
Zero Emissions
New Buildings Plan
BCBEC
June 16, 2016

GREEN BUILDINGS

Lead the world in green building design and construction

Greenest City 2020:

Require all buildings constructed from 2020 to be carbon neutral in operations

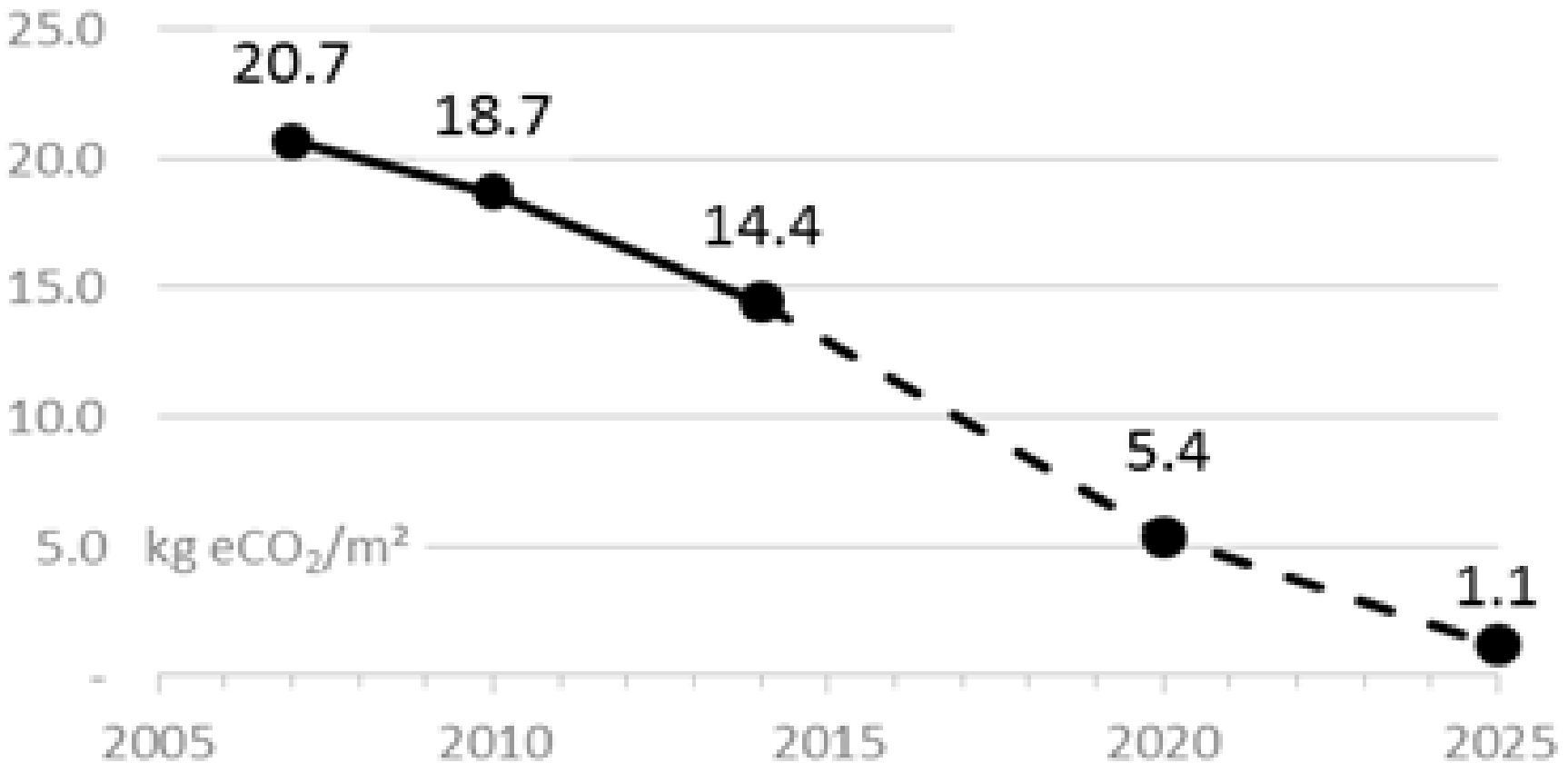
Renewable City Strategy:

