MOTHER CABRINI
CATHOLIC SCHOOL PARENT COUNCIL
CSPC FUNDED AIR CONDITIONING PROPOSAL

Date of Council Meeting (mm/dd/yy):	**Funding Proposal:**
10/03/18	Portable Air Conditioning Units

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II. EXECUTIVE SUMMARY

The Mother Cabrini Catholic School Parent Council (CSPC) proposes to fund the purchase, installation, and a portion of the energy costs of Portable Air Conditioning (PAC) units to reduce the risks of heat-related illness and facilitate the comfort level and educational performance of students during hot weather conditions in the cooling season (May, June, September). The units will be activated when outdoor humidex readings of ≥ 30°C are reported by the Weather Network during the cooling season and will reduce student occupied classroom temperatures to 25°C. Nine PAC units are estimated to cost approximately $6,000 and funding has already been obtained by the CSPC.

III. BACKGROUND

Heat-related illnesses, such as heat exhaustion or heat stroke, are caused by a variety of factors including air quality (e.g., temperature, humidity levels), dehydration, and physical activity; the very young are particularly vulnerable to heat-related illnesses (Centers for Disease Control and Prevention, 2017).

A recent 13 year longitudinal study, assessing 10 million students test scores, found a correlation between educational performance decline and hot weather conditions at temperatures exceeding 23°C (Goodman, Hurwitz, Park, & Smith, 2018). Performance declines were particularly problematic at temperatures exceeding approximately 29°C. Notably, this study found that access to air conditioning substantially mitigates the effects of heat on the academic achievement of students.

Toronto Public Health monitors the Heat Health Alert System for hot weather conditions annually from May 15 to September 30 to alert those at risk for heat-related illnesses of present conditions requiring extra precautions (City of Toronto, a). Heat warnings are issued when hot weather conditions are forecasted to continue for 2 days (3+ days for extended heat warnings) (City of Toronto, b). The following chart illustrates the triggers for a heat warning:

Table 1. Conditions for the Issue of a Heat / Extended Heat Warning

Forecast Temperature High (°C)	Forecast Temperature Low (°C)	Forecast Humidex	Duration (days)	Action
≥31	≥20	≥40	2	Medical Officer of Health will issue a Heat Warning
≥31	≥20	≥40	3+	Medical Officer of Health will issue an Extended Heat Warning

The following chart, based on Heat Warning Statistics (City of Toronto, a), summarizes the number of heat warnings issued for Toronto over the past five years including a breakdown of the number of issued warnings during each school year. From 2014 to 2018, Public Health declared 38 Heat Alerts (32% of which were during the school year) and 20 Extended Heat Alerts (20% of which were during the school year).

Table 2. Heat / Extended Heat Alerts Issued Between 2014 - 2018				
	Heat Alert		**Extended Heat Alert**	
	Total	**May - Sep**	**Total**	**May - Sep**
2018	10	2	6	0
2017	5	5	2	2
2016	14	4	8	1
2015	8	0	4	1
2014	1	1	0	0
Totals	**38**	**12**	**20**	**4**

While Heat / Extended Heat Alerts are triggured during periods where high humidex readings are forcasted to continue over a number of days, humidex readings greater than 30°C are defined by Environment Canada to produce discomfort as well and could occur on a single day. The following table illustrates the comfort levels associated with various humidex ratings (Government of Canada, 2018):

Table 3. Environment Canada Humidex Reading and Degree of Comfort	
Humidex (°C)	**Degree of comfort**
20 - 29	Little discomfort
30 - 39	Some discomfort
40 - 45	Great discomfort; avoid exertion
46 and over	Dangerous; possible heat stroke

The Toronto Catholic District School Board (TCDSB) maintains a Standard Operating Procedure (SOP) for Hot Weather which details the implementation of several control measures when a Heat Warning or Extended Heat Warning are declared (Toronto Catholic District School Board, 2016). Some strategies include reminding students to stay hydrated, encouraging the use of fans near open windows, and rotating students to cooling stations where available.

In schools where Heating, Ventilation and Air Conditioning (HVAC) systems are availale, those systems are utilized to assist in the cooling of schools. In 2017 it was reported that approximately 139

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TCDSB schools have mechanical ventilation systems (Toronto District Catholic School Board, 2017a). In 2012 the TDCSB still supported the funding and installation of HVAC systems in some schools (de Quintal, 2012). The TCDSB's 2013 Energy Management Plan contains a SOP for temperatures of occupied spaces to be maintained at 25°C by air conditioning systems during the cooling seasons (Toronto District Catholic School Board, 2017b). Furthermore, the TCDSB permits childcare tenants to furnish and cover partial energy costs of PAC units (between 7,000 to 12,000 BTU) during the months of July and August (Toronto District Catholic School Board, 2017b).

In a 2017 evaluation of the TCDSB Hot Weather SOP, 36% of responding stakeholders recommended the use of PAC units to assist in the management of hot weather conditions (Toronto District Catholic School Board, 2017b). The Elementary Teachers' (TECT) Joint Health and Safety Committee recommended cooling measures be taken when the humidex reading is ≥ 35°C to combat the risk of heat-related illness (Toronto District Catholic School Board, 2017b).

