	Caledon GDS Case Study - MURB	Multi-Unit Residential Building (6 Units) in Oshawa			
	Created on: 2023-11-28				
OBC 2017 - A1 Package **OBC Climate Zone 1**	Upgrades against NBC 2015 Downgrades against NBC 2015	**NBC 2015 - Reference** **NBC Climate Zone 5**	**GDS 2024 - NBC Tier 3, Dual Fuel** **20% Improvement**	**GDS 2027 - NBC Tier 4, Dual Fuel** **40% Improvement**	**GDS 2030 - NBC Tier 4, Full Electric** **40% Improvement**
	BUILDING ENVELOPES [1]				
RSI 10.56 / R60 [Effective RSI 10.43 / R59.2]	Ceiling with Attic Space	Effective RSI 6.91 / R39.2	RSI 10.56 / R60 [Effective RSI 10.43 / R59.2]	RSI 10.56 / R60 [Effective RSI 10.43 / R59.2]	RSI 10.56 / R60 [Effective RSI 10.43 / R59.2]
RSI 5.46 / R31 [Effective RSI 4.87 / R27.7]	Ceiling without Attic Space	Effective RSI 4.67 / R26.5	N/A	N/A	N/A
RSI 5.46 / R31 [Effective RSI 5.25 / R29.8]	Exposed Floor	Effective RSI 4.67 / R26.5	N/A	N/A	N/A
RSI 3.87 / R22 [Effective RSI 3.00 / R17.0]	Above Grade Walls	Effective RSI 2.97 / R16.9	RSI 3.87 / R22 [Effective RSI 3.08 / R17.5]	RSI 3.87 / R22 [Effective RSI 3.08 / R17.5]	RSI 3.87 / R22 [Effective RSI 3.08 / R17.5]
RSI 3.52 / R20 [Effective RSI 3.72 / R21.1]	Basement Walls Below Grade (B.G.)	Effective RSI 2.98 / R16.9	RSI 3.52 / R20 [Effective RSI 3.72 / R21.1]	RSI 3.52 / R20 [Effective RSI 3.72 / R21.1]	RSI 3.52 / R20 [Effective RSI 3.72 / R21.1]
-	Below Grade Slab Entire Surface > 600 mm B.G.	-	-	-	-
RSI 1.76 / R10 [Effective RSI 1.96 / R11.1]	Heated Slab On Ground	Effective RSI 2.32 / R13.2	N/A	N/A	N/A
	Slab ≤ 600 mm Below Grade	Effective RSI 1.96 / R11.1	N/A	N/A	N/A
	Edge of Below Grade Slab ≤ 600 mm B.G.				
	WINDOWS & DOORS (Window to Wall Ratio = 14.6%)				
U_{ip} 0.29 (U_{si} 1.6) / ER 25 (SHGC-0.26)	Windows/Sliding Glass Doors	U_{ip} 0.32 (U_{si} 1.8) / ER 21 (SHGC-0.26)	Energy Star Zone 2 Windows: U_{ip} 0.25 (U_{si} 1.4) / ER 29 (SHGC-0.26)	Energy Star Zone 2 Windows: U_{ip} 0.25 (U_{si} 1.4) / ER 29 (SHGC-0.26)	Energy Star Zone 2 Windows: U_{ip} 0.25 (U_{si} 1.4) / ER 29 (SHGC-0.26)
U_{ip} 0.50 (U_{si} 2.8)	Skylights	U_{ip} 0.51 (U_{si} 2.9)	N/A	N/A	N/A
As Per OBC (RSI 0.70 / R3.97)	Doors (1 Door can be non-ENERGY STAR Certified)	As Per NBC (RSI 1.10 / R6.25)	Steel Polystyrene (RSI 0.98 / R5.56)	Steel Polystyrene (RSI 0.98 / R5.56)	Steel Polystyrene (RSI 0.98 / R5.56)
	MECHANICALS				
96% AFUE	Space Heating Equipment	92% AFUE	ASHP (8.2 $HSPF_{IV}$, 14 SEER) - 6 x 1.5 tons = 9 tons w/ 96% AFUE Furnace Backup	ASHP (8.2 $HSPF_{IV}$, 14 SEER) - 6 x 1.5 tons w/ 96% AFUE Furnace Backup	**ASHP (8.2 HSPFIV, 14 SEER) - 6 x 1.5 tons** **w/ Electric Backup**
13 SEER	Space Cooling Equipment	14.5 SEER			
75% SRE	HRV/ERV Efficiency	60% SRE	75% SRE	75% SRE	75% SRE
0.80 EF	Domestic HWH (Thermal Eff. Or EF)	0.67 EF	Electric Conventional Tank 0.82 EF	**Hybrid Heat Pump Water Heater (3.0 EF)**	**Hybrid Heat Pump Water Heater (3.0 EF)**
N/A	Combined Space and Water	N/A	N/A	N/A	N/A
As Per OBC	Fireplace	As Per NBC	As Per OBC	As Per OBC	As Per NBC
As Per OBC	Duct Work	As Per NBC	As Per OBC	As Per OBC	As Per NBC
Programmable	Thermostat	Programmable	Programmable	Programmable	Programmable
	ELECTRICAL				
As Per OBC	Lighting (1 Bulb can be non-ENERGY STAR Certified)	As Per NBC	As Per OBC [2]	As Per OBC	As Per OBC
As Per OBC	Exhaust Fans	As Per NBC	As Per OBC	As Per OBC	As Per OBC
As Per OBC	Electrical Savings	As Per NBC	As Per OBC	As Per OBC	As Per OBC
	OTHER				
42% Efficiency — 2 showers	Drain Water Heat Recovery	N/A	N/A	N/A	N/A
3.0 ACH - Detached ; 3.5 - Attached	Air Tightness Target (ACH@50Pa)	2.5 ACH	Assumed 2.5 ACH [3]	Assumed 2.5 ACH	Assumed 2.5 ACH