100% of energy used is renewable by 2050

New buildings required to use 100% renewable energy by 2030 ***or earlier***

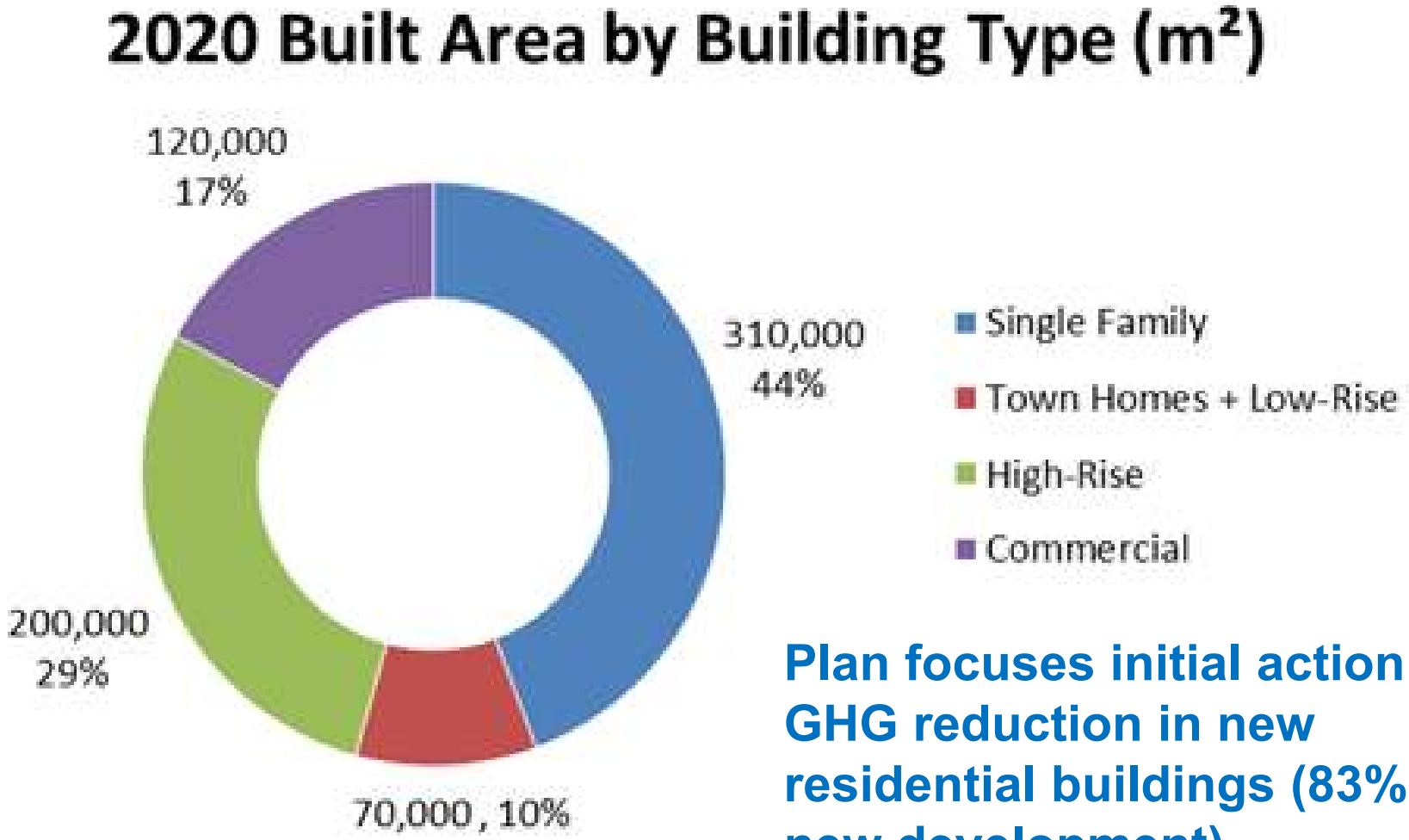
CITY OF VANCOUVER | GREENEST CITY 2020

New Building GHG Emission Trend



Weighted Average GHG Intensity of New Buildings (all types)

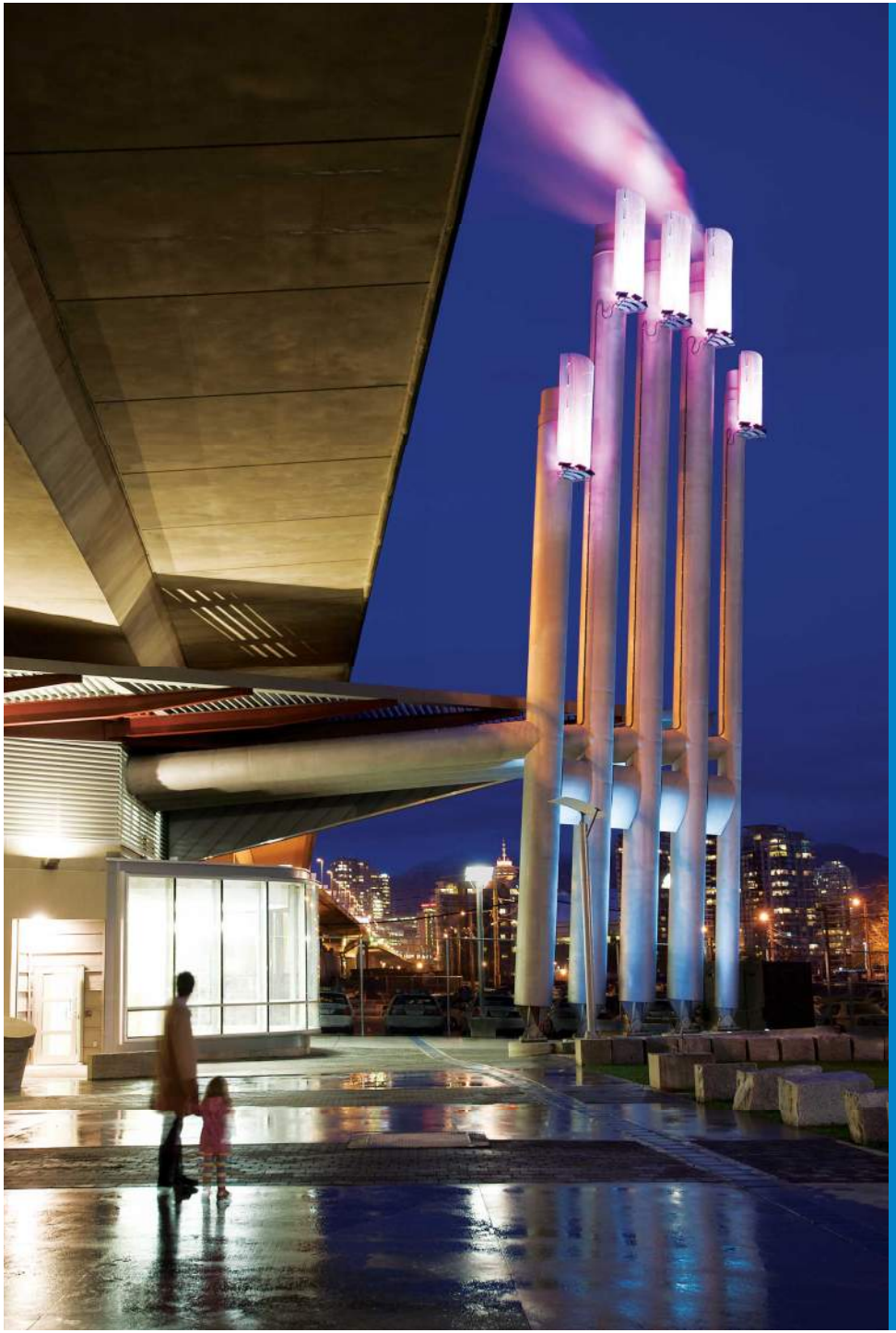
Area of New Buildings per Year



Plan focuses initial action on GHG reduction in new residential buildings (83% of new development)

NZE Building Plan Outline

1. Maximum allowed GHG Emissions and Thermal Energy Demand (TEDI) Targets
2. City Leadership
3. Catalyst Tools
4. Capacity Building



