Building Solutions

Canadian Code Assessment Engine and Above Grade Wall Solutions

Dow.com

Code Assessment Engine & Above Grade Wall Solutions

Presentation Agenda:

1. Code Tool Development and Early History (Les Yard)
2. Code Tool Introduction and Use (Keith Calder)
3. Industry Meetings & Code Tool Learnings (Les)
4. Online Code Tool Demonstration (Keith)
5. Above Grade Wall: Other Design Considerations (Les)
6. If Time …. Dow Above Grade Wall Solutions, Tools, Support

Building & Energy Codes are in Conflict!

Research Has Indicated the Construction Industry wants to make use of Foam Plastics in Above Grade Walls … Why?

Increasing Energy Code Requirements are leading to ….

- ✓ **Greater Demand for High Performance Insulation**
- ✓ **Need for Increased Flexibility in Wall Assembly Design**
- ✓ **Need For More Thermally Efficient Cladding Attachment Methods (Subsequent Reduction in Thermal Bridging)**
- ✓ **Higher Achievable Effective R-Values**
- ✓ **Thinner Wall Assemblies**

How do we know this is so…?

Hugh Bird Vancouver

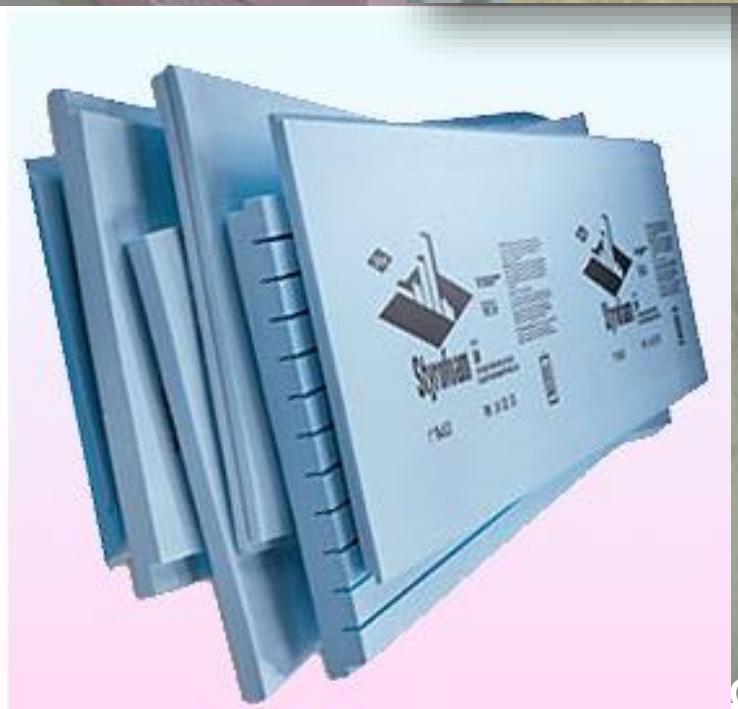
Ottewell Terrace Edmonton

John Paul 2 Vancouver

10 Years + US Experience





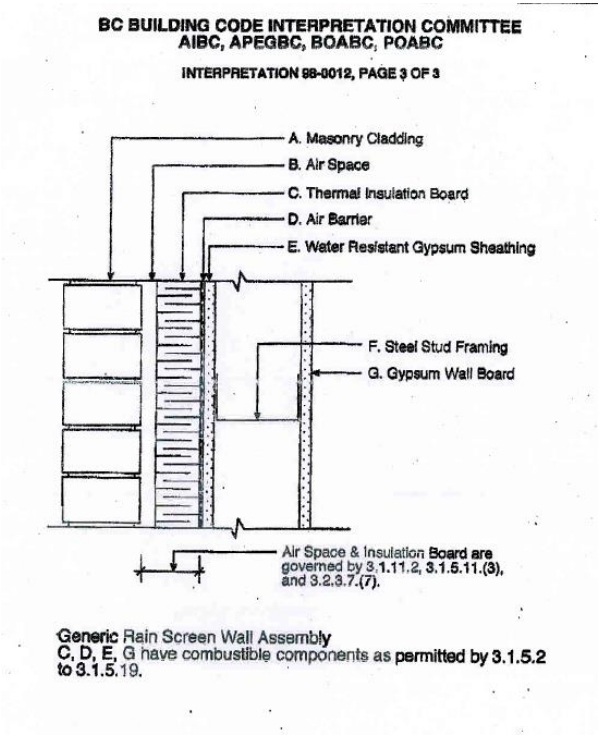



Hugh Bird – Rainscreen Stucco Wall XPS

Belt and Suspenders Wall

No Insulation in the Cavity Space, Ext Gypsum, Full Peel'n Stick A/B, 3" of SM, Flash Taped Seams & Penetrations. 7/8's Surface Mounted Z-girt, Paper-backed Lath and 3 Coat Stucco

Cladding consisted of 25 mm of masonry or concrete (Clarified in NBC 2015 3.1.5.6)


BC BUILDING CODE INTERPRETATION COMMITTEE
AIBC, APEGBC, BOABC, POABC

INTERPRETATION 98-0012, PAGE 3 OF 3

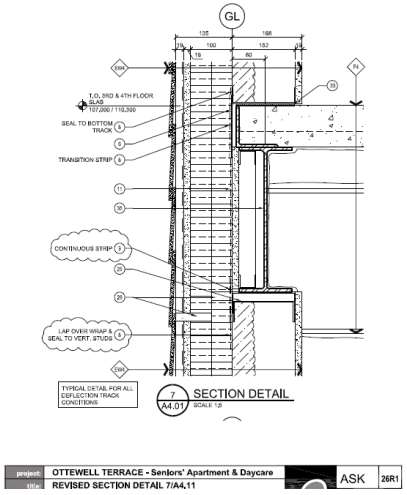
A. Masonry Cladding
B. Air Space
C. Thermal Insulation Board
D. Air Barrier
E. Water Resistant Gypsum Sheathing
F. Steel Stud Framing
G. Gypsum Wall Board
Air Space & Insulation Board are governed by 3.1.11.2, 3.1.5.11.(3), and 3.2.3.7.(7).

Generic Rain Screen Wall Assembly
C, D, E, G have combustible components as permitted by 3.1.5.2 to 3.1.5.19.

Ottewell Terrace TWS

Inverted Wall Assembly

Exterior Gypsum was used as a thermal barrier (met building code / City of Edmonton AHJ)



John Paul 2 TWS

Belt and Suspenders Wall

1.55” Thermax, 2” SPF, Aluminum Extruded and Fiber Cement Cladding

Alternative Solution leveraging NFPA 285 US Fire Testing (City of Vancouver AHJ)

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NOV 08 2013
COMMUNITY SERVICES

CITY OF VANCOUVER

(Please print on pink paper)

CITY OF VANCOUVER
OFFICE OF THE CHIEF BUILDING OFFICIAL
Community Services, 453 West 12th Avenue, Vancouver, BC, V5Y 1V4

ALTERNATIVE SOLUTION PROPOSAL
(In Accordance with Section 2.3 OF Division C of the Vancouver Building By-law)

BU 457878 (Building Permit No.) | 749 West 33rd Street, Vancouver, BC (Project Address) | July 24, 2013 *Revised Nov 6, 13* (Date)

For office use only
Payment $ 697.00 | Invoice Number: CK 012384 722037 | AL Number: AL 401472

APPLICANT INFORMATION

(Professional Seal)
PROFESSIONAL ENGINEER
K.M. CHEN
#33494
BRITISH COLUMBIA
Nov 8, 13

Proposed By: Jun H. Kim, BASc, EIT. / K.M. Gary Chen, MASc, P.Eng
Firm: GHL CONSULTANTS LTD
Address: 950 – 409 Granville Street, Vancouver, BC
Phone: 604 689 4449 Fax: 604 689 4419 Email: jhk@ghl.ca / gc@ghl.ca

CODE REFERENCE(S) & SUMMARY OF DEVIATION(S) FROM VANCOUVER BUILDING BY-LAW

Alternative Solution 7 – Exterior Wall Assembly

Sentence 3.2.3.8.(1) requires an exterior wall containing foam insulation in a building more than 3 storeys in height to comply with Sentences (1), (2) or (3). **Sentence 3.2.3.8.(3)** requires an exterior wall using foamed plastic insulation in a building more than 3 storeys in height to meet Sentences 3.1.5.5.(2) and (3) when tested in accordance with CAN/ULC-S134. The proposed exterior wall assembly using Dow Thermax Sheathing with aluminum or Hardi panel cladding has not yet been tested per CAN/ULC-S134. However, the an exterior wall similar to the proposed wall has been tested to and passed a similar standard in the United States, namely NFPA 285, “*Standard Fire Test Method for Evaluation of*

Thermax Wall System: US Test Approvals

CTQ	TEST	PASS/FAIL	Comments
Fire Performance BRICK, Concrete & Stone	NFPA285	PASS	NFPA285 is IBC Code Requirement for all plastic foam insulations within commercial wall construction.
Fire Performance METAL & MCM	NFPA285	PASS	NFPA285 is IBC Code Requirement for all plastic foam insulations within commercial wall construction.
Fire Performance STUCCO	NFPA285	PASS	NFPA285 is IBC Code Requirement for all plastic foam insulations within commercial wall construction.
Fire Performance Terracotta & Ceramic Tile	NFPA285	PASS	NFPA285 is IBC Code Requirement for all plastic foam insulations within commercial wall construction.
CLASS A THERMAX Ci	ASTM E84	PASS	Commercial insulation must achieve CLASS A ratings in order to used within commercial wall assemblies.
CLASS A CM2030	ASTM E84	PASS	Commercial insulation must achieve CLASS A ratings in order to used within commercial wall assemblies.
CLASS A CM2045	ASTM E84	PASS	Commercial insulation must achieve CLASS A ratings in order to used within commercial wall assemblies.
AIR Barrier	ASTM E2357	PASS	Systems must now be tested in the new Full Scale Wall test.
Water Barrier	ASTM E331	PASS	Systems must now be tested in the new Full Scale Wall test.

US NFPA 285 … CND CAN/ULC S134

NFPA

National Fire Protection Association

The authority on fire, electrical, and building safety

DOW

If the Construction Industry in Canada wants to use Foam Insulation in Above Grade Walls …

Why Has This Taken Off? Why not just run an S134 test (s) to validate?

Main reason we uncovered is …

CODE Confusion!!!

National Building Code of Canada

Analysis of Combustible and Noncombustible Code Requirements

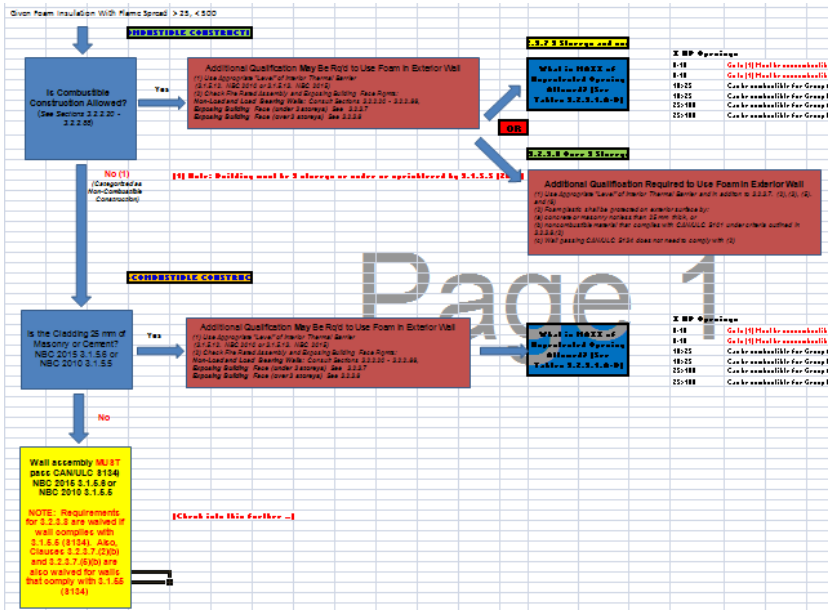
PART 3 (Sections 3.2.2.20 - 3.2.2.88) - NEEDS TO BE CHECKED FOR ACCURACY, BUT GOOD OVERVIEW CONCEPTUALLY

Can be of Combustible Construction (with conditions)

Group	Division	Height/ Stories	Area	Sprinkled	NC, C, HT	Other Restriction
A	1	Production & Viewing of the the Performing Arts				
A	1	Any	Any	Y	NC	FR Rated Assemblies:
A	1	1	< 600 m2	Y	NC, HT	600 Occupants, FR Rated Assemblies
A	1	1		Y	NC, C	< 300 Occupants, FR Rated Assemblies, Autorium Floor Location
A	2	t Elsewhere Classified in Group A				
A	2	Any	Any	Y	NC	FR Rated Assemblies:
A	2	≤ 6	Any	Y	NC	FR Rated Assemblies:
A	2	≤ 2	Table 3.2.2.25	?	NC, C	FR Rated Assemblies:
A	2	≤ 2	1 Storey ≤ 4800 m2 2 Storey ≤ 2400 m2	Y	NC, C	FR Rated Assemblies:
A	2	≤ 2	1 Storey ≤ 2400 m2 (no basement) 1 Storey ≤ 1200 m2 2 Storey ≤ 600 m2	Y	NC, C	?
A	2	1	1 Storey ≤ 400 m2 2 Storey ≤ 500 m2 3 Storey ≤ 600 m2	?	NC, C	FR Rated Assemblies, if basement
A	3	Assembley Occupancies of the Arena Type				
A	3	Any	Any	Y	NC	FR Rated Assemblies, F, M, L
A	3	≤ 2	Table 3.2.2.30	Only if > 1500 m2, used for tradeshow exhibits	NC, HT	FR Rated Assemblies
A	3	≤ 2	1 Storey ≤ 1200 m2 2 Storey ≤ 6000 m2	Y	NC	FR Rated Assemblies, F, M, L
A	3	1	1 Storey ≤ 2400 m2 2 Storey ≤ 3000 m2 3 Storey ≤ 3600 m2	Only if > 1500 m2, used for tradeshow exhibits	NC, C	FR Rated Assemblies, F, M, L
A	3	1	≤ 7200 m2 1 Storey ≤ 1000 m2	Y	NC, C	?
A	3	1	2 Storey ≤ 1250 m2 3 Storey ≤ 1500 m2	?	NC, C	?
A	4	Assembley Occupancies in which Occupants are Gathered in the Open Air				
A	4			Y	NC, HT	?
B	1	Detention Occupancies				

F = Floor
M = Mezzanine
L = Load Bearing Wall
R = Roof

NC = Noncombustible
C = Combustible
HT = Heavy Timber



200+ Exceptions in the NBC … Straight forward? …. NOT! We needed to a way to navigate the complexity of the NBC …. Enter Keith Calder & Jensen Hughes

Part 2: Code Tool Introduction and Use (Keith Calder)

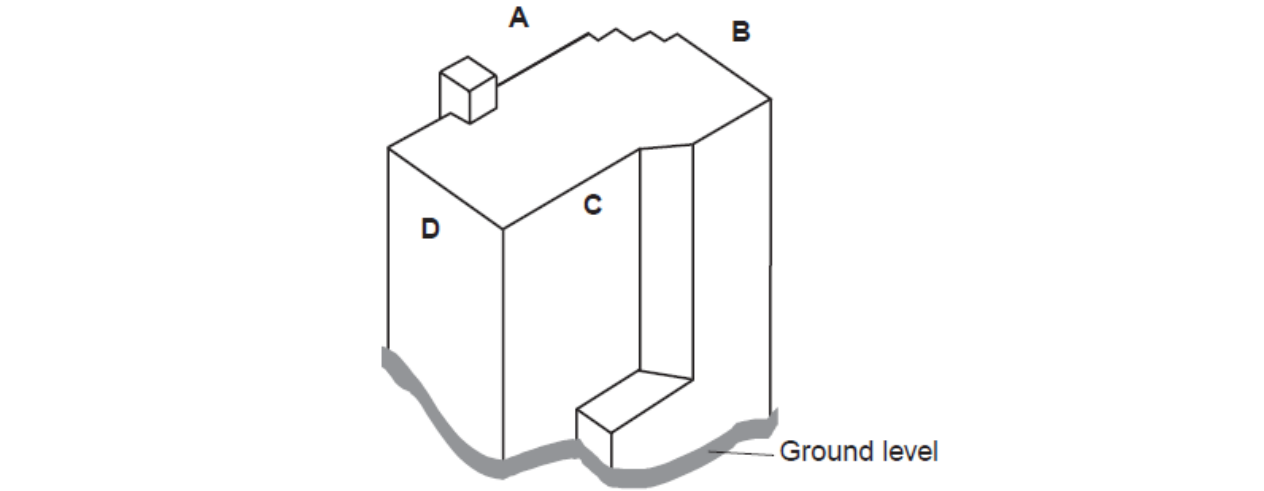
Applicable Building Code

	A
1	**Applicable Building Code:**
2	2015 NBCC

Project Characteristics

Project Characteristics:	
Building Area (m^2):	1200
Building Height (Storeys):	4
Building Height (m):	17
High Building (Subsection 3.2.6.	No
Streets Facing:	2
Sprinklered:	Yes
Major Occupancies:	C,D,E

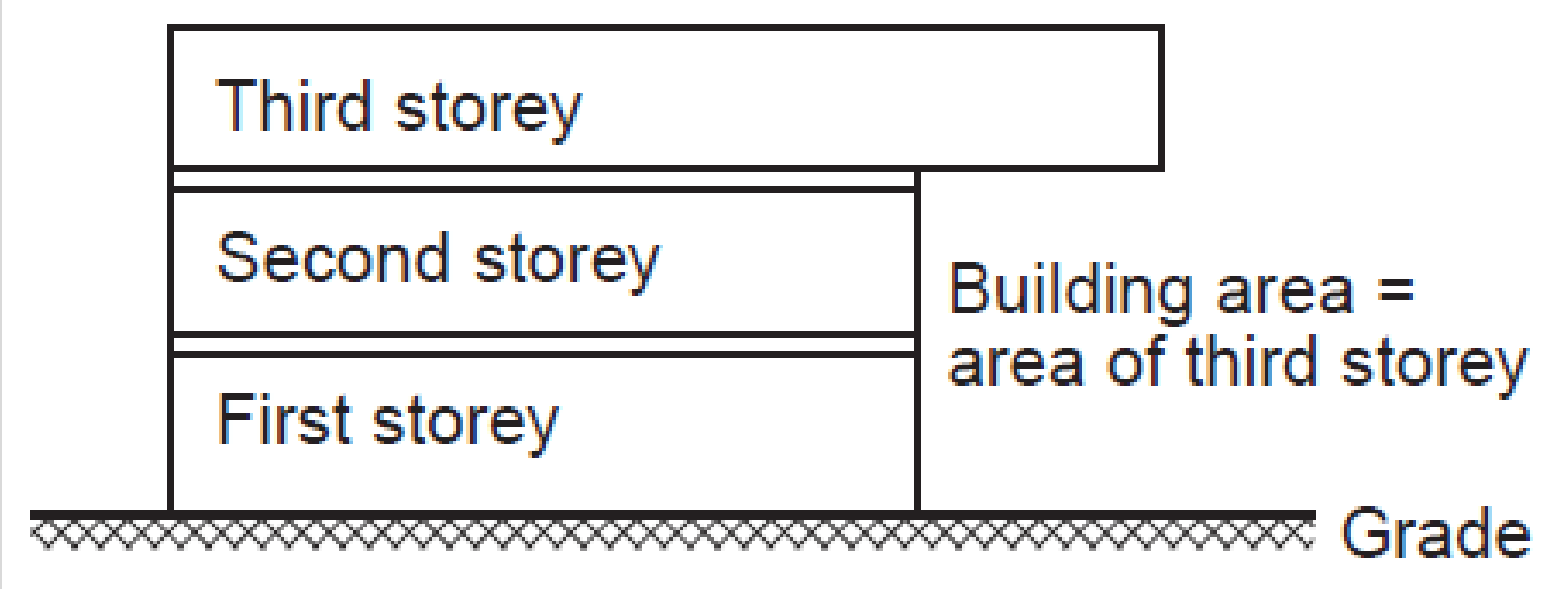
Project Characteristics – Grade



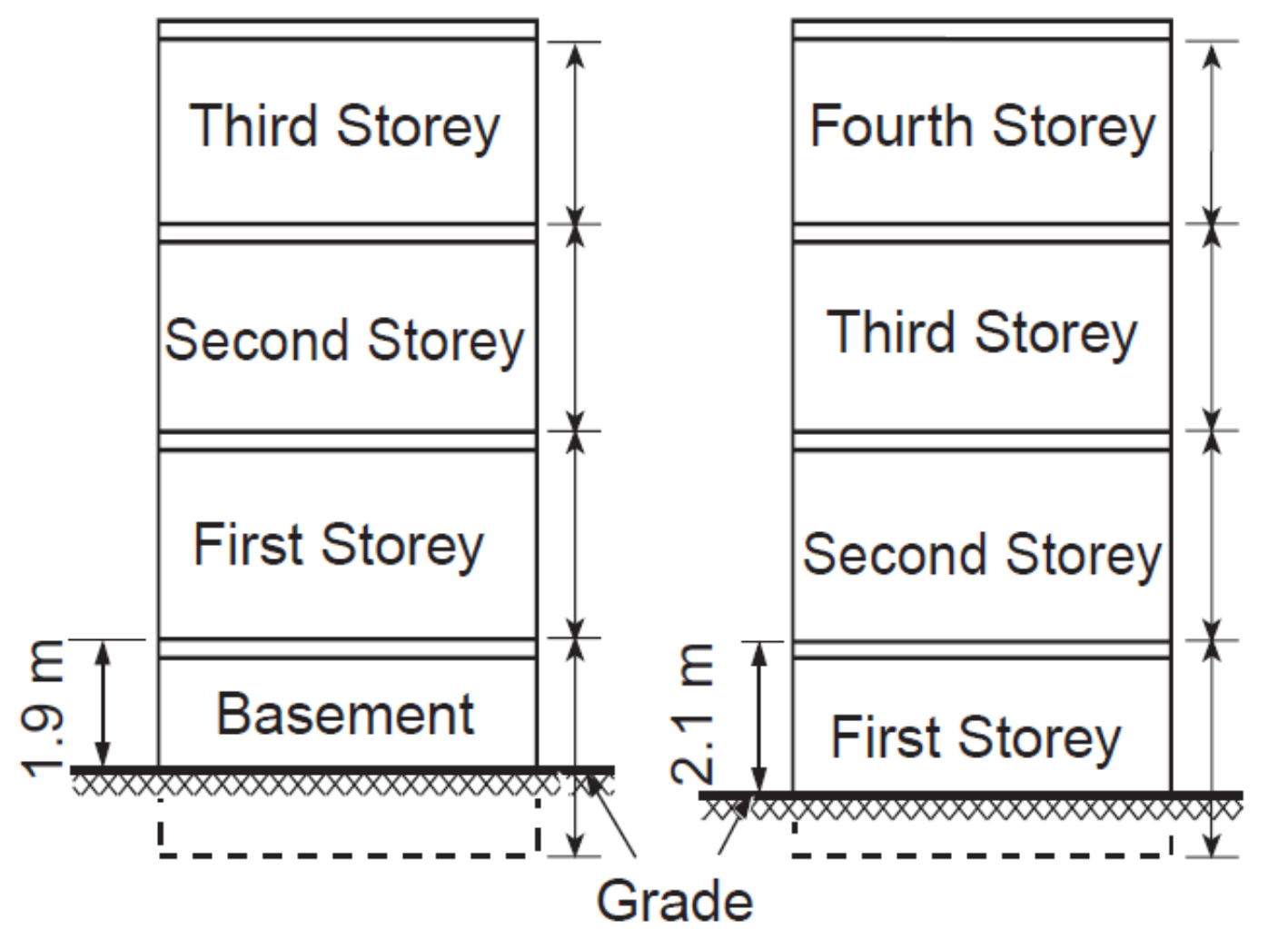
$h_{a, b, c, d}$: Average height of finished ground above benchmark

