

Cost of Delivering Housing in Canada

THE RESEARCH

CMHC commissioned research to assess the cost of delivering two housing archetypes in seven Canadian census metropolitan areas (CMAs) with different climate zones: Yellowknife, Whitehorse, Vancouver, Calgary, Toronto, Montréal and Halifax. The project was undertaken to characterize the cost components associated with providing single-family houses and townhouses as well as the related incremental costs of improved energy efficiency.

OVERVIEW

Using an elemental costing approach, construction was assumed to take place in suburban locations outside of the city centres on new plots of land by a potential developer, rather than as single, one-off construction projects. The costs investigated included those associated with planning, design, procurement and construction. To facilitate comparison of construction and development costs only, land costs were not factored in. For the housing archetypes modelled, total construction costs, including labour and material costs, are broken down into the following elements:

- Substructure, structure and exterior enclosure
- Partitions and doors, finishes, and fittings and equipment
- Mechanical and electrical
- Site work

Similarly, soft costs are stated and include consultant fees, development management costs, government taxes and levies, and marketing and financing costs.

The archetypes modelled were constructed based on compliance with National Building Code of Canada (NBC) 2015. Table 1 provides a summary of the archetype building details.

Changes to the baseline buildings were costed for two packages of improved energy efficiency, with a focus on building enclosure performance and higher efficiency mechanical systems. The increments included a low-energy increment, to represent an ultra-low or near net-zero energy building with enclosure performance comparable to EnerPHit, and an intermediate increment, to represent an intermediary performance target.

Table 1: Summary of archetype building details

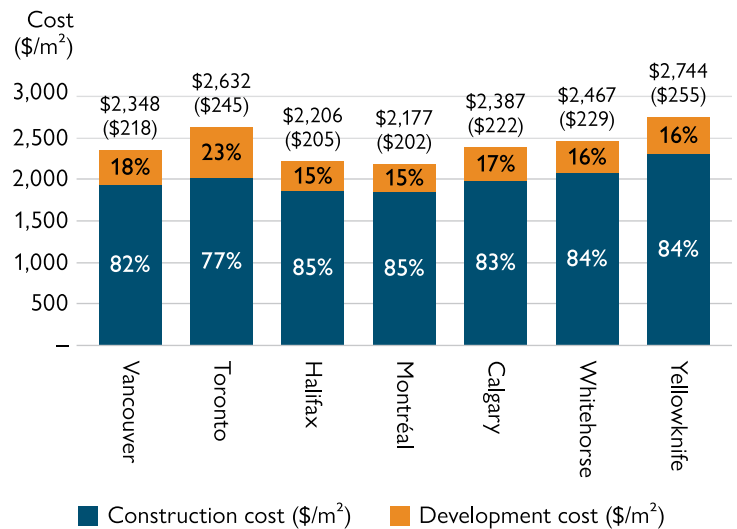
Archetype	Single-family house (SFH)	Townhouse (TH)
Storeys	2 + basement	2.5
Dwelling units	1	5
Above-grade floor area (per dwelling unit)	214 m ² (2,300 sq. ft.)	116 m ² (1,250 sq. ft.)
Basement floor area	79 m ² (850 sq. ft.)	46 m ² (500 sq. ft.)
Gross floor area	358 m ² (3,855 sq. ft.)	167 m ² (1,800 sq. ft.)
Wall framing	2×6	2×6
Bedrooms	4	2
Bathrooms	2.5	1.5
Heating	Gas-fired furnace	Gas-fired furnace
Cooling	DX coil in furnace; no cooling in Whitehorse and Yellowknife	DX coil in furnace; no cooling in Whitehorse and Yellowknife
Ventilation	Heat recovery ventilator	Heat recovery ventilator
Hot water fuel source	Based on typical installs in each city	Based on typical installs in each city
Appliances	Electric	Electric
Foundation	Basement	Slab on grade
Roof	Vented sloped attic	Flat roof
Garage	Detached	Half of lowest level