Two Pathways to NZE for New Buildings

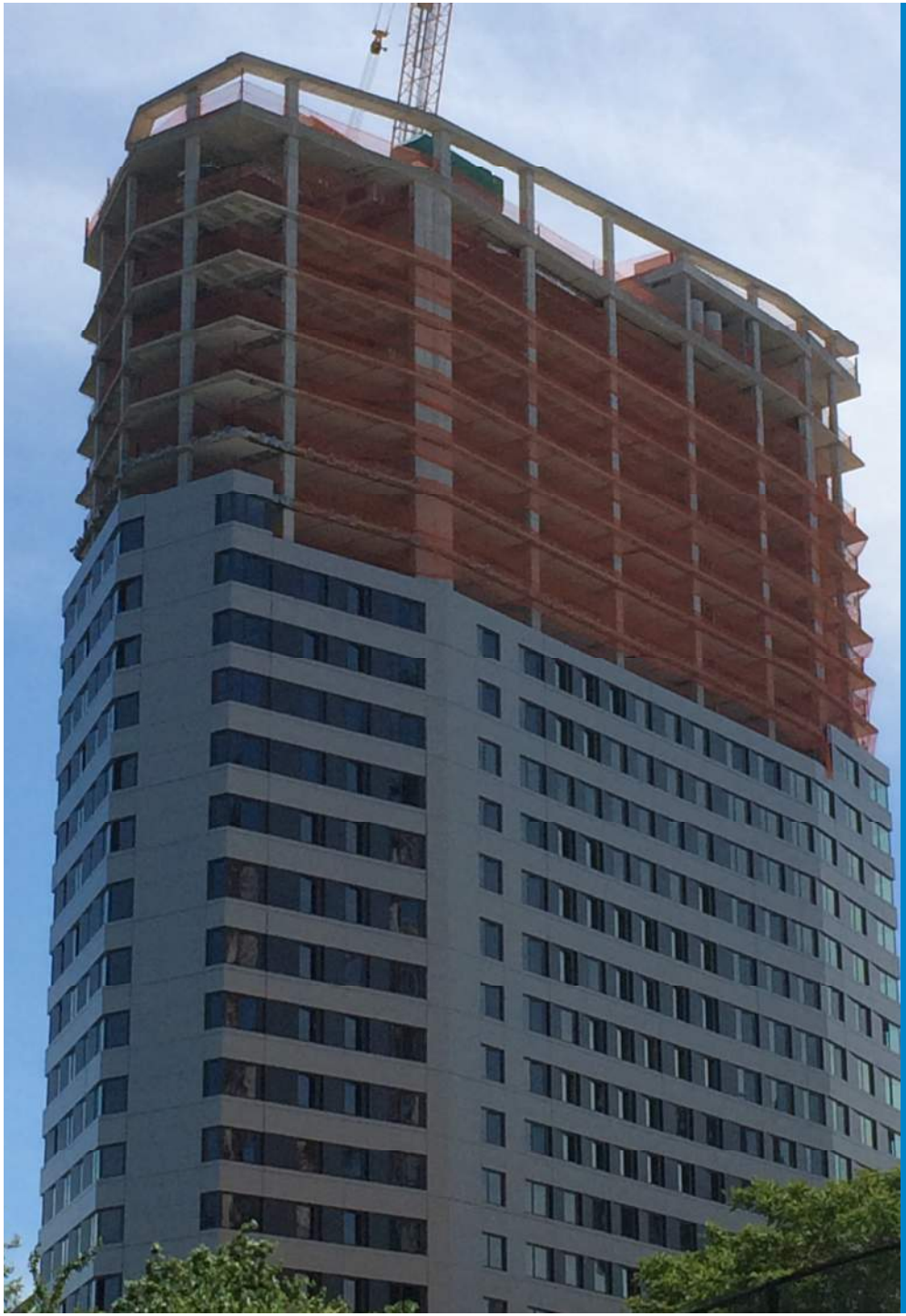
1. Very efficient building envelopes and ventilation systems

OR

2. Neighbourhood Renewable Energy System connection

Passive House Standard

- Best global standard for efficient building envelopes
- Ensures high levels of effective insulation (inc. windows), air tightness, ventilation heat recovery, and thermal comfort
- Applicable to all building types but limited data for high-rise
- Supported by extensive building science research, design tools, training, and third party validation
- 80% reduction in space heating energy use



1. Reflect GHGI and TEDI in Rezoning Policy and Code

- Time stepped reduction in limits (2016 – 2025)*

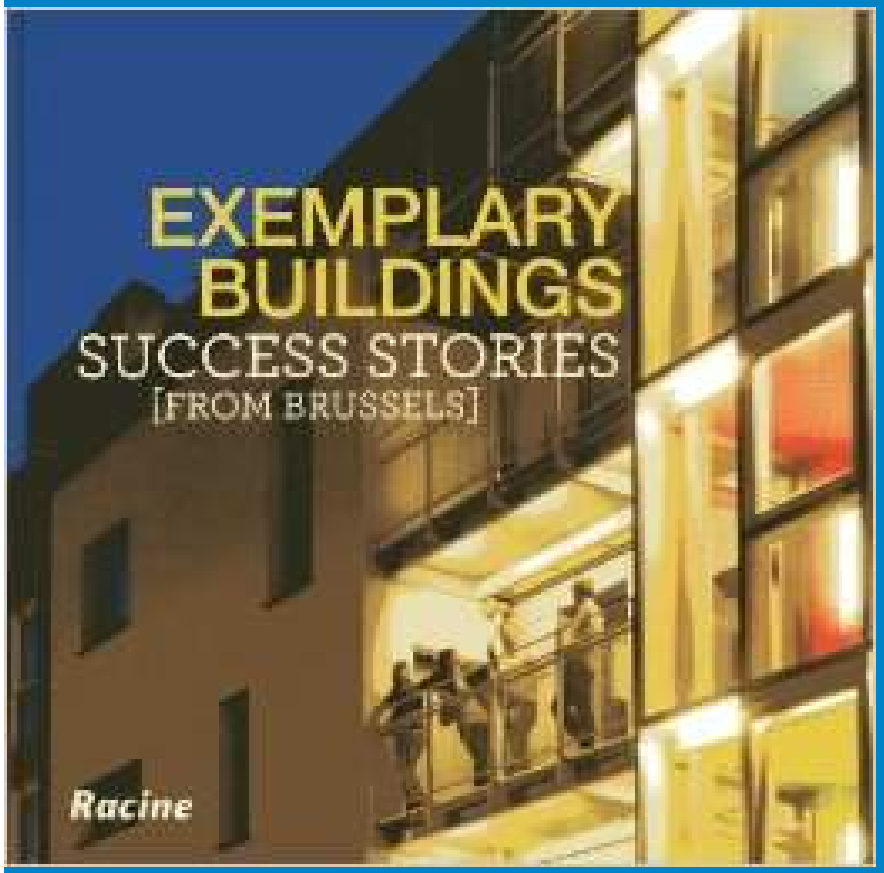
Mandatory requirements for all rezonings (Q4 2016):

- Air barrier testing
- Direct ventilation
- Embodied emissions reporting
- Post occupancy performance reporting
- Thermal comfort

2. CITY LEADERSHIP

- Pursue Passive House (or other zero emission approach) for all *viable* new *"City-led"* building projects
- Updated policy for City-led developments requiring zero emissions within 2 years
- Engage other public sector entities re: leadership (other local governments, BC Housing, etc)

3. Catalyst Tools



- Meaningful and clear incentives required to encourage leaders to begin developing zero emissions/Passive House buildings now
- Aim to launch suite of catalyst tools for detached, low-rise MURB and high-rise MURB by Q1 2017
- Brussel's "Batex" Program is starting point. Included regular call for entries, winners judged on GHG reduction, cost effectiveness, neighbourhood fit/appeal, prize = $13/ft2

4. CAPACITY BUILDING

- Remove policy barriers
- Fund case study development/sharing
- Public education