Project Characteristics – Building Area

› Building Area:

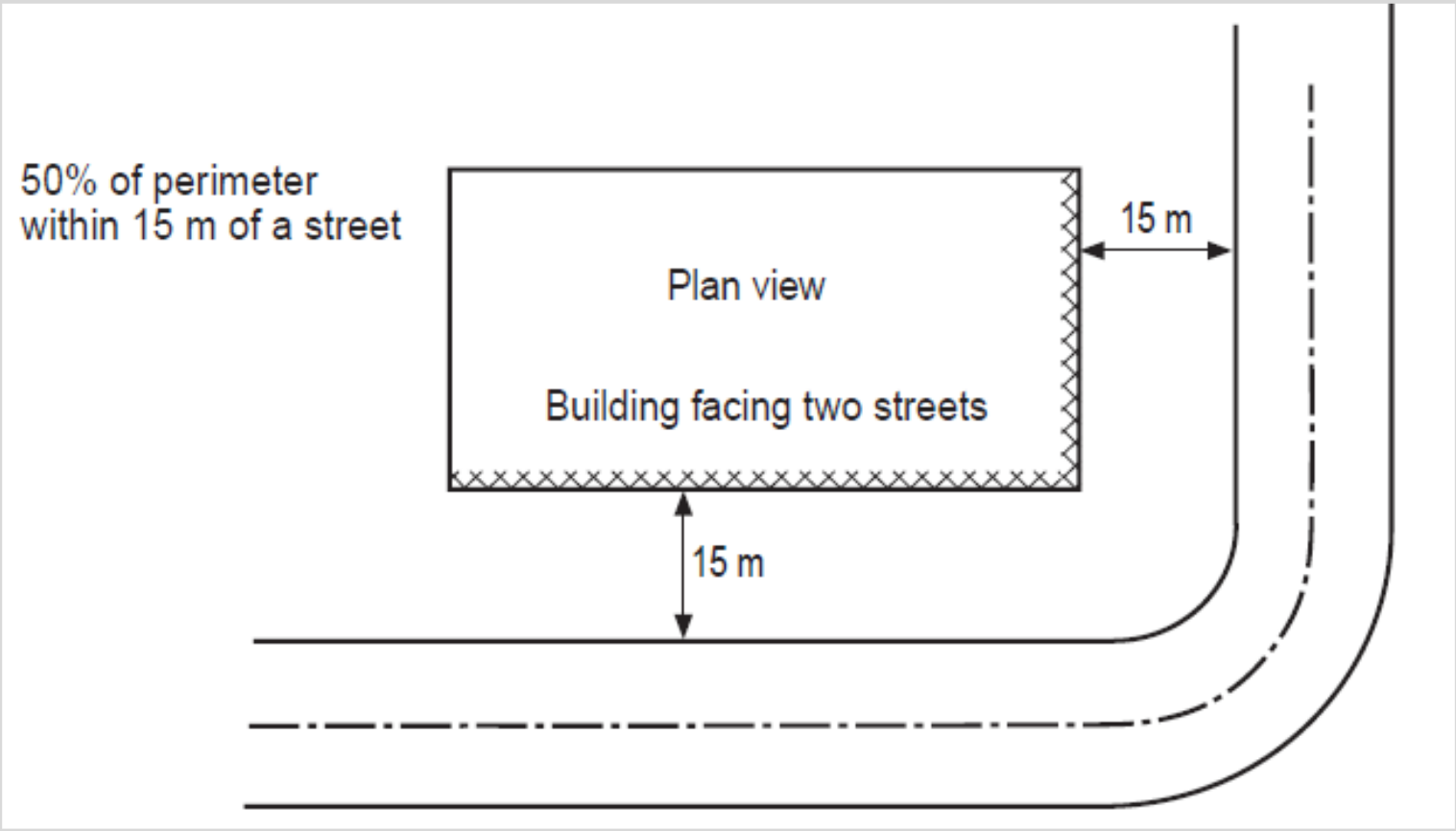


Project Characteristics – Building Height



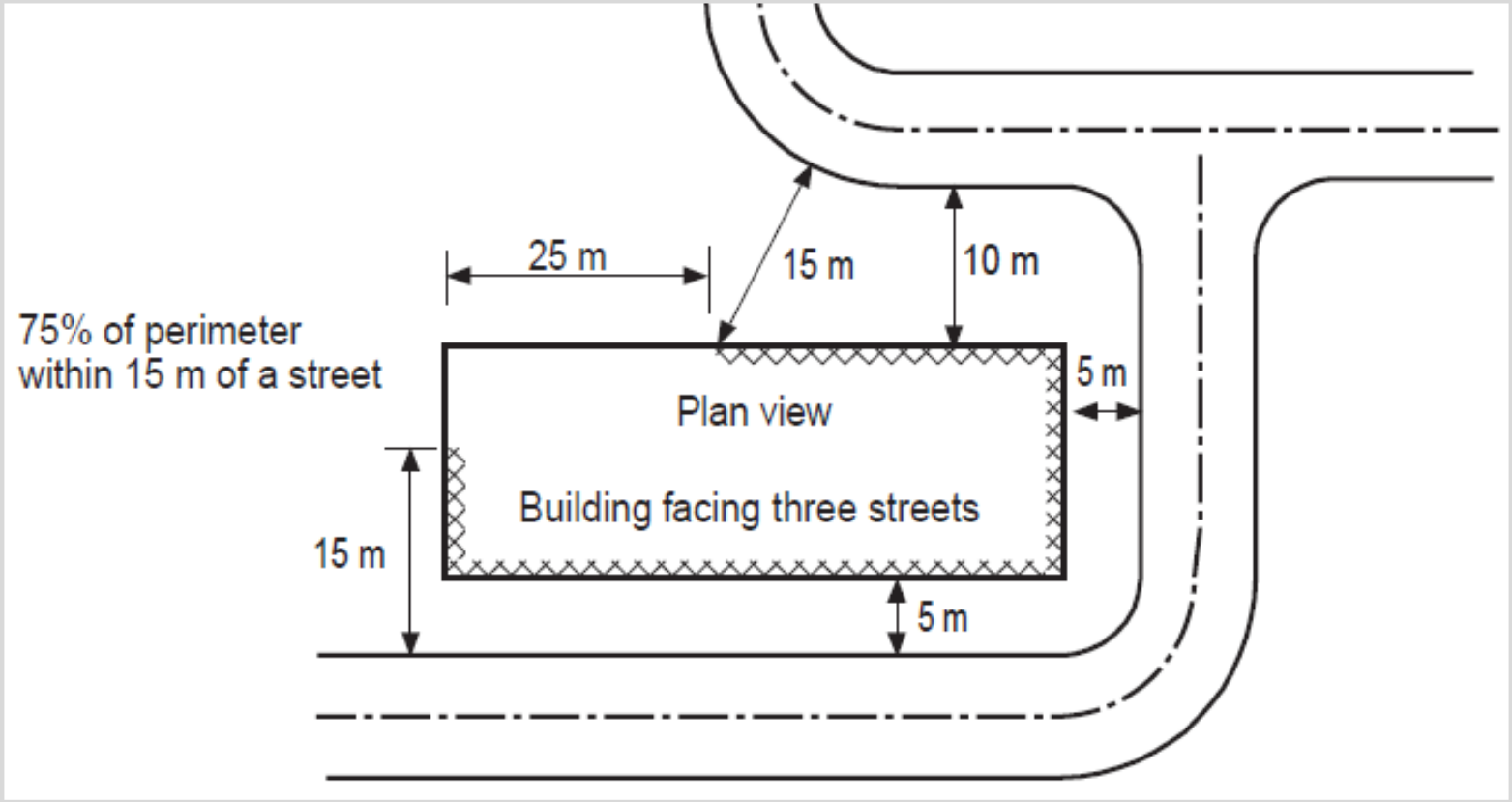
Project Characteristics – Streets Facing

› 2 Streets Facing:



Project Characteristics – Streets Facing

- 3 Streets Facing:



Building Classification - Governing Major Occupancy

3.2.2.49. Group C, up to 3 Storeys, Noncombustible Construction

1) A *building* classified as Group C is permitted to conform to Sentence (2) provided

a) it is not more than 3 *storeys* in *building height*, and
b) it has a *building area* not more than the value in Table 3.2.2.49.

Table 3.2.2.49.
Maximum Building Area, Group C, up to 3 Storeys
Forming Part of Sentence 3.2.2.49.(1)

No. of *Storeys*	Maximum Area, m^2		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	not limited	not limited	not limited
2	6 000	not limited	not limited
3	4 000	5 000	6 000

2) The *building* referred to in Sentence (1) shall be of *noncombustible construction*, and

a) except as permitted by Sentence (3), floor assemblies shall be *fire separations* with a *fire-resistance rating* not less than 1 h,
b) *mezzanines* shall have a *fire-resistance rating* not less than 1 h,
c) roof assemblies shall have a *fire-resistance rating* not less than 1 h, and
d) *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

3) In a *building* that contains *dwelling units* that have more than one *storey*, subject to the requirements of Sentence 3.3.4.2.(3), the floor assemblies, including floors over *basements*, which are entirely contained within these *dwelling units*, shall have a *fire-resistance rating* not less than 1 h but need not be constructed as *fire separations*.

Building Classification - Type of Construction

- Combustibility:

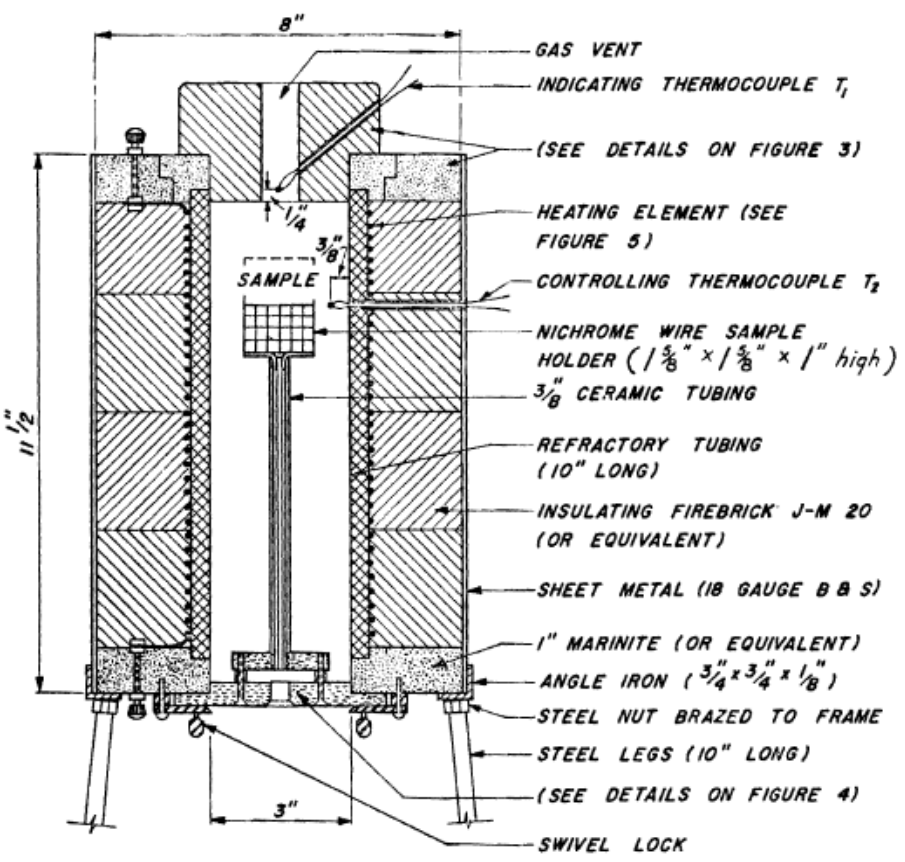


FIGURE 2

DIAGRAM OF COMBUSTIBILITY FURNACE

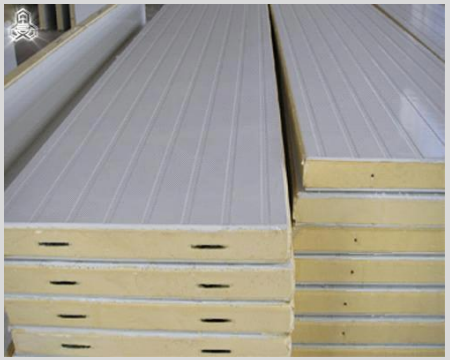
Building Classification - Type of Construction

- **Noncombustible Construction: “**a type of construction in which a degree of fire safety is attained by the use of noncombustible materials for structural members and other building assemblies”



Building Classification - Type of Construction

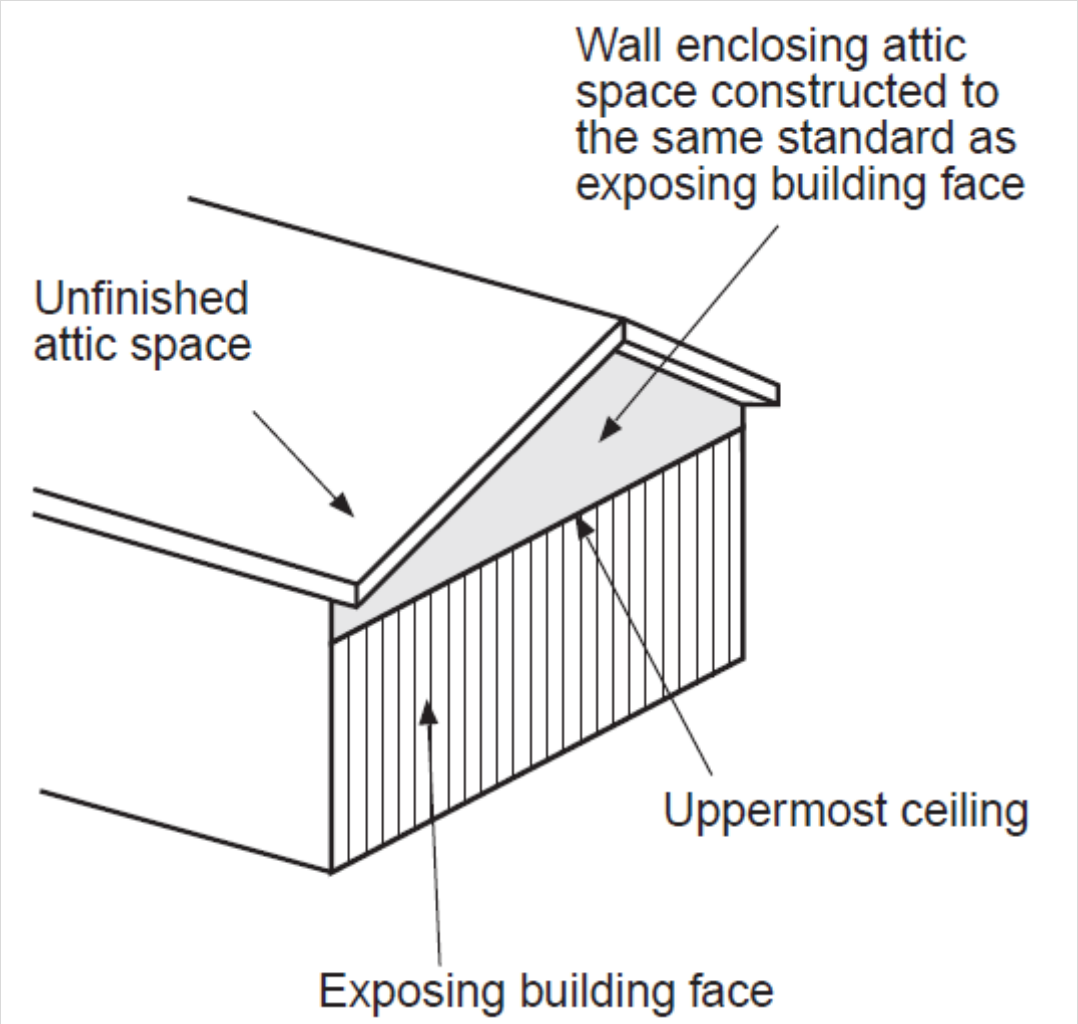
- **Combustible Construction:** “a type of construction that does not meet the requirements for noncombustible construction”



Spatial Separation

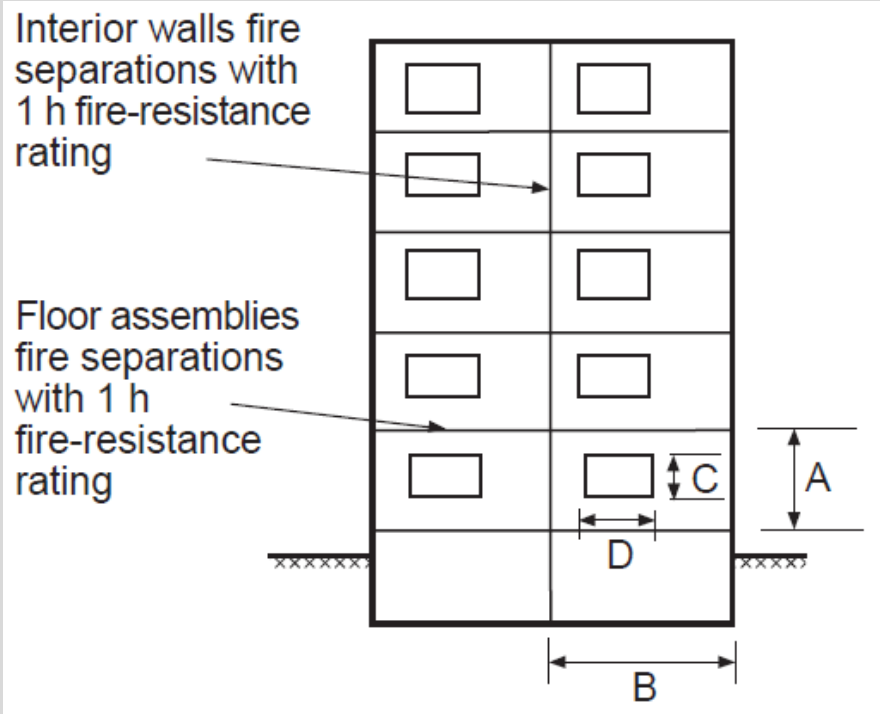
Spatial Separation (Tables 3.2.3.1.-B to 3.2.3.1.-E):	
North Wall	
Occupancy:	C
Wall Height (m):	3
Wall Width (m):	40
Wall Area (m^2):	120.0
Limiting Distance (m):	4
Permitted UPO (%):	33%

Spatial Separation - Exposing Building Face



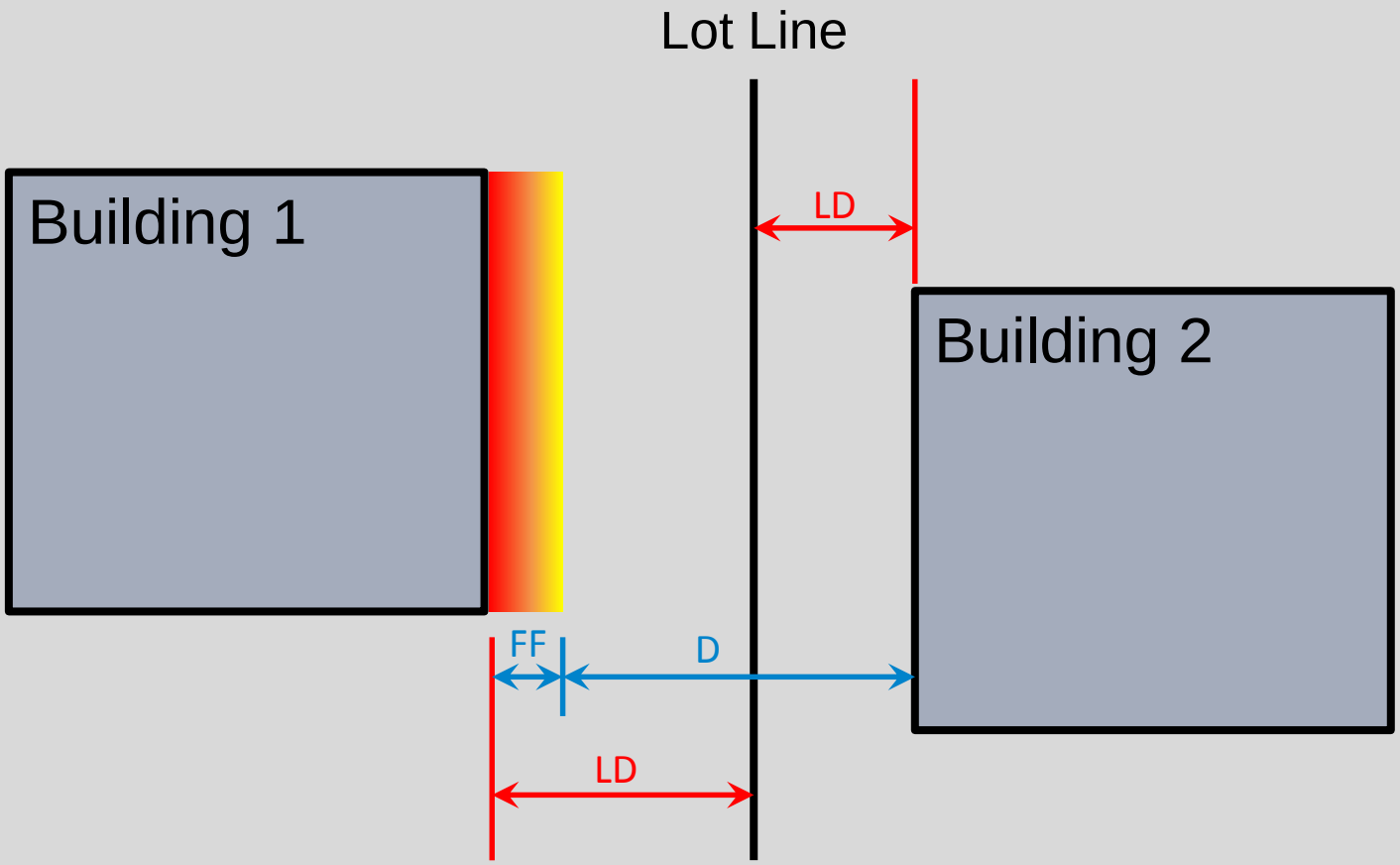
Spatial Separation - Exposing Building Face