KEY FINDINGS

- For the archetypes modelled, total project costs for the single-family house (SFH) were found to vary between \$2,177/m² (\$202/sq. ft.) in Montréal and \$2,744/m² (\$255/sq. ft.) in Yellowknife. For the same centres, the townhouse (TH) had slightly higher total project costs, with a range from \$2,306/m² (\$214/sq. ft.) to \$2,881/m² (\$268/sq. ft.). Refer to figures 1 and 2.
- The construction costs accounted for 75% to 85% of the total project cost and varied between \$1,850/m² (\$172/sq. ft.) to \$2,311/m² (\$215/sq. ft.) for the SFH, compared to \$1,960/m² (\$182/sq. ft.) to \$2,427/m² (\$226/sq. ft.) for the TH. The highest construction costs for both archetypes were noted in Yellowknife.
- The development costs accounted for 15% to 25% of the total project costs and varied between \$328/m² (\$30/sq. ft.) to \$610/m² (\$57/sq. ft.) for the SFH, compared to \$346/m² (\$32/sq. ft.) to \$722/m² (\$67/sq. ft.) for the TH. The highest development costs were noted in Toronto, while the lowest were observed in Montréal. Refer to figures 1 and 2.
- On a per-square-metre (per-square-foot) basis, the townhouse archetype costs were 6% to 8% higher than the single-family house archetype costs, which stemmed mostly from the higher mechanical cost component of the former.
- The largest contributors to the construction costs of the SFH archetype were found to be the exterior enclosure, structure and site work. The largest contributors for the TH archetype were found to be the exterior enclosure, structure and mechanical. Refer to figure 3.
- Given the relatively small contribution of any one construction element to the overall cost of a project, changes in any one cost element are not expected to have a significant impact on the overall cost of housing.
- For an SFH archetype, construction cost premiums over baseline for achieving increment 1 ranged from 2.9% in Vancouver, for an increase of \$57/m² (\$5.3/sq. ft.), to 4.6% in Yellowknife, for an increase of \$107/m² (\$9.9/sq. ft.). For the same centres, construction cost premiums of 5.3% to 9.0% were noted to achieve increment 2. Refer to table 2.
- Above-grade wall insulation and better-performing windows made up most of the marginal capital cost increase for increments 1 and 2. Figure 4 shows the distribution of cost premiums over baseline for an SFH to achieve increment 2.

This figure illustrates the construction, development and total costs for the SFH archetype. It also shows how much of total costs was attributed to the construction and development components for each CMA. For example, the total dollar costs per square metre (square foot in parentheses) for the single-family house archetype in Vancouver were \$2,348 (or \$218 per square foot), of which about 82% was attributed to construction costs and about 18% to development costs.

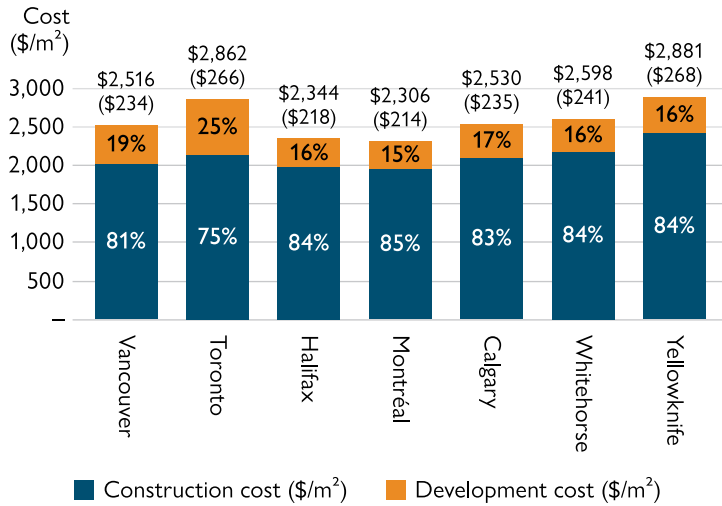
Figure 1: Construction, development and total costs for the single-family house archetype by CMA, 2017



Sources: BTY Group and RDH Building Science

This figure illustrates the construction, development and total costs for the TH archetype. For example, the total costs for the TH archetype in Yellowknife were \$2,881 per square metre (or \$267 per square foot), of which about 84% was attributed to construction costs and about 16% to development costs.

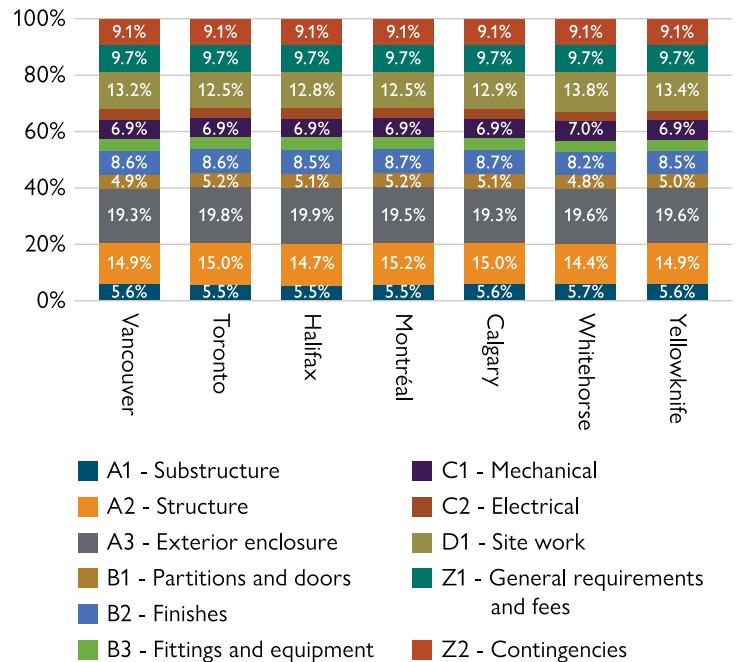
Figure 2: Construction, development and total costs for the townhouse archetype by CMA, 2017



