4 schools had an average GCR of 6.36

As reported in ACRS inspection reports, the most frequent GCR rating in Zone 1 (the mode) is a value of seven which occurred 31 times out of 114 schools. The most frequent GCR rating in Zone 2 is a value of seven which occurred 49 times out of 183 schools. The most frequent GCR rating in Zone 3 is a value of seven which occurred four times out of 11 schools. Lastly, the most frequent GCR rating in Zone 4 is also a value of seven which occurred 28 times out of 83 schools. This information is depicted in Figure 3.3 below.

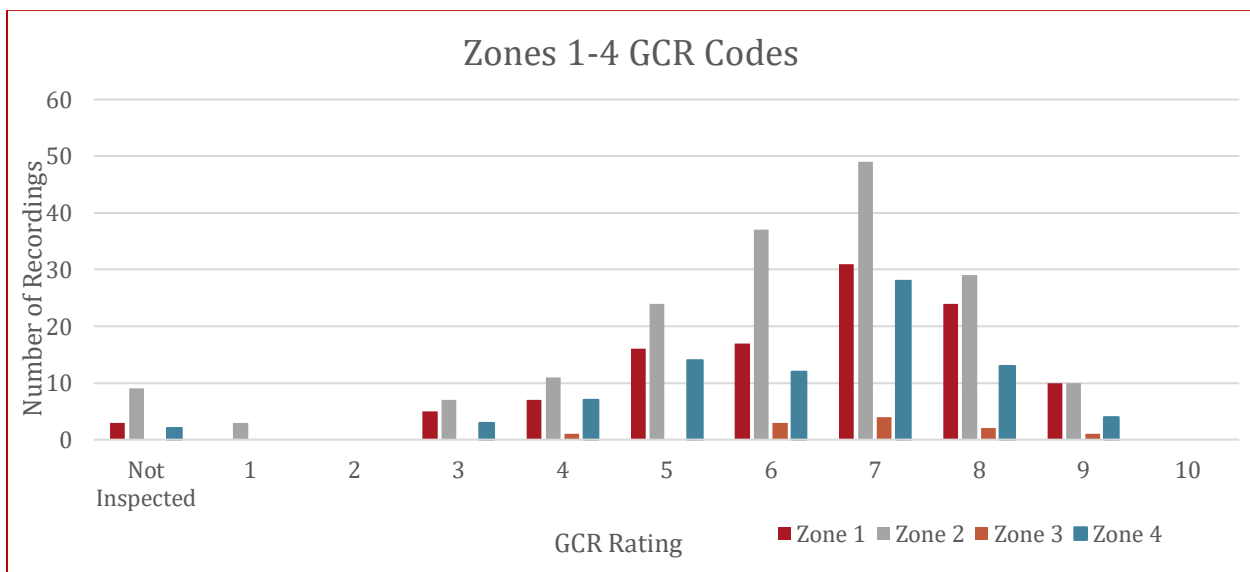


Figure 3.3: General Condition Rating for Schools per Zone

Most school assets also included a rating of how well Operations & Maintenance activities were performed. Of all 391 schools, 2 were not inspected, 51 received an O&M rating of Poor, 222 received an O&M rating of Fair, and 71 received an O&M rating of Good. Additionally, 45 schools did not have any O&M rating or code reported. In all zones the most common rating for O&M was found to be Fair. This information is depicted in Figure 3.4 below.

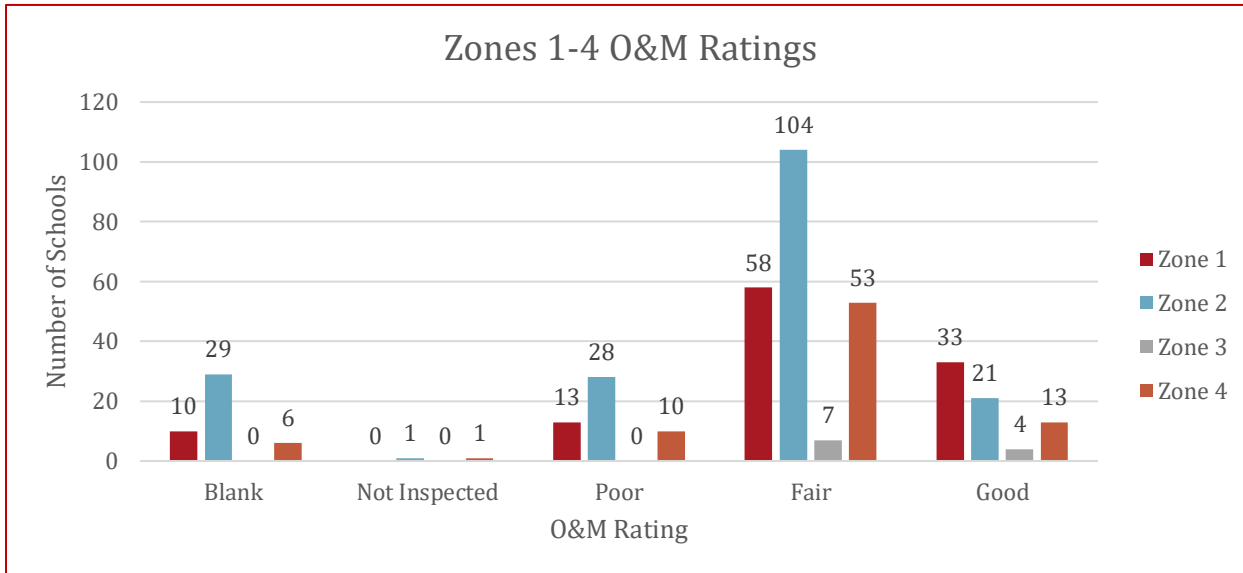


Figure 3.4: Operations & Maintenance (O&M) Rating for Schools per Zone

3.2 Teacherages

Based on a review of asset and nominal roll data supplied by ISC, there are 1026 First Nations teacherages on 135 reserves throughout Canada which together accommodate teachers for a combined student body of 35,357 students. These teacherages can also be categorized according to the four zones which indicate the remoteness of the community in relation to the distance from the nearest service center. Of the teacherage assets in the database prepared by ISC, there are two Zone 1 communities that have teacherages, 62 Zone 2 communities that have teacherages, eight Zone 3 communities that have teacherages, and 63 Zone 4 communities that have teacherages. There are 15 teacherages in Zone 1, 477 teacherages in Zone 2, 48 teacherages in Zone 3, and 486 teacherages in Zone 4. This information is presented in Figure 3.5 and 3.6 below.

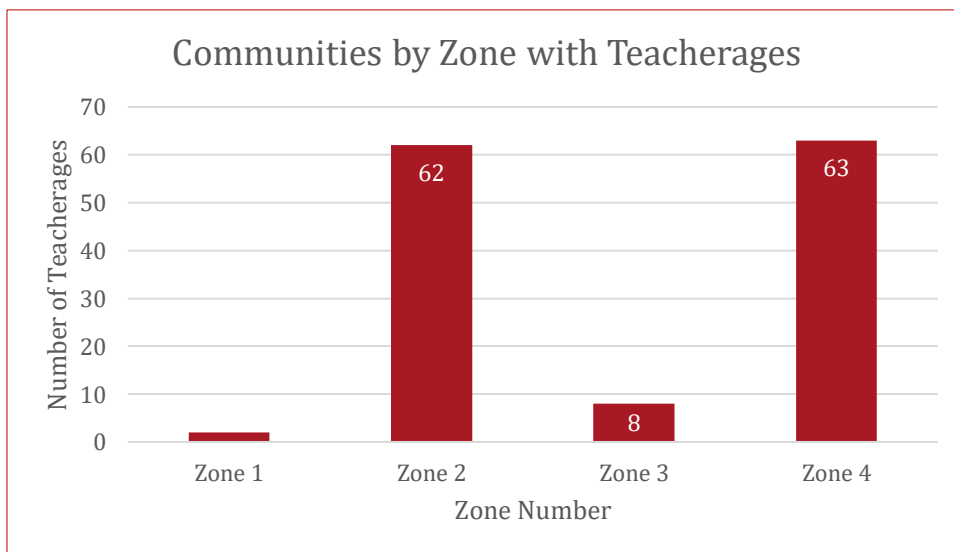




Figure 3.5: Number of Communities with Teacherages per Zone

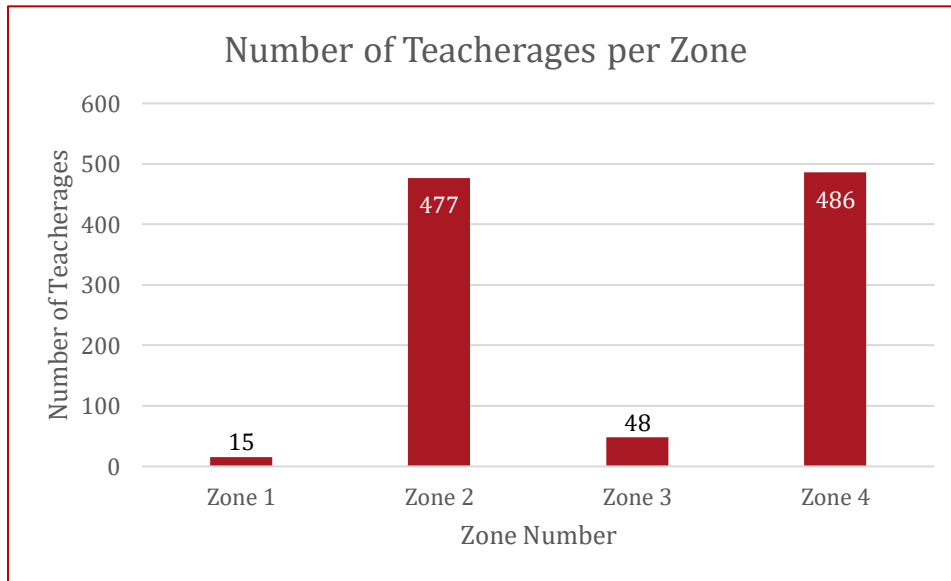


Figure 3.6: Number of Teacherages per Zone

The average number of students in a community per teacherage is 35. This average varies from zone to zone, as follows:

- Zone 1 has an average of 39 students per teacherage
- Zone 2 has an average of 38 students per teacherage
- Zone 3 has an average of 28 students per teacherage
- Zone 4 has an average of 32 students per teacherage

As can be observed from the statistics above, Zone 3 has the lowest average number of students per teacherage, while Zone 1 has the greatest average number of students per teacherage. This information is also summarized in Figure 3.7 below.

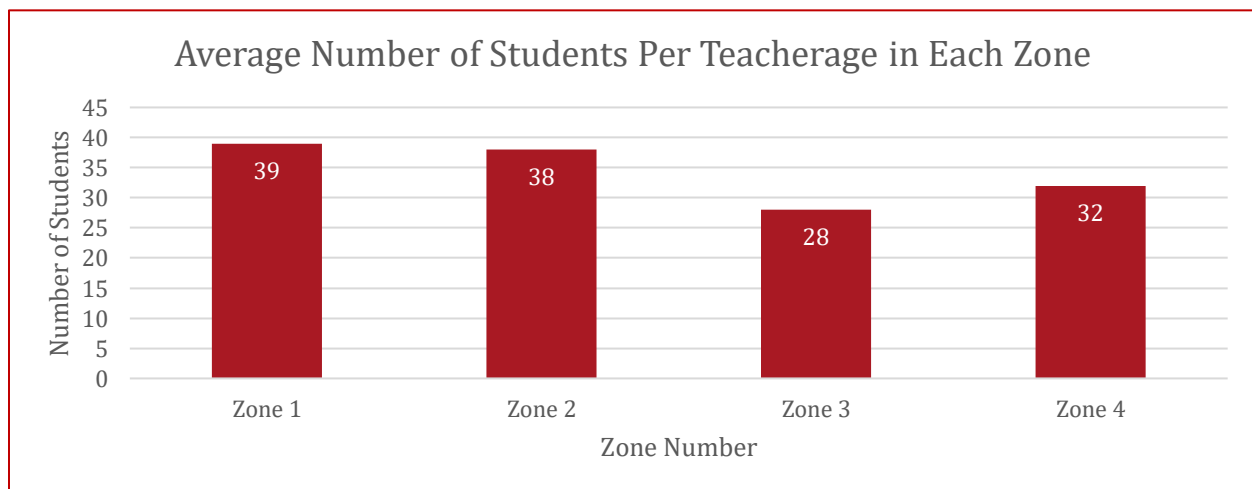




Figure 3.7: Average Number of Students Per Teacherage in Each Zone

The average year of construction of First Nations teacherages was found to be 1996. The average year of construction in Zone 1 for First Nations teacherages is 1996, Zone 2 is 1997, Zone 3 is 1999, and Zone 4 is 1995. On average, the teacherages that are in Zone 4 have the oldest construction year, and the teacherages that are in Zone 3 have the newest construction year.

According to the latest ACRS inspection data, the overall average estimated remaining life of all teacherages is 20.7 years. In Zone 1, the average estimated life remaining is 21.3 years, in Zone 2 it is 20.6 years, Zone 3 it is 23.2 years, and in Zone 4 it is 20.3 years. The teacherage buildings in Zones 2 and 4 have the lowest average estimated life remaining, while the teacherages in Zone 3 have the highest average estimated life remaining.