- Wall Height (A):
  - The height of the exposing building face
- Wall Width (B):
  - The width of the exposing building face
- Wall Area = A x B
- Actual % of Unprotected Openings:
  - (C x D)/(A x B)



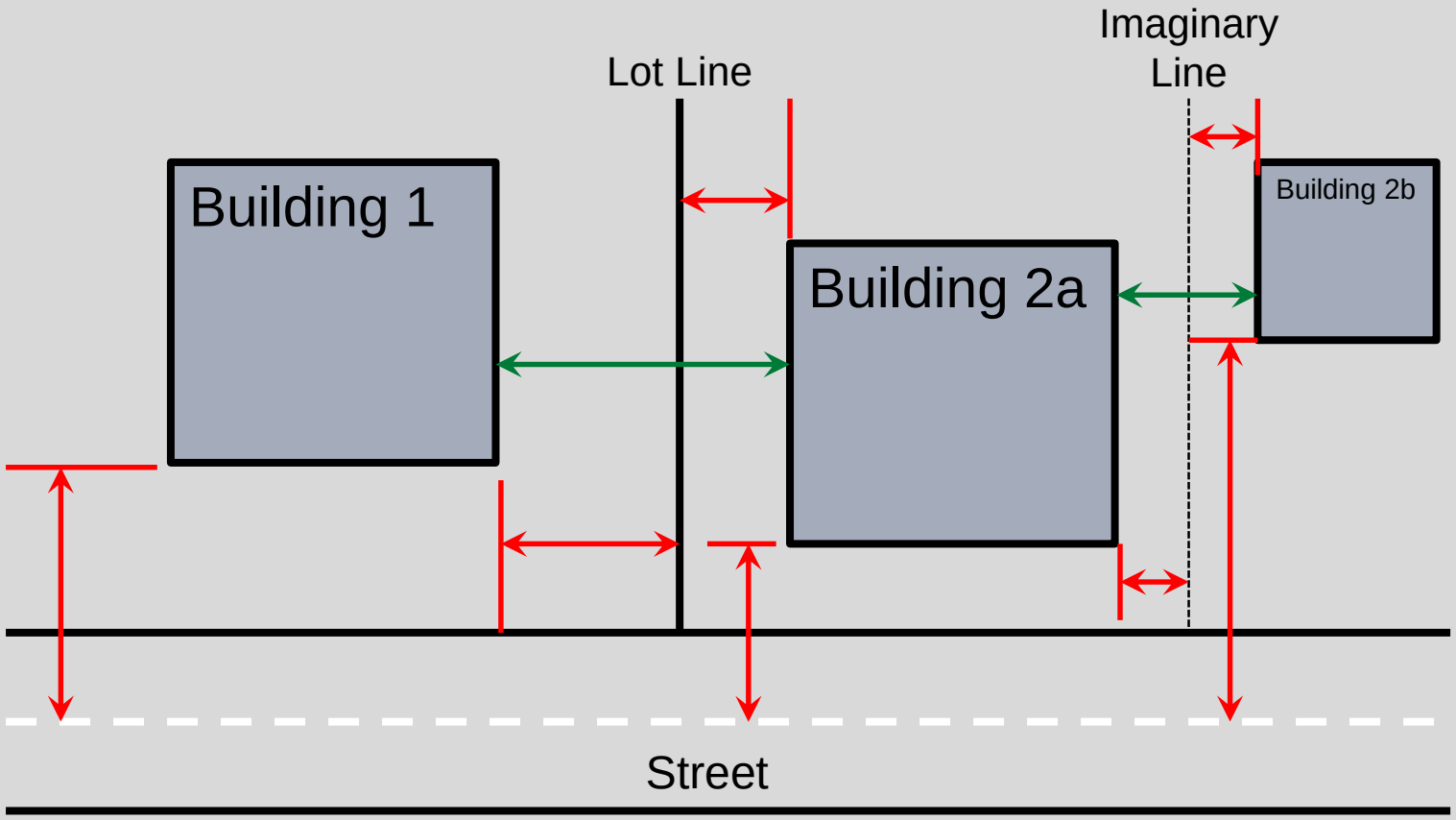
Spatial Separation – Limiting Distance

› Limiting Distance (LD) and Absolute Distance (D)



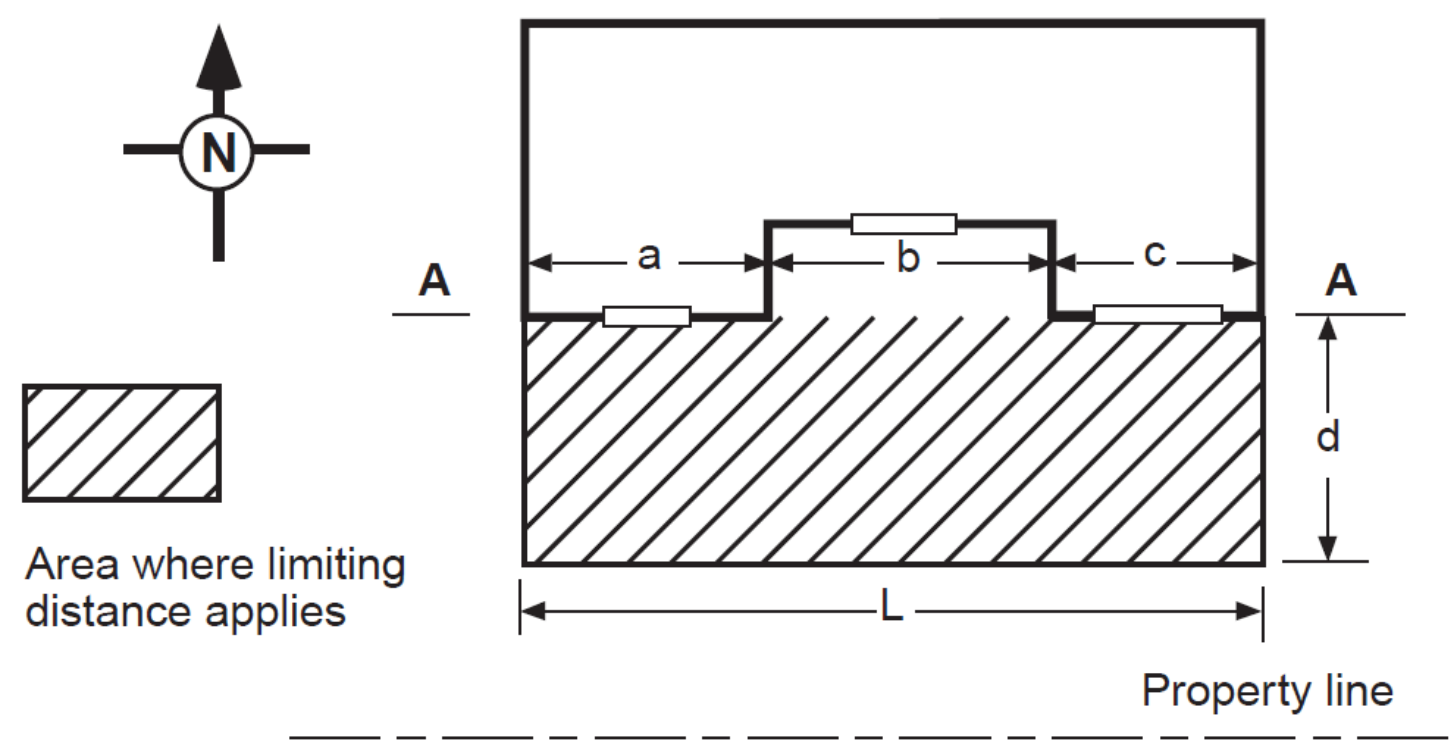
Spatial Separation – Limiting Distance

› Limiting Distance (Red) and Absolute Distance (Green)

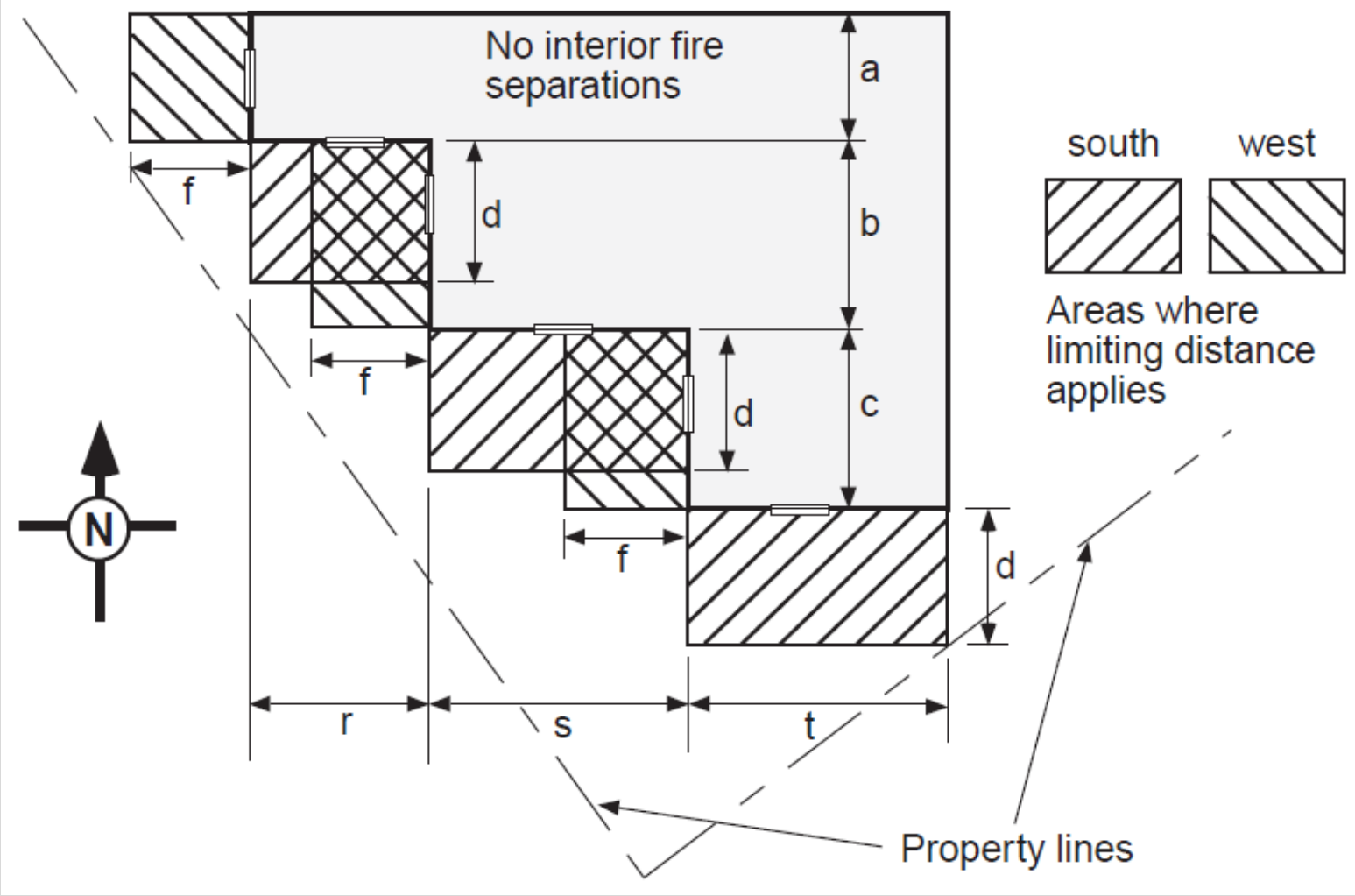


Spatial Separation – Limiting Distance

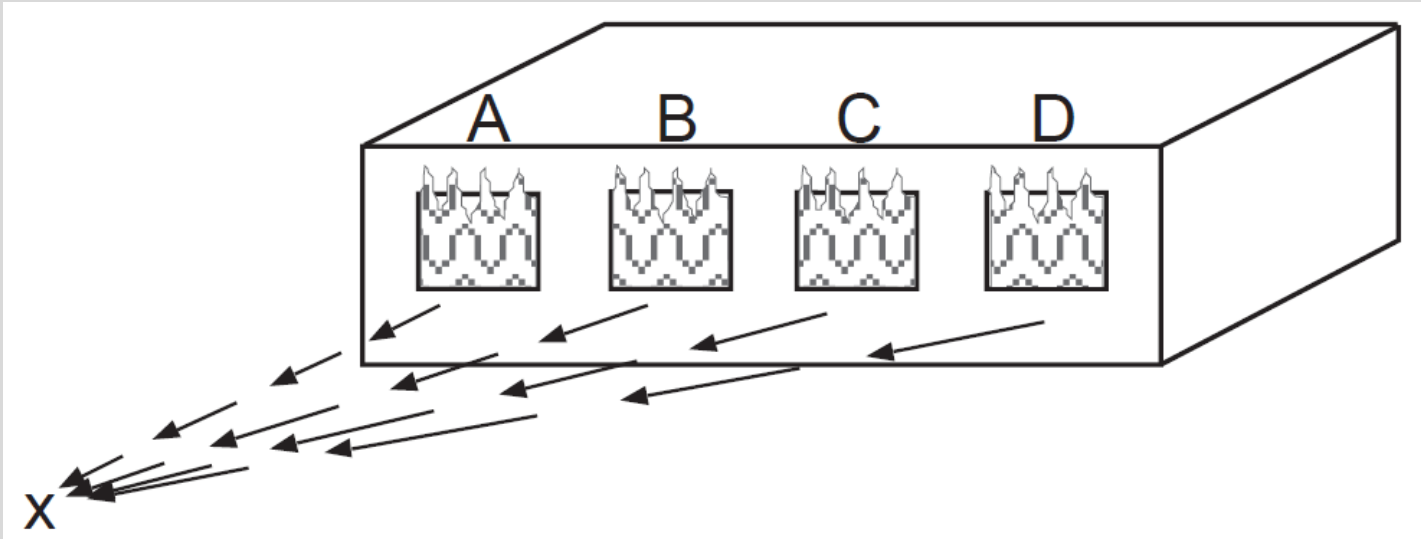
- Limiting Distance – Irregular Building Face - Projection onto Closest Plane Perpendicular to the



Spatial Separation – Limiting Distance



Spatial Separation – Unprotected Opening



area of exposing building face (south side) $= 15 \times 3 = 45\ m^2$

area of unprotected openings $= 15\ m^2$

percentage of unprotected openings $= (15 \div 45) \times 100 = 33\%$

Exterior Wall Construction

East Exterior Wall Construction

Combustible (Article 3.2.2.65.)	45-min FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Combustible (Table 3.2.3.7., and Sentence 3.2.3.7.(4))	Cladding

South Exterior Wall Construction

Combustible (Article 3.2.2.65.)	45-min FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Combustible (Table 3.2.3.7., and Sentence 3.2.3.7.(4))	Cladding

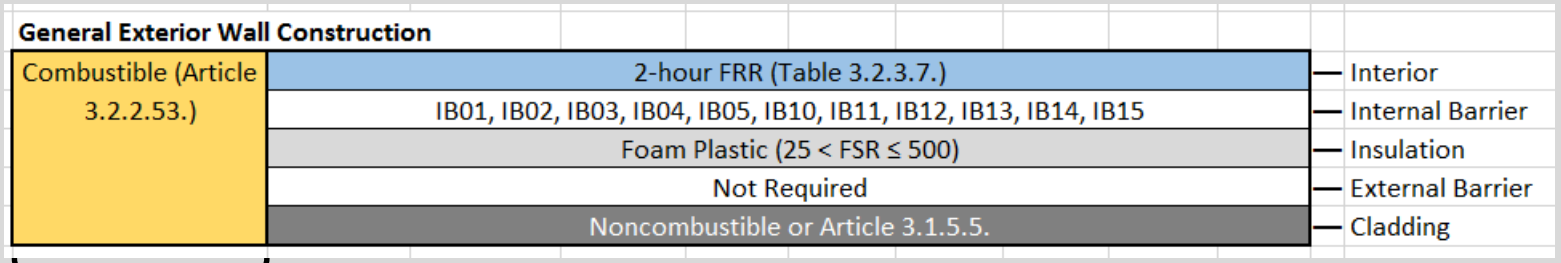
West Exterior Wall Construction

Combustible (Article 3.2.2.65.)	45-min FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Combustible (Table 3.2.3.7., and Sentence 3.2.3.7.(4))	Cladding

General Exterior Wall Construction

Combustible (Article 3.2.2.65.)	2-hour FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Noncombustible or Article 3.1.5.5.	Cladding

Exterior Wall Construction – Building Based



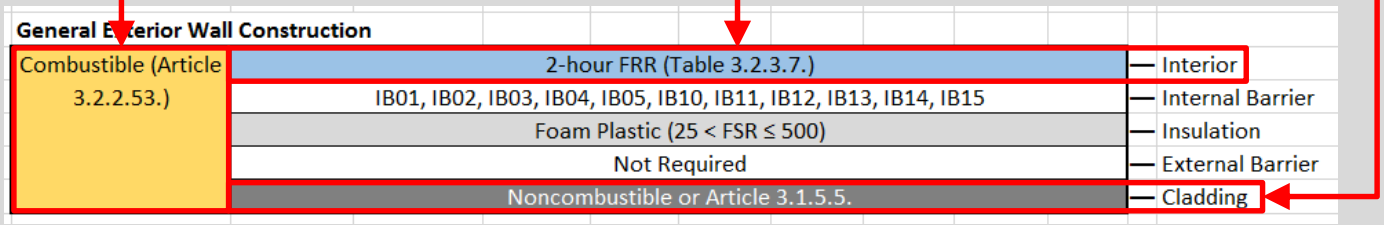
General Exterior Wall Construction		
Combustible (Article 3.2.2.53.)	2-hour FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Noncombustible or Article 3.1.5.5.	Cladding

Required type of construction for the whole wall based on the required type of construction for the building. Can be overridden by the Spatial Separation Requirements

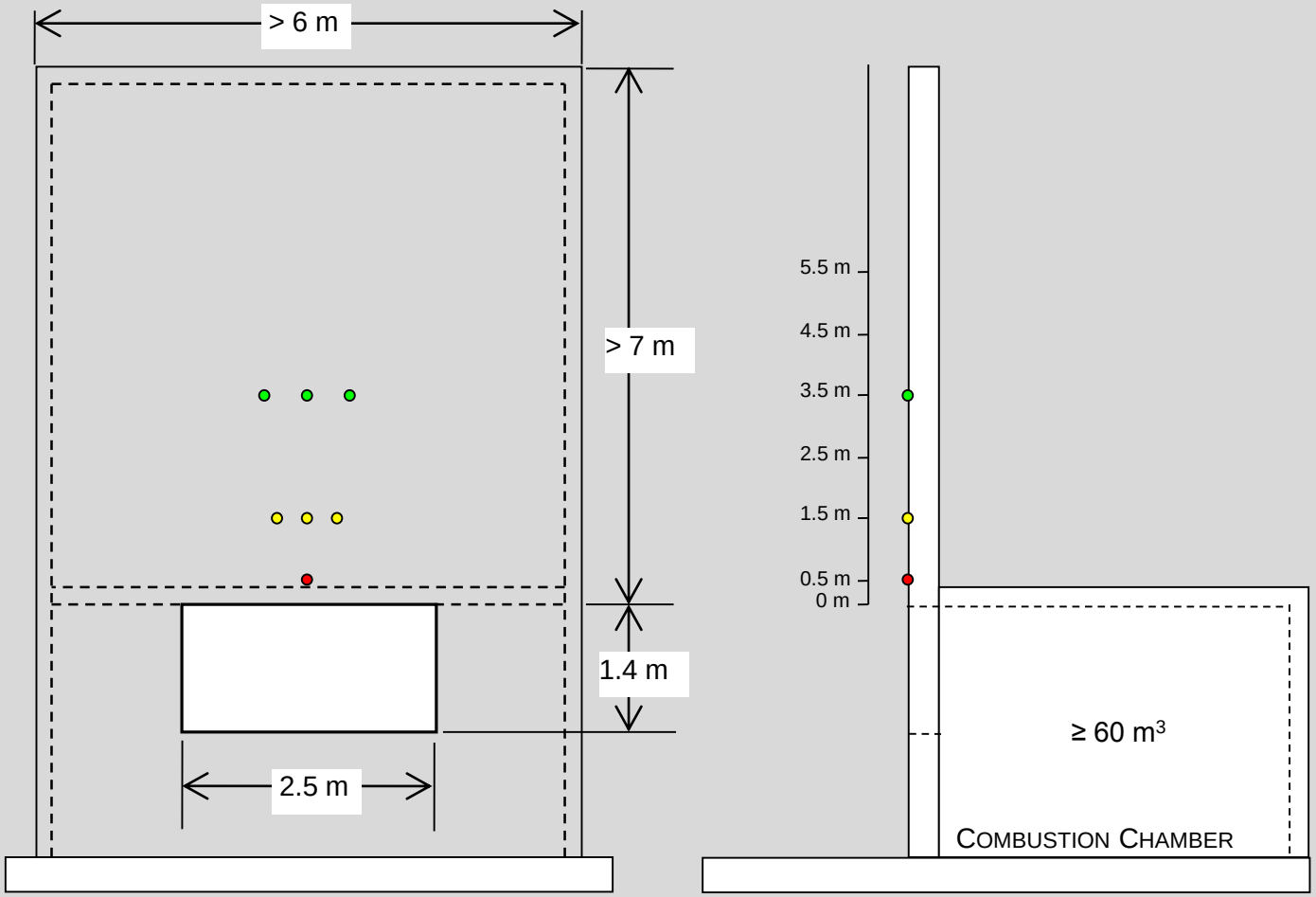
Exterior Wall Construction – Spatial Separation Based