IV. SUMMARY

While there are TCDSB guidelines in place for responding to hot weather conditions, some Catholic Schools have the benefit of HVAC systems with further guidelines for balancing occupant comfort and energy conservation using these systems. The use of fans situated by open windows is permitted by the TDCSB. The TCDSB also permits the use of PAC units during the cooling season by childcare tenants, provided the cost of the unit, installation, and nominal fees to offset the cost of electrical consumption be covered by the tenant.

At Mother Cabrini Catholic School, some fans have been donated by the parent community. However, air quality remains a concern, in that the function of a fan is to move air more rapidly over skin to produce a cooling effect; whereas an AC unit lowers the air temperature to more tolerable levels. The Mother Cabrini CSPC proposes to allocate profits from recent fundraising efforts towards the purchase of 9 free-standing PAC units for each classroom. The units will be run during the cooling season (May, June, September) according to TCDSB Energy Management Plan SOP (i.e., occupied student classrooms will have a temperature maintained at 25°C). To help balance comfort and energy conservation, the units will be utilized when humidex readings are reported by the Weather Network to be ≥ 30°C.

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V. COST PER UNIT ESTIMATES

To cool a room that is approximately 550 sq. ft., a PAC of 12,000 BTU is recommended (Zorn, 2014). The following table compares several PAC units with a 12,000 BTU rating:

Table 4. PAC Unit Comparison

Details	Unit	
Name	Danby Portable Air Conditioner	Danby Portable Air Conditioner
Model Number	DPA120BDCGDB	DPA120E1WDB
BTU	12000	12000
Coverage (sq. ft.)	550	550
Cost	$499	$499
Retailer	Best Buy: https://m.bestbuy.ca/en-CA/product/danby-portable-air-conditioner-12000-btu-white/12681774	Best Buy: https://m.bestbuy.ca/en-CA/product/danby-danby-12000-btu-portable-air-conditioner-dpa120e1wdb-white-dpa120e1wdb/10549448
Warranty Length	4 years	4 years
Warranty Cost	$89.99	$89.99
Energy Star Qualified	No	Yes
Energy Efficiency Rating	9	10.3
Economy Operation Mode	No	Yes
LED Display	Yes	Yes

The estimated cost to purchase 9 Danby Energy Star PAC units including the cost of a 4 year warranty is (($499 + $89.99) x 9) + 13% HST = **$5990.03**.

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VI. COST OF ENERGY CONSUMPTION ESTIMATES

The following table illustrates the conversion of BTU to kilowatt-hours (kWh), a measurement equal to one kilowatt of power consumption per hour (Ketchum):

Table 5. BTU to kWh Conversion Values

BTU	kWh Conversion
7500	2.2
10000	2.9
12000	3.5
14000	4.1

The following table summarizes the number of days where a humidex reading of ≥ 30°C was recorded in Toronto during school months (Toronto Weather Stats). Over five year, there was an average of 28 days where hot weather conditions causing discomfort were recorded during school months.

Table 6. Total Days of Humidex Readings of ≥ 30°C from 2014 - 2018

	Year				
	2018	**2017**	**2016**	**2015**	**2014**
May	8	2	6	7	2
Jun	9	12	8	8	13
Sep	14	15	11	14	7
Oct	0	3	1	0	0
Totals	**31**	**32**	**26**	**29**	**22**
5 Year Average = 28 days					

Using a liberal estimate of the highest energy costs based on the Ontario Energy Boards current May 2018 residential / business summer energy rates of 13.2 cents per hour (Toronto Hydro, 2018a) (Toronto Hydro, 2018b), the following table estimates the cost to run a single PAC unit continuously

over a single day, over 28 days (5 year average number of days with a humidex reading of ≥ 30°C), and over 66 days (approximate average number of weekdays in May, June and September):

Table 7. Cost Estimates for a Single PAC Operation by Rating and Duration

BTU	kWh	6 hours (9am – 3pm)	28 days	66 days
7500	2.2	$1.74	$48.78	$115.00
10000	2.9	$2.30	$64.31	$151.60
12000	**3.5**	**$2.77**	**$77.62**	**$182.95**
14000	4.1	$3.25	$90.92	$214.32

We do not expect that a PAC unit will be run continuously over 6 hours during the entire cooling season. However, for our estimation purposes, for a single PAC unit (12,000 BTU), the estimated cost to continually run the unit for a full day may range between $77.62 (used only on days where a humidex reading is ≥ 30°C) to $182.95 (used continuously on weekdays throughout May, June, and September). For 9 units, the energy consumption costs could range between $698.58 (28 days) to $1646.55 (66 weekdays) per annum.

VII. CSPC REQUEST

The Mother Cabrini CSPC respectfully requests that the TDCSB approve the proposal to use funds raised and allocated (budget: $XX) for the purchase of 9 free-standing Portable Air Conditioning units to be placed in main student occupied classrooms. The units will be turned on during the cooling season (May, June, September) when humidex readings reach ≥ 30°C and student occupied classrooms will have temperatures maintained at 25°C during these hot weather conditions.

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