



MANITOBA CLIMATE
RESILIENCE TRAINING

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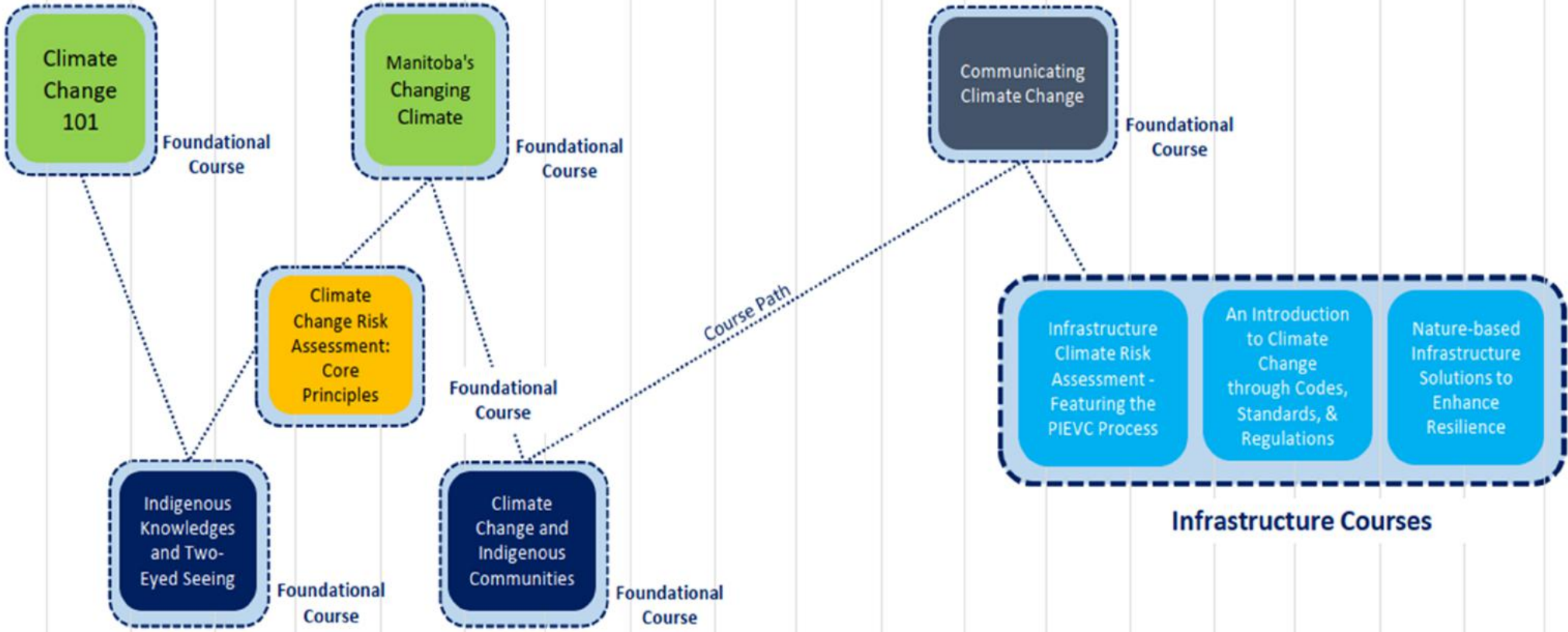
Supported by Natural Resources Canada's Building Regional
Adaptation Capacity and Expertise (BRACE) Program

An Introduction to Climate Change through Codes, Standards, & Regulations

Infrastructure Sector

Highlights of Previous Courses

- MCRT Foundational and Infrastructure Courses



Interaction

- The course is being **recorded** (your participation confirms your agreement)
- **Cameras and Microphones are off**
- **Polls and Breakout Session** to receive your feedback
- **Chat is open**
 - During Presentation and Q&A
 - Comments are welcome and will be monitored
 - Please send comments to **Everyone** not the presenter
- Technical issues, chat issue to **EngGeoMB**
- Follow-up with **survey** and details of the presentation
 - Change **your name** in Zoom



Background

- Loss of stationarity
- Increase risk

Course Purpose

- Role of Codes, Standards, and Regulations in Climate Change Adaptation for Infrastructure



Agenda

- Definitions
 - Codes, Standards, Regulations
- Current State & Limitations
- Current Practices / Upcoming Changes
- Challenges & Opportunities
 - Breakout discussion



Presenters

- Definitions / Current State
Richard Marshall, P.Eng.
- Transportation
Kris Maranchuk, P.Eng.
- Water Management/Water Supply and Treatment
Jeff O'Driscoll, P.Eng.
- Buildings
Tammy Harper, M.Ed.