Based on the data supplied by ISC, the overall average GCR (General Condition Rating) for on reserve teacherages in all zones was determined to be 6.29 (which correlates to a “Fair” rating). Each of the four zones also had an average GCR rating of “Fair”, as follows:

- Zone 1 teacherages had an average GCR of 6.07
- Zone 2 teacherages had an average GCR of 6.39
- Zone 3 teacherages had an average GCR of 6.76
- Zone 4 teacherages had an average GCR of 6.19

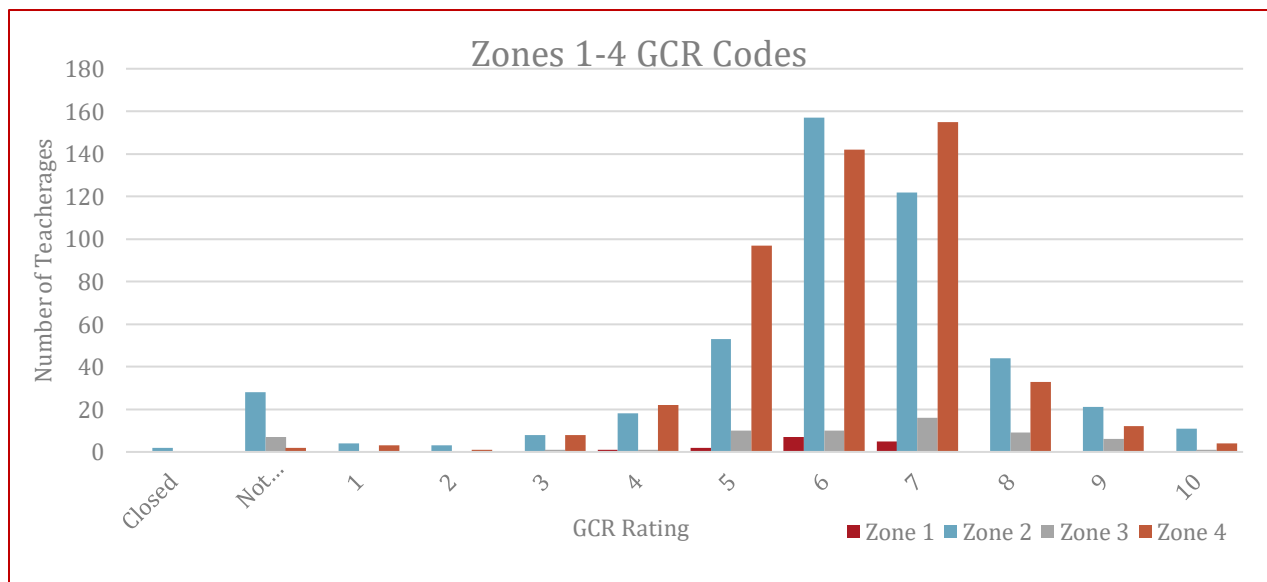


Figure 3.3: Operations & Maintenance (O&M) Rating for Teacherages per Zone

The mode of both Zone 1 and Zone 2 GCR ratings is six. The mode for Zone 3 and Zone 4 GCR ratings is seven. This information is depicted in Figure 3.12.

Most teacherage assets also included a rating of how well Operations & Maintenance activities were performed. Of all 1026 teacherages, 17 were not inspected, four were indicated as being non-operational, 154 received an O&M rating of Poor, 671 received an O&M rating of Fair, and 37 received



an O&M rating of Good. Additionally, 143 teacherages did not have any O&M rating or code reported. In all zones the most common rating for O&M was found to be Fair. This information is depicted in Figure 3.13.

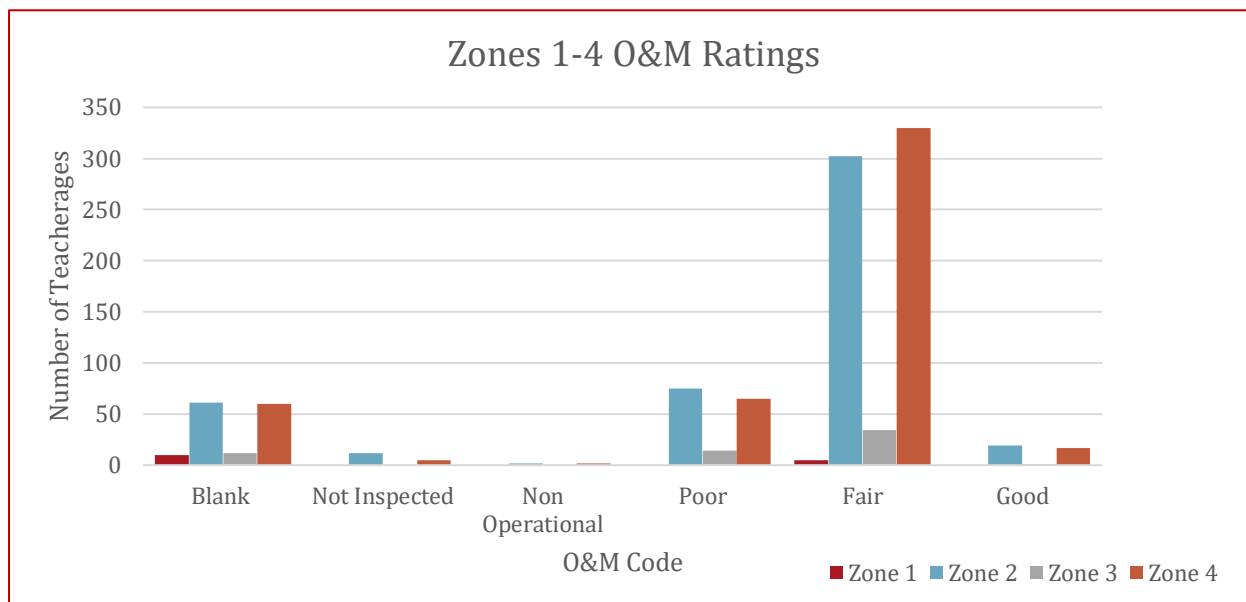


Figure 3.94: General Condition Rating for Teacherages per Zone



4.0 Methodology

To develop appropriate unit costs which may be applied for each educational facility for the purposes of this needs assessment, we have considered the following O&M components:

1. Repair & Maintenance
2. Preventative Maintenance
3. General Facility Maintenance
4. Heating
5. Electricity
6. Insurance

Each of these is described in further detail through Subsection 4.1.

RSMeans Data

In developing realistic O&M estimates, the strategy of zero-based budgeting was applied, and the Gordian 2021 Facilities Maintenance & Repair Costs with RSMeans data book was used as a reference. RSMeans data is the industry-standard materials, labour, and equipment cost information database. RSMeans engineers invest more than 22,000 hours in cost research annually to quantify building products and methodologies, adjust productivity rates, and adjust costs to market conditions. The result is a current and comprehensive cost database. The Facilities Maintenance & Repair Costs data set was designed as a reference for facility managers, owners, engineers, and contractors. The data set provides a framework and definitive data for developing a complete facilities maintenance program.

Our methodology for producing realistic O&M expense estimates using RSMeans data was previously tested and calibrated through an in-depth analysis of schools in an Ontario political-territorial organization's territory, and further refined for an O&M assessment of Northern (Zone 2) Ontario First Nations schools. School as-built drawings were used to identify and quantify building components, and RSMeans was used to determine the required maintenance and repair and preventative maintenance needs for each component.

Further analysis performed on three remote (Zone 4) schools was combined with learning from past O&M studies using to develop a per-square-metre unit cost. This unit-cost methodology was applied to all 391 schools across Canada that are included in this study. Zone adjustment factors, discussed below in Section 4.4, were applied to the per-square metre estimates to obtain a final annualized O&M cost estimate.

4.1 Cost Estimating Categories

4.1.1 Repair and Maintenance

The RSMeans data set provides a reference for time and materials requirements for maintenance and repair tasks, and data is included which validates line items in budgets. Section 1: Maintenance & Repair (M&R) of the RSMeans data set was used to develop this portion of the O&M estimate. Tasks included in M&R include common maintenance tasks performed at facilities, including removal and



replacement, repair and refinishing. Section 1 provides cost data and approximate frequencies of occurrence for each maintenance and repair tasks; the section is intended to be used to prepare estimates for deferred maintenance programs. The frequency indicates how often one should expect, and therefore estimate, that a task will have to be performed.

For each system that applied to the school being assessed, the UNIFORMAT II classification system line number was recorded, along with a system description, the frequency at which the operation should be budgeted for, and the unit of measure for that system. The unit rates for both total in-house costs and total costs including overhead and profits were noted. The number of units for that component were determined from a review of available documentation and total costs were calculated as follows:

$$\text{Approx. Annual Cost for System Component} = \left(\frac{1}{\text{frequency(years)}} \right) * \text{Unit Cost} * \text{No. Units}$$

As an example, exterior doors are assumed to be *Solid Core, Painted* fire safety rated exterior doors. From the Ontario school building drawings, 12 such doors are identified. The typical frequency of repainting such doors is four years. The RSMMeans database estimates a unit cost of \$80.50 for materials and labour to repaint one door. Thus, the approximate annual cost for the finish of the exterior doors is:

$$\text{Approx. Annual Cost for System Component} = \left(\frac{1}{4} \right) * \$80.50 * 12 = \$241.50$$

RSMMeans lists four elements to maintain under exterior doors for the Ontario school, including repairing the doors, estimated to be needed every 12 years at a unit cost of \$535.88 and full replacement of the doors every 40 years at a unit cost of \$1472.00 and \$1500.00 for doors without safety glass, and with safety glass windows, respectively.

This indicates a total annual cost for maintaining exterior doors of \$1225.98 for total ongoing maintenance of 12 *solid core, painted* exterior doors as calculated below:

$$\begin{aligned} \text{Approx. Annual Cost for System Component} \\ &= \left(\frac{1}{4} \right) * \$80.50 * 12 + \left(\frac{1}{12} \right) * \$535.88 * 12 + \left(\frac{1}{40} \right) * \$1472.00 * 2 + \left(\frac{1}{40} \right) * \$1500.00 * 10 \\ &= \$ 1225.98 \end{aligned}$$

The RSMMeans analysis outlined above was used to develop a model used in a previous study which estimated M&R costs for 44 schools in an Ontario-based political-territorial organization. This analysis was used to create a model to estimate M&R costs by school size in square metres and validated against Zone 1, 2 and 4 schools. The model was further validated using three Zone 2 schools that were assessed in a previous study, in addition to the three Zone 4 schools discussed in Section 4.2 of this report.

The M&R unit cost determined through these studies was determined to be \$110 per square metre. Table 4.1 shows the comparison in annual O&M cost estimation using the sample data and the modeled costs based on gross floor area, with a 1% variance between the two when viewed in



aggregate. It should be noted that the RSMeans analysis of the Ontario School was based on old drawings before an expansion was built.

Table 4.1: M&R Comparison between RSMeans Annual Cost Estimation and Modeled Annual Cost Estimation in Remote Schools

| | British Columbia School | Ontario School | Quebec School |
|--------------------------|--------------------------------|-----------------------|----------------------|
| RSMeans Estimate: | \$ 790,303.95 | \$ 333,130.05* | \$ 670,869.70 |
| Average: | \$ 598,101.23 | | |
| Modeled Value | \$ 536,250.00 | \$ 410,850.00 | \$ 825,000.00 |
| Average Modeled | \$ 590,700.00 | | |

4.1.2 Preventative Maintenance

The RSMeans data set also includes preventative maintenance checklists with labour-hour standards that can be used to develop and benchmark a preventative maintenance program. Section 2: Preventative Maintenance (PM) of the RSMeans data set was used to develop this portion of the O&M estimate. This section provides the framework for a complete PM program, including a comprehensive list of equipment for which PM should be considered, actual PM steps, and budget documentation. The PM section lists tasks and their frequency for normal use situations (whether weekly, monthly, quarterly, semi-annually, or annually). The data also includes the labour-hours to perform each item as well as cost data. The annualized data has been used for this analysis, as it corresponds to the scenario where all items on the schedule are performed at the recommended frequency.

The interior doors may be used as an example to illustrate this methodology. Interior swinging fire doors should have the following preventative maintenance tasks completed quarterly (C1025 110 1950):

1. Remove fusible link hold-open devices (0.026 labour-hrs)
2. Remove obstructions that block or delay full movement/swing of door (0.013 labour-hrs)
3. Check swing of door; door must latch on normal closing (0.013 labour-hrs)
4. Test operation of panic hardware (0.007 labour-hrs)
5. Check operation of special devices such as smoke detectors or magnetic door releases (0.013 labour-hrs)
6. Lubricate hardware (0.013 labour-hrs)
7. Full out maintenance checklist and report deficiencies (0.013 labour-hrs)

Include material costs, the cost for these PM items for each door is \$14.85 including overhead profit. Since this task should be performed quarterly, the annualized cost of \$53.50/door has been applied.

A model for estimating PM was created for the past 44-school study in a similar process as described for M&R above. However, it is assumed that all facilities below 1000 m² have common PM expenses that would result in a baseline of approximately \$25,000 per year. Above 1000 m² the model increases the price of PM linearly by a factor of \$2.22 per square metre above 1000 m².