Establish an Independent Centre of Zero Emission Building Excellence

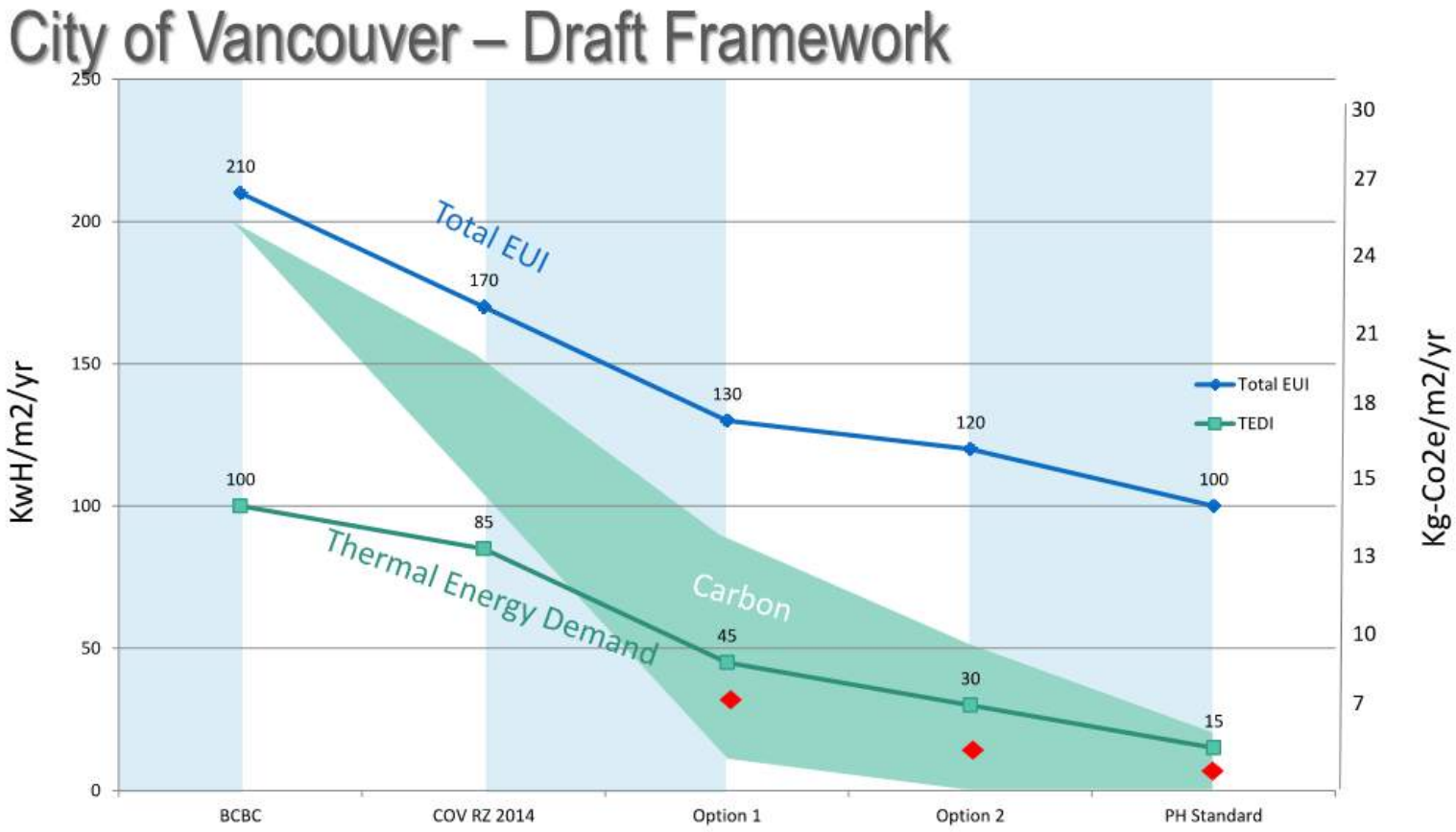
- Facilitate workshops, dialogues, peer-to-peer knowledge sharing
- Curated research library and publication of best practices (design, finance, policy)
- Identify trends

TEDI Limits and Implications for

Building Type	Baseline Requirement	Typical Outcome of Current Requirements		**2016 Limits**		2020 Limits		2025 Limits	
		GHGI	TEDI	**GHGI**	**TEDI**	GHGI	TEDI	GHGI	TEDI
Low-Rise MURB	Code	12.5	50	**5.5**	**35**	5	25	0	10
Low-Rise MURB	Rezoning	10.5	42	**5**	**25**	4.5	10	0	10
High-Rise MURB	Rezoning	16.5	46	**6**	**32**	5	18	0	TBD
High-Rise MURB	RZ & NEU	5.5	46	**6**	**40**	5	40	0	TBD