Poll



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Understanding Codes, Standards and Regulations (CS&R)

- Acts
- Regulations
- Codes
- Standards

* Definition and description of these legislated entities as related to buildings are similar for all sectors

Presenter: Rick Marshall



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Understanding Codes, Standards, & Regulations

Act

- A law enacted by the Legislative Assembly
- Also called a **Statute**
- A Bill becomes an Act when it receives Royal Assent

Two primary Manitoba Acts which govern buildings

- The Buildings and Mobile Homes Act
- The Fires Prevention and Emergency Response Act



Understanding Codes, Standards, & Regulations

Regulation

- A delegated legislation
- Made by a person or body under the authority of an Act passed by the Legislature
- The regulation-making body is specified by the Act

Regulations under The Buildings and Mobile Homes Act

- Building Fees Regulation
- Designated Buildings Regulation
- Manitoba Building Code
- Manitoba Plumbing Code
- Mobile Homes Standards and Permits Regulation



Understanding Codes, Standards, & Regulations

Code

- A set of rules
- Canada has four model codes.
 - National Building Code (2010, 2015)
 - National Fire Code (2010, 2015)
 - National Plumbing Code (2010, 2015)
 - National Energy Code for Buildings (2011, 2015, 2017)



Understanding Codes, Standards, & Regulations

Standard - a document that provides a set of agreed-upon rules, guidelines or characteristics for activities or their results (Standards Council of Canada)

Standards - establish accepted practices, technical requirements, & terminologies for diverse fields

Technical standard - an established norm or requirement regarding technical systems

Code – WHAT you MUST do Standard – HOW you will do it



Current State of Codes, Standards and Regulations (CS&R)

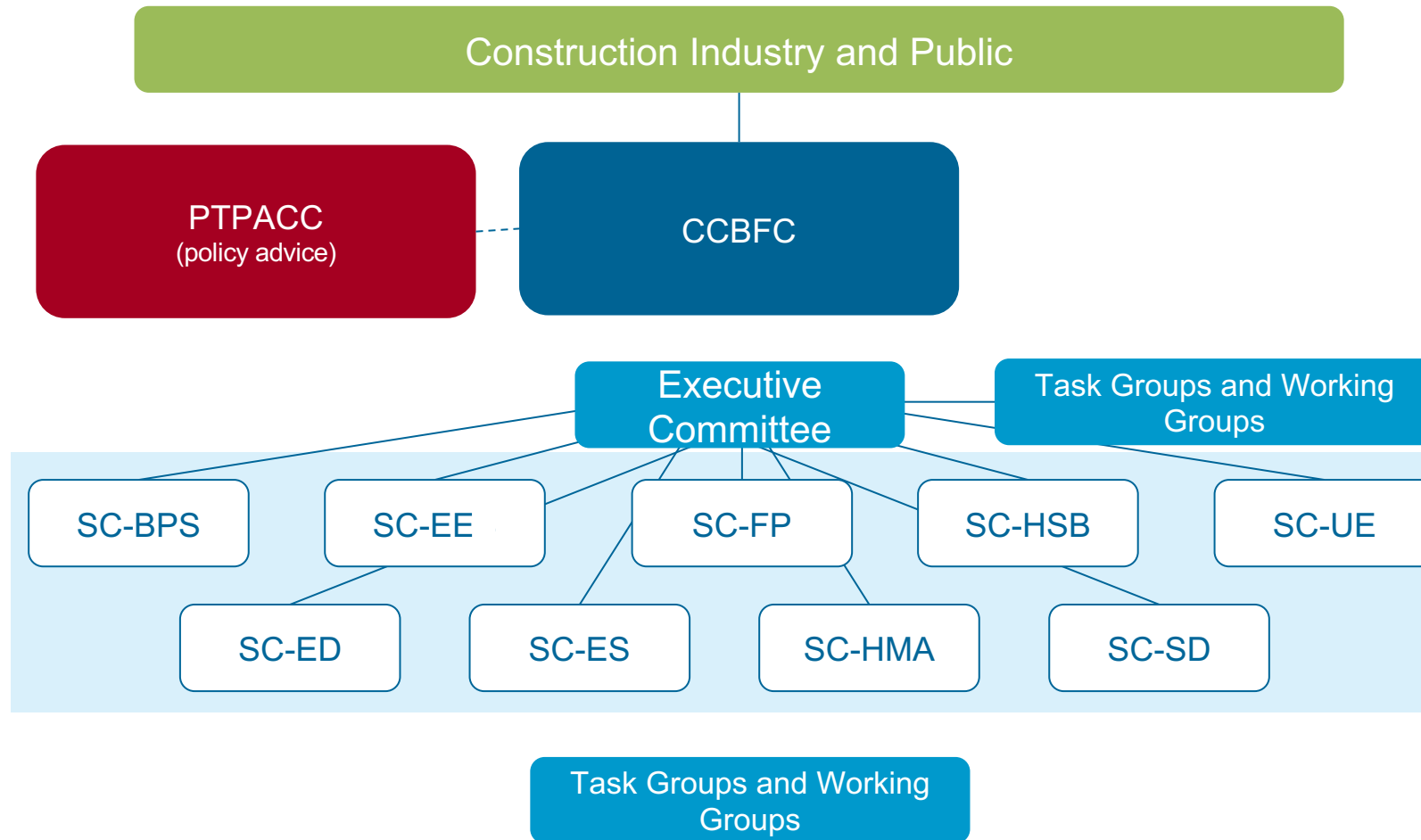
- Current state
- Responsiveness to change
- Acceptance and adaptation