It should also be noted that due to the systems included in a school, PM can vary greatly. The Quebec school, for example, utilizes a simpler HVAC system than the British Columbia school. The Quebec



school also had fewer fixtures in bathrooms. When all differences are summed, the Quebec school was found to have a very low estimated PM cost under RSMeans. It appears to be an outlier in this regard as it yields a per-square metre cost of just \$ 12.16 compared to the approximately \$45 per-square metre cost averaged from the British Columbia and Ontario schools. These differences are difficult to represent in a model that estimates cost based on gross floor area and per square metre unit costs. However, when assessed in aggregate across many schools of varying sizes, the larger schools (5000 m² to 10,000 m²) balance out the smaller schools (500 m² to 2000 m²) – this is even more true in Zone 4 schools.

Table 4.2: PM Comparison between RSMeans Annual Cost Estimation and Modeled Annual Cost Estimation in Remote Schools

| | British Columbia School | Ontario School | Quebec School | Hypothetical 6000 m ² School |
|---|----------------------------|----------------|------------------|---|
| RSMeans Estimate: | \$ 60,523.13 | \$ 43,974.38* | \$ 25,368.75 | |
| RSMeans Estimate/m² | \$ 46.56 | \$ 44.15 | \$ 12.68 | |
| Average: | \$ 43,288.75 | | | |
| Modeled Value | \$ 152,497.50 | \$ 93,750.00 | \$ 158,325.00 | \$ 191,625.00 |
| Modeled Value/m² | \$ 117.31 | \$ 94.13 | \$ 79.16 | \$ 31.94 |
| Average Modeled | \$ 134,857.50 | | | |

*The Ontario School RSMeans Estimate is based on older pre-expansion drawings.

Comparing the modeled PM estimate for a hypothetical 6000 m² school, it yields a cost of \$31.94/m².

4.1.3 General Facility Maintenance

General maintenance refers to day-to-day maintenance tasks such as cleaning and snow clearing. Salaries for in-house caretaker staff are included in this item. For a First Nations school, it is expected that salaries for a caretaking supervisor and/or caretaker should be provided for in the facility's O&M budget. A per-square-metre unit cost of \$100.90 was calculated, however janitorial salaries do not scale directly with facility size and should be treated as an approximate benchmark for validating a model that was created to approximate such costs.

General Facility Maintenance also includes supplies used by janitorial staff for upkeep of the facility. The model assumes a base cost of \$40,000 representing a part-time salary for a janitor and supplies to service a small school below 1000 m² gross floor area. The model applies a linear growth factor of \$12.2 per square metre above 1000 m².

Based on the data received, the expenses for general maintenance salaries and supplies are averaged below and compared with the modeled average. When viewed in aggregate between these three data points, this yields a 1% variance, which is very good.



Table 4.3: Summary of Annual General Maintenance Costs for Three Remote Schools

| | British Columbia School | Ontario School | Quebec School |
|-----------------------------|-------------------------|----------------|---------------|
| Janitorial Salaries: | \$ 179,421.91 | \$ 199,934.88 | \$ 97,451.19 |
| Maint. Supplies: | \$ 30,673.85 | \$ 52,758.98 | \$ 12,233.95 |
| Total: | \$ 210,095.77 | \$ 252,720.86 | \$ 109,685.14 |
| Average: | \$ 197,198.68 | | |
| Modeled Value | \$ 163,725.00 | \$ 238,287.50 | \$ 195,750.00 |
| Average Modeled | \$ 199,257.50 | | |

4.1.4 Heating

On a school-by-school basis, heating is estimated through an average of historical heating costs. On the roll-up for all 391 schools, a modeled estimate was used to approximate heating costs. The model assumes that all schools use heating fuel of some kind, which is most often true.

From past studies, it was found that heating fuel costs vary by remoteness zone, with Zone 1 having a cost of 90 cents per litre, and zones 2, 3 and 4 costing 110 cents, 130 cents and 200 cents per litre respectively. It is then assumed that schools use 30 units of fuel per m² per year.

Data provided by the British Columbia, Ontario and Quebec schools included historical utility costs for the facilities. It should be noted that the Ontario school provided historical O&M accounts information for only the 2020-2021 fiscal year. As such, it may not be representative of typical O&M expenses.

It was assumed that as heating expenses were not itemized for the Quebec school, it is heated with electricity as is common in the province. This assumption has been confirmed by the school's administrators.

The British Columbia school included heating as a line item in the budget figures provided. However, they also included propane. It is not known whether propane is also used for heat or another purpose. Thus, it was included in the heating expenses for the British Columbia school.

The Ontario school listed heating fuel and confirmed that the school is heated with diesel fuel that is trucked in using winter roads as soon as the roads are solid enough to support a fuel truck. This can account for the significantly higher heating costs seen in the Ontario School historical O&M expenses.

The heating data was also normalized as a unit cost per Heating Degree Day [4]. This still positions the Ontario school as the most expensive to heat, as at \$0.0105 /m²/HDD, it is approximately twice the British Columbia school with \$0.0049/m²/HDD.

The average per square metre cost for heating was \$65.01 /m². Comparing this to the modeled costs of heating for a remote Zone 4 school, the model yields an estimate of \$60 /m² representing 8.3% variance, which is within a reasonable 10% variance.



4.1.5 Electricity

On a school-by-school basis, electricity is estimated through an average of historical heating costs. On the roll-up for all 391 schools, a modeled estimate was used to approximate electricity costs. The model assumes that all schools use heating fuel of some kind, which is most often true.

In past studies, it was assumed that on-grid communities – typically true for Zones 1, 2 and 3 – buy electricity at an average of 25 cents per kWh, while remote communities relying on off-grid diesel generation pay 100 cents per kWh. It is then assumed that schools use 100 units of electricity per m² per year. One weakness in this model is the variation between regions. Quebec and British Columbia have extensive hydroelectric generation in remote areas of the provinces, providing low-cost electricity to many hard-to-access communities that are classified as Zone 4 by ISC. The model was initially developed as part of a 44-school study of schools in Ontario, and thus uses Ontario electricity costs.

Data provided by the British Columbia, Ontario and Quebec schools included historical utility costs for electricity use by the school. It should be noted that the Ontario school provided historical O&M accounts information for only the 2020-2021 fiscal year, which is characterized by the pandemic year, and assumed reduced use of the facility.

Observing electricity costs for the British Columbia school, which provided data for 2018, 2019 and 2020, the per square metre cost is similar to the Ontario school in 2020-2021.

The average per square metre cost for electricity was observed to be \$24.08/m². However, considering the limited historical data from the Ontario school, we may wish to assume a higher price. Quebec has the lowest electricity prices of the provinces, and British Columbia is approximately average [5], thus it may be advantageous to assume a higher average price nationally.

Some further assumptions were made in analyzing the O&M accounting records provided for the Ontario school, which listed electricity (Hydro) for two school buildings and teacherages. Teacherages were not included in this analysis as it is assumed they do not contribute to the school floorspace. However, it is understood that the school was renovated with an expansion in its history which may be metred separately. Thus, it was assumed that the original school structure and expansion are metred and billed separately.

The Quebec school was assumed to be heated using electricity, which was confirmed by the school administration, thus the electricity costs for the Quebec school do include heating costs. This places Quebec at an advantage over many other provinces in terms of utility expenses.



4.1.6 Total Utilities

Utilities are summarized in the following table:

Table 4.4: Summary of Annual Utility Costs for Three Remote Schools

| | British Columbia School | Ontario School | Quebec School |
|--|-------------------------|----------------|---------------|
| Electricity: | \$ 33,289.03 | \$ 62,097.97 | \$ 50,754.60 |
| Heating: | \$ 28,208.19 | \$ 216,005.35 | -- |
| Total: | \$ 61,497.22 | \$ 278,303.32 | \$ 50,754.60 |
| Per Sq. Metre Electricity: | \$ 25.61 | \$ 21.26 | \$ 25.38 |
| Average Per Sq. Metre Electricity | \$ 24.08 | | |
| Per Sq. Metre Heat: | \$ 21.70 | \$ 73.72 | -- |
| Per Sq. Metre/HDD | \$ 0.0035 | \$ 0.0105 | -- |
| Average Per Sq. Metre Heat | \$ 65.01 | | |

Assessing the difference in heating cost between the British Columbia and Ontario schools from a purely per square metre rate, we find a 70 % variation. However, by introducing Heating Degree Days (HDD) into the analysis, we find just 17% difference in cost which may be accounted for through regional differences in heating fuel costs and delivery. While the assessment for all 391 schools will not incorporate HDD as local HDD data for all schools was not provided and is out of scope of this study, it is worth noting that this is a factor that can lead to variation of costs.

Furthermore, it should be noted that the electricity costs for remote schools assessed may be more similar to the 25 cents per square metre assumed for Zones 1, 2 and 3, rather than the 100 cents per square metre assumed in the model when looking at the comparison in Table 4.4.

4.1.7 Insurance

Insurance data was only available for the British Columbia and Quebec schools, which varied by approximately 45% from their average of \$31,248.35. While these individual schools vary widely between them, the average cost estimate produced by our model is \$32,649.40 when considering all 83 Zone 4 schools. This represents a variance of just 4% from the real-world average of the two schools assessed.



Table 4.5: Comparison of Annual Insurance Costs for Three Remote Schools

| | British Columbia School | Ontario School | Quebec School |
|--|-------------------------|------------------|------------------|
| Insurance: | \$ 38,361.35 | -- | \$ 24,135.36 |
| Average: | \$ 31,135.36 | | |
| Per Sq. Metre: | \$ 29.51 | -- | \$ 12.07 |
| Average Per Sq. Metre | \$ 20.79 | | |
| Modeled Value: | \$ 9,700 | \$ 34,000 | \$ 21,000 |
| Modeled Average (All Zone 4 schools): | \$ 32,649.40 | | |

The difference in insurance cost between the British Columbia and Quebec schools is significant, likely due to regional differences in risk factors, standard pricing, and regulations. Insurance is also not priced by square metre alone and considers many factors.

4.2 Detailed O&M Estimate Development

Our methodology included a detailed operations and maintenance assessment for three schools: one in British Columbia, one in Ontario, and one in Quebec. In each case, the repair and maintenance and preventative maintenance needs of the facility were determined using RSMMeans data on a component-by-component basis. The general maintenance, heating, electricity and insurance lines are based on historical data obtained from the school. The development of detailed O&M estimates for these schools resulted in the outcomes outlined in the following sections:

All costs presented below represent annualized costs.

4.2.1 British Columbia School

A 1300 square meter school in British Columbia was assessed using the methodology described above. Accurate quantities of components were obtained from two sets of construction drawings. A detailed line-by-line analysis using RSMMeans data resulted in the following estimate:

Table 4.6: Annual Cost Estimate for Remote School in British Columbia

| Component | Cost per m ² | Amount |
|---|-------------------------|------------------------|
| Maintenance and Repair | | \$ 790,303.95 |
| Preventive Maintenance | | \$ 60,523.13 |
| General Maintenance | \$ 161.61 | \$ 210,095.77 |
| Heating | \$ 30.83 | \$ 40,073.18 |
| Electricity | \$ 25.61 | \$ 33,289.03 |
| Insurance | \$ 29.51 | \$ 38,361.35 |
| TOTAL | | \$ 1,172,646.41 |
| 2020 O&M Budget Allocation | | \$390,000.00 |
| % of estimated actual O&M cost covered | | 33.25% |



The drawings provided accounted for the entire existing school structure and so this estimate reflects the estimated real annualized O&M costs for the school.

The British Columbia school provided data that included all general maintenance, heating, electricity and insurance expenses for three years. It should be noted that the expense information included 2019 and 2020. In 2020 some expenses, such as insurance and heat were dramatically lower than in 2018 and 2019 and it is assumed that this is due to operational changes during the COVID-19 pandemic. The school paid just \$24,666.04 for insurance in 2020. If this is treated as an outlier, the average insurance costs are 45,209.00, and the cost increased by 6.7% from 2018 to 2019. If this increase is consistent, we expect that the 2020 costs would be at most \$49,812.97 or if it were to follow a more reasonable 2% inflation, \$47,618.74.

Heating was dramatically lower in 2020 compared to 2019, and it is assumed that the school was left empty during the pandemic and maintained at a minimum operational temperature during the winter. The 2020 heating cost was omitted from the average calculation and only the higher 2019 heating cost was considered, as it is assumed that is most reflective of future costs. Accounting for 2% inflation, the heating cost is expected that it would have been \$40,874.64 in 2020. It is difficult to predict future heating costs from just two data points as heating requirements fluctuate from year to year.