CITY OF VANCOUVER

Solutions Based Approach

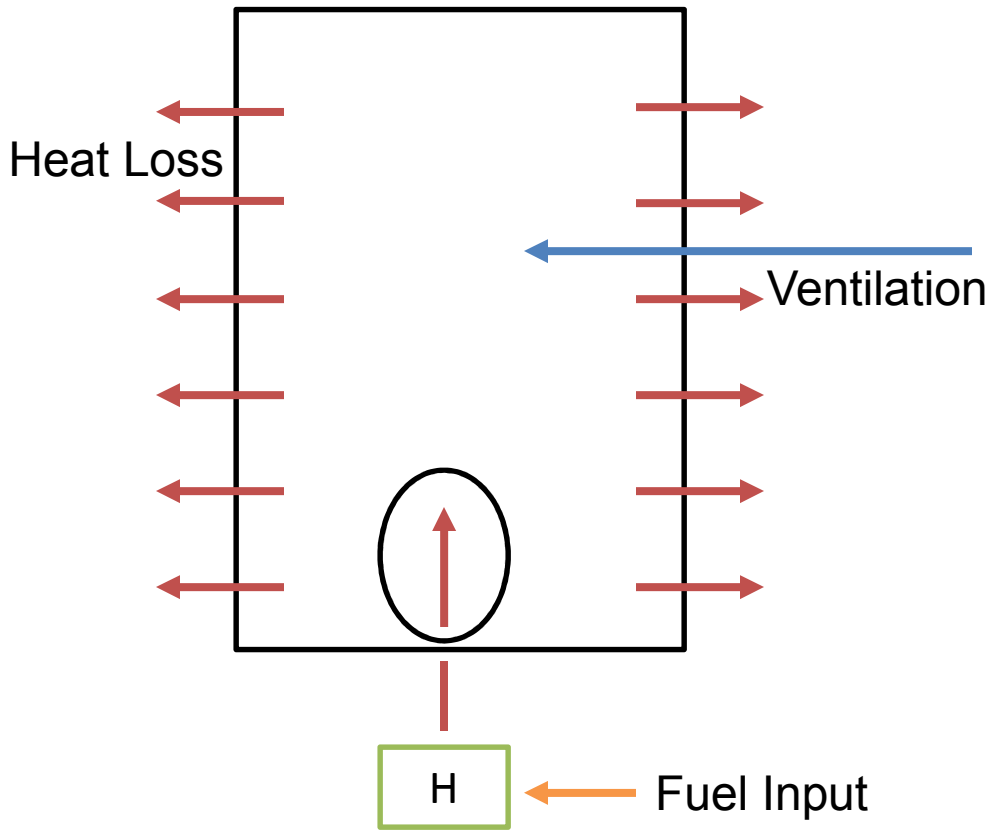


bty MORRISON HERSHFIELD EnerSys INTEGRAL GROUP

70 Years MORRISON HERSHFIELD
PEOPLE · CULTURE · CAPABILITIES

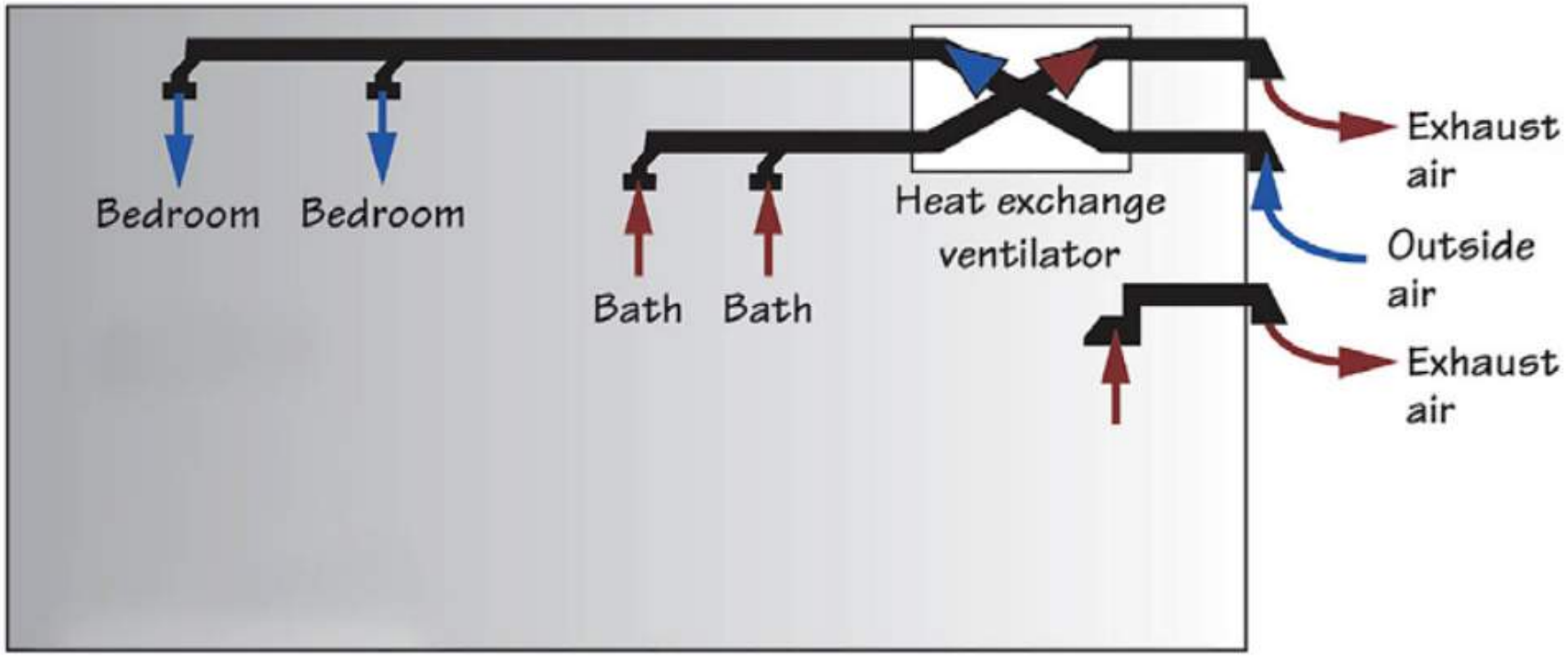
Why TEDI?

"Thermal Energy Demand Intensity"



- Reduce Envelope Loss
  - Walls
  - Windows
  - Roofs
  - Air Leakage
- Reduce Ventilation Load
  - Quantity Fixed
  - Temperature?
  - Heat Recovery

Ventilation and TEDI



TEDI Limits and Implications for

Building Type	Baseline Requirement	Typical Outcome of Current Requirements		**2016 Limits**		2020 Limits		2025 Limits	
		GHGI	TEDI	**GHGI**	**TEDI**	GHGI	TEDI	GHGI	TEDI
Low-Rise MURB	Code	12.5	50	**5.5**	**35**	5	25	0	10
Low-Rise MURB	Rezoning	10.5	42	**5**	**25**	4.5	10	0	10
High-Rise MURB	Rezoning	16.5	46	**6**	**32**	5	18	0	TBD
High-Rise MURB	RZ & NEU	5.5	46	**6**	**40**	5	40	0	TBD