Presenter: Rick Marshall



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Current State of Codes, Standards, & Regulations



Standing Committees

- Building and Plumbing Services (SC-BPS)
- Energy Efficiency (SC-EE)
- Earthquake Design (SC-ED)
- Environmental Separation (SC-ES)
- Fire Protection (SC-FP)
- Hazardous Materials and Activities (SC-HMA)
- Housing and Small Buildings (SC-HSB)
- Structural Design (SC-SD)
- Use and Egress (SC-UE)



Current State of Codes, Standards, & Regulations

Membership of the CCBFC and its Standing Committees

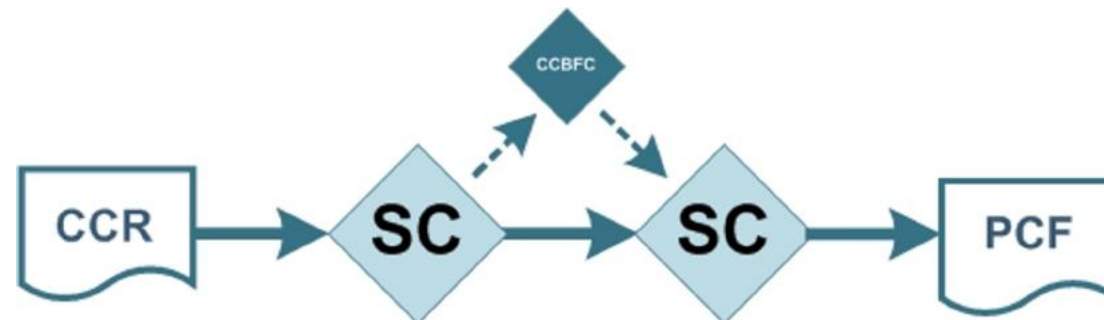
Reflects a matrix with balanced representation from major sectors

- Regulatory
- Industry
- General interest
- Broad geographic representation

Current State of Codes, Standards, & Regulations

Code Change request to Proposed Change:

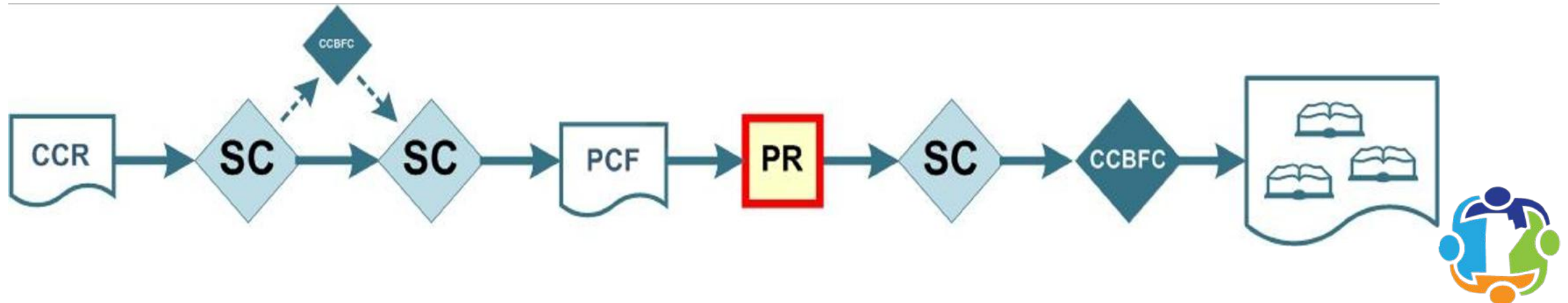
- Code change request from proponent
- CCC staff analysis
- Standing Committee review
- CCBFC input
- Standing Committee development
- Proposed Change (PCF)



