Up the Ladder to the Roof: Standards for safety, quality and resilience

January 31, 2020       IIBEC Western Chapter, AGM & Conference
On Deck

☀ Exposure Control Plan
  • Laurence Matzek, Director, RoofStar Guarantee Program

☀ The Roofing Practices Manual (RPM) (Updates) and the Future of Code Development
  • James Klassen, RoofStar Technical Advisor

Thank you for supporting the RoofStar Guarantee Program!
Exposure Control Plan

Agenda

★ Project Overview
★ Chemical Exposure by Roof System
★ Impact to the Roofing Industry
★ Next Steps
Exposure Control Plan - Overview

★ WorkSafeBC OHS Regulation

★ Mandate is to protect workers:
  • Injury Prevention
  • Disease Prevention
Exposure Control Plan - Overview

★ WorkSafeBC OHS Regulation
   Part 5: Chemical Agents and Biological Agents
   • 5.48 Exposure limits
   • 5.54 Exposure control plan

★ Pre-2017 WorkSafeBC focused its attention to enclosed spaces

★ In 2017, WorkSafeBC turned its attention to roofing
Exposure Control Plan - Overview

RCABC was asked to develop an Exposure Control Plan (ECP) tool to assist the roofing industry.

Hired hygienist for the project.

Engaged with:
- membrane manufacturers
- RCABC contractors
Exposure Control Plan - Overview

☆ Roofing products containing hydro-carbon
  • Primers
  • Adhesives
  • Cleaners
  • Mastics

☆ 540+ Product SDS Collected
  & Evaluated
Exposure Control Plan - Overview

★ Measured the workers’ exposure during the application
Exposure Control Plan - Overview

Charts Developed:

- Membrane type and application
- Chemical with exposure risk
- Time of application
- Risk level
Chemical Exposure by Roof System

- **SBS**
  - **Naphtha**
    - Use > 1 hour/day: **Moderate Risk**
    - Use ≤ 1 hour/day: **Low Risk**
  - **Hydrocarbons**: **Low Risk**
  - **Asphalt Fumes**: **Low Risk**
  - **Stoddard Solvent**: **Low Risk**
Chemical Exposure by Roof System

PMMA Liquid Systems

Methyl Methacrylate

Use > 1 hour/day — High Risk
Use ≤1 hour/day — Moderate Risk
Chemical Exposure by Roof System

EPDM
- Mechanically Attached/ Loose-Laid and Ballasted
  - Toluene
    - Use > 6 hours/day: High Risk
    - Use for more than 1 hour to 5 hours per day: Moderate Risk
    - Use ≤ 1 hour/day: Low Risk
  - Naphtha
    - Use > 1 hour/day: Moderate Risk
    - Use ≤ 1 hour/day: Low Risk
Chemical Exposure by Roof System

- **TPO**
  - Mechanically Attached
    - Toluene
      - Use > 6 hours/day
        - High Risk
      - Use for more than 1 hour up to 6 hours per day
        - Moderate Risk
      - Use ≤ 1 hour/day
        - Low Risk
  - Naphtha
    - Use > 1 hour/day
      - Moderate Risk
    - Use ≤ 1 hour/day
      - Low Risk
    - Use > 1 hour/day
      - High Risk
  - Toluene
    - Use from 30 minutes to 1 hour/day
      - Moderate Risk
    - Use ≤ 30 minutes/day
      - Low Risk
    - Use > 1 hour/day
      - Moderate Risk
  - Naphtha
    - Use > 1 hour/day
      - Moderate Risk
    - Use ≤ 1 hour/day
      - Low Risk
  - Ethyl Benzene
    - Low Risk
Chemical Exposure by Roof System

Roof Systems not tested:

- PVC
- Hot Rubber
Risk Summary

★ Low Risk Operating Procedures
  • Eye Protection
  • Gloves

★ Medium Risk Operating Procedures
  • Low risk protection +
  • Coveralls / Protective Suit
  • Half-mask respirator

★ High Risk Operating Procedures
  • Medium risk +
Impact to the Industry

- Roofing Contractor
- Observers
- Design Authority / Specifier
- Roof Membrane Manufacturers
Impact to the Roofing Contractor

- OHS 5.55 provides Types of Controls
Impact to the Roofing Contractor

★ Program awareness

★ Regulation Compliance
  • Exposure Control Plan
  • Site Specific Risk Assessment

★ Employee Training and Equipping

★ Project Planning
  • Request for alternate membrane applications
  • Cost out higher risk applications
  • System risk-cost analysis
Impact to the Roof Observer

★ Protection from Chemical Exposure
  • Aware of products at risk
  • Time on site
  • Proximity to application
Impact to the Design Authority

★ Processing requests for Change Orders

★ Answering health related inquiries

★ Project specifications
  • Alternate applications options
    o must be considered
    o may become the most economical

★ Project Budget Impact
  • Costs likely will increase
Impact to the Roof Manufacturer

★ Alternate membrane applications
  • Eliminate / low hydro-carbon products

★ Drive innovation towards new applications
  • Compliance and testing to meet product standards is time consuming
Balancing Risk: Hot Works and Chemical Exposure

A risk-cost analysis will guide you in making good roof system decisions
Next Steps

★ Training for RCABC Contractor Safety Officers and Site Safety Assessors
  • Langley    February 11 & March 5
  • Victoria   February 18
  • Kelowna    February 25

★ Final Review with WorkSafeBC

★ More Information
  • RCABC
  • WorkSafeBC
  • Roofing BC Magazine – Winter 2020
Questions?