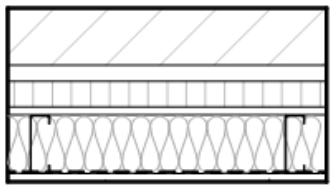
CITY OF VANCOUVER

2016 Rezoning Limits

- 50%
- **60%**
- 50%

70 Years MORRISON HERSHFIELD
PEOPLE · CULTURE · CAPABILITIES

The Assembly R-value



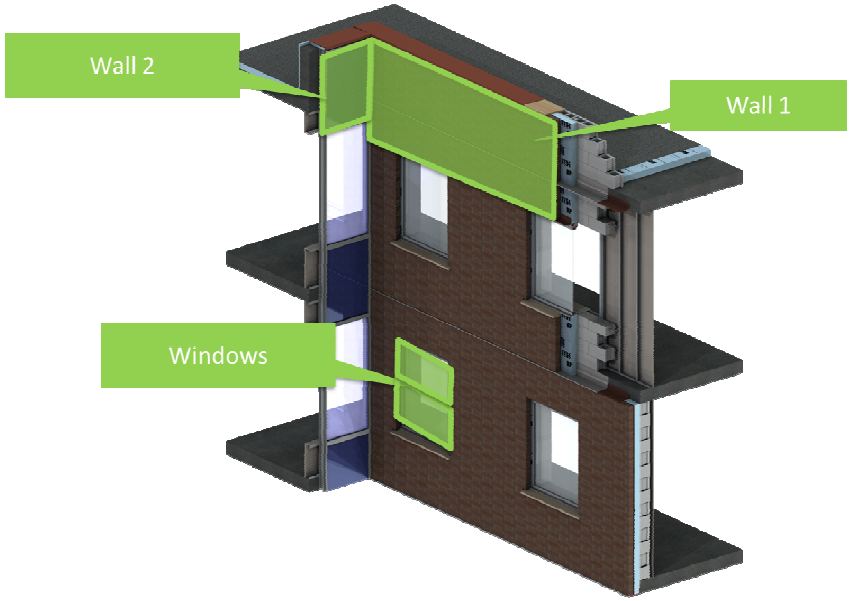
TYPICAL BRICK WALL WITH STUD BACKUP

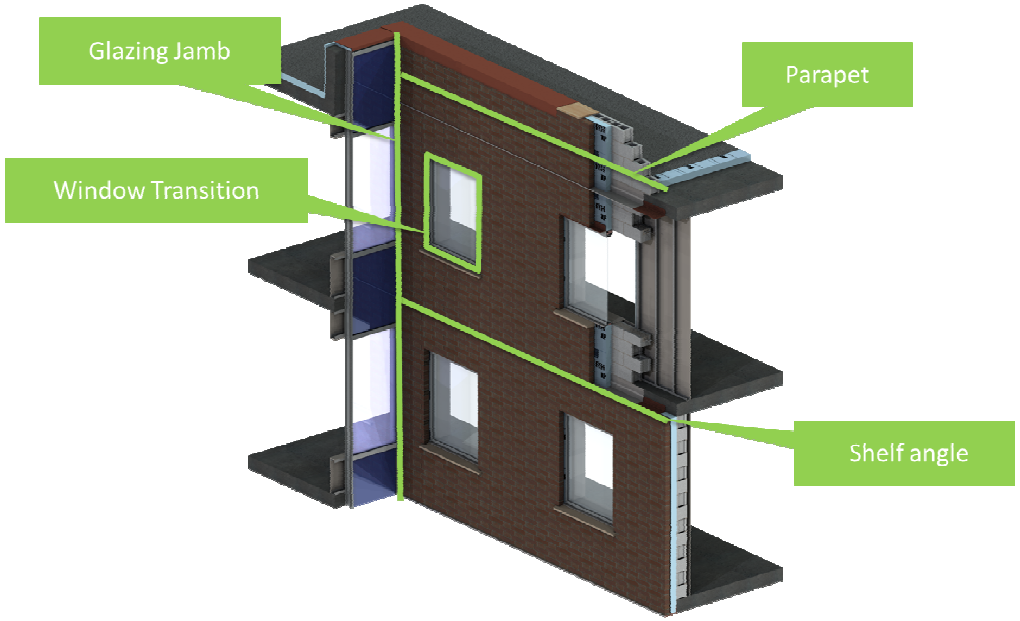
- 90mm FACE BRICK
- 25mm AIR SPACE (VENT TOP AND BOTTOM)
- MASONRY ANCHORS EVERY 400mm O.C. VERTICALLY & 600 mm O.C. HORIZONTALLY
- 40mm SEMI-RIGID INSULATION
- 13mm EXTERIOR GRADE SHEATHING
  SEAL PERIMETER AND PENETRATIONS AGAINST MIGRATION OF MOISTURE
- 92mm STRUCTURAL STEEL STUDS AT 400mm O.C.
- 89 BATT INSULATION (R.S.1. 2.1)
- 6mil. POLY VAPOUR BARRIER
- 13mm G.W.B. SEALED TOP AND BOTTOM

-COULOR YELLOW

The Real World

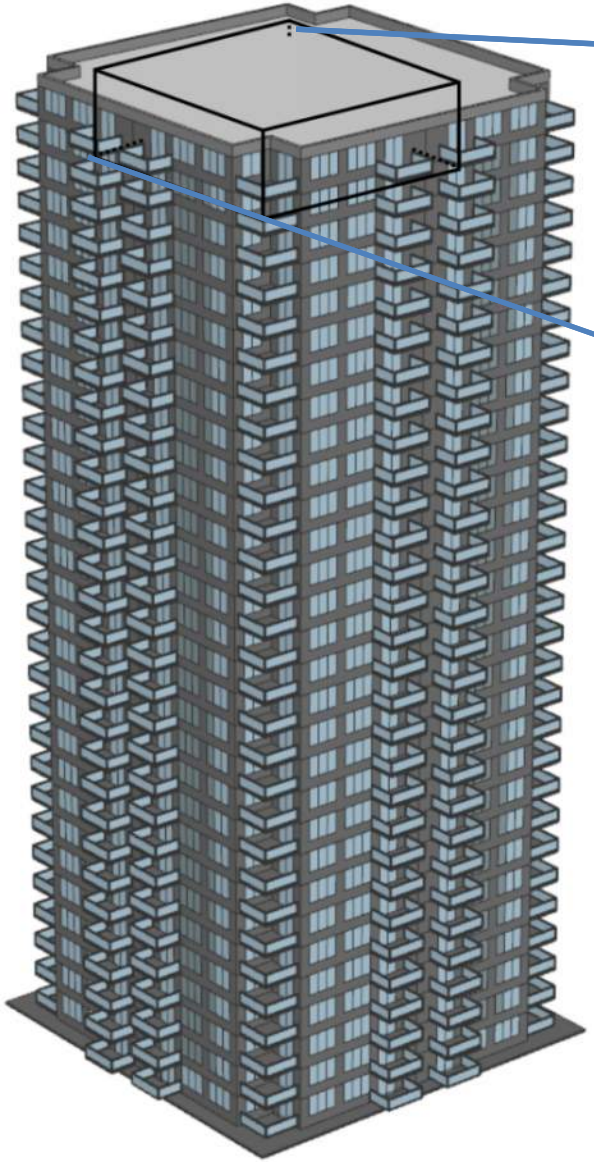
The Whole Picture

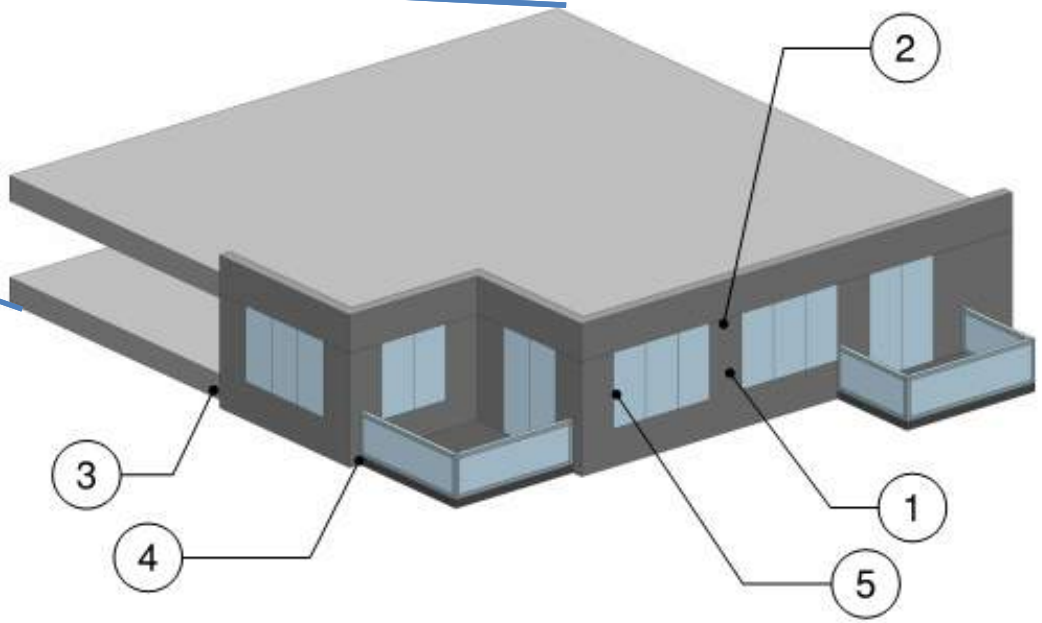




Total Heat loss	=	heat loss due to clear field	+	Heat loss due to interface details