Table 3.2.3.7.
Minimum Construction Requirements for Exposing Building Faces
Forming Part of Sentences 3.2.3.7.(1) and (2)

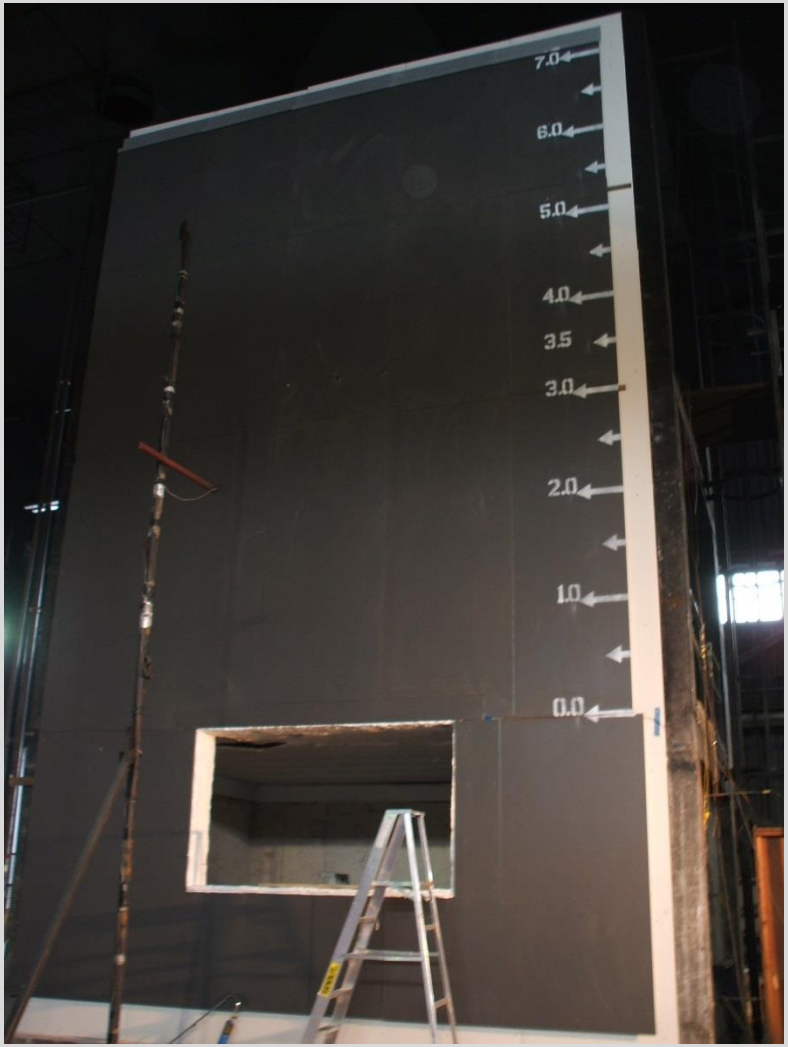
Occupancy Classification of *Building* or *Fire Compartment*	Maximum Area of *Unprotected Openings* Permitted, % of *Exposing Building Face* Area	Minimum Required *Fire-Resistance Rating*	Type of Construction Required	Type of Cladding Required
Group A, B, C, D, or Group F, Division 3	0 to 10	1 h	*Noncombustible*	*Noncombustible*
	> 10 to 25	1 h	*Combustible* or *Noncombustible*	*Noncombustible*
	> 25 to 50	45 min	*Combustible* or *Noncombustible*	*Noncombustible*
	> 50 to < 100	45 min	*Combustible* or *Noncombustible*	*Combustible* or *Noncombustible*(1)
Group E, or Group F, Division 1 or 2	0 to 10	2 h	*Noncombustible*	*Noncombustible*
	> 10 to 25	2 h	*Combustible* or *Noncombustible*	*Noncombustible*
	> 25 to 50	1 h	*Combustible* or *Noncombustible*	*Noncombustible*
	> 50 to < 100	1 h	*Combustible* or *Noncombustible*	*Combustible* or *Noncombustible*



Exterior Wall Construction – Cladding (3.1.5.5.)



Exterior Wall Construction – Cladding (3.1.5.5.)



Part 3: Code Tool Learnings & Dow Above Grade Wall Solutions (Les Yard)

NBC Building Code Tool

How has it been Received? Vetted?

Dialog, Architecture49, Morrison Hershfield, RDH Building Engineering, Canadian Code Centre….

Late Spring 2016 …*Through YE 2016 … May 2017 …*

…We provided a Simple Output based on Simple Inputs using NBCC 2015

Applicable Building Code:	
2015 NBCC	

Legend	
	Input cell
	Calculated cell
	Combustible
	Noncombustible
	2-hour FRR
	1-hour FRR
	45-min FRR

Project Characteristics:	
Building Area (m²):	1200
Building Height (Storeys):	4
Building Height (m):	12
Streets Facing:	3
Sprinklered:	Yes
Major Occupancies:	E

Building Classification:	
Governing Occupancy:	E
Governing Article:	3.2.2.65. Group E, up to 4 Storeys, Sprinklered
Type of Construction:	Combustible
Max. Area (m²):	1800
Max. Height (Storeys):	4
Additional Requirements:	None

Spatial Separation (Tables 3.2.3.1.-B to 3.2.3.1.-E):

North Wall		**North Exterior Wall Construction**		
Wall Height (m):	6.6	Combustible (Article 3.2.2.65.)	No Rating	Interior
Wall Width (m):	53.5		IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15, IB16	Internal Barrier
Wall Area (m²):	353.1		Foam Plastic (25 < FSR ≤ 500)	Insulation
Limiting Distance (m):	21		EB01, EB02, Article 3.1.5.5.	External Barrier
Permitted UPO (%):	100%		Combustible (Table 3.2.3.7.)	Cladding

East Wall		**East Exterior Wall Construction**		
Wall Height (m):	6.6	Combustible (Article 3.2.2.65.)	2-hour FRR (Table 3.2.3.7.)	Interior
Wall Width (m):	9.5		IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15, IB16	Internal Barrier
Wall Area (m²):	62.7		Foam Plastic (25 < FSR ≤ 500)	Insulation
Limiting Distance (m):	3		EB01, EB02, Article 3.1.5.5.	External Barrier
Permitted UPO (%):	16%		Noncombustible or Article 3.1.5.5.	Cladding

South Wall		**South Exterior Wall Construction**		
Wall Height (m):	6.6	Combustible (Article 3.2.2.65.)	1-hour FRR (Table 3.2.3.7.)	Interior
Wall Width (m):	54.3		IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15, IB16	Internal Barrier
Wall Area (m²):	358.4		Foam Plastic (25 < FSR ≤ 500)	Insulation
Limiting Distance (m):	9		EB01, EB02, Article 3.1.5.5.	External Barrier
Permitted UPO (%):	26%		Combustible (Table 3.2.3.7., and Sentence 3.2.3.7.(4))	Cladding

West Wall		**West Exterior Wall Construction**		
Wall Height (m):	6.6	Combustible (Article 3.2.2.65.)	2-hour FRR (Table 3.2.3.7.)	Interior
Wall Width (m):	33.6		IB01, IB02, IB03, IB04, IB05, IB10, IB11, IB12, IB13, IB14, IB15, IB16	Internal Barrier
Wall Area (m²):	221.8		Foam Plastic (25 < FSR ≤ 500)	Insulation
Limiting Distance (m):	5		EB01, EB02, Article 3.1.5.5.	External Barrier
Permitted UPO (%):	16%		Noncombustible or Article 3.1.5.5.	Cladding

Fantastic!… NBC 2015 … but we want to use this now

Initial Feedback from Industry Sessions

- This is more than a marketing tool … it is a Design Tool
- Original version was based on NBC2015. We want to use this now … please add (NBC2010, BCBC, VBBL, ABC, OBC, QBC capability)
- Keep the Code Tool generic and show your work
- Allow users to Opt-In for more information and access to Dow Solutions (I.E. Keep the Tool Generic and Not Result in Dow Products)
- Code Tool has ability to provide education and consensus on complex articles in Part 3 -- from those who write and develop the code, the design community and code enforcement (AHJ)

So Keith went back to work… NBCC 2010, OBC 2012, QBC 2013, ABC 2014, VBBL 2014

Applicable Building Code:

2010 NBCC

Legend

	Input cell
	Calculated cell
	Combustible
	Noncombustible
	2-hour FRR
	1-hour FRR
	45-min FRR

Project Characteristics:

Building Area (m²):	14400
Building Height (Storeys):	3
Building Height (m):	17
High Building (Subsection 3.2.6.)	No
Streets Facing:	2
Sprinklered:	Yes
Major Occupancies:	C,D,E

Building Classification:

Governing Occupancy:	E
Governing Article:	3.2.2.62. Group E, Any Height, Any Area, Sprinklered
Type of Construction:	Noncombustible
Max. Area (m²):	Unlimited
Max. Height (Storeys):	Unlimited
Additional Requirements:	None

Spatial Separation (Tables 3.2.3.1.-B to 3.2.3.1.-E):

North Wall

Wall Height (m):	3
Wall Width (m):	40
Wall Area (m²):	120.0
Limiting Distance (m):	4
Permitted UPO (%):	16%

North Exterior Wall Construction

Noncombustible (Article 3.2.2.62.)	2-hour FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Noncombustible or Article 3.1.5.5.	Cladding

East Wall

Wall Height (m):	3
Wall Width (m):	87
Wall Area (m²):	261.0
Limiting Distance (m):	4
Permitted UPO (%):	14%

East Exterior Wall Construction

Noncombustible (Article 3.2.2.62.)	2-hour FRR (Table 3.2.3.7.)	Interior
	IB01, IB02, IB03, IB04, IB05	Internal Barrier
	Foam Plastic (25 < FSR ≤ 500)	Insulation
	Not Required	External Barrier
	Noncombustible or Article 3.1.5.5.	Cladding

South Wall

Wall Height (m):	3
Wall Width (m):	39
Wall Area (m²):	117.0
Limiting Distance (m):	4
Permitted UPO (%):	16%

South Exterior Wall Construction

Noncombustible (Article 3.2.2.62.)	2-hour FRR (Table 3.2.3.7.)	Interior
	Not Required	Internal Barrier
	Noncombustible	Insulation
	Not Required	External Barrier
	Noncombustible or Article 3.1.5.5.	Cladding

West Wall

Wall Height (m):	3
Wall Width (m):	87
Wall Area (m²):	261.0
Limiting Distance (m):	4

West Exterior Wall Construction

Noncombustible (Article 3.2.2.62.)	2-hour FRR (Table 3.2.3.7.)	Interior
	Not Required	Internal Barrier
	Noncombustible	Insulation
	Not Required	External Barrier

Oh and BTW… This should not be a design tool just for Dow. We want access to it on our desktops …

Code Assessment Engine – Web Interface

Code Assessment Engine – Web Interface

Learnings from the Code Assessment Engine

Generally … Where One Can & Cannot Use Foam?

Examples of Where Foam Plastic Permitted:

- Combustible Buildings and 3 Stories & Below Non-Combustible …Above That?
- Behind Concrete and Masonry 25mm and thicker Cladding or Wall Assemblies that meet Article 3.1.5.5. (Assembly has passed the CAN/ULC S134 Fire Test)
- Protected by a Thermal Barrier that meets CAN/ULC S101 (Article 3.2.3.8.(1)(b) PLUS Non-Combustible Cladding
- Required … Fire Block Required At Floors and Ceilings or Every 20 m horizontally and every 3 m vertically if cavity gap is greater than 25 mm (NBC Article 3.1.11.2.)

Examples of Buildings Where Foam Plastic NOT Permitted:

- Where Spatial Separation allows less than 10% UPO (only non-combustible insulation acceptable)
- High Rise Buildings with Fire Sensitive Claddings (I.E. everywhere where claddings are not 25mm of Concrete or Masonry)
- Unsprinklered Buildings

Building Code: In Summary Fire …

- **Fire behavior and the associated code requirements are … Complicated**
- Significant work by professional consultants, researchers and forensic study has resulted in sufficiently complex and well vetted regulations (NBCC Part 9 / Part 3)
- Fire can be managed by preventing it, or controlling it or reducing the impact of fire if it occurs.
- Ensuring the safety of a building's occupants is a fundamental goal of fire design and of The Entire Industry
- A designer must meet multiple criteria to ensure a structure's success while under construction and once in service ... Fire is Number One!
- **A good place to start evaluating the use of Foam Insulation … is the Code Assessment Engine**

Did I Mention? …We are only at Step One

Can I Use Foam Insulation?

Can one use Foam Insulation?

- Wall Builder
- Code Assessment Engine

Which Above Grade Wall Solution?

- Interactive/ Consultative Presentation

Why use Dow Wall Assembly?

- Wall Analysis

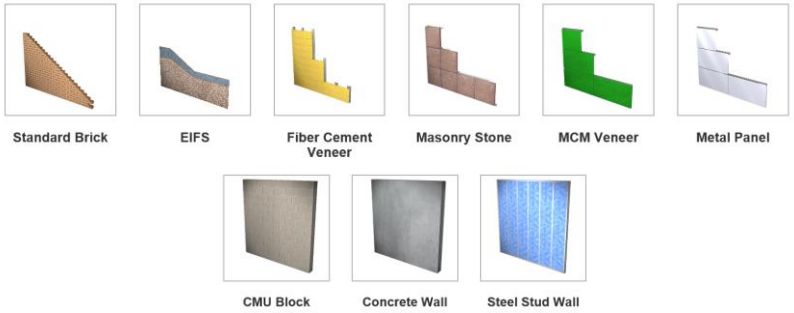
Technical Support Available From Dow?

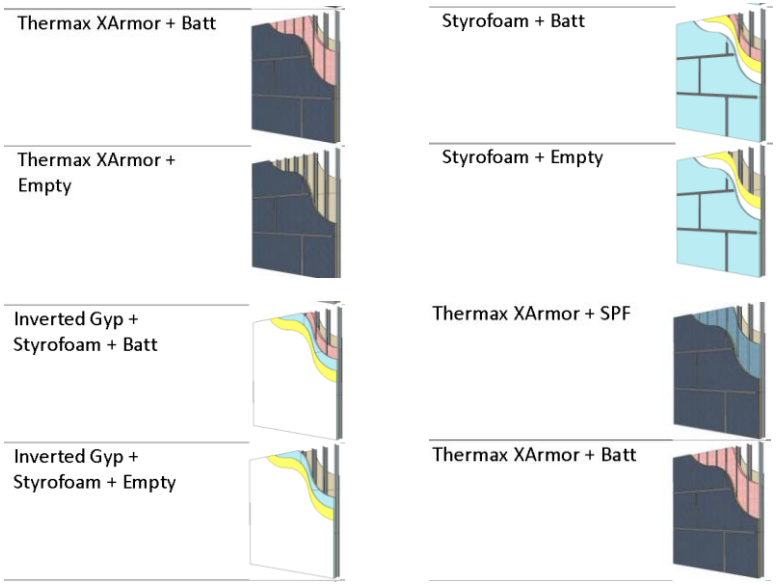
- Website
- Details
- BSD speclink

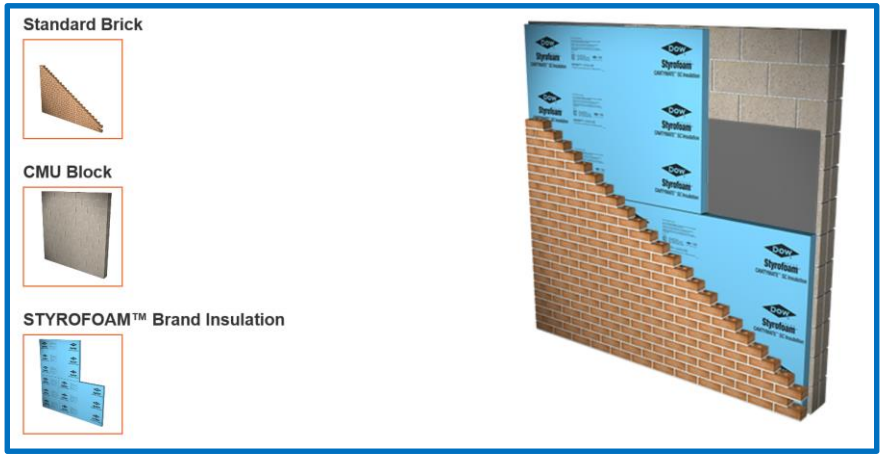
If Yes …

Great … I can Use Foam Insulation …

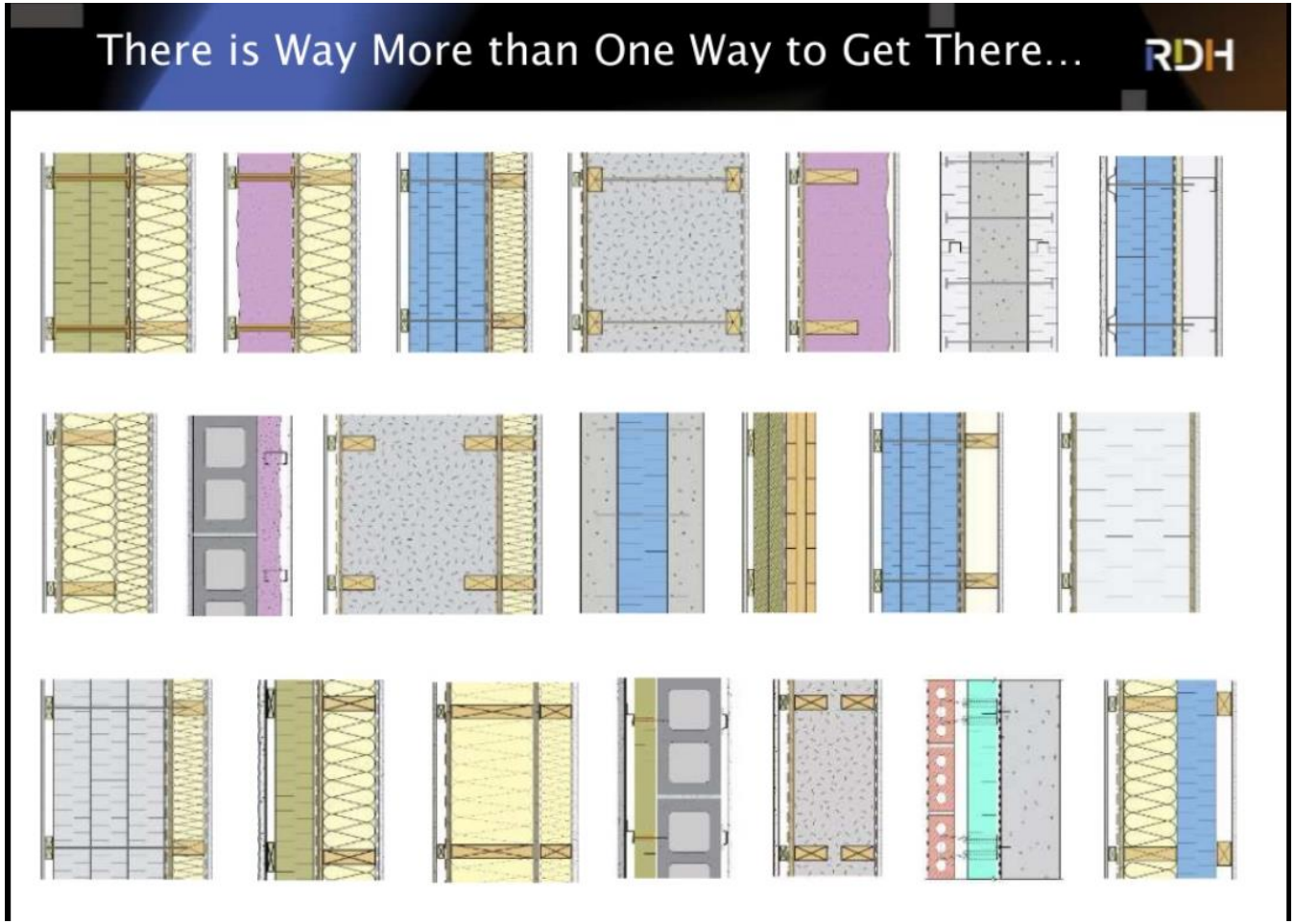
Where do I go from here? So many Options …?