Results For NBC Compliance	**NBC Compliance Requirement**		**GDS 2024 - NBC Tier 3, Dual Fuel**		**Compliance Check (✓/X)**	**GDS 2027 - NBC Tier 4, Dual Fuel**		**Compliance Check (✓/X)**	**GDS 2030 - NBC Tier 4, Full Electric**		**Compliance Check (✓/X)**
	Tier 3	**Tier 4**	**Reference [4]**	**Proposed**		**Reference [4]**	**Proposed**		**Reference [4]**	**Proposed**	
Energy Consumption (GJ)	≥ 20%	≥ 40%	117.67	79.27	**32.6% ✓**	117.65	50.61	**57.0% ✓**	114.6	49.6	**56.7% ✓**
Gross Space Heat Loss (GJ)	≥ 10%	≥ 20%	140.08	109.26	**22.0% ✓**	140.08	104.01	**25.7% ✓**	140.0	104.0	**25.7% ✓**
Peak Cooling Load (W)	Lower Than Reference House		9125	6749	**Pass ✓**	9125	6749	**Pass ✓**	9125.0	6749.0	**Pass ✓**
Fuel Consumption - Natural Gas (m^3/year)	-		1317.8	8.0	-	1317.8	10.0	-	0.0	0.0	-
Fuel Consumption - Propane (L/year)	-		0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
Fuel Consumption - Electricity (kWh/year)	-		44619.4	49093.0	-	44619.4	41107.0	-	57411.2	40928.0	-
GHG Emissions ($kgCO_2eq$/year) [5]	-		3.9	1.5	**61.5%**	3.9	1.3	**67.6%**	1.7	1.2	**28.7%**

OR

Results For Energy Star v17.1 Revision 2 Performance Compliance		**GDS 2024 - Energy Star v17.1 Rev. 2**		**Compliance Check (✓/X)**
		Reference [6]	**Proposed**	
Energy Consumption (GJ)	At least 15.0% lower than Reference [6]	146.9	119.29	**18.8% ✓**

NOTES

[1] All GDS 2024, 2027 and 2030 building envelope meets or exceeds the minimum thermal resistance requirements of Energy Star v17.1 Revision 2.

[2] Minimum 75% ENERGY STAR Lighting Required for the Energy Star Compliance.

[3] For the purpose of calculating Energy Star Compliance, the Air Tightness Target for Detached is 2.5 ACH@50 Pa ; for Attached is 3.0 ACH@50 Pa

[4] EnerGuide Rating System (ERS) Reference House [6] Ontario Reference House

[5] GHG Emission Factors - Values obtained from the NRCan Emission Factors and Reference Values Website (**Link**) :
Natural Gas = 1.921 $kgCO_2/m^3$ Propane = 1.515 $kgCO_2/L$ Electricity = 0.030 $kgCO_2/kWh$