EXAMPLE

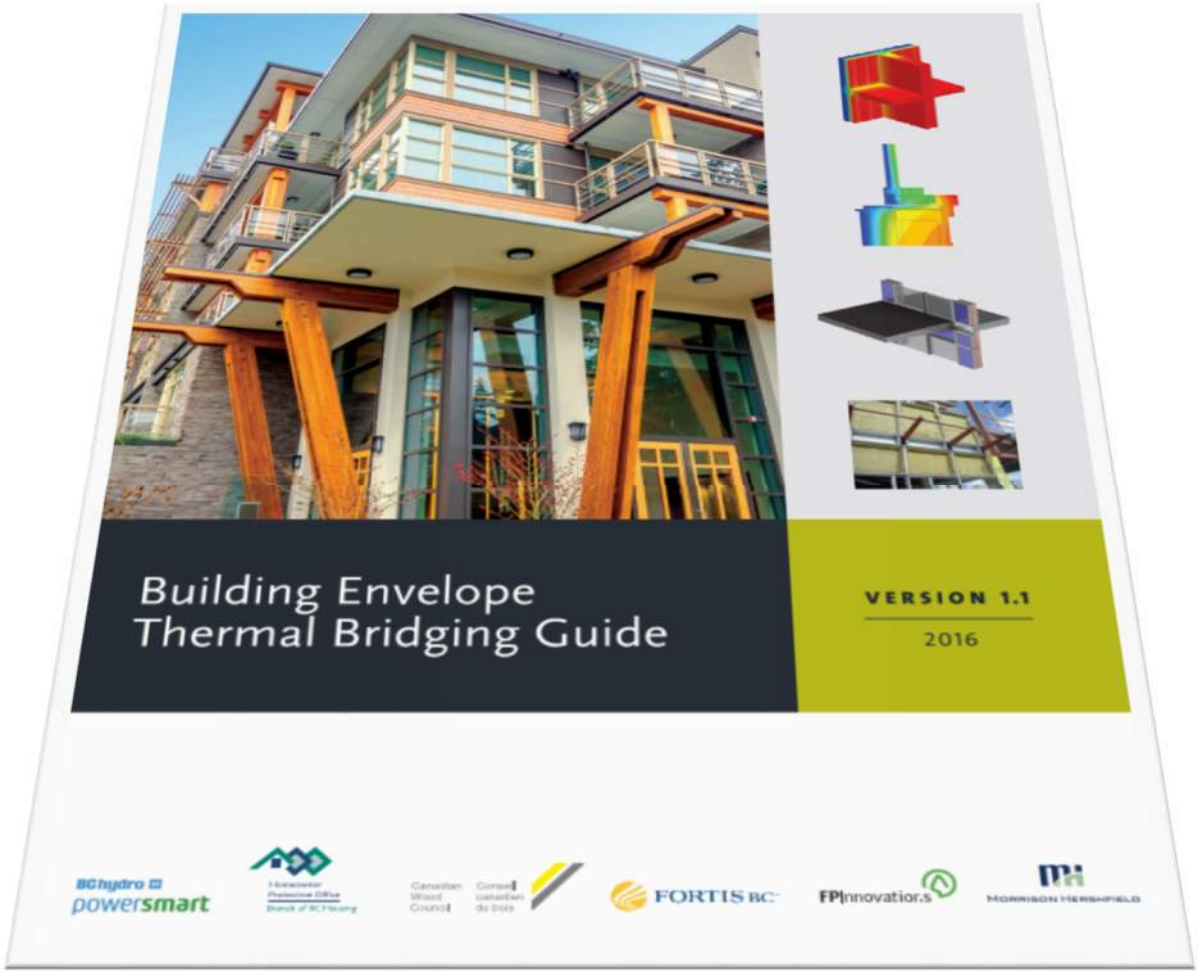




1	Concrete Clear Wall
2	Parapet
3	Slab Edge
4	Balcony Slab
5	Window Transition

MORRISON HERSHFIELD

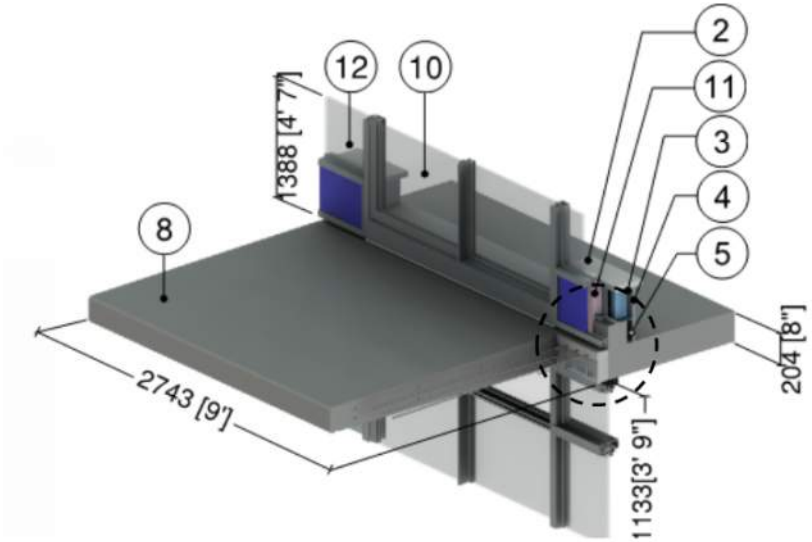
BUILDING ENVELOPE THERMAL BRIDGING GUIDE

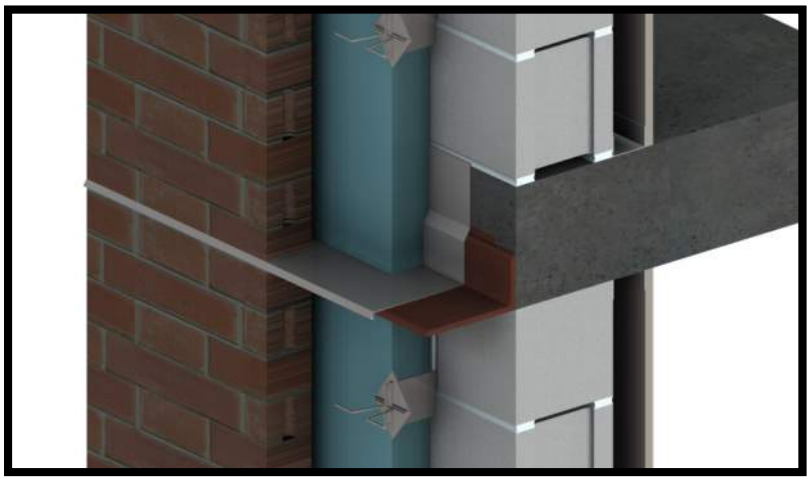


MORRISON HERSHFIELD

EM GUIDELINES

- Clear, consistent approach to energy modeling
- Standardizing of some inputs that are outside of the design team control but potentially large impact
- Explicit and detailed guidance on how to calculate heat loss, inclusion of thermal bridging, etc.