Did I Say … So Many Options … Slide from RDH Presentation on CoV's Effective R-22 … Many Vetted Methods to Approach Walls …



Slide from RDH Presentation (Effective R22) Lorne Ricketts

Wall Design and Construction Must Meet:

1. **Structural and Design Safety**
2. **Fire Safety**
3. **Bulk Water Control**
4. **Air Control**
5. **Vapour Control**
6. **Thermal Control**
7. **Thermal Efficiency**
8. **Environmental Effectiveness**
9. **Product / System Transparency**
10. **Product / System Acceptance**

Wall Design and Construction Must Meet:

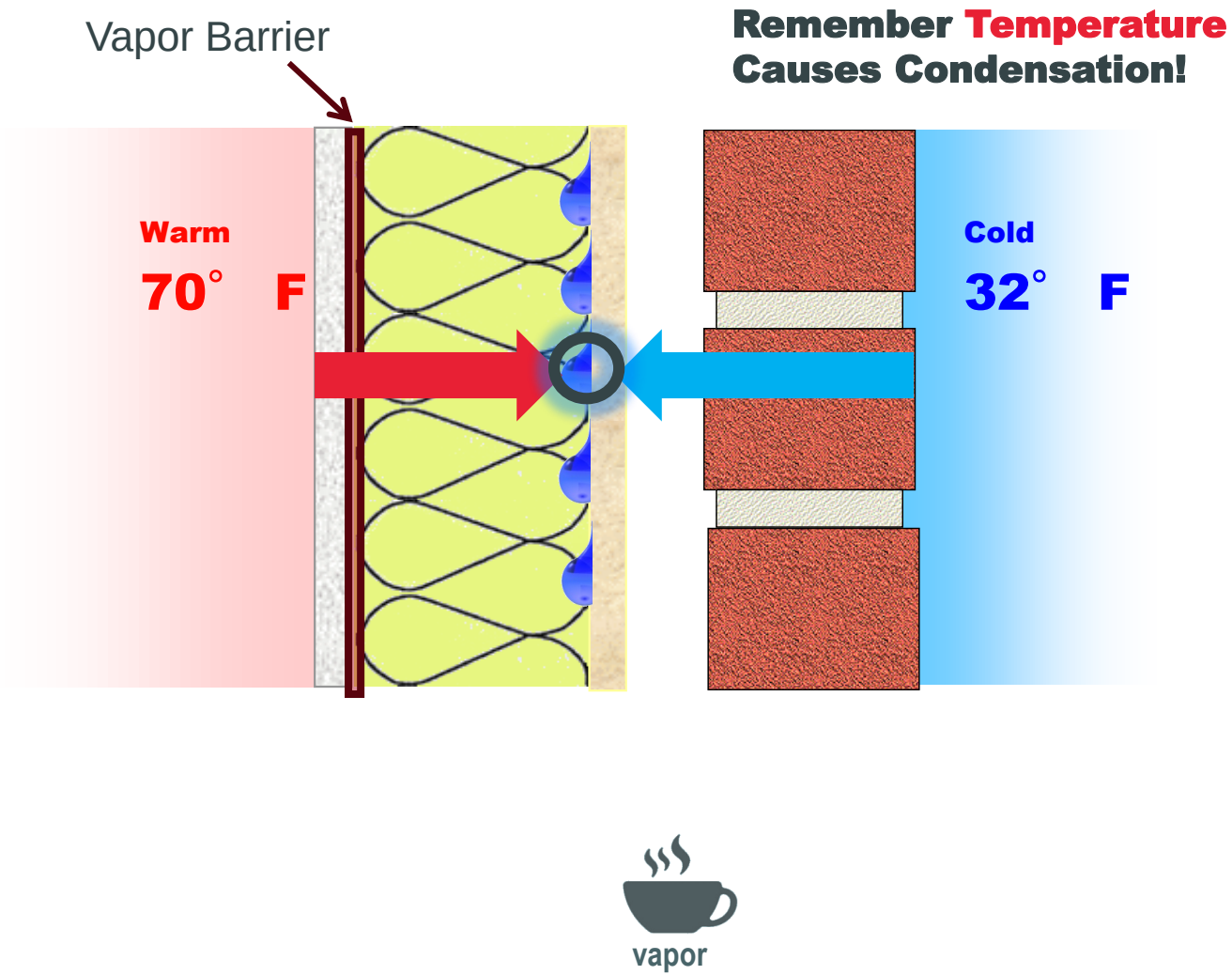
1. Structural and Design Safety
2. Fire Safety
3. Bulk Water Control
4. Air Control
5. Vapour Control
6. Thermal Control
7. Thermal Efficiency
8. Environmental Effectiveness
9. Product / System Transparency
10. Product / System Acceptance

Energy & Moisture

Effective Building Practice: Traditional Vapour Control

Building Code	1. Structural and Design Safety
	2. Fire Safety
Effective Building Practice	3. Bulk Water Control
	4. Air Control
	5. Vapour Control
	6. Thermal Control
Energy Code	7. Thermal Efficiency
Sustainability	8. Environmental Effectiveness
	9. Product / System Transparency
	10. Product / System Acceptance

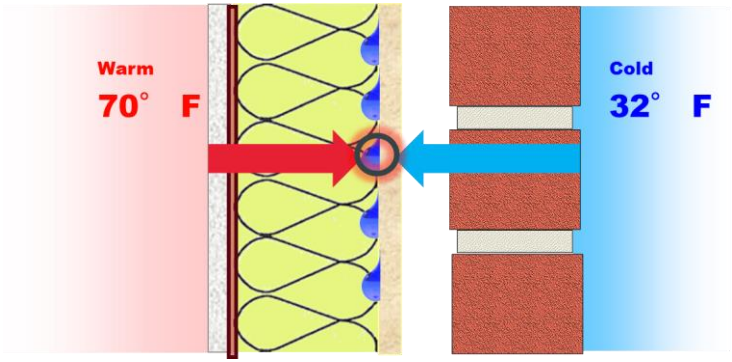
Vapor Layer | Building Science



Vapor Layer | Building Science

Misconceptions “debunked”

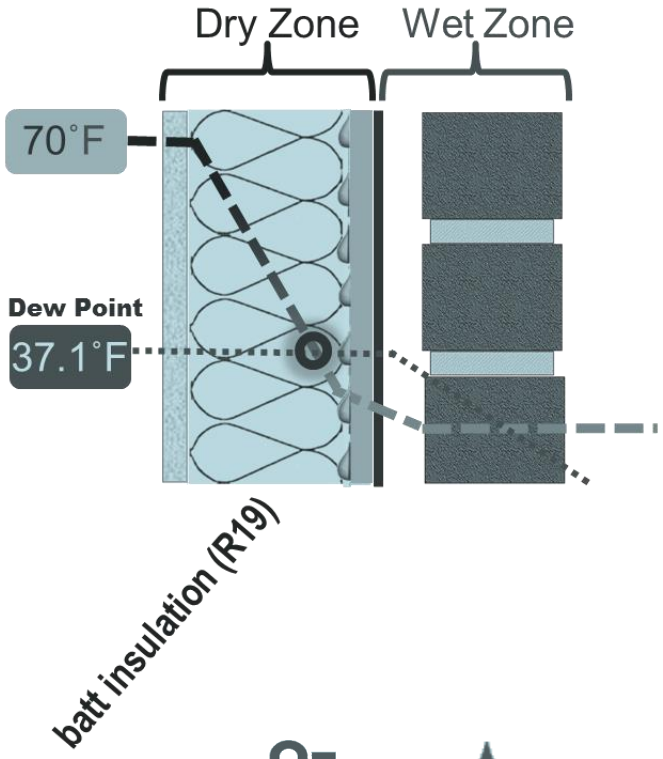
1) Vapor is **not bad**
2) Vapor & humidity are **almost always present**
3) The goal is to **eliminate liquid water**
4) Need to **prevent vapor from becoming liquid water**

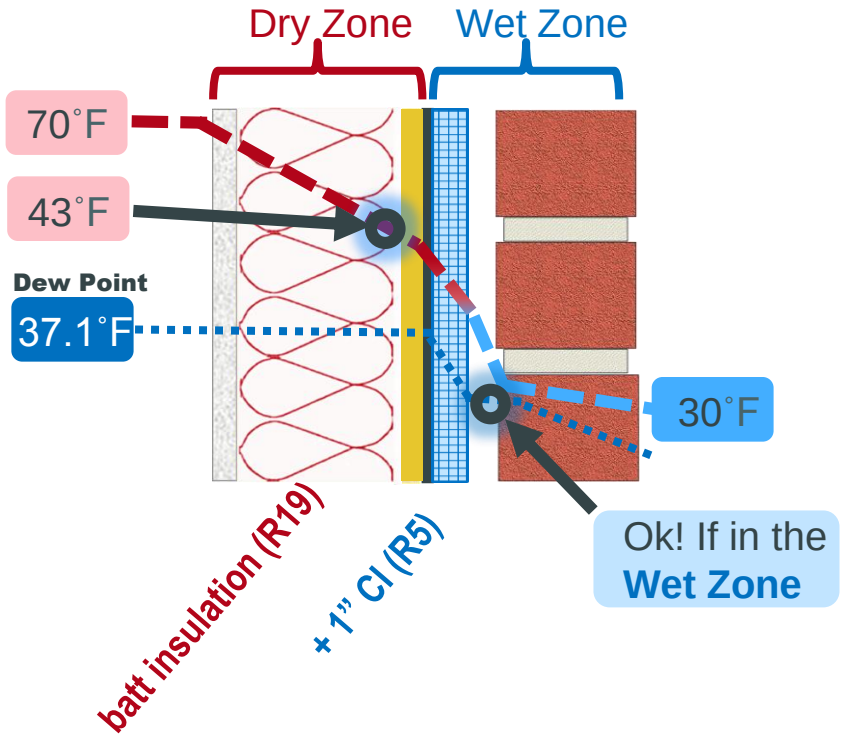


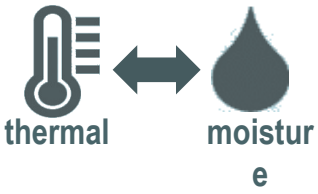
Thermal Layer | Relating to Moisture

Example Conditions

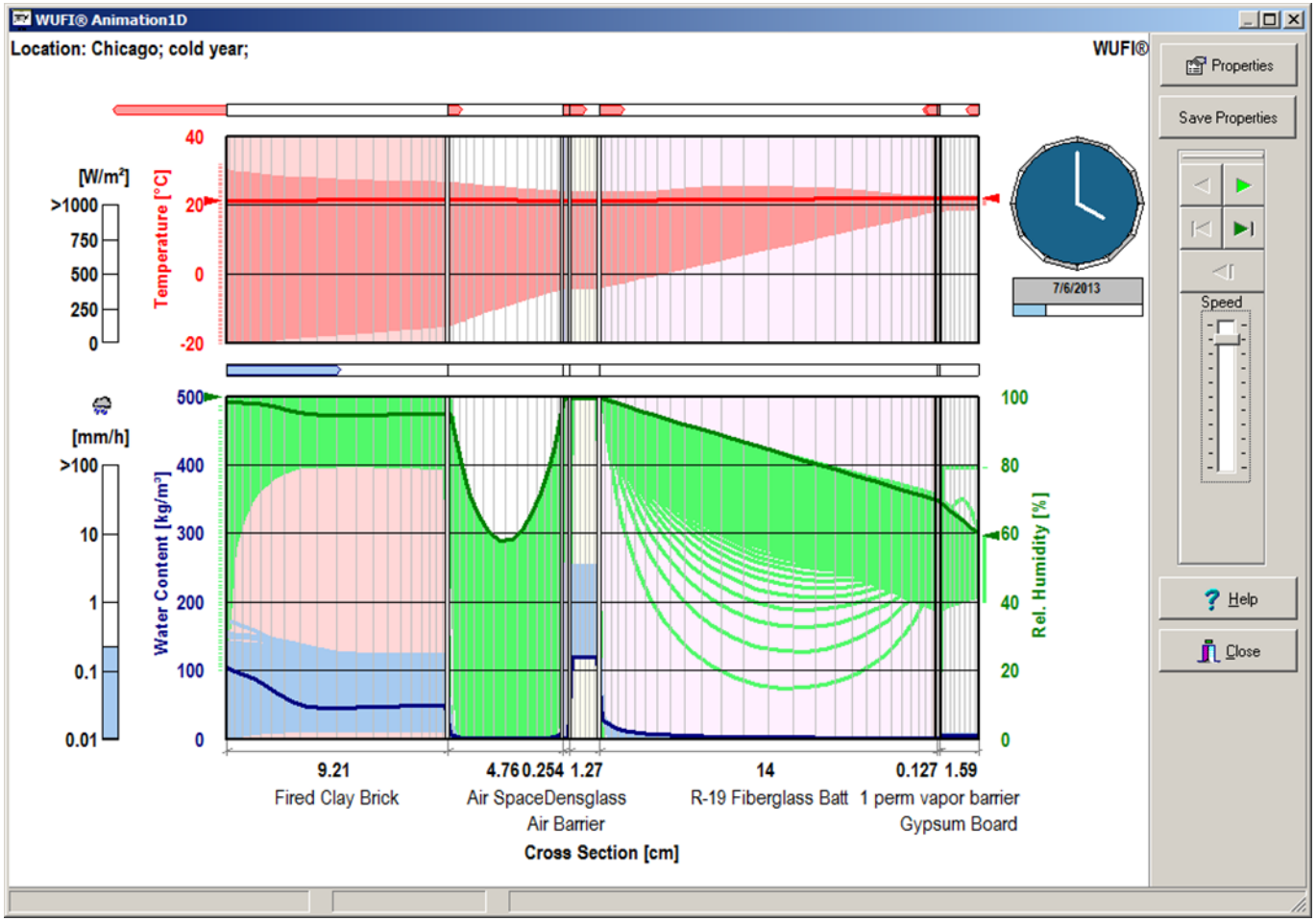
Indoor Temperature: 70˚F
Indoor RH(Relative Humidity) 30%
Outdoor Temperature: 30˚F







WUFI vs Dew Point Analysis



3rd Party Resources – Exterior Insulation & Condensation Control

CMHC Best Practice Guide "Brick Veneer Steel Stud"

"Danger of condensation in the stud space is absent in only one instance, where there is 75 mm (3 in.) of cavity insulation and no insulation in the stud space."

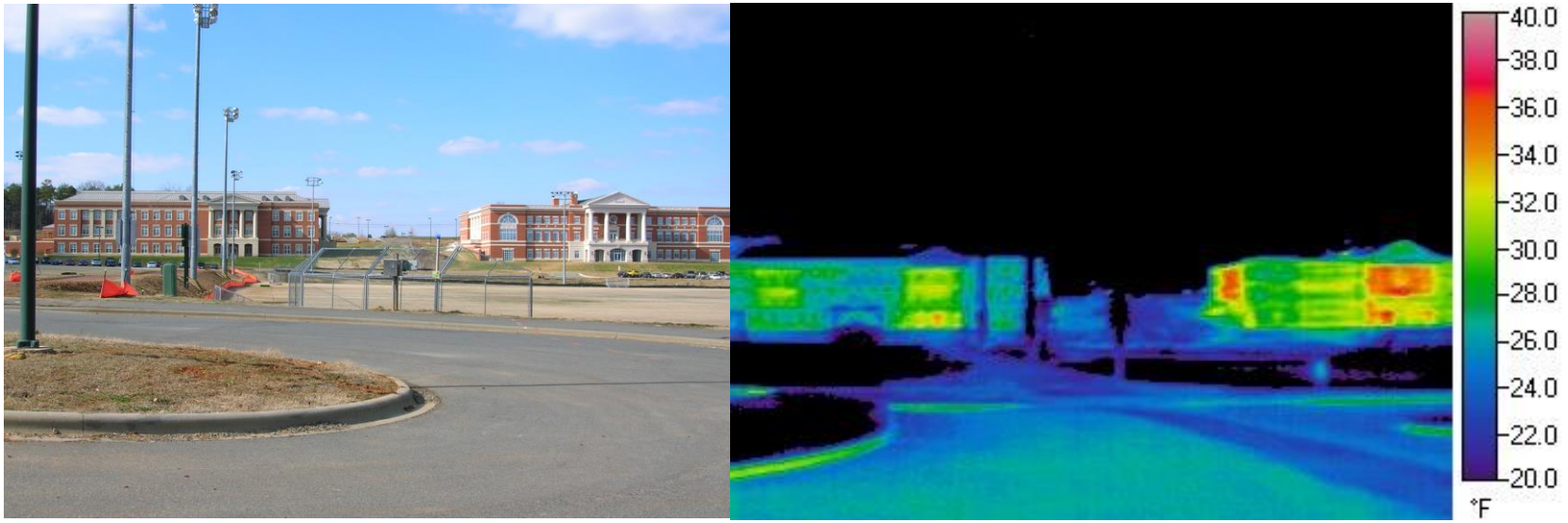
PERSIST Wall (AB Infrastructure – Red Book / Blue Book)

The design approach recommended may be described as the "Pressure Equalized Rain Screen Insulated Structure Technique", or "PERSIST". This approach is characterized by the following:

- An air barrier system installed exterior to and supported by the structure.
- Insulation installed tight to the exterior of the air barrier system.
- A cladding system designed based on rain screen principles, installed over an air space that is pressure equalized with the exterior and drained to the exterior.

Also … NRC (1960's), Alaska REMOTE, many others recognize the benefits of an exterior insulated wall with empty cavity

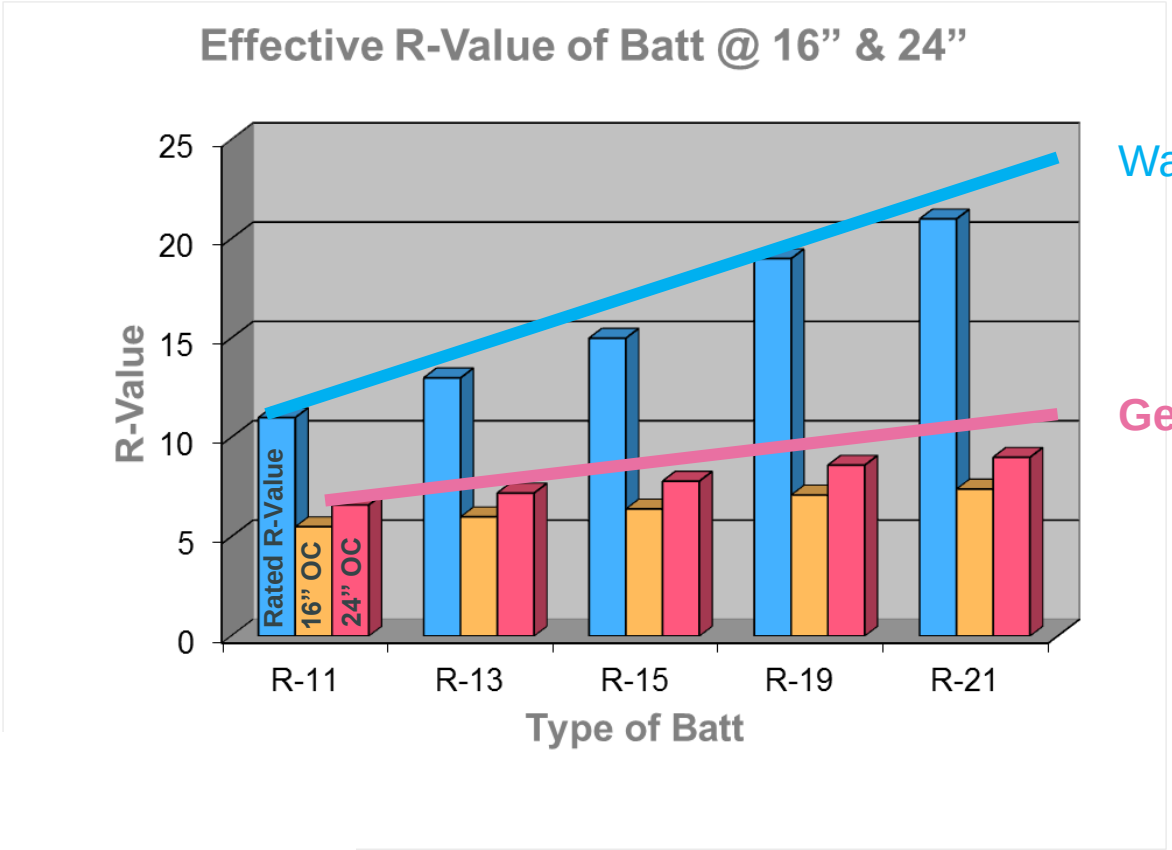
Effective Building Practice: Thermal Control … Efficient Use of Materials



Building Code
Effective Building Practice
Energy Code
Sustainability

1. Structural and Design Safety
2. Fire Safety
3. Bulk Water Control
4. Air Control
5. Vapour Control
6. Thermal Control
7. Thermal Efficiency
8. Environmental Effectiveness
9. Product / System Transparency
10. Product / System Acceptance

Thermal Layer | Building Science



Want & expect

Get

WHO SAYS?

thermal

Thermal Layer | Building Science

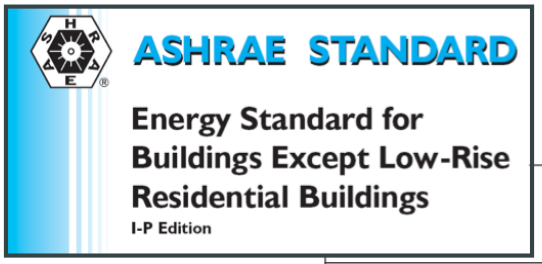


TABLE A9.2B Effective Insulation/Framing Layer R-Values for Wall Insulation Installed Between Steel Framing

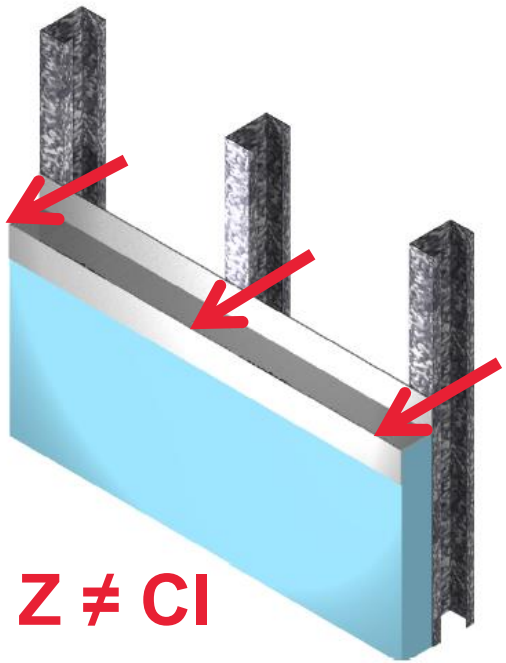
Nominal Depth of Cavity (in.)	Actual Depth of Cavity (in.)	Rated R-Value of Airspace or Insulation	Effective Framing/Cavity R-Value at 16 in. on Center	Effective Framing/Cavity at 24 in. on Center
Empty Cavity, No Insulation				
4	3.5	R-0.91	0.79	0.91
Insulatied Cavity				
4	3.5	R-11	5.5	6.6
4	3.5	R-13	6.0	7.2
4	3.5	R-15	6.4	7.8
6	6.0	R-19	7.1	8.6
6	6.0	R-21	7.4	9.0
8	8.0	R-25	7.8	9.6

Based on Calculated and Measured Data

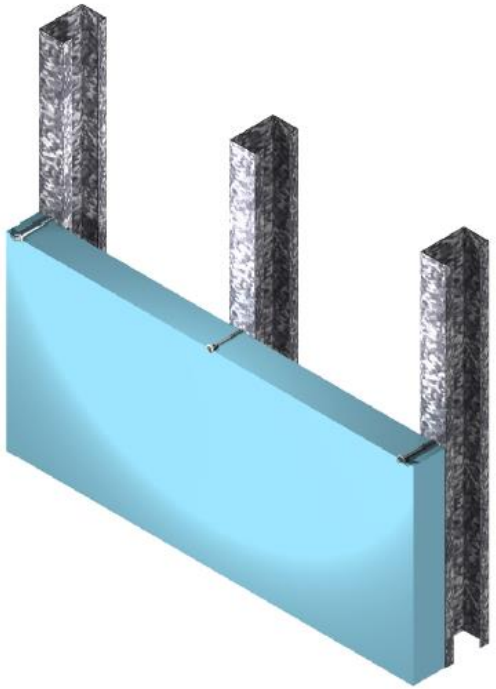
Table shown taken from ASHRAE 90.1-2007

Thermal Layer | Building Science

Fasteners and Thermal Bridging (Effective R-Value)