Current State of Codes, Standards, & Regulations

Proposed Change (PCF) to Requirement:

- Public review
- Standing committee final recommendation
- Commission decision
- Publication of codes



Current State of Codes, Standards, & Regulations

National Standards of Canada

Development of :

- Use International standard development best practices and safeguards
- May be nationally developed or may be adoptions of international standards



Current State of Codes, Standards, & Regulations

National Standards of Canada

Steps:

- Identifying the need for the standard
- Reviewing the existing standards landscape
- Engaging stakeholders
- Notifying the public
- Developing the standard (by technical experts)
- Public consultation
- Review of public comments and revision as needed by the technical committee
- Vote and approval of the National Standard
- Publication
- Maintenance

Current State of Codes, Standards, & Regulations

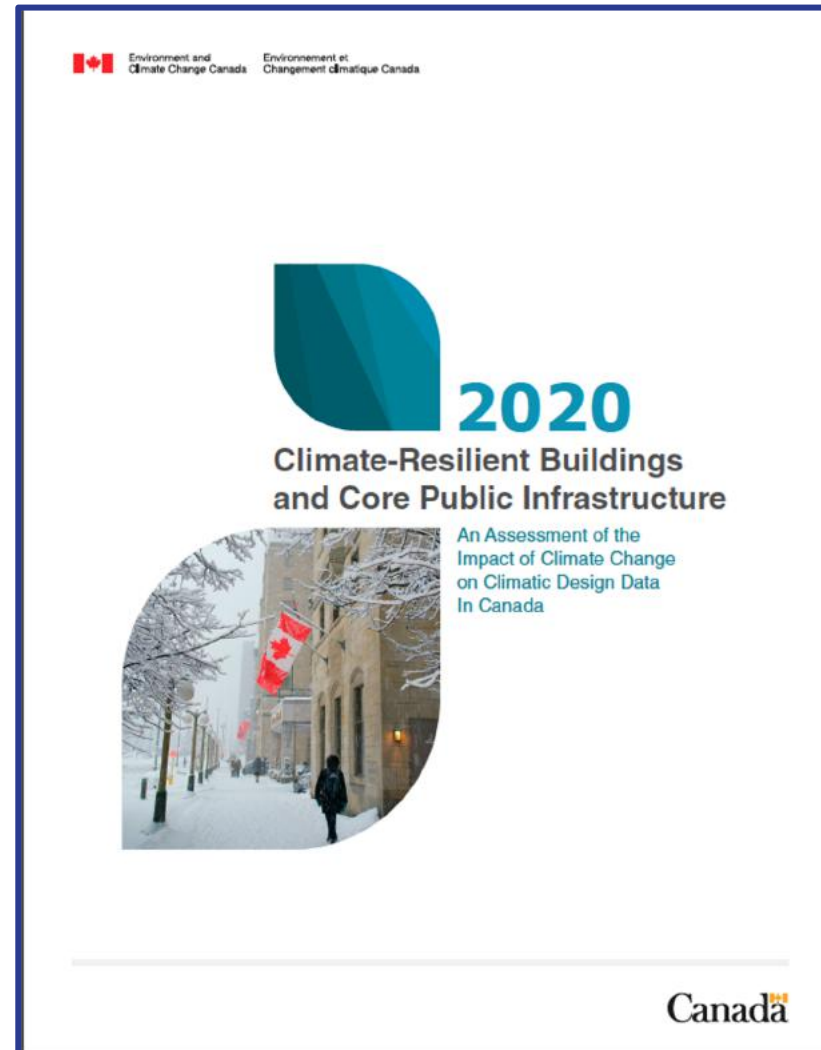
The Climate-Resilient Buildings and Core Public Infrastructure Initiative