Sources: BTY Group and RDH Building Science

This figure provides further breakdown of the construction portion of total costs (which excludes development costs), net of taxes. The percentages represent how much of the construction costs was attributed to any element. For example, in Montréal, the structure costs represented 15.2% of the construction costs, whereas in Whitehorse, they made up 14.4% of the construction costs. For all CMAs, site work, contingencies, and general requirements and fees made up about 30% of the construction costs for this housing archetype.

Figure 3: Breakdown of SFH construction costs by construction element (excluding taxes) by CMA, 2017



Sources: BTY Group and RDH Building Science

This table provides expected marginal construction cost increases for achieving increments 1 and 2, as percentages of construction costs. For example, to achieve increment 1 energy performance, the marginal construction cost would be 4.6% in Calgary, versus 2.9% in Vancouver. Similarly, for increment 2, the marginal cost would be 8.0% in Calgary, versus 5.3% in Vancouver.

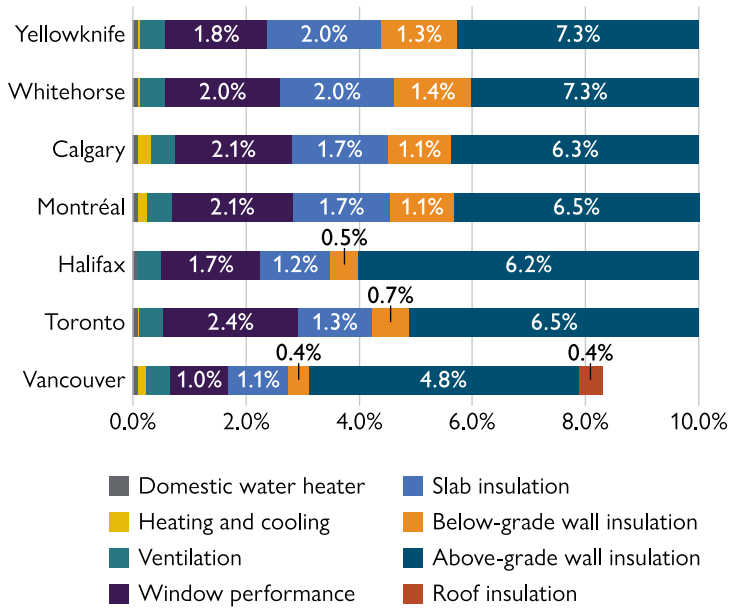
Table 2: SFH construction cost premiums over baseline for increments 1 and 2

	Vancouver	Toronto	Halifax	Montréal	Calgary	Whitehorse	Yellowknife
Increment 1							
\$ increase per m ²	57.2	84.2	69.1	84.2	90.6	97.1	106.8
\$ increase per sq. ft.	5.3	7.8	6.4	7.8	8.4	9	9.9
% increase over construction costs	2.9%	4.1%	3.7%	4.6%	4.6%	4.7%	4.6%
Increment 2							
\$ increase per m ²	102.5	156.5	128.4	151.1	158.6	192.1	208.2
\$ increase per sq. ft.	9.5	14.5	11.9	14	14.7	17.8	19.3
% increase over construction costs	5.3%	7.7%	6.9%	8.1%	8.0%	9.2%	9.0%

Sources: BTY Group and RDH Building Science

This figure indicates the expected percentage construction cost increase of each element over baseline for achieving increment 2 for selected elements. The largest contributor to the increases in marginal cost was associated with the addition of insulation to the above-grade walls (rigid exterior insulation). Note that a combination of only some elements below can be sufficient to achieve increment 2 levels of performance.

Figure 4: Low-energy increment cost increase per element for the SFH archetype by CMA, 2017



Sources: BTY Group and RDH Building Science

IMPLICATIONS FOR THE HOUSING INDUSTRY

This research project was undertaken to help government, industry and other housing sector stakeholders better understand the cost components of delivering housing. By understanding the main influences of Northern housing costs, policy analysts, program designers and housing providers can have a better idea of where to focus their efforts to address housing costs. This information can also be used to anticipate the potential impact of programs and initiatives on housing costs, based on which of the individual cost elements they may touch upon and the relative contribution of those elements to the overall cost of housing.