MORRISON HERSHFIELD

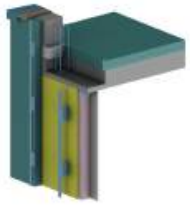
Effective R-9 Is Achievable, But…

Effective R-9 Scenarios

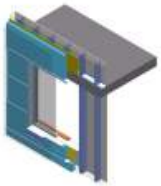
Effective R-9 Examples for High Rise MURB

Steel Stud

Enhanced case developed for exercise without thermally broken balconies

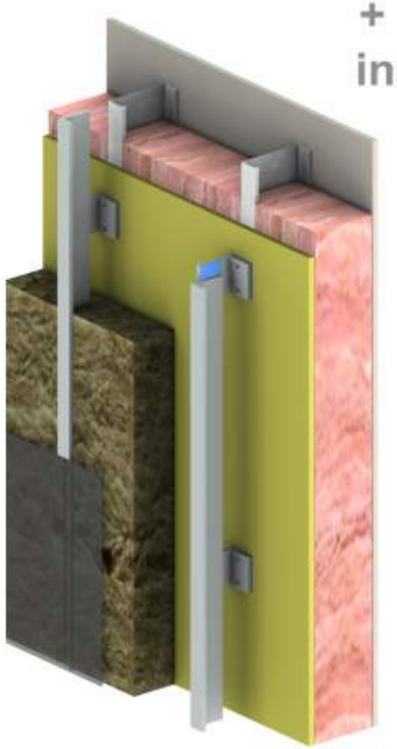


Improved glazing transition



+ Insulation outboard of slab

+ Exterior insulation



2016 Scenario 1 – R9
Improved Details, Highly Insulated Walls, Typical Balconies

Heat Loss Components	% Heat Loss
Steel Stud Wall (R25)	34%
Balcony Slab at Sliding Door	26%
Parapet: At Steel Stud Wall	0%
Parapet: At Glazing	0%
Floor: At Steel Stud Wall	0%
Floor: At Steel Stud Wall w/Balcony	20%
Floor: At Glazing	3%
Floor: At Sliding door	0%
Glazing Transition: Window/Door Frame	10%
Corner: Inside	0%
Corner: Outside	3%
Interior Wall Intersection: Fire Seperation	0%
At grade: Doors	0%
At grade: Steel Stud Wall	2%

2016 Scenario 2 – Improved Details, Modest Walls, Reduced or Thermal Broken Balconies

Heat Loss Components	% Heat Loss
Steel Stud Wall (R15)	57%
Balcony Slab at Sliding Door	14%
Parapet: At Steel Stud Wall	0%
Parapet: At Glazing	0%
Floor: At Steel Stud Wall	0%
Floor: At Steel Stud Wall w/Balcony	7%
Floor: At Glazing	3%
Floor: At Sliding door	0%
Glazing Transition: Window/Door Frame	11%
Corner: Inside	1%
Corner: Outside	3%
Interior Wall Intersection: Fire Seperation	1%
At grade: Doors	1%
At grade: Steel Stud Wall	3%

Effective R-9 Scenarios

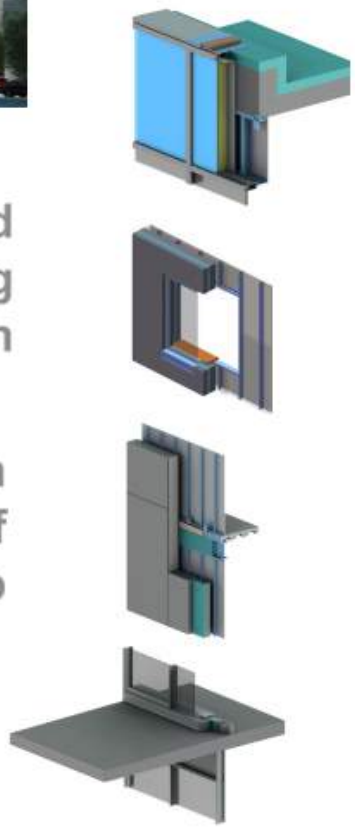
Effective R-9 Examples for High Rise MURB

Precast Concrete

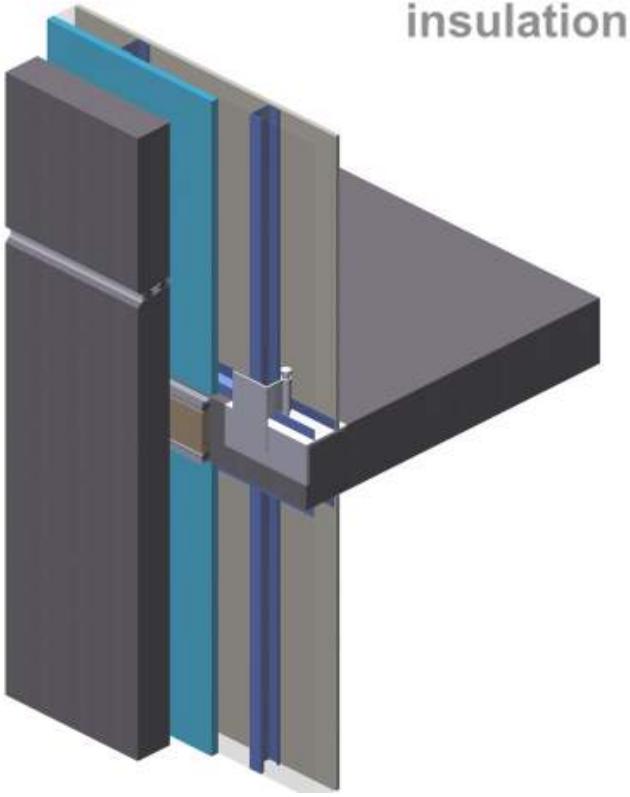
Enhanced details without thermally broken balconies

Improved glazing transition

+ Insulation outboard of slab



+ Exterior insulation

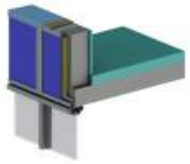


Effective R-9 Scenarios

Effective R-9 Examples for High Rise MURB

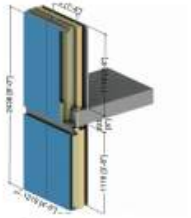
Window Wall

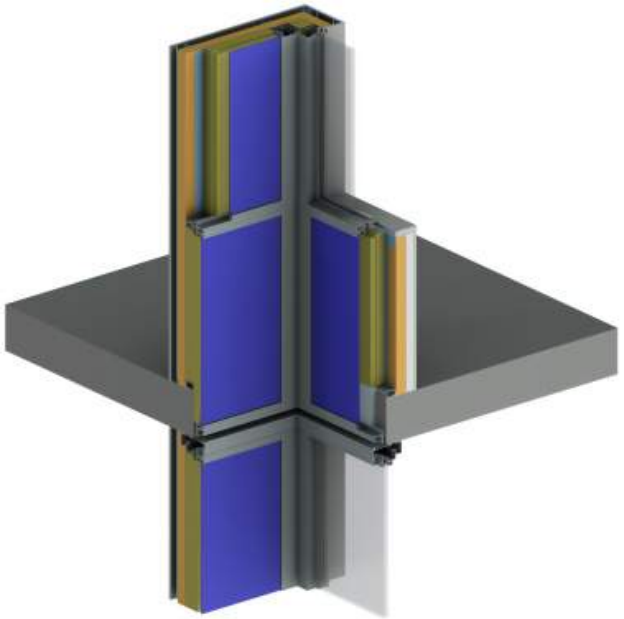
Enhanced case developed for exercise without thermally broken balconies



+ Spray-foam inboard

Improved Deflection Header





2020 and Beyond

- Push to Triple Glazing
- Pressure on some of the following
  - **Increased air tightness**
  - **Higher effective R-values**
  - **Non conductive frames/higher performance windows**
  - **Lower glazing ratios**
  - **Heat recovery efficiency and applicability**

QUESTIONS?