Some Key Projects:

- Climatic Data and Loads
- Canadian Electrical Code – changes to increase resiliency
- Flooding – Code changes (2025 cycle), Guidelines, and Best Practices for flood reduction
- Wildland Urban Interface Fires – National Guidelines, Code Changes (2025 Cycle)
- Updates to Standards (CSA, ULC)



Climate Data and Loads



Temperature Fluctuations

Scenario	Year in which this may be reached	Design Temperatures, deg-C				Degree days below 18C (HDD)
		January		July		
		2.5% deg-C	1% deg-C	Dry deg-C	Wet deg-C	
NBC 2010		-33	-35	30	23	5670
NBC 2015		-33	-35	30	23	5670
+0.5 C	2020	-31	-32.8	31.3	24.0	5394
+1.0 C	2035	-29.6	-31.5	31.9	24.5	5182
+1.5 C	2048	-28.4	-30.2	32.7	25.1	4940
+2.0 C	2059	-27.2	-29.0	33.4	25.6	4718
+2.5 C	2069	-25.2	-27.0	34.1	26.2	4483
+3.0 C	2080	-23.6	-25.3	34.5	26.5	4302
+3.5 C	2091	-21.7	-23.5	35	26.9	4108

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Rain Events

Scenario	Year in which this may be reached	15-minute rain, mm	One day rain, 1/50 occurrence, mm	Annual rain, mm	Annual total Precipitation, mm
NBC 2010		28	108	415	500
NBC 2015		28	108	415	500
+0.5C	2020	29.8	115	424	507
+1.0C	2035	31.3	121	442	521
+1.5C	2048	32.9	127	457	534
+2.0C	2059	34.3	132	474	547
+2.5C	2069	36.0	139	489	557
+3.0C	2080	37.4	144	508	572
+3.5C	2091	38.8	150	526	585

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Wind Events

Scenario	Year in which this may be reached	Driving Rain Wind Pressure, Pa	Hourly Wind Pressures, Pa	
			1/10 return	1/50 return
NBC 2010		180	0.35	0.45
NBC 2015		180	0.35	0.45
+0.5C	2020	185	0.353	0.458
+1.0C	2035	190	0.356	0.464
+1.5C	2048	200	0.358	0.469
+2.0C	2059	201	0.356	0.466
+2.5C	2069	202	0.360	0.476
+3.0C	2080	202	0.363	0.480
+3.5C	2091	204	0.365	0.487

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Ground Snow Loads

Scenario	Year in which this may be reached	Snow Load, kPa, 1/50 return	
		Ss	Sr
NBC 2010		1.9	0.2
NBC 2015		1.9	0.2
+0.5C	2020	1.80	0.2
+1.0C	2035	1.76	0.21
+1.5C	2048	1.70	0.21
+2.0C	2059	1.60	0.2
+2.5C	2069	1.50	0.19
+3.0C	2080	1.41	0.18
+3.5C	2091	1.32	0.17

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Current Practices & Upcoming Changes

- Transportation Infrastructure

Presenter: Kris Maranchuk  **RRC** POLYTECH



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Current Practices & Upcoming Changes

Current Practices

- **Acts:**
 - Highway Traffic Act
- **Regulations:**
 - No specific regulations outside of the Highway Traffic Act
- **Codes:**
 - No specific codes exist for roads (not part of any building codes)
 - Bridges are either AASHTO LRFD Bridge Design Specifications or Canadian Highway Bridge Design Codes
- **Standards:**
 - Provide guidance for transportation agencies
- **Best Practices:**
 - Guide the industry as a whole and are typically followed but not recorded



Current Practices & Upcoming Changes

Upcoming Changes

- **Standards:**
 - Public agencies are shifting towards more sustainable materials and specifications
 - Greener concrete, asphalt, specification alignment, etc.
- **Regulations:**
 - Federal carbon changes may affect how infrastructure regulations are developed



Current Practices & Upcoming Changes

Agencies providing standards/guidance on test methods

- Canadian Standards Group (CSA)
- American Association of State Highway and Transportation Officials (AASHTO)
- ASTM International (formerly American Society for Testing and Materials)

Geometric Design Guide for Canadian Roads - Transportation Association of Canada (TAC)

- Provides guidance on roadway design standards
- Agencies free to adapt based on geographic location and specific applications (ex: Manitoba Transportation & Infrastructure “Blue Sheets”)



Current Practices & Upcoming Changes

AASHTO LRFD Bridge Design vs. Canadian Highway Bridge Design Code (CSA S6:19)

- Provides guidance on bridge design standards
- Uses a global or Load and Resistance Factor Design Methodology
- Agencies are free to make changes to the standards based on geographic location and specific applications

Manual of Uniform Traffic Control Devices for Canada

- Provides guidance on roadway traffic control devices (signs, delineation, etc.)