The research shows that the primary cost drivers for housing construction price differences across Canada are labour and material disparities for various locations. Variations in development costs and taxes also contribute to the differences, but to a lesser extent. Significant changes in the cost of any one element of constructing housing will not have a significant impact on the cost of housing, indicating that multiple approaches are likely required to reduce housing costs.

As we move to more stringent code requirements, this study sheds some light on the incremental cost increases for the single-family house and townhouse archetypes. It shows there are multiple ways of achieving different energy efficiency levels with various cost implications.

FURTHER READING

Full report – *Cost of Delivering Housing in Canada*
https://eppdscrmssa01.blob.core.windows.net/cmhcprodcontainer/sf/project/archive/research_3/cost_of_delivering_housing_in_canada.pdf

Project Manager(s):

Zabiullah Tarshi
 Housing Needs Research
 Canada Mortgage and Housing Corporation

Research Consultants:

BTY Group and RDH Building Science



ALTERNATIVE TEXT AND DATA FOR FIGURES

Figure 1: Construction, development and total costs for the single-family house archetype by CMA, 2017

	Vancouver	Toronto	Halifax	Montréal	Calgary	Whitehorse	Yellowknife
Construction cost (\$/m ²)	1,930	2,021	1,865	1,850	1,984	2,079	2,311
Development cost (\$/m ²)	418	610	342	328	403	388	433
Sum	2,348	2,632	2,206	2,177	2,387	2,467	2,744
As percent of total							
Construction cost (\$/m ²)	82%	77%	85%	85%	83%	84%	84%
Development cost (\$/m ²)	18%	23%	15%	15%	17%	16%	16%

Sources: BTY Group and RDH Building Science

Figure 2: Construction, development and total costs for the townhouse archetype by CMA, 2017

	Vancouver	Toronto	Halifax	Montréal	Calgary	Whitehorse	Yellowknife
Construction cost (\$/m ²)	2,028	2,140	1,969	1,960	2,102	2,184	2,427
Development cost (\$/m ²)	488	722	374	346	428	414	454
Sum	2,516	2,862	2,344	2,306	2,530	2,598	2,881
As percent of total							
Construction cost (\$/m ²)	81%	75%	84%	85%	83%	84%	84%
Development cost (\$/m ²)	19%	25%	16%	15%	17%	16%	16%

Sources: BTY Group and RDH Building Science

Figure 3: Breakdown of SFH construction costs by construction element (excluding taxes) by CMA, 2017

	Vancouver	Toronto	Halifax	Montréal	Calgary	Whitehorse	Yellowknife
A1 - Substructure	5.6%	5.5%	5.5%	5.5%	5.6%	5.7%	5.6%
A2 - Structure	14.9%	15.0%	14.7%	15.2%	15.0%	14.4%	14.9%
A3 - Exterior enclosure	19.3%	19.8%	19.9%	19.5%	19.3%	19.6%	19.6%
B1 - Partitions and doors	4.9%	5.2%	5.1%	5.2%	5.1%	4.8%	5.0%
B2 - Finishes	8.6%	8.6%	8.5%	8.7%	8.7%	8.2%	8.5%
B3 - Fittings and equipment	4.2%	4.1%	4.3%	4.2%	4.1%	4.1%	3.8%
C1 - Mechanical	6.9%	6.9%	6.9%	6.9%	6.9%	7.0%	6.9%
C2 - Electrical	3.6%	3.5%	3.5%	3.5%	3.5%	3.6%	3.6%
D1 - Site work	13.2%	12.5%	12.8%	12.5%	12.9%	13.8%	13.4%
Z1 - General requirements and fees	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%
Z2 - Contingencies	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%

Sources: BTY Group and RDH Building Science

Figure 4: Low-energy increment cost increase per element for the SFH archetype by CMA, 2017

	Vancouver	Toronto	Halifax	Montréal	Calgary	Whitehorse	Yellowknife
Domestic water heater	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Heating and cooling	0.1%	0.0%	0.0%	0.2%	0.2%	0.0%	0.0%
Ventilation	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Window performance	1.0%	2.4%	1.7%	2.1%	2.1%	2.0%	1.8%
Slab insulation	1.1%	1.3%	1.2%	1.7%	1.7%	2.0%	2.0%
Below-grade wall insulation	0.4%	0.7%	0.5%	1.1%	1.1%	1.4%	1.3%
Above-grade wall insulation	4.8%	6.5%	6.2%	6.5%	6.3%	7.3%	7.3%
Roof insulation	0.4%	0.5%	0.4%	0.6%	0.6%	0.6%	0.6%

Sources: BTY Group and RDH Building Science