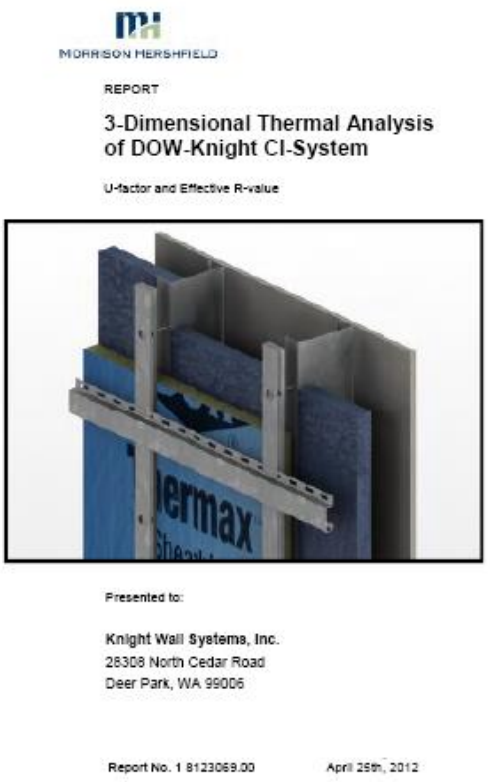


Z ≠ CI



thermal

Dow – Knight Wall Ci-System & Thermal Bridging


MORRISON HERSHFIELD

REPORT

3-Dimensional Thermal Analysis of DOW-Knight CI-System

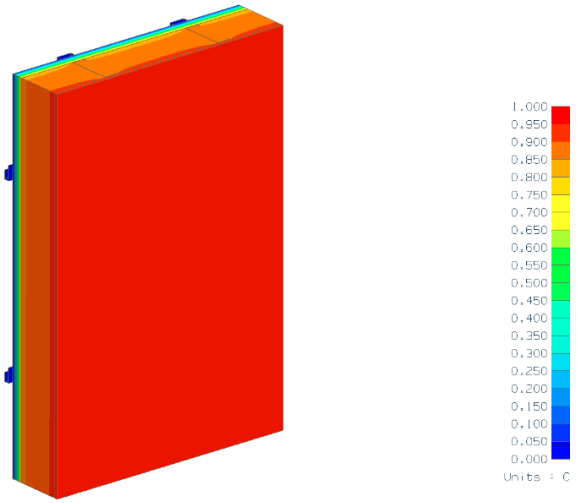
U-factor and Effective R-value

Presented to:

Knight Wall Systems, Inc.
28308 North Cedar Road
Deer Park, WA 99006

Report No. 1 8123069.00 April 25th, 2012

- 3-Dimensional Thermal Analysis of Dow-Knight CI-System
- Morrison Hershfield
- Minimal Thermal Bridge and High Effective R-Value



Structural & Attachment

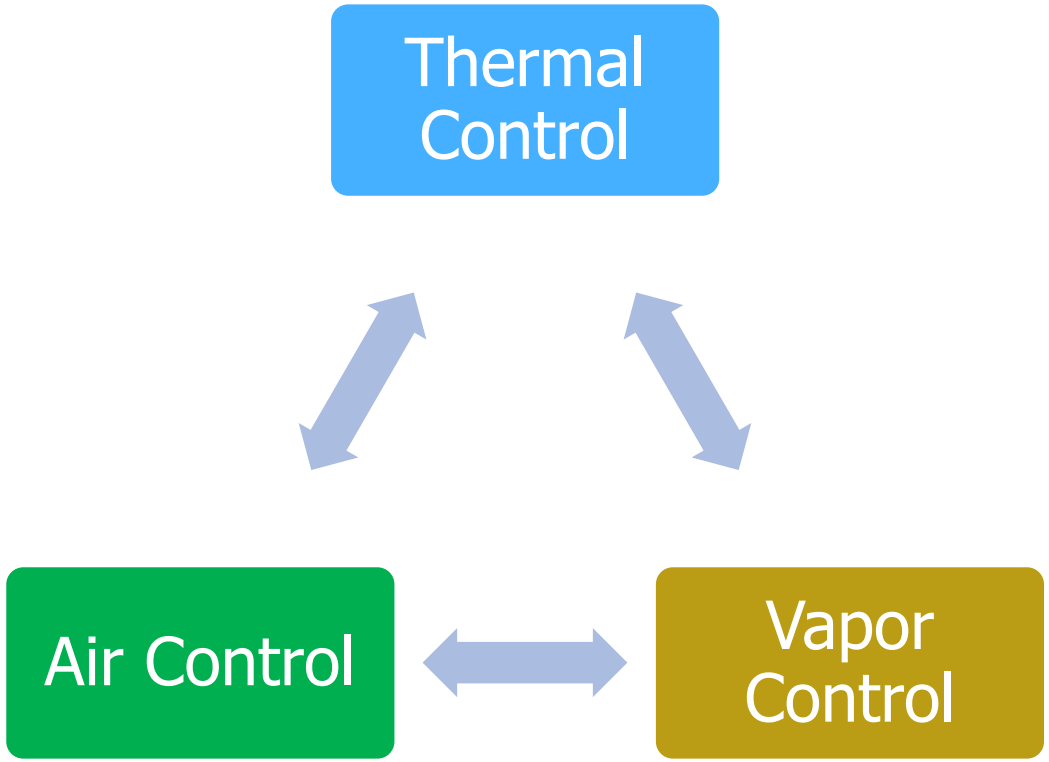
3,500 lb Concrete Block supported by 4’x8’ grid / metal furring on Dow Thermax rigid insulation.

Deflection minimal.

25 PSI = 3600 PSF

(compressive strength)

Interrelated System & Performance



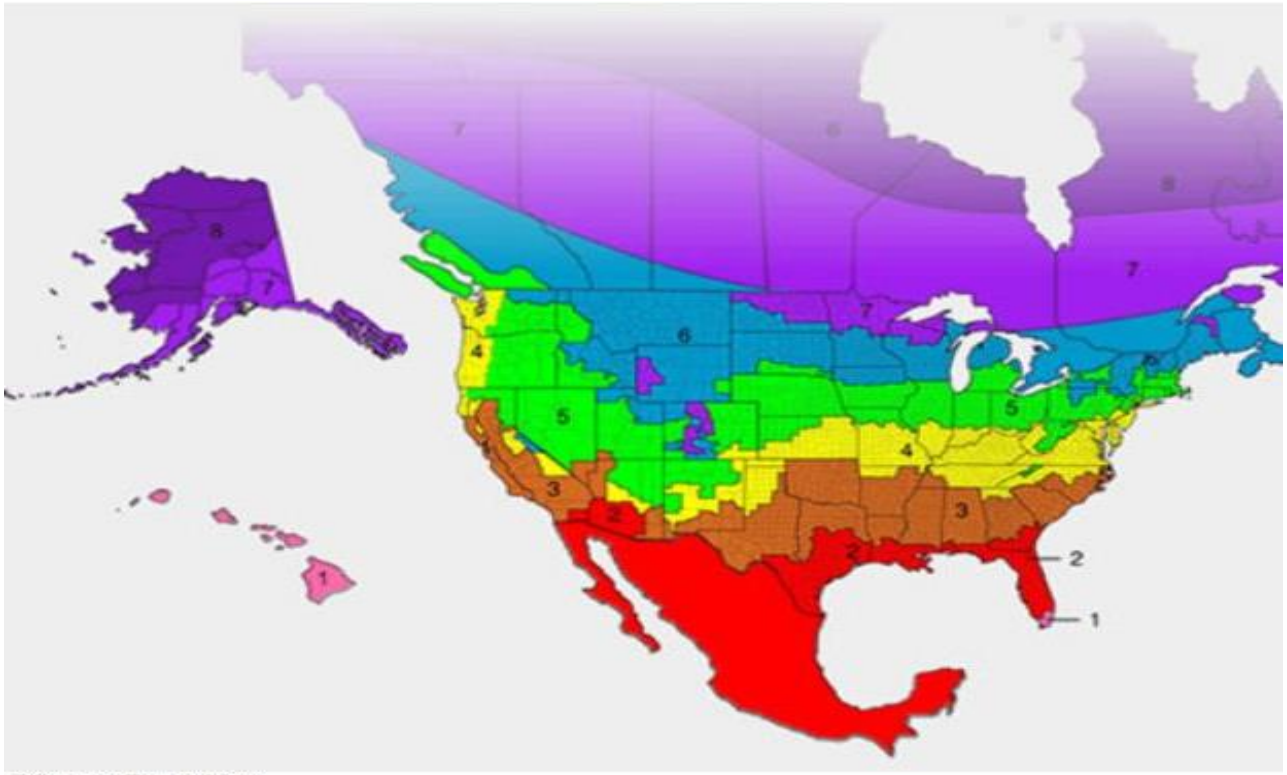
Also … Number of & Sequencing of Layers, Clarity of Material Purpose, Buildability, Cost of Installation, …

Wall Design and Construction Must Meet:

1. Structural and Design Safety
2. Fire Safety
3. Bulk Water Control
4. Air Control
5. Vapour Control
6. Thermal Control
7. Thermal Efficiency
8. Environmental Effectiveness
9. Product / System Transparency
10. Product / System Acceptance

Energy Code: Thermal Efficiency

Follow your local Energy Code (ASHRAE 90.1, NECB 2011/2015, NBC 9.36 Provisions) OR Project's Energy Performance Goal



Climate Zone Map

Building Code	1. Structural and Design Safety 2. Fire Safety
Effective Building Practice	3. Bulk Water Control 4. Air Control 5. Vapour Control 6. Thermal Control
Energy Code	7. Thermal Efficiency
Sustainability	8. Environmental Effectiveness 9. Product / System Transparency 10. Product / System Acceptance

Definitions & Key Terms

USI or U-Value (Metric or Imperial)

A U value is a measure of heat loss in a building element such as a wall, floor or roof. It can also be referred to as an 'overall heat transfer co-efficient' and measures how well parts of a building transfer heat. This means that the higher the U value the worse the thermal performance of the building envelope.

R-Value (Imperial) or 1/U

RSI (Metric) or 1/USI (x 5.678263 for R)

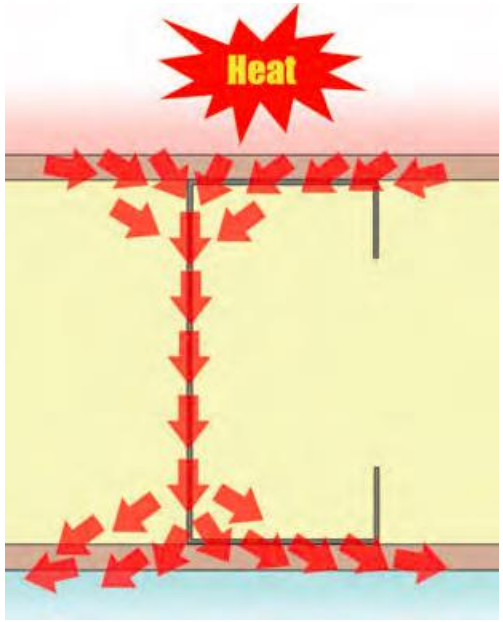
Nominal R-Value

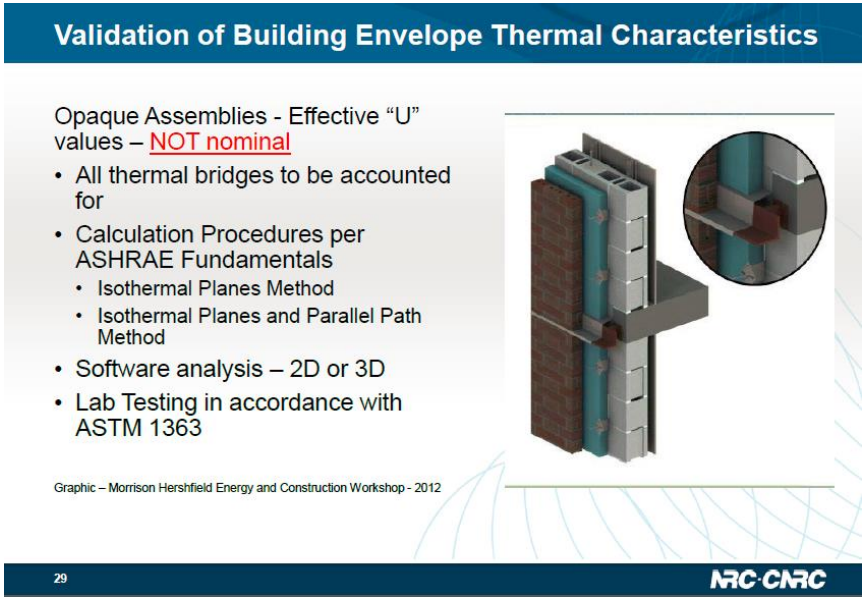
Effective R-Value

Continuous Insulation

HDD-C (18 C) NECB / NBC 9.36

HDD-F (65 F) ASHRAE 90.1





Source;: DBS Technote 513 & NRC MECB Presentation

Long Term Thermal Resistance (LTTR) Styrofoam XPS R5+

CONSTRUCTION

Evaluation Listing CCMC 04888-L

STYROFOAM™ Brand ROOFMATE™, STYROFOAM™ Tech-Crete Blanks, STYROFOAM™ SM, STYROFOAM™ Brand PERIMATE™, STYROFOAM™ HIGHLOAD™ 40, STYROFOAM™ HIGHLOAD™ 60, STYROFOAM™ HIGHLOAD™ 100, STYROFOAM™ Panel Core 30, STYROFOAM™ Panel Core 40, STYROFOAM™ Panel Core 60

MasterFormat:	07 21 13.06
Evaluation Issued:	1984-04-06
Re-evaluated	2017-07-18
Re-evaluation due:	2020-04-06

1. Evaluation

The products conform to CAN/ULC-S701-11.

The long-term thermal resistance (LTTR) for 50 mm is RSI 1.80.

2. Description

The products are Type 4, blue-tinted, extruded polystyrene rigid board thermal insulation.

3. Standard and Regulatory Information

See the Annex, appended to this Listing, which summarizes the product standard.

This/these product(s) was/were evaluated to the product standard referenced in the Annex current as of 2016-10-20. Note that the Annex may have been updated since this Listing was issued to include more recent editions of the applicable product standard. Therefore this Listing may not reflect the requirements contained in any updated version of this product standard.

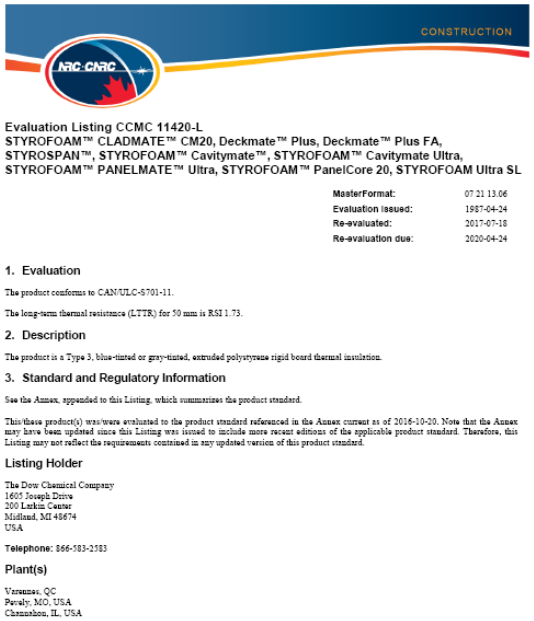
Listing Holder:

The Dow Chemical Company
1605 Joseph Drive
200 Larkin Center
Midland, MI 48674
USA

Tel.: 866-583-2583

Plant(s)

Varennes, QC
Pevely, MO, USA
Channahon, IL, USA



CONSTRUCTION

Evaluation Listing CCMC 11420-L

STYROFOAM™ CLADMATE™ CM20, Deckmate™ Plus, Deckmate™ Plus FA, STYROSPAN™, STYROFOAM™ Cavitymate™, STYROFOAM™ Cavitymate Ultra, STYROFOAM™ PANELMATE™ Ultra, STYROFOAM™ PanelCore 20, STYROFOAM Ultra SL

MasterFormat:	07 21 13.06
Evaluation Issued:	1987-04-24
Re-evaluated:	2017-07-18
Re-evaluation due:	2020-04-24

1. Evaluation

The product conforms to CAN/ULC-S701-11.

The long-term thermal resistance (LTTR) for 50 mm is RSI 1.73.

2. Description

The product is a Type 3, blue-tinted or gray-tinted, extruded polystyrene rigid board thermal insulation.

3. Standard and Regulatory Information

See the Annex, appended to this Listing, which summarizes the product standard.

This/these product(s) was/were evaluated to the product standard referenced in the Annex current as of 2016-10-20. Note that the Annex may have been updated since this Listing was issued to include more recent editions of the applicable product standard. Therefore, this Listing may not reflect the requirements contained in any updated version of this product standard.

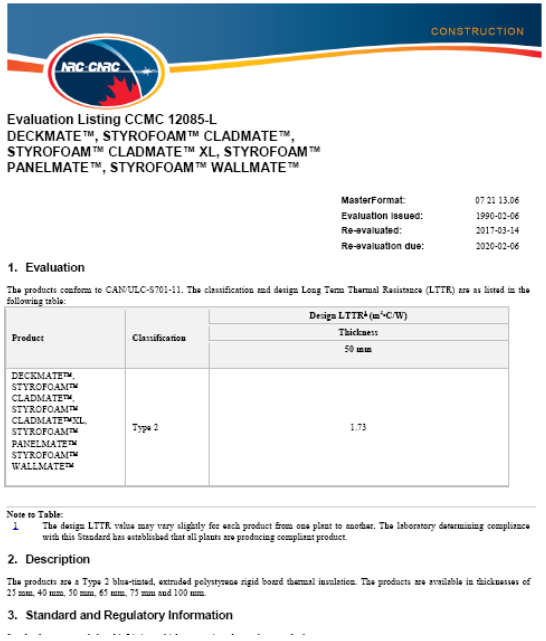
Listing Holder

The Dow Chemical Company
1605 Joseph Drive
200 Larkin Center
Midland, MI 48674
USA

Telephone: 866-583-2583

Plant(s)

Varennes, QC
Pevely, MO, USA
Channahon, IL, USA



CONSTRUCTION

Evaluation Listing CCMC 12085-L

DECKMATE™, STYROFOAM™ CLADMATE™, STYROFOAM™ CLADMATE™ XL, STYROFOAM™ PANELMATE™, STYROFOAM™ WALLMATE™

MasterFormat:	07 21 13.06
Evaluation Issued:	1990-02-06
Re-evaluated:	2017-03-14
Re-evaluation due:	2020-02-06

1. Evaluation

The products conform to CAN/ULC-S701-11. The classification and design Long Term Thermal Resistance (LTTR) are as listed in the following table:

Product	Classification	Design LTTR[1] (m²•C/W) Thickness 50 mm
DECKMATE™, STYROFOAM™ CLADMATE™ STYROFOAM™ CLADMATE™XL, STYROFOAM™ PANELMATE™ STYROFOAM™ WALLMATE™	Type 2	1.73

Note to Table:
1 The design LTTR value may vary slightly for each product from one plant to another. The laboratory determining compliance with this Standard has established that all plants are producing compliant product.

2. Description

The products are a Type 2 blue-tinted, extruded polystyrene rigid board thermal insulation. The products are available in thicknesses of 25 mm, 40 mm, 50 mm, 65 mm, 75 mm and 100 mm.

3. Standard and Regulatory Information

R-Value and Mean Temperature ISO

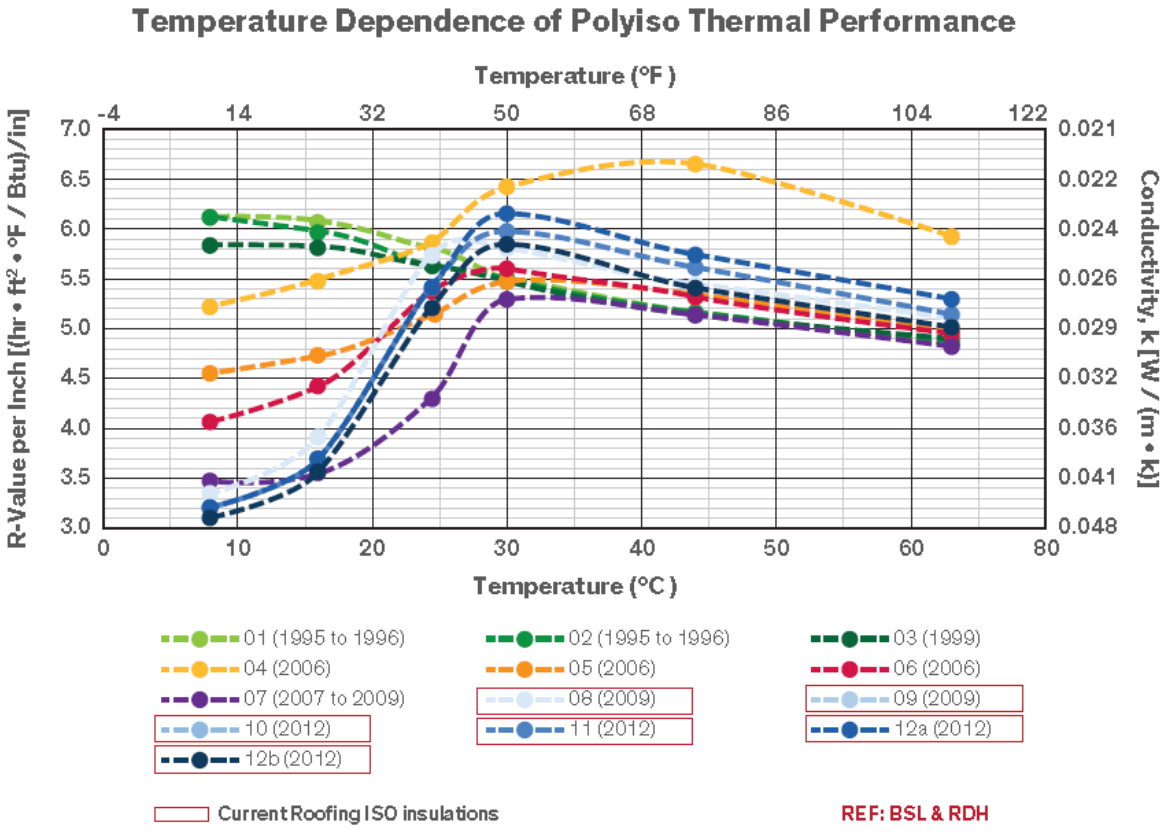


Figure 2. Thermal resistance dependency of various Roofing ISO insulations

THERMAX & Mean Temperature

Low Mean Temp Performance

- THERMAX outperforms all Competitive ISO's in this Area.
- Only ISO to increase in R-Value below 55 Degrees
- 37% Higher R-Value at 40 Degree Mean Temp

Ask Architect to inquire on competitive ISO's performance at low mean temperatures.