High Level Challenges and Opportunities

Challenges:

- Regulatory bodies are reluctant to change
 - Need a 'top – down' approach
- Industry is semi-reluctant to change
 - Cost – benefit analyses need to be performed
- Climate change and resilience is a long-term goal
 - Short-term benefits?
 - Initial investments?
 - Non-renewable materials are becoming harder to source



High Level Challenges and Opportunities

Opportunities:

- Infrastructure is vital to our supply chain (COVID-19 has reinforced this)
- Many industry groups are looking at changes to become 'greener'
 - Regulatory agencies need to adapt
- Many working groups are being formed (even locally) to discuss climate change and greener processes / materials
 - Concrete, Asphalt, Recycled Materials, etc.



Current Practices & Upcoming Changes

- Water
 - Water Management
 - Water Supply & Treatment

Presenter: Jeff O'Driscoll



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Current Practices & Upcoming Changes

Current Practices - Water Management

- Regulations
 - Many related to resource management.
 - Do not provide specific guidance on Climate Change
- Codes
 - Not codified area of Infrastructure
- Standards
 - New Standards on Flood Resilient Design of Communities and IDF Curves
- Best Practices
 - Most CC guidance through best practices
 - CWRA, CWWA, Dam Safety Association, Intact Centre, etc.



Current Practices & Upcoming Changes

Current Practices - Water Supply and Treatment

- Regulations
 - Safe Drinking Water Act, Environment Act
 - Do not provide specific guidance on Climate Change
- Codes
 - Building Code, Plumbing Code, Energy Code, etc.
- Standards
 - Flood Resilient Design of Communities and IDF Curves
 - AWWA, CSA, NSF
- Best Practices
 - Most CC guidance through best practices
 - CWWA, Intact Centre, etc.



Current Practices & Upcoming Changes

Standards

- Canadian Standards Association
 - **CSA W204:19** Flood Resilient Design of new Residential Communities
 - **CSA W210** Prioritization of Flood Resilience Work in Existing Residential Communities (Publication Pending)
 - **CSA W211** Management Standard for Stormwater Systems (Publication Pending)
 - **CSA PLUS 4013:19** Development, interpretation and use of rainfall intensity-duration-frequency (IDF) information
 - **CSA W200-18** Design of Bioretention Systems
 - **CSA W201-18** Construction of Bioretention systems
 - **CSA S900.1:18** Climate change adaptation for wastewater treatment plants
 - **CSA W203:19** Planning, design, operation, and maintenance of wastewater treatment in northern communities using lagoon and wetland systems