4.2.2 Ontario School

A 2930 square meter school in Ontario was assessed using the methodology described above. Accurate quantities of components were obtained from two sets of construction drawings. A detailed line-by-line analysis using RSMeans data resulted in the following estimate:

Table 4.7: Annual Cost Estimate for Remote School in Ontario

| Component | Cost per m ² | Amount |
|---|-------------------------|-----------------|
| Maintenance and Repair | \$ 333.13 | \$ 976,071.05 |
| Preventive Maintenance | \$ 43.97 | \$ 128,844.92 |
| General Maintenance | \$ 86.25 | \$ 252,720.86 |
| Heating | \$ 73.72 | \$ 216,005.35 |
| Electricity | \$ 21.26 | \$ 62,287.97 |
| Insurance | \$ 20.79 | \$ 31,238.35 |
| TOTAL | | \$ 1,667,168.50 |
| 2020 O&M Budget Allocation | | \$666,910.00 |
| % of estimated actual O&M cost covered | | 40.00% |

The drawings used to obtain this estimate were only available for the historical 1000 m² building and do not include the expansion that was constructed in approximately 2004/2005 as stated by the Operations and Maintenance Manager for the school. This expansion increased the school's gross area to its present day 2930 m². To estimate the Maintenance and Repair and Preventative Maintenance costs, a per-square-metre cost was estimated by dividing the RSMeans estimate by 1000 m² to obtain \$ 333.13 and \$ 43.97 respectively. These values were multiplied by 2930 m² to



reach the estimated costs of \$ 976,071.05 and \$ 128,844.92.

In lieu of historical expense data for insurance on the Ontario school, an average of the British Columbia and Quebec schools unit costs was used as the insurance cost for the Ontario School. It should be noted this is not an exact estimate as insurance differs between provinces and is not a function of only gross floor area. However, we can assume this cost to be nearer the real cost than neglecting the expense entirely.

The high cost of heating the Ontario school is reflective of the extreme temperatures experienced in remote Northern Ontario and the logistical challenges of procuring and transporting sufficient fuel for the entire season by winter roads. The fuel is also used to heat the teacherages located adjacent to the school.

4.2.3 Quebec School

A 2000 square meter school in Quebec was assessed using the methodology described above. Accurate quantities of components were obtained from one set of construction drawings. A detailed line-by-line analysis using RSMMeans data resulted in the following estimate:

Table 4.8: Annual Cost Estimate for Remote School in Quebec

| Component | Cost per m² | Amount |
|---|-------------------------------|---------------|
| Maintenance and Repair | | \$ 670,869.70 |
| Preventive Maintenance | | \$25,368.75 |
| General Maintenance | \$ 54.84 | \$ 109,685.14 |
| Heating | - | - |
| Electricity | \$ 25.38 | \$ 50,754.60 |
| Insurance | \$ 12.07 | \$ 24,135.36 |
| TOTAL | | \$ 880,813.55 |
| 2019 O&M Budget Allocation | | \$243,917.00 |
| % of estimated actual O&M cost covered | | 27.69% |

As noted above in Section 4.1.4, it was assumed that as no separate heating line was provided for the Quebec school, that it relies on electric heat, which is common in the province. It was later confirmed by the school administration that this assumption is correct.

As Quebec utilizes almost entirely hydroelectric generation for their extensive electricity grid, this is the most economical way to heat buildings and homes in the province.

4.3 Contractor and Supplier Estimates

To calibrate the zone multipliers discussed in Section 4.4, suppliers were contacted to provide estimates for a cross-section of items found in the design drawings of the three schools assessed in this report. It proved challenging to obtain quotes for work to be done at remote locations. The requests for quotation were transparent about the requests being used for a study that would inform future budget planning and not an immediate request for repair work.



In total, five estimates were obtained for various material and repair work. These will be discussed in greater detail below. In some cases, the estimator provided a unit-cost estimate while others were a total cost for the job. These quotes will be shared with the schools so they can contact the suppliers and contractors for future work when necessary.

Employees and leadership at the schools have shared anecdotes that finding skilled tradespeople willing to travel to their communities to deliver O&M services is a common challenge.

These estimates were used to calibrate the Zone 4 multiplier used in establishing an accurate method of estimating Operation & Maintenance in the most remote communities.

4.3.1 British Columbia School

Three quotes were obtained for the British Columbia school. They were to replace ceramic floor tile in bathrooms (3700 sq.ft), replace acoustic ceiling tile, non-fire rated (10700 sq.ft), and replacing fire sprinkler heads (255 units).

Table 4.9: Summary of Repair Quotations for British Columbia School

| Item | Estimated Price | Comments |
|---|--|---|
| Replace 2"x2" thin set ceramic tile floor | \$ 50.00/sq.ft* 3700 sq.ft = \$ 185,000.00 | This is in-line with expected cost relative to the RSMeans standard estimate. |
| Replace acoustic tile ceiling, non fire-rated | \$ 86,800.00 for 10700 sq.ft | This is in-line with expected cost relative to the RSMeans standard estimate. |
| Replace sprinkler head | \$ 14,376.00 for 255 sprinkler heads | This is considerably less than the RSMeans estimate. However, it may help balance out higher estimates. |

4.3.2 Ontario School

Two quotes were obtained for the Ontario school. They were to perform a total replacement of the flat built-up roof (96 square or 9600 sq.ft), and to replace acoustic tile ceiling, fire-rated (9600 sq.ft).

Table 4.10: Summary of Repair Quotations for Ontario School

| Item | Estimated Price | Comments |
|---|---|---|
| Total BUR roof replacement | \$ 100.00/ sq.ft * 9600 sq.ft = \$ 960,000.00 | This considerably higher than the RSMeans standard estimate, however, this work is very material and labour intensive, incurring high material transportation costs and increased travel, lodging and labour costs due to remoteness. |
| Replace acoustic tile ceiling, fire-rated | Material only: \$43,360.02 Approximated with labour: \$101,000.00 - \$120,000.00 | This didn't include the cost of removing old tile and installing new tile. Approximations of \$2 - \$5/m ² are listed online, if we assume the higher end, or slightly above this is in-line with |



| | | |
|------------------------------|--------------------------------------|--|
| | | expectations when compared to the RSMeans standard estimate. |
| Replace vinyl sheet flooring | Requested, but no estimate received. | N/A |

4.3.3 Quebec School

Suppliers were unresponsive to requests for quotations to perform work in the Quebec school. Following months of requests and no success, the lack of availability and willingness of contractors to provide estimates for northern Quebec school maintenance speaks to the challenges remote First Nations face that are not comparable to provincial schools. The following quotes were sought from suppliers.

Table 4.11: Summary of Repair Quotations for Quebec School

| Item | Estimated Price | Comments |
|---|--|----------|
| Replace & finish wood clapboards 1 st floor | Requested, but no estimate received. | N/A |
| Replace glass – 1 st floor, 1” insulating panel with heat reflective glass | Requested, but no estimate received. | N/A |
| Replace sprinkler head | Ontario branch attempted to connect us with a Quebec office, however no response was received. | N/A |

4.4 O&M Zone Multiplier Review

Zone multipliers are used to adjust standard cost estimates like those provided in RSMeans to the different remoteness zones as defined by Indigenous Services Canada. As Zone 1 is located within 50 km of the closest service centre it is assumed that the Zone 1 multiplier is 1.

Through analysis of past construction and renovation projects conducted by FNESL on behalf of clients in Zones 2 and 3, multipliers of 2 and 2.5 respectively have been found to produce reasonable cost estimates in those zones. Previously, a multiplier of 3 was assumed for O&M in Zone 4.

After further review of supplier estimates a multiplier between 3.25 and 3.75 was found to be more accurate for Zone 4. More data could increase our confidence and narrow this down to a more precise figure. The results of this report were acquired using 3.75 as the remoteness factor to estimate O&M requirements for Maintenance and Repair and Preventative Maintenance at Zone 4 schools.

The following calculation was used to obtain the Zone Multiplier:

$$\text{Zone Multiplier} = \left[\sum_{i=1}^N \left(\frac{\text{Supplier Estimate}_i}{\text{RSMeans Estimate}_i} \right) \right] / N$$



N is the number of supplier estimates used for the assessment.

In other words, the Zone multiplier is the average of the ratios between the quoted cost at a given school and the RSMean standard estimate.

Note that some supplier estimates cost significantly more than 3.75 times the standard Zone 1 estimate. The quoted cost for a built-up roof replacement, which requires a large quantity of heavy material and is very labour intensive, was found to be 8 to 10 times the RSMean estimate. While maintenance work using lighter materials which can be completed by smaller crews may be closer to 1.5 or 2 times the RSMean standard estimate.

Emergency repairs requiring heavy material to be flown to the job site may incur a significantly greater cost than planned maintenance. If planned, materials can be transported by winter roads at lower cost in advance of work to be completed later in the year.

4.5 Cost Estimate Generation

Costs for all 391 schools and 1026 teacherages were generated using unit costs that are justified and validated against past analysis of Zone 1, 2, 3 and 4 schools, and analysis of the Zone 4 schools discussed in this report.

Table 4.12 was generated using data from past studies of school O&M for various First Nations and organizations. This includes a Southern Ontario First Nation, a 44-school study spanning Zones 1 through 4 in Northern Ontario, and a study of three Zone 2 schools in Ontario. These studies were conducted with 2018 dollar values.

Table 4.12: O&M Cost Estimates for Real Schools in Various Remoteness Zones in Past Studies

| School Geographic Location | O&M Cost Estimate (\$/sq.m.) |
|----------------------------|------------------------------|
| Southern Ontario (Zone 1) | \$226.32 / sq.m. of school |
| Northern Ontario (Zone 4) | \$623.95 / sq.m. of school |
| Northern Ontario (Zone 2) | \$531.98 / sq.m. of school |
| Northern Ontario (Zone 2) | \$377.56 / sq.m. of school |
| Northern Ontario (Zone 2) | \$346.20 / sq.m. of school |

Unit costs are calculated at a per square metre rate for maintenance and repair, preventative maintenance, heating, electricity and insurance at an assumed national rate that varies only by remoteness zones.

The model used in this study generates the average unit costs per sq.m of school shown in Table 4.13 and are seen to have an average variance of 9.7 % from sample school data.



Table 4.13: Modeled O&M Cost Estimates Per Square Metre Across Remoteness Zones

| School Geographical Zone | Modelled O&M Cost Estimate (\$/sq.m) | Variance from Past School Estimates |
|--------------------------|--------------------------------------|-------------------------------------|
| Zone 1 | \$ 241.00 | 6 % |
| Zone 2 | \$ 361.68 | 15 % |
| Zone 3 | \$ 399.70 | -- |
| Zone 4 | \$ 685.30 | 8 % |

This model is effective for providing rough budget recommendations. It does not consider variation in utility costs across regional suppliers of electricity and gas. Further it does not consider differences in heating technology used by different schools, for example heating using furnace oil versus natural gas. It also does not consider heating degree days in different regions.

4.5.1 Schools O&M Costs

To generate per square metre unit costs for each zone, the value in the following table reflects the various factors that were used to model O&M expenses for schools. These were developed and calibrated through study of real-world school and utility data.

Table 4.14: Summary of Model Adjustment Factors for Schools

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
|--|--------|--------|--------|--------|
| Zone Multiplier | 1 | 2 | 2.5 | 3.75 |
| PM Factor (/m² over 1000 m²) | 2.22 | | | |
| Heating Costs (Cents/L of fuel) | 90 | 110 | 130 | 200 |
| Heating Fuel Usage (Units/m² of GFA) | 30 | | | |
| Electricity Costs (Cents / kWh) | 25 | 25 | 25 | 100 |
| Electricity Requirements (Units/m² of GFA) | 100 | | | |
| Insurance Costs (/m² factor over 1000/m²) | 1.8 | 1.8 | 1.8 | 15 |

Zone multiplier is used to adjust the cost estimate to different levels of remoteness for Zones 1 through 4, reflecting the increased cost associated with maintaining facilities in more remote communities. The Zone Multiplier is applied to M&R and PM estimates.

The PM (preventative maintenance) factor is used to model the increase in cost per square metre above 1000 m² of gross area.

1000 m² is the gross floor area which more than 80% of schools exceed and was chosen as a baseline below which it is reasonable to assume base PM costs will remain relatively constant. The PM Factor



of 2.22 above 1000 m² is a was calibrated using an average of the real schools assessed using RSMMeans PM tables. As noted in section Preventative Maintenance 4.1.2, PM contains a high degree of variation between school design and is difficult to model on an individual basis. This model is validated for estimating total O&M expenses across a set of many schools, such as this set of 391 schools across Canada. With more time and a larger data set, this model may be developed to produce closer individual school values for PM.

Heating costs assume that the school is heated by gas or diesel, and that that transport of the fuel to remote areas increases the costs of heating fuel. These costs can fluctuate for a single school based on different conditions including weather and availability of fuel trucks. The model is assumed to be accurate when estimating the expense for multiple schools.

Electricity costs vary by electricity source and can also vary greatly between provinces. This is a limitation of the model being used. It is assumed that Zone 1, 2 and 3 are supplied electricity by a reliable grid connection. Zone 4 is assumed off-grid and supplied by diesel generators.

Insurance is estimated by assuming that any school 1000 m² or under pays \$ 5000/yr. In zones 1, 2 and 3, it was assumed the cost increases by approximately \$ 1.8/m² square metre above 1000 m². In Zone 4, it was assumed that the cost increases by approximately \$ 15/m² above 1000 m². This model appears to produce reasonable results based on available data. It may overestimate insurance cost for facilities larger than 4000 m². More data is required to refine this model.

4.5.2 Teacherages O&M Costs

To generate estimated O&M costs for each teacherage across a four remoteness zones, the values in the following table were used for schools.