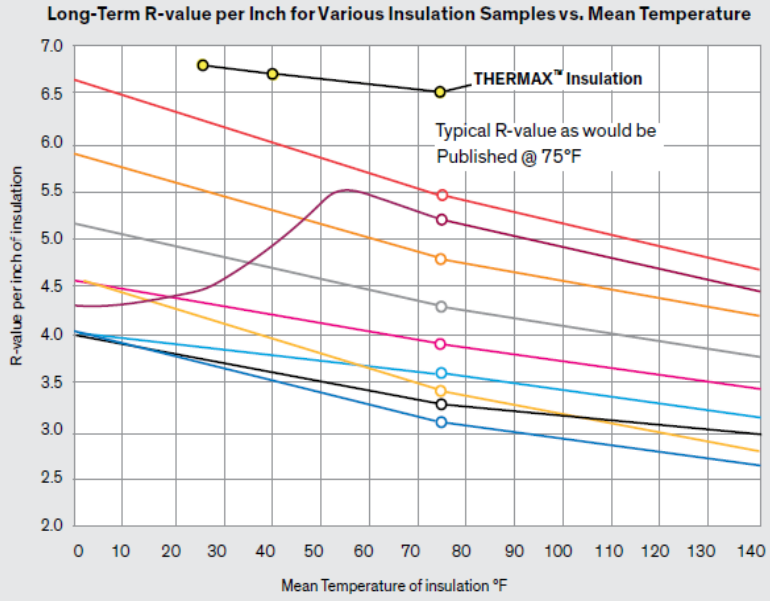


Figure 3: Common Representation of Selected Insulation R-Values as a function of Mean Temperature with THERMAX Brand Insulation properties added.

Energy Code: Thermal Efficiency

Energy Code Requirements will ramp up along with research in resiliency of buildings and infrastructure. New and existing buildings. Both Provincially and Federally

Canada

BC Energy Step Code

A Best Practices Guide for Local Governments

A resident of Fort McMurray, Alta, looks at the damage to homes on Thursday, June 2, 2016. Fires like the one that devastated the city are likely to become more frequent as a result of climate change, scientists have predicted.

Wall Design and Construction Must Meet:

1. Structural and Design Safety
2. Fire Safety
3. Bulk Water Control
4. Air Control
5. Vapour Control
6. Thermal Control
7. Thermal Efficiency
8. Environmental Effectiveness
9. Product / System Transparency
10. Product / System Acceptance

Sustainability: Environmental Effectiveness

Innovative, High Molecular Weight, Non-PBT (Persistent, Bioaccumulative, Toxic) Polymeric Flame Retardant (Polymeric FR) additive for extruded polystyrene (XPS) and expanded polystyrene (EPS) foam insulation Applications. Dow Trademark BlueEdge™

All Canadian XPS and EPS required to comply.

Deadline was December 23rd, 2016

POLYMERIC FLAME RETARDANT

Dow's ongoing commitment to sustainable chemistry and to providing brand leading and innovative solutions serves as the foundation from which we continue to build on our commitment to solving world challenges.

In 2011, Dow Global Technologies LLC (DGTL), a subsidiary of The Dow Chemical Company, launched the innovative, high molecular weight, Non-PBT (Persistent, Bioaccumulative, Toxic) Polymeric Flame Retardant (Polymeric FR) additive for extruded polystyrene (XPS) and expanded polystyrene (EPS) foam insulation applications.

Dow's Polymeric FR technology is the result of several years of research and development led by DGTL, taking full advantage of the company's deep polymer, chemistry process science, applications know-how and EH&S expertise to find more sustainable products.

Dow's Polymeric FR has become the next-generation industry standard flame retardant for use in both extruded polystyrene foam (XPS) and expanded polystyrene foam (EPS) insulation applications globally. The New Polymeric FR has received a number of awards including:

- 2012 R&D 100 Award. This is the 50th Anniversary of the award, given annually since 1963. The winners are selected by an independent judging panel and the editors of R&D Magazine. The award is widely recognized as the "Oscars of Innovation," that identifies and celebrates the top technology products for the year.

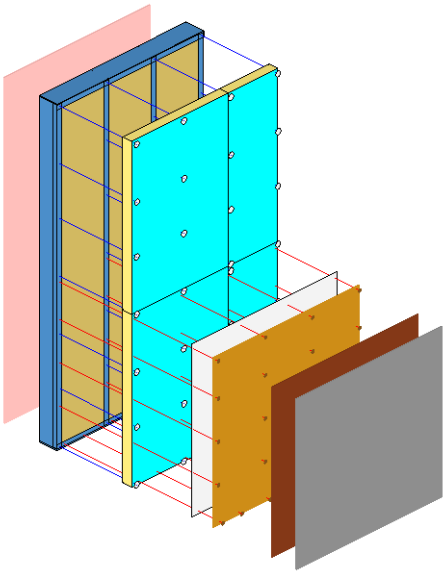
Building Code	1. Structural and Design Safety
	2. Fire Safety
Effective Building Practice	3. Bulk Water Control
	4. Air Control
	5. Vapour Control
	6. Thermal Control
Energy Code	7. Thermal Efficiency
Sustainability	8. Environmental Effectiveness
	9. Product / System Transparency
	10. Product / System Acceptance

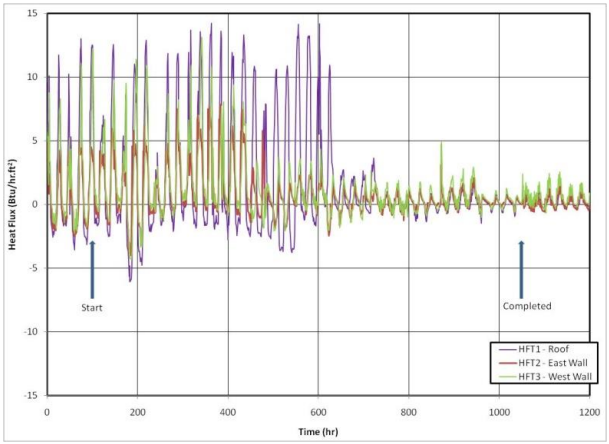
Wall Design and Construction Must Meet:

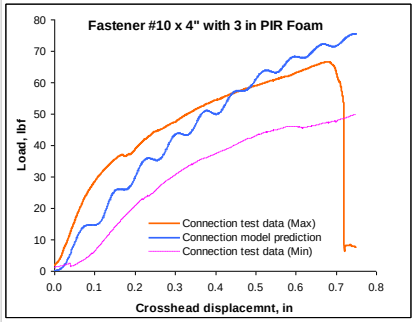
1. Structural and Design Safety
2. Fire Safety
3. Bulk Water C
4. Air C
7. Thermal Efficiency
8. Environmental Effectiveness
9. Product / System Transparency
10. Product / System Acceptance

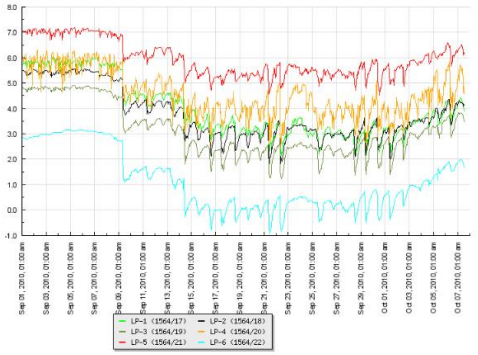
Time For A Reality Check!

Sponsored“ci” Research, Case Studies and Pilot Projects









Comparing Products / Systems?
Example "Reality Check" Checklist

- System / Product Tried and Tested? What testing and/or case studies have been done? Lab Only? In Situ?
- Prove It? Research – Manufacturer only? And/or 3rd party peer reviewed?
- What is the Cost? Product, System, Installed?
- Buildability? Standard Practice, Differentiated Skills?
- Compatibility? Is the product / system play well with others?
- ……

Code Assessment Engine & Above Grade Wall Solutions - Presentation Summary

- Primary Focus of Presentation: Can we use Foam Insulation in Above Grade Walls? *Use Code Assessment Engine to determine Yes? or No? & what conditions?*

- Bigger Question …Should We? or Why Would We Consider the Use of Foam Insulation in Above Grade Walls?

  Does the wall meet the intent of the building code, use sound building science, what about cost (labour & materials), does the wall have a track record (in the lab and in the field), what support is available, …. ???

Thank You

Q & A?

Les Yard CTR
Building Science Specialist
Dow Building Solutions

Dow Chemical Canada ULC
604-472-7266 | lyard@dow.com

WORLDWIDE PARTNER

Keith Calder | Technical Director - Canada

JENSEN HUGHES
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13900 Maycrest Way | Unit 135 | Richmond, BC V6V 3E2
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kcalder@jensenhughes.com | www.jensenhughes.com

CCBST 2017

Vancouver
November 6-8
Hosted by BCBEC

www.ccbst2017.ca

JENSEN HUGHES

Advancing the Science of Safety

WARNING! Dow Stuff …..

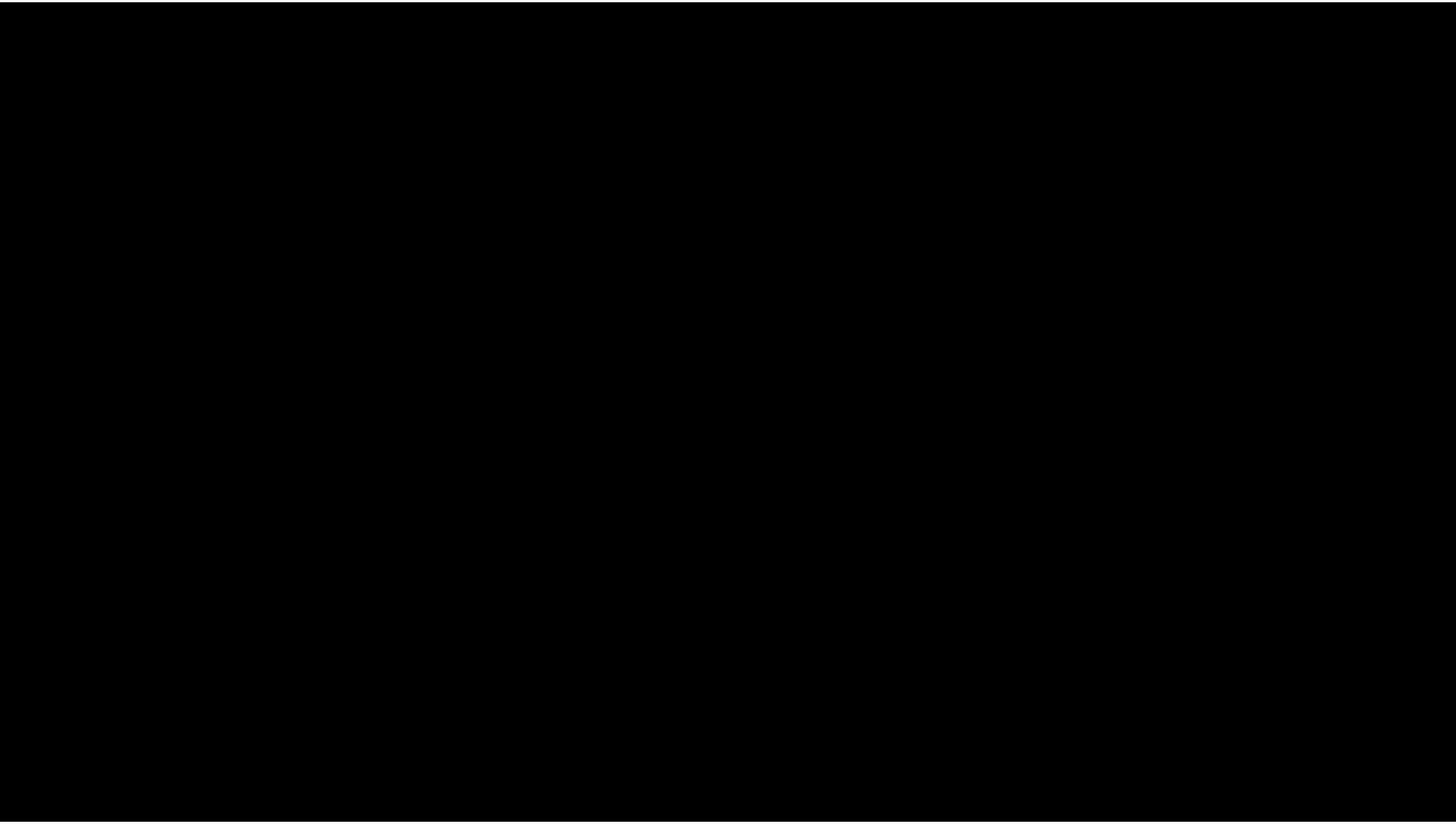
Building Solutions

Canadian Code Assessment Engine and Above Grade Wall Solutions

Dow.com

10 Years + US Experience

Current Video



Did I Mention? …We are only at Step One

Can I Use Foam Insulation?

Can one use Foam Insulation?

- Wall Builder
- Code Assessment Engine

Which Above Grade Wall Solution?

- Interactive/ Consultative Presentation

Why use Dow Wall Assembly?

- Wall Analysis

Technical Support Available From Dow?

- Website
- Details
- BSD speclink

If Yes …

What Tools Are Available To Help Determine Which Wall Assembly Is Best For My Project?

Can one use Foam Insulation?

- Wall Builder
- Code Assessment Engine

Which Above Grade Wall Solution?

- Interactive/ Consultative Presentation

Why use Dow Wall Assembly?

- Wall Analysis

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- Details
- BSD speclink®e

Which Above Grade Wall Solution?

Interactive Presentation

Which Above Grade Wall Solution?

Interactive Presentation

BETTER BUILDING STARTS HERE

DOW WALL SYSTEMS

MAX ARMOR WALL SERIES

Combines all control layers (thermal, water, vapor and air) while acting as primary external sheathing material. Most efficient design with the lowest cost for material and labor.

DUAL ARMOR WALL SERIES

Multi-functionality of the rigid insulation layer brings complete protection (thermal, water, vapor and air) with an added layer of gypsum for additional protection.

CLASSIC WALL SERIES

Long-used wall type using discrete layers for WRB/air barrier, thermal continuous insulation and primary exterior gypsum.

OTHER WALL ASSEMBLIES

Limited in functionality, but available for use to meet certain code or project requirements.

DOW BUILDING SOLUTIONS

Which Above Grade Wall Solution?

Interactive Presentation

Which Above Grade Wall Solution?

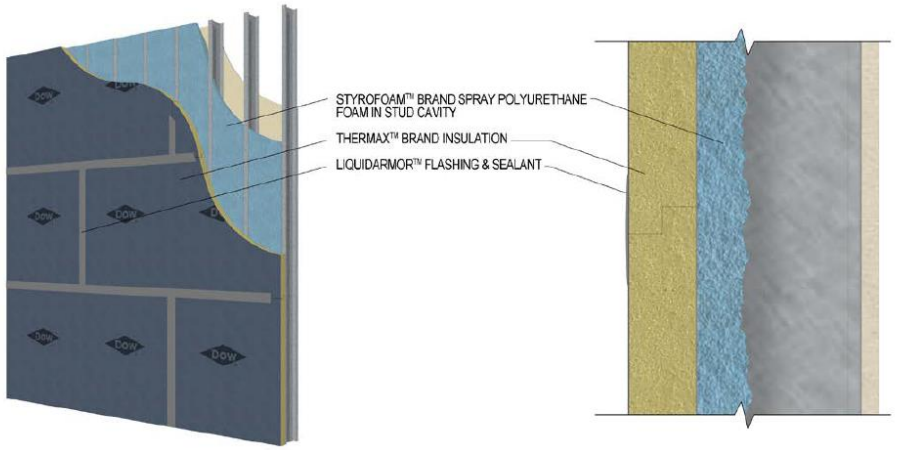
Interactive Presentation

BETTER BUILDING STARTS HERE

MAX ARMOR | DUAL ARMOR | CLASSIC | OTHER

THERMAX XARMOR™ Exterior Insulation + SPF

- Most robust performance with thinnest wall profile
- THERMAX XARMOR™ (ci) Exterior Insulation: 4-mil facer offers the most protection from damage during construction
- LIQUIDARMOR™ Flashing and Sealant: the most advanced protection at all seams and punch openings
- STYROFOAM™ Brand SPF Insulation in stud cavity: secondary air/water sealing
- 15-year water resistance and thermal warranty available
- Other THERMAX™ Brand Insulation options available; trade-off provides cost savings



DOW BUILDING SOLUTIONS **MAX ARMOR** WALL SERIES

Why Use Dow Products and Assemblies?

Can one use Foam Insulation?

- Wall Builder
- Code Assessment Engine

Which Above Grade Wall Solution?

- Interactive/ Consultative Presentation

Why use Dow Wall Assembly?

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Technical Support Available From Dow?

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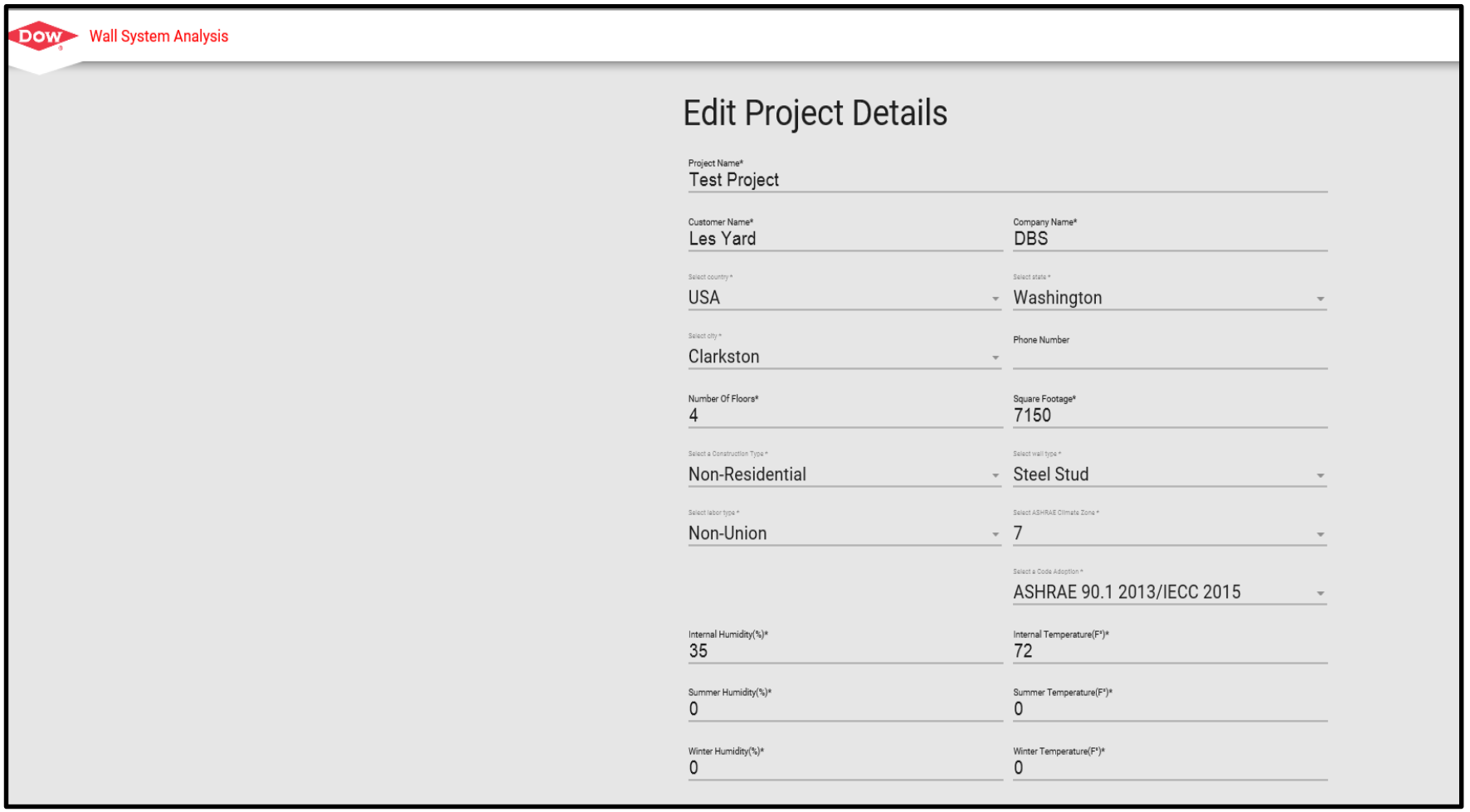
- BSD speclink®e

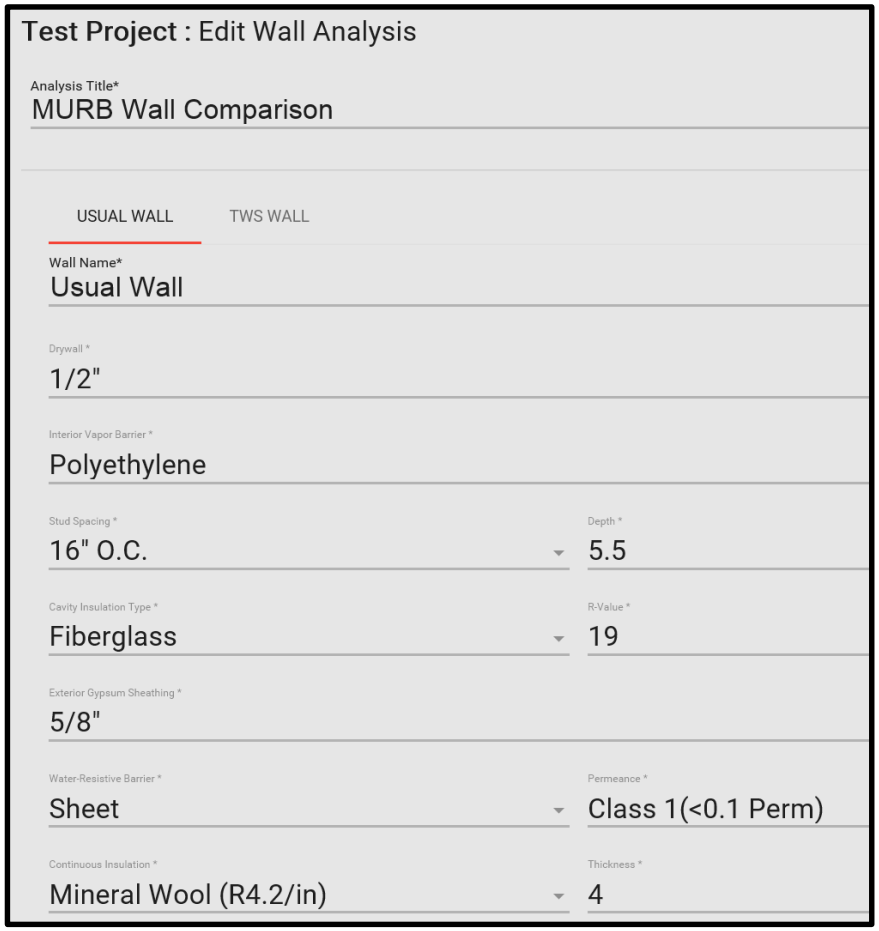
Why Use Dow Products & Solutions?