Current Practices & Upcoming Changes

Best Practices

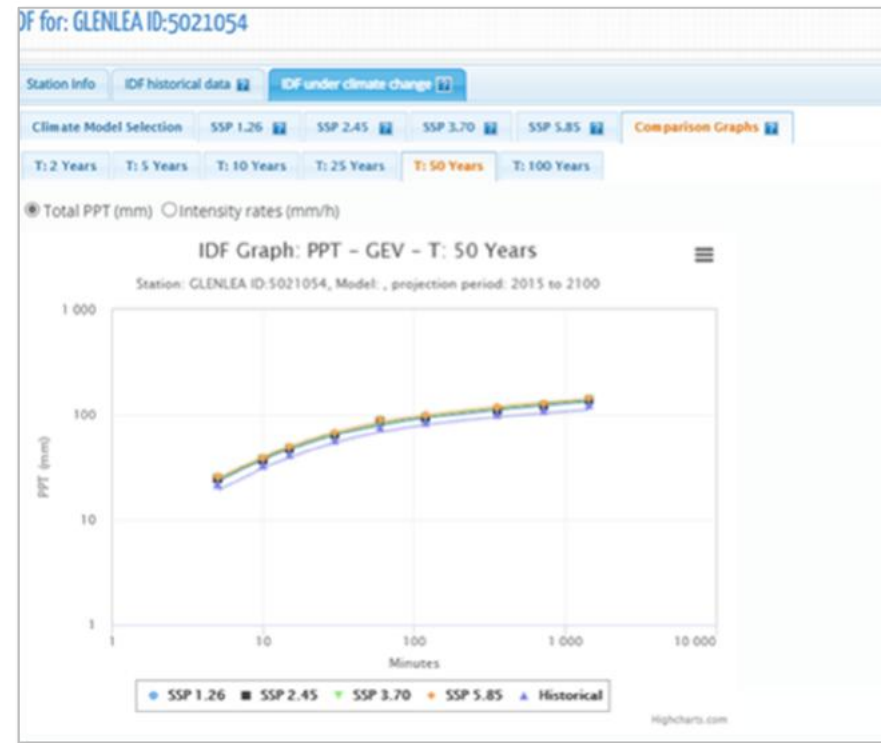
- Standards Council of Canada
 - Guide for Integrating Climate Change Adaptation Considerations into Canadian Standards
- Ouranos
 - Standardization guidance for weather data, climate information and climate change projections
- Engineers Canada
 - Developing a Stormwater Quality Management Standard considering a Changing Climate
- Intact Centre for Climate Adaptation
 - Developing Canadian Standard for New Flood Resilient Residential Communities and Existing Communities



Current Practices & Upcoming Changes

Best Practices

- Intensity-Duration-Frequency (IDF) Tools
 - IDF-CC Tool 5.0- Western University, Institute for Catastrophic Loss Reduction and Facility for Intelligent Decision Support
 - CSA PLUS 4013:19 Development, interpretation and use of rainfall intensity-duration-frequency (IDF) information



Current Practices & Upcoming Changes

Best Practices

- Flood Hazard Mapping
 - Critical for understanding risk and guiding future development
 - Strong push to produce flood hazard maps for communities
 - Inventory of methods for estimating climate change-informed design water levels for floodplain mapping (NRC, March 2019)
- Dam Safety
 - Ouranos
 - Flood Frequency Analysis and Dam Safety in the 21st Century Climate (2021)
 - Probable Maximum Floods and Dam Safety in the 21st Century Climate (2015)



Current Practices & Upcoming Changes

Best Practices

- Water Management Hydrology
 - Climate Adaptation through 'Brute Force'
 - Increase design threshold (e.g. 1:100 to 1:200)
 - Heavy analysis or no regrets action (more resilience – 10% safety factor – rule of thumb).
 - Act and then prove later and tweak
- Water Supply and Treatment
 - Incorporate Climate Risk Assessment in Operation, Planning and Design.
 - PIEVC
 - ISO Standards 14090, 14091 and 31000
 - Climate Projections - Confidence levels tiers -Low (T3) to High (T1)
 - Water Distribution Systems
 - Climate Change Risks and Opportunities (NRC 2022)



Current Practices & Upcoming Changes

- Buildings

Presenter: Tammy Harper



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Current Practices & Upcoming Changes

Current Practices

- Codes
 - CCBFC and the 2020 Codes
- Regulations
 - MBC does not provide specific guidance on Climate Change

Upcoming Changes

- Current and future changes



Current Practices & Upcoming Changes

CCBFC and the 2020 Codes

- To be published in February 2022
- Will introduce Tiered Energy Codes for Housing and Buildings
 - National Energy Code for Buildings
 - NBC Section 9.36 Energy Efficiency in Houses and Small Buildings
- In 2023/2024 there will be a further update of standards published as an Errata.



Current Practices & Upcoming Changes

Province of MB and 2020 Codes

- Adoption /Harmonization of Codes
- No Regulations for Climate Change or Resiliency
 - Building and Mobile Homes Act
 - Climate and Green Plan Act
 - Energy Act



High Level Challenges and Opportunities

“In flux” is the name of the game

- Highlights of future codes for Energy Efficiency
- Bill 38
- Adoption of Construction Codes 2015/2017
- Enforcement and Compliance



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High Level Challenges and Opportunities

“In flux” is the name of the game

- When things are in flux there is also opportunity for great change
- Codes are the minimum standard, nothing prevents anyone from going above
- Climate Data Changes



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Challenges & Opportunities Discussion

Breakout Session

- Transportation
- Water
- Buildings



What **needs**, **challenges**, and **opportunities** do you have or foresee with respect to codes, standards, and regulations?





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