Table 4.15: Summary of Model Adjustment Factors for Teacherages

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
|--|--------|--------|--------|--------|
| Zone Multiplier | 1 | 2 | 2.5 | 3.75 |
| PM Factor (/m² over 90 m²) | 2.2 | | | |
| Heating Costs (Cents/L of fuel) | 90 | 110 | 130 | 200 |
| Heating Fuel Usage (Units/m² of GFA) | 30 | | | |
| Electricity Costs (Cents / kWh) | 25 | 25 | 25 | 100 |
| Electricity Requirements (Units/m² of GFA) | 100 | | | |
| Insurance Costs (/m² factor over 90/m²) | 1.8 | 1.8 | 1.8 | 15 |



The same assumptions were made to estimate the O&M costs for teacherages as with schools in section 4.5.1. There are a few notable exceptions. The calculated estimates are difficult to validate due to extremely limited information. They are interpolated using the known costs for school buildings.

To estimate the Preventative Maintenance cost, the second quartile gross area of all 1026 teacherages was found to be 87 m² and rounded to 90 m². This was used as a minimum benchmark. Using a linear scale, the minimum Preventative Maintenance cost for schools of \$ 25,000 for a gross area of 1000 m² was adjusted to \$2250 for a 90 m² teacherage. More data points are necessary to validate this, however it is judged to be a reasonable estimate.

Insurance costs were estimated using an assumed base cost of \$750 for teacherages up to and including 90 m², increasing by the same factors used in the school estimate for every square metre above 90 m². Like the schools, this may result in overestimates for the largest teacherage buildings. More data is required to validate these assumptions. The average cost of insurance on homes across Canada was found to be approximately \$840 annually in 2012 [6] which is approximately \$960.45 in 2021. The average insurance cost calculated for teacherages using this model is \$986 thus the insurance costs estimated using this model can be considered reasonable overall. It should be noted that insurance costs can vary significantly between provinces [6].

5.0 Summary of Existing O&M Formulas

The following seven funding models developed and used by provinces to calculate school funding. Only the sections of the funding formulae pertaining to O&M were assessed, apart from British Columbia, which does not separate O&M from the broader school funding. School boards must allocate a portion of their funding to facilities for upkeep.

Section Comparison to Provincial O&M Funding7.0 offers a comparison between estimated funds generated through these formulae and the estimated annual O&M costs generated through the model outlined in Section 4.0. Although the estimated funding generated through the British Columbia, Ontario and Quebec models are based on several assumptions, it is evident that the O&M funding provided through these formulae is insufficient to maintain First Nations schools – particularly in remote communities.

5.1 British Columbia

Based on the *Operating Grants Manual 2020/2021* funding for O&M in British Columbia is not broken out from general operating fund including instruction and administration costs. Total funding is allocated by school district based on::

- Basic Enrolment-Based Funding:
 - Standard Schools enrolment
 - Continuing Education
 - Distributed Learning
 - Alternate Schools
 - Home Schooling
- Supplements for Enrolment Decline



- Supplements for Unique Student Needs
 - Special Needs Students
 - Other Unique Student Needs
 - English Language Learning
 - Indigenous Education
 - Adult Education
- Supplements for Salary Differential
- Funding Protection (Includes clauses for small communities, rural communities, etc.)
 - Supplement for Unique Geographic Factors – Small Community Supplements (Table 6a)
 - This is based on *previous year's* enrolment.
 - Elementary Small Community Funding
 - Communities with 250 or fewer elementary school-age FTE students
 - Communities with 75 or fewer elementary school-age FTE students and located at least 40 km by road from nearest elementary school or the school is located at least 5 km from the nearest elementary school which can only be accessed by gravel road, logging road or water.
 - Secondary Small Community Funding
 - Communities with 635 or fewer secondary school-age FTE students
 - Grade 11 and 12 Small Community Funding
 - Communities with 215 or fewer Grade 11 & 12 FTE students.

5.2 Alberta

Based on the *Funding Manual for School Authorities 2021/22 School Year* O&M funding in Alberta is the sum of both a Student Allocation and a School Space Allocation.

The Student Allocation for this year is noted to be \$213 per fulltime equivalent (FTE) student. The School Space Allocation is noted to be \$62/m² for utilized area and \$42/m² for underutilized area. A school is fully utilized if utilization exceeds 85%, and in this case the School Space Allocation is calculated as follows:

$$\text{School Space Allocation} = \text{Utilized Space (m}^2\text{)} \times \text{Utilized Rate}$$

For underutilized schools the School Space Allocation is calculated as follows:

$$\text{School Space Allocation} = \text{Utilized Space (m}^2\text{)} \times \text{Utilized Rate} + \text{Underutilized Space (m}^2\text{)} \times \text{Underutilized Rate}$$

Referencing Section 9 of the School Capital Manual the Utilization Rate is calculated as follows:

$$\text{Utilization Rate} = \text{Total Adjusted Enrolment/Net Capacity} \times 100$$

Total Adjusted Enrolment is calculated as follows:

$$\text{Total Adjusted Enrolment} = \text{ECS} \times 0.5 + \left(\text{Grades 1 to 12} - \text{Severe disabilities} \right) + \text{Severe disabilities} \times 3.0$$



In the first year of a new school opening the schools utilized and underutilized space are each determined to be 50% of the gross school area.

A Small Rural Schools Grant recognizes unique challenges faced in operating and delivering educational services with low student enrollment.

5.3 Saskatchewan

Based on the *2020-21 Funding Manual O&M* funding in Saskatchewan is calculated based on a “funded space” and a square meter rate. A school is fully utilized if utilization exceeds 85%. For fully utilized schools, the funded space is equal to the actual school space. For underutilized schools the funded space is calculated as follows:

$$\text{Funded Space} = \text{Utilized Instructional Space (m}^2\text{)} + 70\% \text{ of Under-utilized Instructional Space (m}^2\text{)} + 100\% \text{ of Non-instructional Space (m}^2\text{)}$$

For underutilized schools the funded space is calculated as follows:

$$\text{Funded Space} = \text{Actual Space (m}^2\text{)} + 70\% \text{ of Over-utilized Actual Space (m}^2\text{)}$$

The square meter rate for total plant operations and maintenance funding for 2020-2021 was \$79.14/m².

5.4 Manitoba

In Manitoba, funding for O&M is allocated at the division level according to the *Funding of Schools 2021/2022 School Year*. Each division receives the lesser of the “Maximum Support” and the “Occupancy Expenditures” which are defined as follows:

$$\text{Maximum Support} = \left(80\% \text{ of total area of active school buildings} + 20\% \text{ of total weighted ages of active school buildings} \right) \times \$85,500,000$$

$$\text{Occupancy Expenditures} = 68\% \left(\text{Allowable expenses from 2020/2021} + \text{Average of 2018/2019 and 2019/2020 total expenses} - \text{Total expenses in 2020/2021} \right)$$

When calculating Occupancy Expenditures all expenses from previous years are as reported under Function 800 in the Financial Reporting and Accounting in Manitoba Education (FRAME) financial statements.

5.5 Ontario

O&M funding for schools in Ontario is covered under the School Facility Operations and Renewal Grant as defined in the *Education Funding Technical Paper 2020-21* prepared by the Ontario Ministry



of Education. According to this document there are two major allocations that define O&M funding: the School Operations Allocation and the School Renewal Allocation.

The School Operation Allocation is the sum of the six following components:

- Base School Operation
- Enhanced Top-Up for School Operations
- Community Use of Schools
- Licensing and Related Fees for Approved Asset Management Software
- Capital Lease Amount on School Authority Amalgamation
- Education and Community Partnership Program (ECP) Operations Allocation

Base School Operations are defined as being:

$$\text{Base School Operations} = \text{Enrolment} \times \frac{\text{Benchmark Area per Pupil}}{\text{Area per Pupil}} \times \text{Supplemental Area Factor} \times \text{Benchmark for Operating Costs}$$

In this formula, the benchmark area per pupil is 9.70 m² for elementary students, 12.07 m² for secondary students, and 9.29 m² for adult education and other programs. The benchmark for operating costs is \$91.56/m².

The Supplemental Area Factor (SAF) is calculated using the actual area per pupil. If the actual area per student is less than the benchmark noted above, then the SAF is equal to 1.0. To calculate the actual area per pupil, the total adjusted gross floor area (GFA) of a school is divided by the total on-the-ground capacity (OTG) of the school. The adjusted GFA is calculated for schools less than 10 years old to reflect the construction area benchmark introduced in 2000. The adjustment reflects the lesser of the actual area per student or the construction benchmark areas that were introduced. The SAF is then calculated as follows:

$$\text{SAF} = \left(\frac{\text{Actual GFA}}{\text{OTG}} \right) / \text{Benchmark Area per Pupil}$$

The Enhanced Top-Up for School Operations is available to elementary schools that are 10 km or more further from the next closest elementary school, secondary schools that are 20 km or more further from the next closest secondary school and are operating at less than full capacity. Schools operating beyond capacity do not generate enhanced top-up funding, however they do generate increased Base School Operations based on their additional enrolment.

The top-up is calculated as follows:

$$\text{Enhanced Top-Up for School Operations} = \left(1 - \frac{\text{Enrolment}}{\text{OTG}} \right) \times \text{OTG} \times \frac{\text{Benchmark Area per Pupil}}{\text{Area per Pupil}} \times \text{SAF} \times \text{Benchmark for Operating Costs}$$

The Community Use of Schools Allocation is as out in the Grants for Student Needs – Legislative Grants for the 2020–2021 School Board Fiscal Year regulation and is provided to all school boards. No formula is provided for how funding is determined [5].



The allocation received by each school board for Licensing and Related Fees for Approved Asset Management Software is laid out in the Grants for Student Needs – Legislative Grants for the 2020–2021 School Board Fiscal Year, however no information is provided surrounding how the allocation for each school board is determined [6]. The amount provided to the board is the lesser of the amount specified in the regulation and the board’s expenditure for renewal software licensing fees as reported to the Ministry in the board’s annual financial statements for the fiscal year [6].

In 2020-21, \$0.1 million was provided to continue capital lease arrangements made by former school authorities in remote communities. This is intended to assist where school authorities have been amalgamated.

School Renewal Allocations are granted by the Ministry to address the costs of repairs and renovations. They are calculated as a combination of Base School Renewal, Enhanced Top-up for School Renewal, Enhancement to Address Deferred Maintenance Needs, and School Renewal Investment. Each are determined separately, with the former two being calculated on a per-school basis, and the latter two being allocated to each school board.

Base School Renewal is calculated using the following, similar to the Base School Operations formula:

$$\text{Base School Renewal} = \text{Enrolment} \times \frac{\text{Benchmark Area per Pupil}}{\text{Area Factor}} \times \text{Benchmark for Renewal Costs} \times \text{GAF}$$

The Benchmark renewal cost for schools < 20 years is \$7.89 per m², while for schools ≥ 20 years of age it is \$11.83 per m². Supplemental Area Factor (SAF) and Geographic Adjustment Factor (GAF) is set for each school board in the Grants for Student Needs – Legislative Grants for the 2020-21 School Board Fiscal Year regulation, and in similar documents for subsequent years. In calculating the age of a school facility when the school has been renovated with additional wings, a weighted age is used based on the age and GFA of additions. Schools are exempt from using SAF when the capacity is below certain thresholds (Elementary with capacity less than 200 pupil places, Secondary with less than 300 pupil places) or have less GFA per student than the benchmark rates.

Similar to the Enhanced Top-Up for School Operations, the Enhanced Top-up for School Renewal is for eligible schools that are located 10 km away or 20 km away from the nearest similar school for elementary and secondary schools respectively and operating below capacity. The formula for determining Enhanced Top-Up for School Renewal is as follows:

Equation 5.1: Enhanced Top-up for School Renewal in Ontario

$$\text{Enhanced Top-Up for School Renewal} = \left(\frac{1 - \text{Enrolment}}{\text{OTG}} \right) \times \text{OTG} \times \frac{\text{Benchmark Area per Pupil}}{\text{SAF}} \times \text{Benchmark for Renewal Costs} \times \text{GAF}$$

Enhancement to Address Deferred Maintenance Needs, and School Renewal Investment are allocated by the Ministry and are listed for each school board in the Grants for Student Needs – Legislative Grants for the 2020-21 School Board Fiscal Year regulation.



5.6 Quebec

The Quebec funding structure is available in French only. It has been reviewed using a novice-to-moderate understanding of French, with the support of a machine translation service. Best efforts have been made to summarize the Quebec O&M funding structure in English. The Province of Quebec allocates funding for school operations and maintenance under three measures (16013, 16014, 16044).

Under Measure 16011 (Mesure 16011 – Gestion des écoles)

A simple calculation is made using the previous year's allocation, adjusted for the current year using a single factor. This ensures consistent funding for schools; however, it does not account for changes in needs.