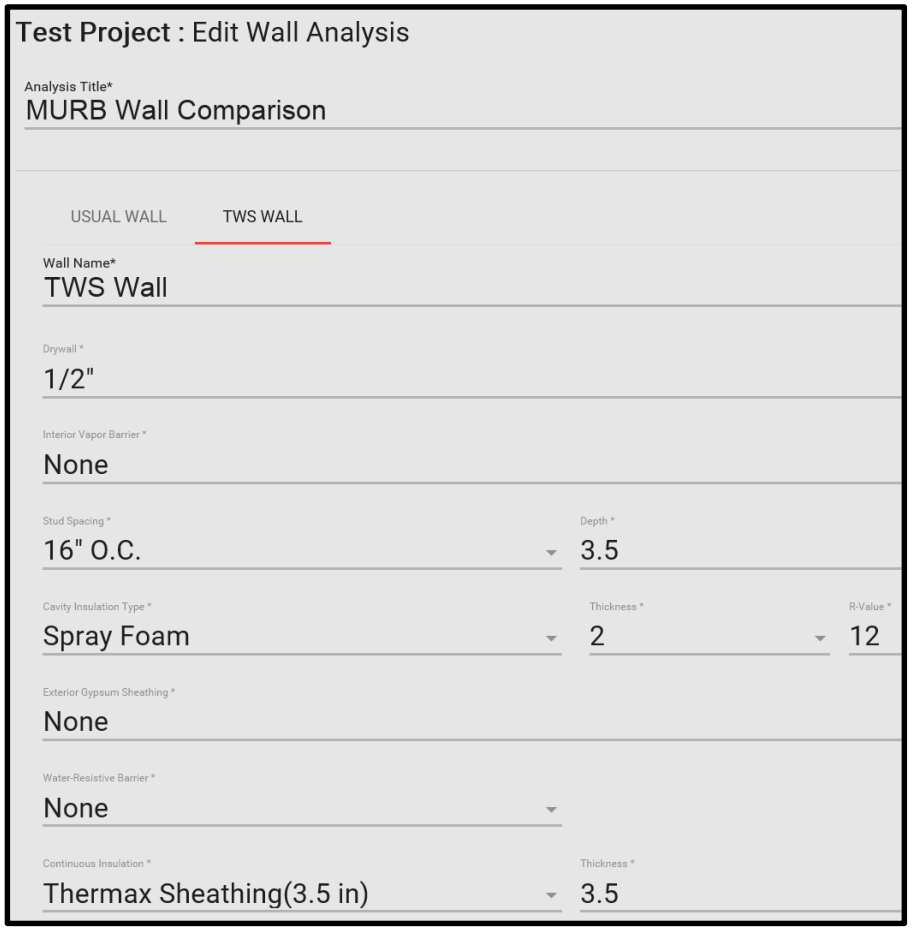
Wall Analysis Tool (Project Input)



Why Use Dow Products & Solutions?

Wall Analysis Tool (Wall Comparison / Input)





Why Use Dow Products & Solutions?

Wall Analysis Tool (Output = Energy & Condensation Performance and Material & Labour Cost Comparison)

Wall Analysis

Fiber Cement / Knight CI / XPS / SPF
Generated on **04/06/2017** for **Philip Harms**

Project Conditions

Ashrae Climate Zone	7
Code Adoption**	ASHRAE 90.1 2010/IECC 2012
Construction Type	Non-Residential
Wall Type	Steel Stud
Labor Type	Non-Union
Project Size (SF of Wall)	20000

Project Code Requirements

Prescriptive Requirement	R-13 + R-7.5 ci
Assembly MAX U-Value	0.064
Project State	North Dakota
RS Means Nearest City	Bismarck
Number Of Stories	4

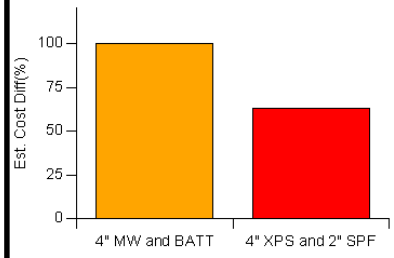
Temperatures & Humidity

Interior - Temperature	70
Interior - Humidity	35
Summer - Humidity	40
Summer - Temperature	80
Winter - Humidity	80
Winter - Temperature	10

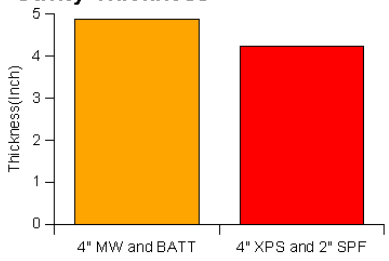
Cost & Performance

Est. Savings in Cost & Labor	37%	
Est. Change in R-Value	1.68%	
	4" MW and BATT	**4" XPS and 2" SPF**
Improvement Over Code	37.85%	38.9%
Effective R-Value	25.142	25.572
Effective U-Value	0.0398	0.0391
Cavity Thickness (in)	4.875	4.25
IECC Compliance	Yes	Yes

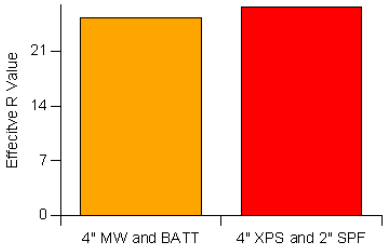
Cost Analysis



Cavity Thickness



R-Value



The Dow Chemical Company
Dow Building Solutions
200 Larkin Center
Midland, MI 48674

Sales and Technical Information
1-866-583-BLUE (2583)

Building Solutions: building.dow.com
Masonry Systems: ultrawallsystem.com
Framed Assemblies: themaxwallsystem.com

What Resources are there to Support? –
Product Information, Details, Specifications

Can one use Foam?

- Wall Builder
- Code Assessment Engine

Which Above Grade Wall Solution?

- Interactive/ Consultative Presentation

Why use Dow Wall Assembly?

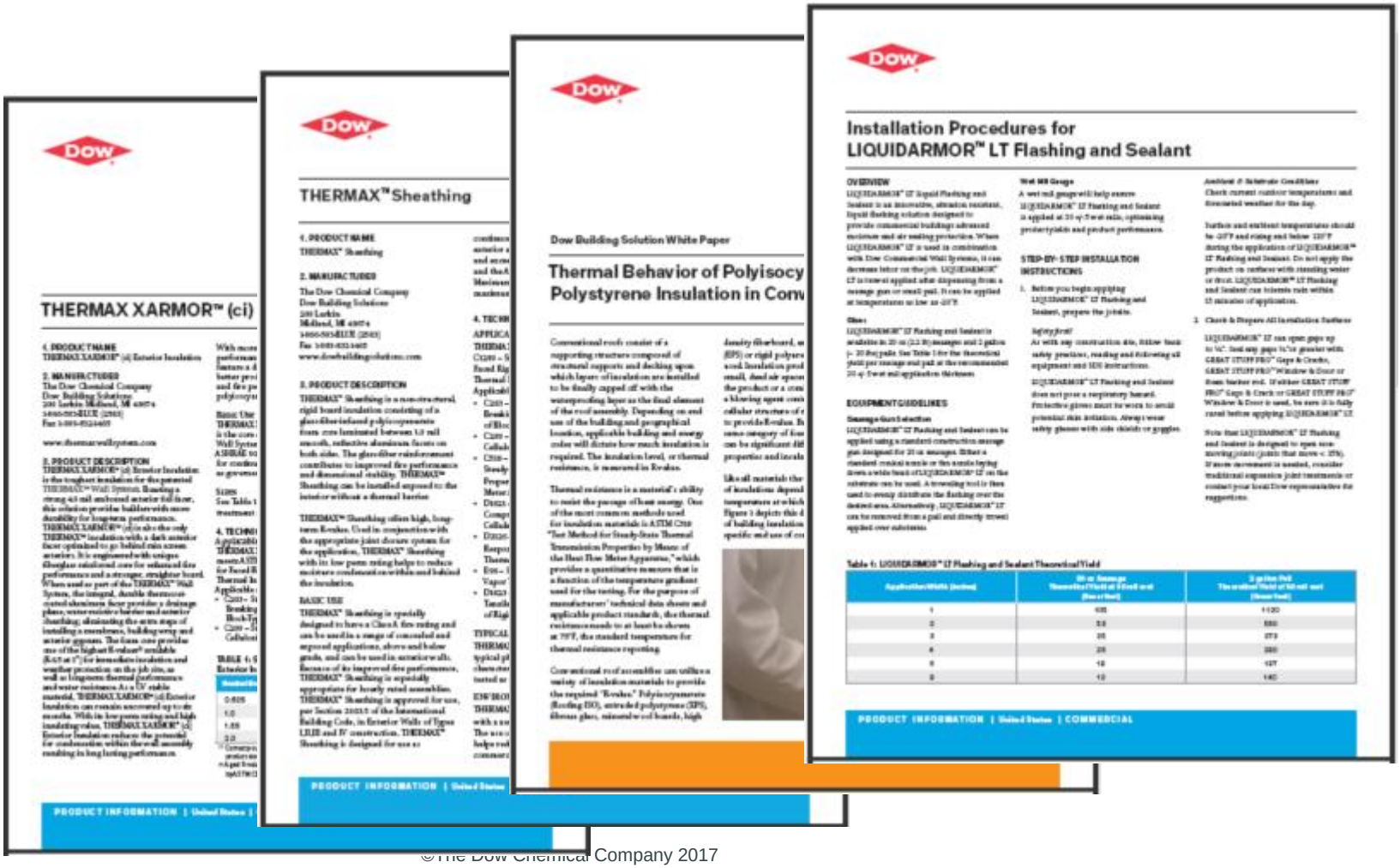
- Wall Analysis

Technical Support Available From Dow?

- Website
- Details
- BSD speclink™

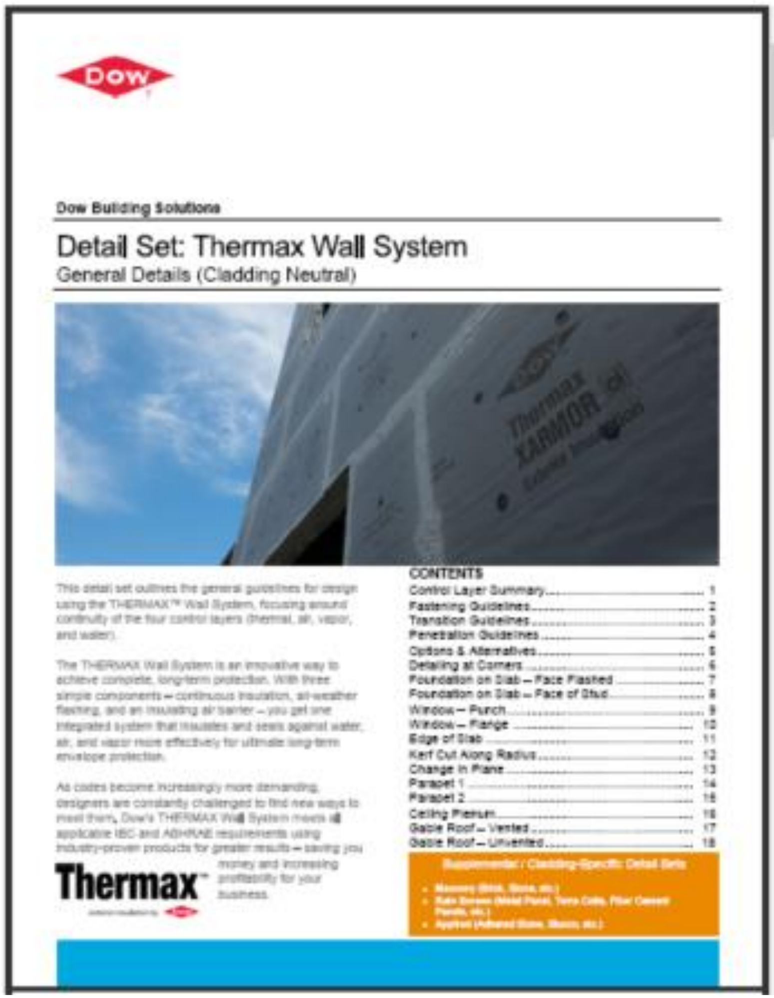
What Resources Are Available?

Website, Product Information, Tech Solutions, White Papers



What Resources Are Available?

Generic Details (Masonry & Cladding Sets Available)



Dow Building Solutions

Detail Set: Thermax Wall System

General Details (Cladding Neutral)

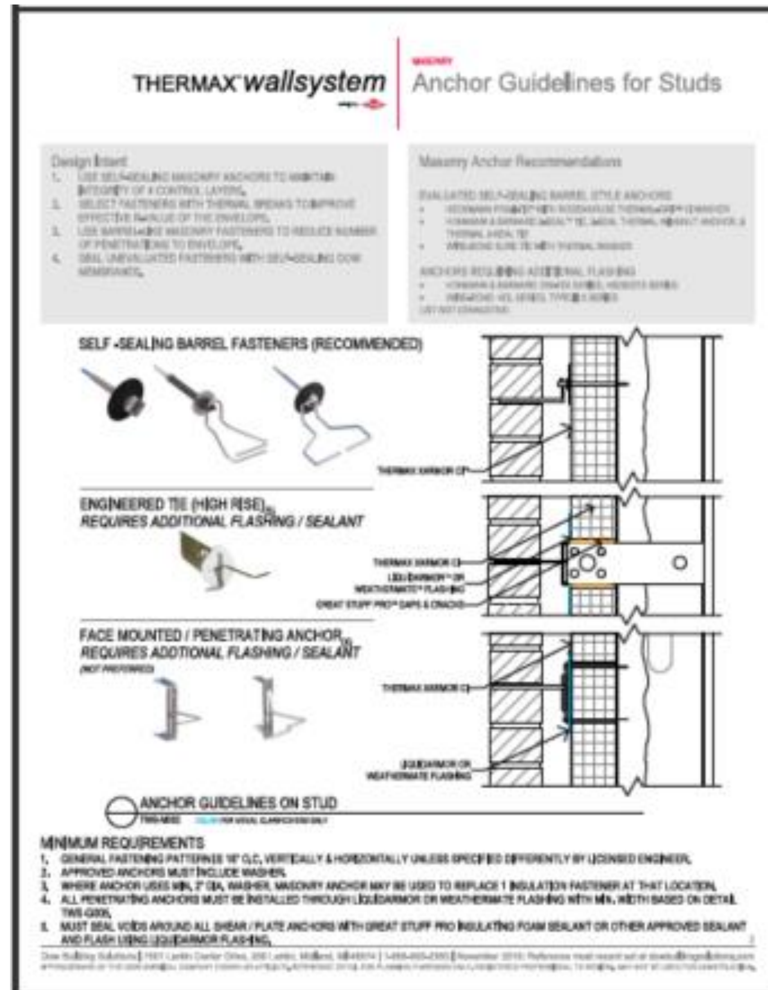
This detail set outlines the general guidelines for design using the THERMAX™ Wall System, focusing around continuity of the four control layers (thermal, air, vapor, and water).

The THERMAX Wall System is an innovative way to achieve complete, long-term protection. With three simple components – continuous insulation, all-weather flashing, and an insulating air barrier – you get one integrated system that insulates and seals against water, air, and vapor more effectively for ultimate long-term envelope protection.

As codes become increasingly more demanding, designers are constantly challenged to find new ways to meet them. Dow's THERMAX Wall System meets all applicable IBC and ASHRAE requirements using industry-proven products for greater results – saving you money and increasing profitability for your business.

Thermax™

CONTENTS



THERMAX wallsystem

Anchor Guidelines for Studs

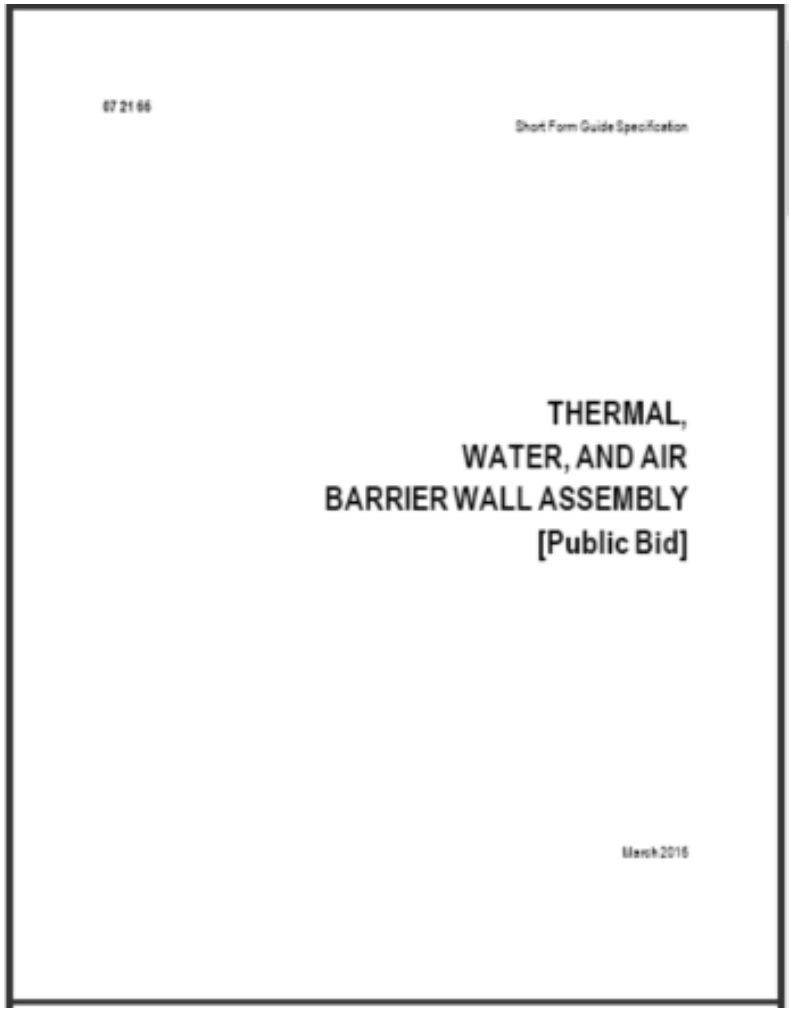
Design Intent

Masonry Anchor Recommendations

MINIMUM REQUIREMENTS

What Resources Are Available?

Specifications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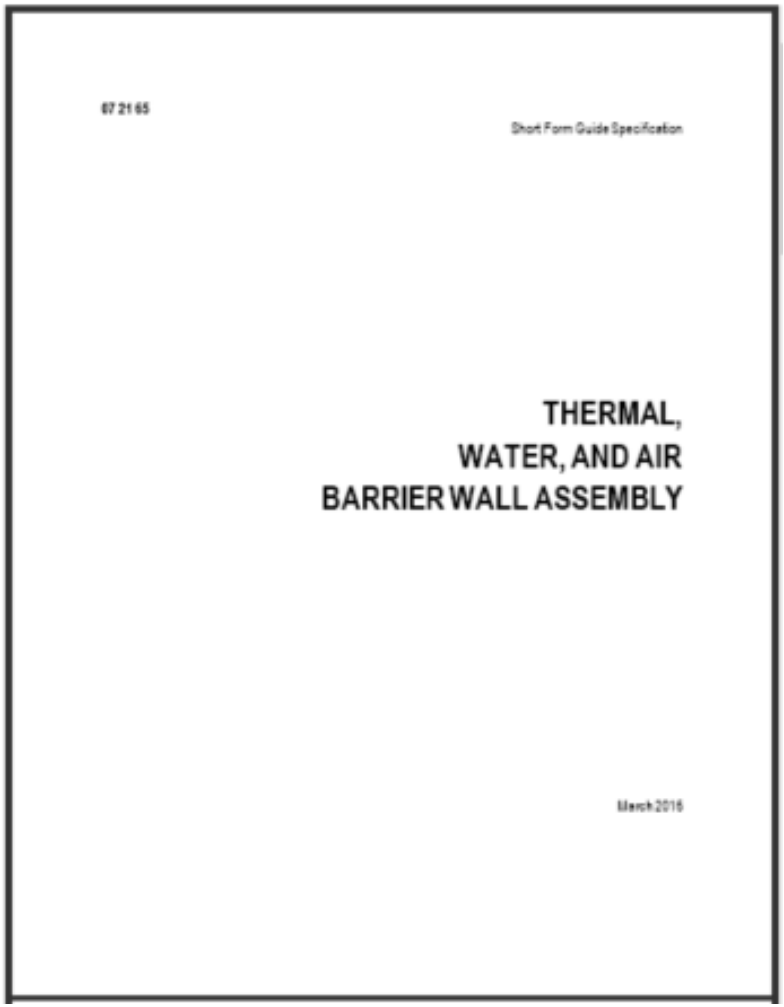
Short Form Guide Specification

THERMAL,
WATER, AND AIR
BARRIER WALL ASSEMBLY
[Public Bid]

March 2016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Short Form Guide Specification

THERMAL,
WATER, AND AIR
BARRIER WALL ASSEMBLY

March 2016

What Resources Are Available?

SpecLink … Coming Soon

Thank You

Q & A?

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WORLDWIDE PARTNER

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