Measures 16013 and 16014 are under *16010 – Basic allocation for the organization of services*

Under Measure 16013 (Mesure 16013 – Fonctionnement des équipements)

School Maintenance allowance is calculated as follows:

- | | |
|--|--|
| Total area considered (A) | – includes residences for students and teachers if applicable |
| Standardized area (B) | – weighted school population multiplied by 9.5 m ² /pupil |
| Area retained (C = A – B) | |
| Funding coefficient (D) | – the coefficient in the given year is 90% |
| Financed area (E = C x D) | |
| Amount allocated per square meter (F) | – \$20.62 for the 2021-2022 school year |
| School maintenance allowance (G = E x F) | |

Under Measure 16014 (Mesure 16014 – Ajustement pour l'énergie)

An adjustment to school funding is made for energy requirements. This applies a series of weightings and adjustments to the previous year's energy expenses. The weighting and adjustment factors can be found in the document "*Information specific to the school year concerned*" (Renseignements spécifiques à l'année scolaire concernée)

Under Measure 16044 (Mesure 16044 – Entretien des bâtiments)

Every year, the provincial budget allocates funding for school building maintenance. A portion of that funding – \$40 Million in 2021-2022 and \$30 Million in 2022-2023 – is allocated to each school based on its gross floor space. This is a simple calculation that allocates a fraction of the total provincial



maintenance budget based on the school's gross floor space as a fraction of the total school floor space in the province. It assumes that maintenance cost for the school is a function of its floorspace.

Equation 5.2: Budget Allocation for Schools under Measure 16044 in Quebec

$$\begin{aligned} & \text{Allocation (a priori)} \\ &= \frac{\text{Total recognized area of school building (in m}^2\text{)}}{\text{Total recognized area of all school buildings (in m}^2\text{)}} \\ & \times \text{Budget allowance for that year} \end{aligned}$$

Under Measure 15540 – Maintenance of the village school (Mesure 15540 – Maintien de l'école de village)

There is an additional allowance made for schools in small towns (des municipalités dévitalisées). This funding is intended to support school buildings where the school has fewer than 100 students and located in a municipality with fewer than 25,000 residents.

| | | |
|--|------------|--|
| If fewer than 25 students | Allocation | = \$1,002 x number of students |
| If 25 to 75 students | Allocation | = \$25,038 |
| If 75 to 100 students | Allocation | = \$25,038 – [\$1,002 x (number of students – 75)] |
| | | + |
| If the building has fewer than 50 students | Allocation | = \$5,008 |
| If the building has 50 to 100 students | Allocation | = \$2,504 |

5.7 New Brunswick

New Brunswick funding model for First Nations school facilities maintenance was provided in draft. Operating expenses were described to be calculated based on *School Square Footage* × \$2.58. The total facilities funding is thus calculated as a combination of the operating expenses and a proxy rate per student which is based on the Total Facilities Funding less the operating expenses, divided by the number of funded students enrolled in provincial schools.

This was calculated as such in the provided document:

| | |
|--|-----------------|
| A: Provincial Total, Total Facilities funding | \$108,465,400 |
| B: Provincial Funding, Operating Expenses | \$51,477,400 |
| C: Operating Expenses is applied directly, thus A - B = | \$56,888,000 |
| D: Provincial Total, Funded Enrolment | 97,842 students |
| Per Student Proxy Rate: C / D = | \$581.43 |

| | |
|---------------------------|--------------------------------|
| Allocation Formula | |
| Operating Expenses: | Sq. Footage of School × \$2.58 |



| | |
|---------------------|-----------------------------|
| Facilities – other: | Funded Enrolment × \$581.43 |
|---------------------|-----------------------------|

6.0 Results

6.1 Annual O&M Requirements for Schools

Using the methods outlined in Section 4, the total O&M requirements for the 391 schools assessed in this report is \$ 375,204,786. This cost estimate model is calibrated using 2021 RSMeans values and is valid for that year.

Error! Reference source not found. summarizes the analysis of estimated O&M requirements across the entire dataset, and by zone. See Appendix A for the full table including quartile distribution of school funding requirements. The average estimated Zone 4 total O&M requirement is \$1,793,017. This figure is 3.51 times the Zone 1 average estimated total O&M requirement of \$509,795.

| Costs (Dollars) | | | | | |
|------------------------------------|----------------|---------------|----------------|---------------|----------------|
| | Overall | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Number of Facilities | 391 | 114 | 183 | 11 | 83 |
| Total | \$ 375,204,786 | \$ 58,116,585 | \$ 156,087,193 | \$ 12,180,584 | \$ 148,820,424 |
| Average | \$ 959,603 | \$ 509,795 | \$ 852,935 | \$ 1,107,326 | \$ 1,793,017 |
| Gross Floor Area (m ²) | | | | | |
| Total | 1,030,339.8 | 290,407.9 | 478,330.2 | 31,261.9 | 230,339.8 |
| Average | 2,635.1 | 2,547.4 | 2,613.8 | 2,842.0 | 2,775.2 |
| Minimum | 107.0 | 107.0 | 135.0 | 773.0 | 219.6 |
| Maximum | 9,885.2 | 9,718.8 | 9,054.6 | 4,310.0 | 9,885.2 |

Table 6.1: Summary of Estimated O&M Requirements for Schools

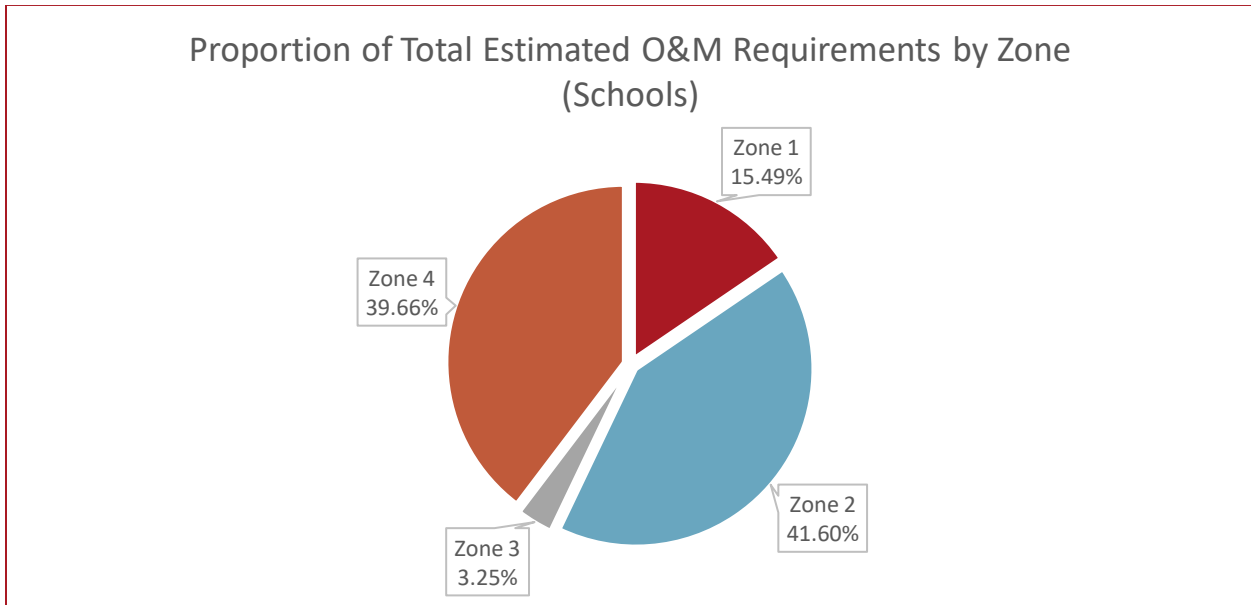


Figure 6.1: Proportion of Total Estimated O&M Requirements by Zone (Schools)

The model used to estimate O&M requirements for schools by gross floor area is linear in shape, as seen in Figure 6.2 depicting the growth in O&M requirements by gross floor area for schools in each zone.

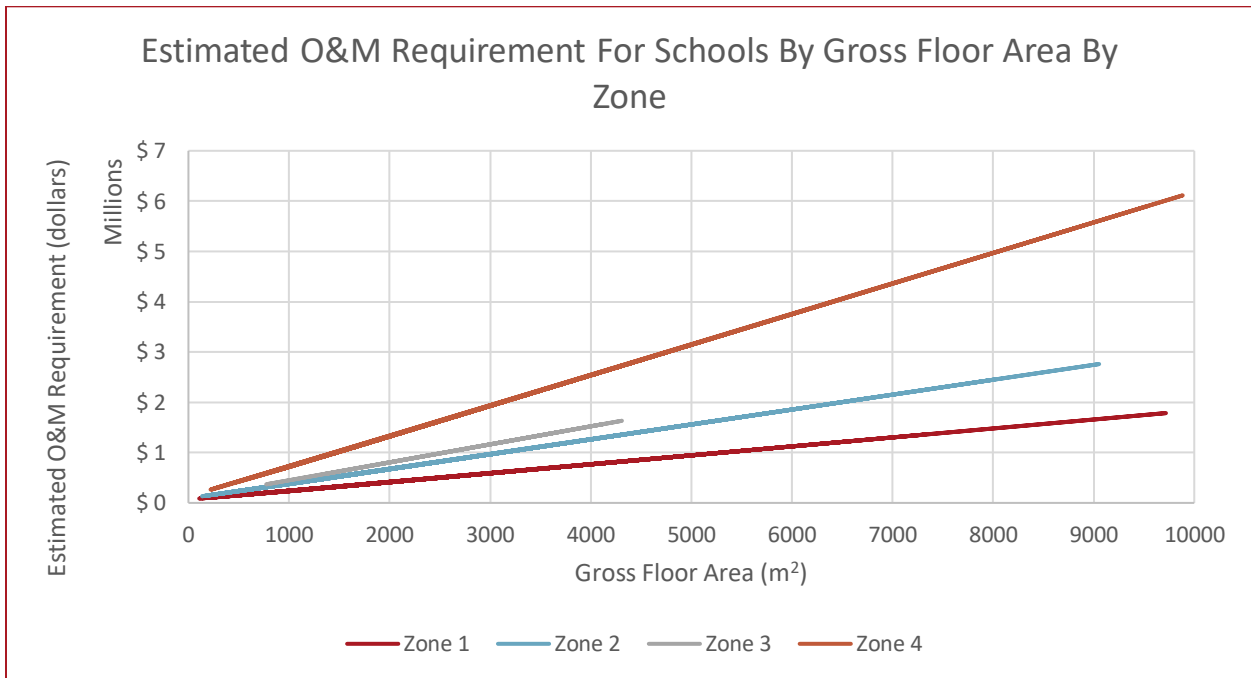


Figure 6.2: Estimated O&M Requirement by Gross Floor Area by Zone (Schools)



6.2 Annual O&M Requirements for Teacherages

Using the methods outlined in Section 4, the total O&M requirements for the 1026 teacherages assessed in this report is \$ 67,705,872.

summarizes the analysis of estimated O&M requirements across the entire dataset, and by zone. See Appendix B - Table 4 for the full table including quartile distribution of school funding requirements.

| Costs (Dollars) | | | | | |
|------------------------------------|---------------|------------|---------------|--------------|---------------|
| | Overall | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Number of Facilities | 1026 | 15 | 208 | 30 | 153 |
| Total | \$ 67,705,872 | \$ 304,792 | \$ 24,355,609 | \$ 3,899,982 | \$ 39,145,489 |
| Average | \$ 65,960 | \$ 20,319 | \$ 51,710 | \$ 63,934 | \$ 81,723 |
| Gross Floor Area (m ²) | | | | | |
| Total | 148,154.8 | 1,434.9 | 71,277.4 | 9,324.7 | 66,117.9 |
| Average | 144.4 | 95.7 | 151.3 | 152.9 | 138.0 |
| Minimum | 46.4 | 73.1 | 15.5 | 72.0 | 10.0 |
| Maximum | 769.0 | 134.2 | 1,032.0 | 496.0 | 1,672.0 |

Table 6.2: Summary of Estimated O&M Requirements for Teacherages

With only 15 teacherages located in First Nations classified as Zone 1, and the lowest unit-cost Zone 1 O&M expenses represent just 0.45% of the total requirements for maintaining teacherages. Zone 2, with the greatest number of teacherages represents 35.97% of the total O&M requirements for teacherages. Zone 3, with just 30 teacherages represents 5.76% of total O&M requirements for teacherages. Zone 4 communities have the greatest O&M funding requirement at 57.82% of the total.

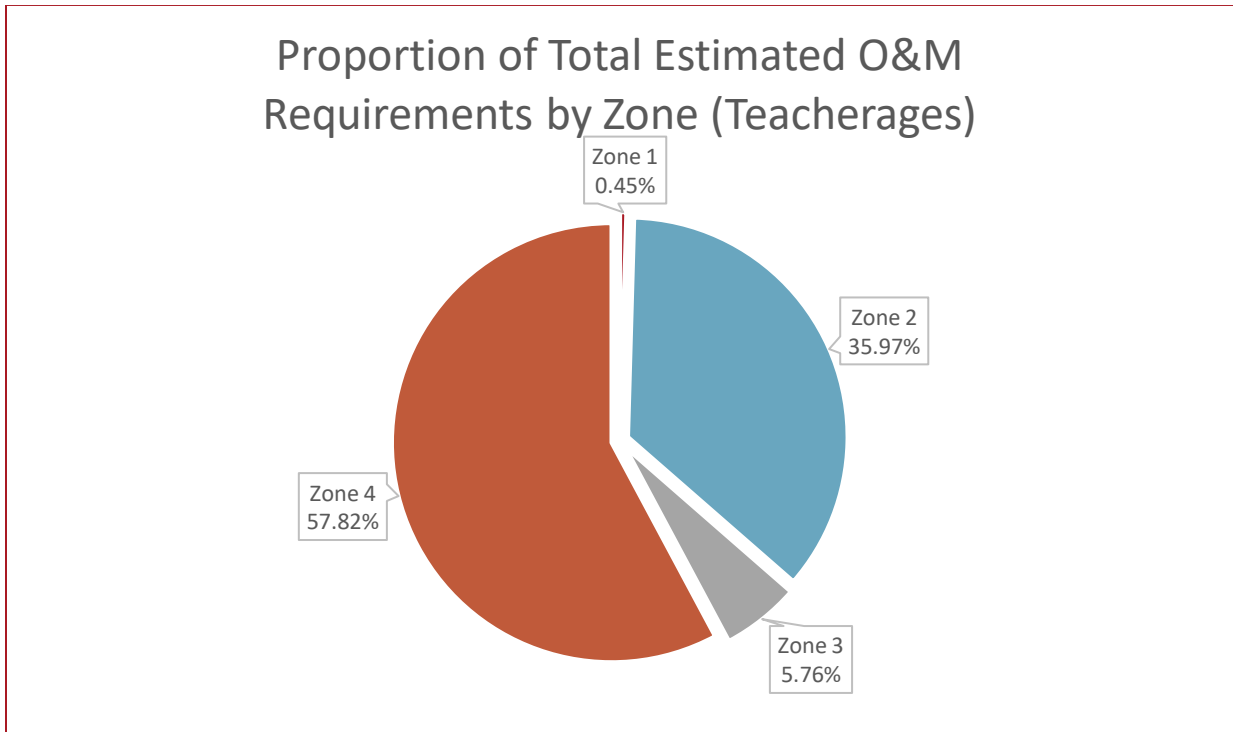


Figure 6.3: Proportion of Total Estimated O&M Requirements by Zone (Teacherages)

The model used to estimate O&M requirements for teacherages by gross floor area is linear in shape, as seen in Figure 6. Figure 6.2 depicting the growth in O&M requirements by gross floor area for schools in each zone.

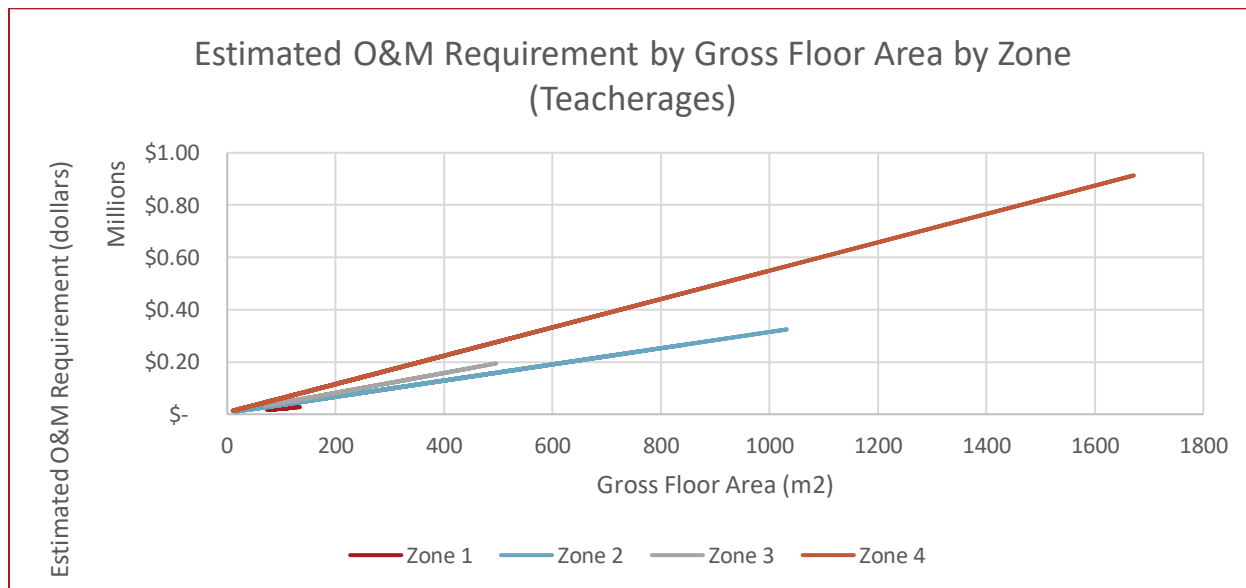


Figure 6.4: Estimated O&M Requirement by Gross Floor Area by Zone (Teacherages)



6.3 5-year Inflation Projection

As economies continue to be impacted by the COVID-19 pandemic through supply chain challenges, labour shortages and border insecurities, we assume that inflation will remain above 2% for the 2022 and 2023 years. Following this, we can assume a typical 2% inflation in 2024 through 2026. It should be noted that inflation remains difficult to predict during this time.

Based on these assumptions, the O&M costs can be expected to grow by the following amounts nationwide in the next five years.

| Year | Assumed Inflation | Schools | Teacherages | Total |
|------|-------------------|-------------------|------------------|-------------------|
| 2021 | - | \$ 375,204,785.63 | \$ 67,705,872.10 | \$ 442,910,657.73 |
| 2022 | 2.2 % | \$ 383,459,290.91 | \$ 69,195,401.28 | \$ 452,654,692.19 |
| 2023 | 2.2 % | \$ 391,895,395.31 | \$ 70,717,700.11 | \$ 462,613,095.42 |
| 2024 | 2 % | \$ 399,733,303.22 | \$ 72,132,054.11 | \$ 471,865,357.33 |
| 2025 | 2 % | \$ 407,727,969.28 | \$ 73,574,695.19 | \$ 481,302,664.48 |
| 2026 | 2 % | \$ 415,882,528.67 | \$ 75,046,189.10 | \$ 490,928,717.77 |

7.0 Comparison to Provincial O&M Funding

Detailed calculations based on the assumptions listed in subsections 7.1 through 7.3 can be found in Appendix B: Table 3.

7.1 British Columbia Model

An important factor to remember under the British Columbia model is that it determines total funding to the school district. From the total funding received the school district allocates which funds pay salaries for teachers, administrators and other staff, course supplies and equipment, and O&M.

Assumptions:

- It was assumed any school that has 75 or fewer students qualified for the remote school's fund. This may overestimate funding in some cases.
- A community can only be eligible for one of the Elementary Small Community funds, so it is assumed that the larger of the two calculated is used. 70% of total enrolment was assumed to be elementary school aged.
- Secondary small community factor is for communities with fewer than 635 secondary school-age FTEs with two tiers – communities with fewer than 100 and communities between 100 and 635 FTEs. Without this specific information, it was assumed all schools qualify for the funding and it is assumed that 30% of a school's enrolment is secondary school aged.
- It was assumed that every school would likely qualify for a portion of low-enrolment factor funding. For this purpose, it was assumed 10% of this fund would go to each school.
- With several small pools of funding available for various factors that data is not available for,



it was simply assumed that an additional \$50,000 would be available for each school.

- It is assumed that salaries, instruction expenses and administration account for 85% of the school budget, leaving 15% for O&M.

Based on the assumptions made above, the British Columbia model would allocate \$ 141,804,457.66 for O&M for all 391 schools included in this study. This is a large divergence from the estimated O&M costs projected by the model used in this study. There are several reasons the model falls short for First Nations schools. These reasons include:

- The funding model is based wholly on student enrollment and assumes O&M requirements can be considered as a small portion of all costs associated with operating a school, including administrative and teacher salaries.
- The increased costs due to remoteness is not well represented in the British Columbia model as it is primarily intended to serve as a buffer against lost funding due to fluctuations in enrollment, not to satisfy the unique needs of a remote school with a small student population.
- These clauses are better designed to support rural hamlets than often remote First Nations communities.
- These funding models are designed to support regional or district school boards, for which economies of scale help balance inequities in resource allocation between urban, suburban, and rural schools.
- The model used in this study is concerned with the requirements of maintaining the school structures to serviceable standard for the life of the building. Some school data have very low, and in some cases no, enrollment relative to the size of the school building. Thus, under the British Columbia funding model, as interpreted and based on the assumptions above, some schools receive limited to no funds.

The school building has an important role within communities, and while enrollment may fluctuate over time in First Nations schools, the buildings must be adequately maintained as community assets.

7.2 Ontario Model

More information would be needed to calculate more precise estimates of funding issued to schools using the Ontario model. Some assumptions were made to acquire a national total estimate of funding.

Assumptions:

- All schools are operating at precisely full capacity (Enrolment = OTG capacity).
- All schools represent a single national school board for the purpose of calculating one SAF value.
- 60% of enrolment is elementary students and 40% is secondary students and when calculated across 391 schools, it can be assumed that each school accommodates both elementary and secondary students.
- 55% of schools are older than 20 years, while 45% of schools were constructed fewer than 20 years ago.
- A single Geographic Adjustment Factor of 1.5 can be used to represent all schools in the list. The governing document lists factors as high as 1.67 for remote northern schools, 1.30 for



schools in Thunder Bay, and 1.0 for Toronto schools.

- These assumptions mean that no schools are eligible for the enhanced top-up figures, however these figures would produce lower funding than if a school has maximum enrolment.

The assumptions made above should yield an overestimate, and thus is conservative. However, it does not factor top-ups for community use of school facilities. The Province of Ontario incentivizes schools to allow the use of gymnasiums, auditoriums and classrooms for recreational athletics, arts productions, and community meetings with additional funding – this has been neglected.

With the assumptions listed above, O&M funding for all schools under the Ontario model would be just \$120,619,998.58 versus the estimated requirement of \$375,204,786; or only 32% of the estimated necessary funding to maintain the school structures.

The Ontario Model does recognize that O&M funding needs to be based on characteristics of school facility sizes, it remains partially based on enrollment. The model also fails to address some of the needs of First Nations schools. Some of these shortcomings are similar to those in the British Columbia model, and include:

- It is tailored to distributing funding through regional or district school boards which enjoy economies of scale when allocating resources.
- Rural clauses are designed to address the needs of hamlets and small towns, rather than the needs of often remote First Nations communities.
- The Government of Ontario incentivizes schools be used for community gatherings and activities and expects compensation for these activities to cover a portion of O&M expenses. This was not included in the estimations; however, this would only account for a small amount of additional funding per school.
- Remoteness factors used in the Ontario funding model go as high as 1.67, however through various studies on school O&M estimation, it has been determined that remote communities' needs are better represented by factors as high as 3.75, as used in the FNESL model of First Nation School O&M cost estimation.
- The model used in this study is concerned with the requirements of maintaining the school structures to serviceable standard for the life of the building. Some school data have very low, and in some cases no, enrollment. Thus, under the Ontario funding model, as interpreted and based on the assumptions above, some schools receive limited to no funds.

As recognized within the Ontario funding model, through its Community Use of Schools component, the school building has an important role within communities, and while enrollment may fluctuate over time in First Nations schools, the buildings must be adequately maintained as community assets.

7.3 Quebec Model

The Quebec model uses a very simple process for calculating O&M funding for schools. The assumptions made below do produce some flaws in the calculations. Additional data would be required to include additional measures under the model.

As the model was understood, it provided the most funding for school O&M, providing an assumed



amount of \$238,270,270.63 for all the schools in the data set. This represents 63.5% of the necessary estimated funding to maintain the school structures.

Assumptions:

- For the purpose of Measure 16011, the previous year's expenses were based on the estimated expenses in Table 3 in Appendix B, including general maintenance, heating, electricity and insurance, with the current year's adjustment factor applied.
- Measure 16012 is concerned with the management of board head offices and were not included in this assessment.
- Under Measure 16013 it was assumed that schools that generated \$ 0 funding through this measure are considered at capacity and were not included.
- Measure 16014, adjustment for energy, was included in the calculation in 16011 and the same adjustment factor for the current year was applied.
- Other funding adjustments for special needs were not included, as data is not available to calculate these funding streams. However, these are small top-ups and not significant funding sources.
- The \$40 million which would be allocated for all Quebec schools and distributed based on the fraction of gross floor area under measure 16044 was entirely allotted to First Nations schools in this study, based on their fraction of gross floor area of the entirety of First Nations schools. Neglecting this, however, the Quebec model remains the provincial model with the highest O&M funding.

The Quebec model relies heavily on historical budgets, which have adjustments applied based on conditions in utility pricing, inflation, etc., which then inform current year budgeting. This approach appears to produce results closest to the true O&M requirements of the facility.

While the Quebec model does produce the highest O&M funding for schools, the ability to account for remote schools is limited. One positive feature of the Quebec funding model is that the province allocates a pool of funding for school O&M across the province, and those funds are distributed based on gross floor area as a fraction of the total gross floor area of school's province wide.

Weaknesses in the Quebec funding model include:

- O&M funding allocation is largely based on historical maintenance data. Thus, it assumes that the school facilities have historically been adequately funded.
- The Quebec funding model does consider small community schools with low enrollment for special funding; however, it does not account for the increased O&M costs incurred due to remote geography of First Nations.

The Quebec funding model is the strongest of the three models used to compare existing models of funding for school facility O&M. However, because much of the funding is calculated based on historical costs, it is less responsive to large year-to-year cost changes and rapid inflation.



8.0 Conclusion

8.1 School O&M Costs

An annual O&M cost estimate was developed for on-reserve First Nations school facilities across Canada using a linear model based on gross floor area and calibrated unit costs to estimate the maintenance requirements of schools located on reserves across the country.

The model breaks down school O&M into six components which are outlined in Subsection 4.1. By basing these components on characteristics and validating them against either known facility maintenance and repair and preventative maintenance costs (through RSMeans) or historical custodial, utility and insurance costs, a zero-based budgeting approach builds the funding requirements for school facilities “from the ground up” to ensure these facilities remain serviceable for at least their expected serviceable life.

The total school annual O&M estimate for needs for schools was determined to be \$375,204,786.

This value was calculated taking into consideration the estimated maintenance and repair, preventative maintenance, general maintenance (including janitorial wages/salaries), heating and electricity, and insurance. Costs were estimated for each numbered school in the set of 391 schools, and the cost per school was summed to achieve the total estimated Canada-wide cost. Table 1 in Appendix B shows the estimated cost breakdowns for each numbered school.

An analysis of the estimated provincial funding allocated for O&M through three very different models used by British Columbia, Ontario and Quebec was completed. Through the analysis it was determined that the Quebec approach yielded funding that is closest to the estimated expenses, however this represents just 64% of required funding to maintain all schools. The British Columbia model produced funding that addresses 38% of O&M needs, while the Ontario model addresses 32% of O&M needs.

Comparing the estimated O&M requirements for common school sizes across the four remoteness zones, it is observed that maintenance budgets should accommodate the differences in costs between these zones. Zone 1 is major centres across Canada, while Zone 2 and Zone 3 represent are considerably more expensive. A limited stock of schools exists in Zone 3 and tend to be larger than the average found in other zones. Zone 4, where road access is only seasonal or can only be accessed by air or barge, represents a large increase in cost. As seen in Table 8.1 typical 2,300 m² school in Zone 4 is more than three times the cost to maintain as a similarly sized school in Zone 1.



Table 8.1: School Size Categories and Estimated O&M by Zone

| Size Category | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
|----------------|--|--|--|--|
| Smaller | 1400 m ² \$ 310,404.00 | 1,450 m ² \$499,784.00 | 1,800 m ² \$708,270.00 | 1,450 m ² \$975,537.50 |
| Typical | 2250 m ² \$ 450,512.00 | 2,500 m ² \$829,720.00 | 3,100 m ² \$1,203,340.00 | 2,300 m ² \$1,508,372.50 |
| Larger | 3,800 m ² \$ 719,847.60 | 3,600 m ² \$1,142,710.00 | 3,700 m ² \$1,413,716.90 | 3,700 m ² \$2,314,657.50 |
| Largest | 9,800 m ² \$1,785,545.60 | 9,000 m ² \$2,760,478.80 | 4,300 m ² \$1,632,840.00 | 9,900 m ² \$6,113,219.18 |

8.2 Teacherage O&M Costs

An annual O&M cost estimate was developed for on-reserve First Nations teacherages across Canada using a similar model to the one used to estimate school O&M costs.

The total school annual O&M estimate for needs for teacherages was determined to be \$67,705,872.

This value was calculated taking into consideration estimated maintenance and repair, preventative maintenance, heating and electricity and insurance. General maintenance was assumed to be included in the schools' janitorial costs. Costs were estimated for each of the 1026 teacherages and the cost per teacherage was summed to achieve the total estimated Canada-wide cost. Table 2 in Appendix B shows the estimated cost breakdowns for each numbered teacherage.

Teacherages were not included in the estimated provincial funding analysis in Section 7.0 as more information would be required to conduct this assessment.

Comparing the estimated O&M requirements for common teacherage sizes across the four remoteness zones, it is observed that maintenance budgets should accommodate the differences in costs between these zones. Zone 1 is like major centres across Canada, while Zone 2 and Zone 3. Zone 1 is seen to have only 15 teacherages in this study. It is assumed that teachers working in Zone 1 schools would live locally, renting or owning an apartment or home of their own. Zone 3 also has few teacherages, at just 30 structures: unsurprising, given the small number of Zone 3 schools. Zones 2 and 4 are seen to have the most teacherages at 208 and 153, respectively. They also have the largest teacherage buildings – presumably multi-unit buildings – to accommodate more teachers in remote locations. As seen in Table 8.2 below, the typical sizes of teacherages are larger in Zones 2, 3 and 4, compared to Zone 1. However, a 75 m² teacherage in Zone 4 is estimated to cost 47,625.00 to maintain per year, compared to \$16,930.99 in Zone 1, a threefold increase.



Table 8.2: Teacherage Size Categories and Estimated O&M Cost by Zone

| Size Category | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
|----------------|-----------------------------------|-------------------------------------|------------------------------------|--------------------------------------|
| Smaller | 74 m ² \$16,194.55 | 90 m ² \$32,411.40 | 85 m ² \$38,309.25 | 80 m ² \$50,262.50 |
| Typical | 75 m ² \$16,930.99 | 100 m ² \$36,215.40 | 100 m ² \$43,377.10 | 90 m ² \$55,750.00 |
| Larger | 105 m ² \$21,872.00 | 170 m ² \$56,963.06 | 165 m ² \$67,758.94 | 145 m ² \$85,487.50 |
| Largest | 135 m ² \$27,323.10 | 1050 m ² \$324,444.00 | 495 m ² \$194,356.00 | 1,672 m ² \$913,430.00 |

8.3 Limitations

This assessment offers a national estimate into the true cost of maintaining First Nations schools and teacherages; however, the data set is not inclusive of all First Nations education infrastructure, including federal schools, private schools, schools in self-governing First Nations communities, and schools whose education programming is delivered by the province.

RSMeans is an industry standard tool used for estimating operations & maintenance costs for a variety of structures and facilities. However, there are generalizations and assumptions made in developing the estimates for individual schools, which were then used to calibrate a model used to provide a cost estimate for all 391 schools and 1026 teacherages. As demonstrated in section 4.5, the model is within 15% or better when compared to true estimated costs of individual schools, depending on the zone. When looking at schools in aggregate, as in this assessment, the modeled estimates are within 10% of true estimated costs.

In developing comparisons between estimated required O&M funding through the model used in this study with funding models using provincial formulae, there are several assumptions made to complete the comparison. As such, these comparisons would require additional information on a school-by-school basis including data on specific enrollment, school board involvement, and other contributing factors. Despite these assumptions, the results show a discrepancy in funding between 32% and 64% to maintain schools, which demonstrates that significant attention is required to reassess provincial comparability and the application of the interim funding formula for First Nations schools.

8.4 Asset Management Planning

When considering replacement of existing infrastructure within a First Nation, such as a school or teacherage, it is important to consider Asset Management Planning (AMP). It is crucial to maintain an AMP lens in any infrastructure analysis, and to recognize the ways in which education infrastructure is interconnected with other community infrastructure, including water, wastewater, internet and more.



As noted within this study, the model developed for assessing O&M requirements for many schools is accurate within about 5 - 10% of real-world estimates when averaged across sets of many schools, however O&M expenses can vary greatly between individual schools. Thus, it is important to develop an individualized asset management plan for a community's infrastructure, including its schools.

9.0 References

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Appendix A

Extended Analysis

Cost Analysis of Schools – Overall and Zones 1, 2, 3, 4

| Costs | | | | | |
|------------------------------------|----------------|---------------|----------------|---------------|----------------|
| | Overall | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Number of Facilities | 391 | 114 | 183 | 11 | 83 |
| Total | \$ 375,204,786 | \$ 58,116,585 | \$ 156,087,193 | \$ 12,180,584 | \$ 148,820,424 |
| Average | \$ 959,603 | \$ 509,795 | \$ 852,935 | \$ 1,107,326 | \$ 1,793,017 |
| Minimum | \$ 87,334 | \$ 87,334 | \$ 132,530 | \$ 369,547 | \$ 264,488 |
| 1st Quartile | \$ 444,995 | \$ 248,018 | \$ 502,842 | \$ 740,261 | \$ 974,965 |
| 2nd Quartile | \$ 777,970 | \$ 454,919 | \$ 814,520 | \$ 1,203,340 | \$ 1,482,925 |
| 3rd Quartile | \$ 1,203,070 | \$ 719,993 | \$ 1,145,629 | \$ 1,412,972 | \$ 2,332,446 |
| Maximum | \$ 6,113,219 | \$ 1,785,546 | \$ 2,760,479 | \$ 1,632,840 | \$ 6,113,219 |
| Gross Floor Area (m ²) | | | | | |
| Total | 1,030,339.8 | 290,407.9 | 478,330.2 | 31,261.9 | 230,339.8 |
| Average | 2,635.1 | 2,547.4 | 2,613.8 | 2,842.0 | 2,775.2 |
| Minimum | 107.0 | 107.0 | 135.0 | 773.0 | 219.6 |
| 1st Quartile | 1,390.0 | 1,089.0 | 1,439.0 | 1,819.5 | 1,434.0 |
| 2nd Quartile | 2,400.0 | 2,249.5 | 2,490.0 | 3,110.0 | 2,270.0 |
| 3rd Quartile | 3,684.5 | 3,740.7 | 3,605.5 | 3,695.1 | 3,666.5 |
| Maximum | 9,885.2 | 9,718.8 | 9,054.6 | 4,310.0 | 9,885.2 |

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 Maintenance Needs Assessment*



| Total Cost breakdown by Expense Type (Schools) | | | | | |
|---|-----------------------|----------------------|-----------------------|----------------------|-----------------------|
| | Overall | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Maint. & Repair. | \$ 240,789,696 | \$ 31,944,872 | \$ 105,232,642 | \$ 8,597,023 | \$ 95,015,159 |
| Prev. Maint. | \$ 23,657,100 | \$ 3,273,100 | \$ 10,529,000 | \$ 801,000 | \$ 9,054,000 |
| Gen. Maint. | \$ 23,869,000 | \$ 6,884,000 | \$ 11,108,000 | \$ 690,000 | \$ 5,187,000 |
| Heating | \$ 38,665,511 | \$ 7,841,014 | \$ 15,784,896 | \$ 1,219,214 | \$ 13,820,387 |
| Electricity | \$ 43,033,979 | \$ 7,260,198 | \$ 11,958,255 | \$ 781,548 | \$ 23,033,978 |
| Insurance | \$ 5,189,500 | \$ 913,400 | \$ 1,474,400 | \$ 91,800 | \$ 2,709,900 |
| Total | \$ 375,204,786 | \$ 58,116,585 | \$ 156,087,193 | \$ 12,180,584 | \$ 148,820,424 |



Cost Analysis of Teacherages – Overall and Zones 1, 2, 3, 4

| Costs | | | | | |
|---|----------------|---------------|---------------|---------------|---------------|
| | Overall | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Number of Facilities | 1026 | 15 | 208 | 30 | 153 |
| Total | \$ 67,705,872 | \$ 304,792 | \$ 24,355,609 | \$ 3,899,982 | \$ 39,145,489 |
| Average | \$ 65,960 | \$ 20,319 | \$ 51,710 | \$ 63,934 | \$ 81,723 |
| Minimum | \$ 9,970 | \$ 16,195 | \$ 9,970 | \$ 33,267 | \$ 13,338 |
| 1st Quartile | \$ 35,850 | \$ 16,563 | \$ 33,414 | \$ 38,309 | \$ 51,449 |
| 2nd Quartile | \$ 51,449 | \$ 21,818 | \$ 36,806 | \$ 43,377 | \$ 57,016 |
| 3rd Quartile | \$ 69,084 | \$ 21,899 | \$ 56,963 | \$ 67,759 | \$ 86,099 |
| Maximum | \$ 913,430 | \$ 27,323 | \$ 324,444 | \$ 194,356 | \$ 913,430 |
| Gross Floor Area (m²) | | | | | |
| Total | 148,154.8 | 1,434.9 | 71,277.4 | 9,324.7 | 66,117.9 |
| Average | 144.4 | 95.7 | 151.3 | 152.9 | 138.0 |
| Minimum | 46.4 | 73.1 | 15.5 | 72.0 | 10.0 |
| 1st Quartile | 90.0 | 75.1 | 92.0 | 85.5 | 82.3 |
| 2nd Quartile | 104.7 | 103.7 | 103.1 | 98.6 | 92.4 |
| 3rd Quartile | 182.0 | 104.2 | 168.7 | 163.2 | 146.2 |
| Maximum | 1,672.0 | 134.2 | 1,032.0 | 496.0 | 1,672.0 |



| Total Cost breakdown by Expense Type (Teacherages) | | | | | |
|---|----------------------|-------------------|----------------------|---------------------|----------------------|
| | Overall | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Maint. & Repair. | \$ 42,040,273 | \$ 157,835 | \$ 15,681,021 | \$ 2,564,279 | \$ 23,637,139 |
| Prev. Maint. | \$ 6,371,588 | \$ 34,150 | \$ 2,262,300 | \$ 367,375 | \$ 3,707,763 |
| Gen. Maint. | \$ - | \$ - | \$ - | \$ - | \$ - |
| Heating | \$ 15,683,799 | \$ 90,396 | \$ 5,488,357 | \$ 848,543 | \$ 9,256,502 |
| Electricity | \$ 2,598,813 | \$ 10,761 | \$ 534,580 | \$ 69,935 | \$ 1,983,536 |
| Insurance | \$ 1,011,400 | \$ 11,650 | \$ 389,350 | \$ 49,850 | \$ 560,550 |
| Total | \$ 67,705,872 | \$ 304,792 | \$ 24,355,609 | \$ 3,899,982 | \$ 39,145,489 |