🌟 RCABC Contacts

- Bryan Wallner, CEO
- Rob Scales, Director, Education and Training
- Laurence Matzek, Director, RoofStar Guarantee Program
- James Klassen, RoofStar Guarantee Advisor
- Doug Wells, RoofStar Guarantee Advisor
The Roofing Practices Manual (RPM)
Roofing Practices Manual (RPM)

Some things change

Once upon a time the RPM…
Roofing Practices Manual (RPM)

looked like this…
Today it looks like this…
Roofing Practices Manual (RPM)

The official Manual for the RoofStar Guarantee Program...online only.

- Standards for every type of system, which support or exceed the
  - BCBC
  - NBCC and CSA Standards (roofing)
  - VBBL
Roofing Practices Manual (RPM)

Restructuring

★ Completed and launched in 2016

★ Includes
  o Separate Accepted Materials division
  o Guarantee Standards specific to each roof system
  o Generic construction details
  o Highlights that alert the reader to recent changes
Rewriting the content

Thursday November 2018

- SBS Membrane Systems
- Architectural Sheet Metal (ASM) Roofing

Thursday November 2019

- Asphalt Shingles
- Single Ply Membranes (EPDM, TPO, PVC)

Slated for 2020

- Hot Rubberized Asphalt
Roofing Practices Manual (RPM)

Updating drawings
★ Coloured 3D drawings for improved clarity
★ CAD (for ASM)
  ○ Produced in-house, as we are able
Roofing Practices Manual (RPM)

A new (ish) structure
★ 14 Parts in each Standard
★ 3 Sections per Part
  o General (including Design)
  o Materials
  o Application
RPM – System Standards Structure

★ New nomenclature:
  o Systems defined by function rather than slope
  o Slopes redefined and represented graphically
  o Numbering structure resembles BCBC
    ▪ Division
    ▪ System
    ▪ Standard
    ▪ Part
    ▪ Section
    ▪ …
Asphalt Shingle Systems: highlights

Salvation Army Chilliwack Community Church, Chilliwack
How to find the Standard

www.rcabc.org
Asphalt Shingle Systems: highlights

A. Top to bottom update of all standards

☆ Launched in late 2019, revisions reflect
  o 14-Part format
  o CSA-A123.51 Standards for application
  o One set of standards for all slope designs
  o Considerable development of design guidelines and standards
  o A stronger emphasis on materials
  o Expanded application requirements
  o Illustrations embedded in the Standard
Part 1: General

★ 1.3 Design Considerations
  o High snow conditions
  o Hot works (yes, even on asphalt shingle projects)

★ 1.4 Scope addresses both new construction and replacement roofing

★ 1.6 RoofStar Guarantee: Coverage and Limitations
Asphalt Shingle Systems: highlights

Part 2: Supporting Structures

- Wall (perpendicular)
- Extreme Slope: >12:12, up to a perpendicular wall
- Steep Slope: >1:1 (12” in 12”) to = 21:12 (21” in 12”)
- Common Slope: 1:3 (4” in 12”) to = 1:1 (12” in 12”)
- Low Slope: 1:6 (2” in 12”) to < 1:3 (4” in 12”)
- Flat: Less than 1:6 (2” in 12”)

39
Asphalt Shingle Systems: highlights

Part 2: Supporting Structures

☆ Suitable decks must be ‘nailable’
☆ Wood decks: min. 12.7 mm (1/2”)
Asphalt Shingle Systems: highlights

Part 3: Securing the Roof Assembly

- Standards for systems insulated above a sub-deck
- Minimum fastener types, numbers and penetration requirements
- Illustration of proper fastening
Asphalt Shingle Systems: highlights

Part 6: Air and Vapour Controls

- Identical to Part 6 in Waterproofing (roofs)
- Includes attic ventilation standards
- Cross-referenced with Part 11 (see sub-Section 11.2.3)
Asphalt Shingle Systems: highlights

Part 8: Eave Protection and Underlayments

- Clarified standards for materials (see table also)
- Underlayment as a separation layer is a good design idea
- Expanded application standards
  - End and side laps
  - Material orientation
Part 9: Field Shingles

- Material requirements grounded in CSA A123.5
- Clarified standards for materials (see table in Accepted Materials)
- Expanded application standards
- Standards to clearly address changes in slope
Asphalt Shingle Systems: highlights

Part 10: Perimeters and Walls

☆ New subsection on Design parameters
☆ Expanded application standards that include
  o Perimeter metal flashings
Part 10: Perimeters and Walls

- Expanded application standards that include
  - Revised and detailed standards for valleys, including dead valleys
Asphalt Shingle Systems: highlights

Part 10: Perimeters and Walls

★ Expanded application standards that include
  ○ How to handle valley transitions
Asphalt Shingle Systems: highlights

Part 10: Perimeters and Walls

☆ Expanded application standards that include
  o How to design and construct junctions with Waterproofing Systems
Asphalt Shingle Systems: highlights

Part 11: Drains and Penetrations

★ Expanded and improved standards for penetration flashings and curbs
Part 12: Other Details (Built-in Gutters)

★ Gutter membranes:
  o Extend up the slope at least
    ▪ 150 mm (6”)
    ▪ 300 mm (12”) in regions with typical heavy snow

★ New gutters:
  o At least 300 mm (12”) wide
  o No higher than the gutter width
  o Designed with an overflow
Asphalt Shingle Systems: highlights

Part 13: Metal Flashings

☆ Principally focused on materials and application
☆ Addresses fabrication and application of the flashings required in Part 10.
Single-ply Roof Systems: highlights

Grandview Heights Aquatic Centre, Surrey
Single Ply Roof Systems: highlights

Part 1: General

☆ For all Waterproofing Roof Systems:
  o RoofStar 15-year Guarantee Standards (coming soon)
Single Ply Roof Systems: highlights

Part 1: General

★ For all Waterproofing Roof Systems:
  o RoofStar 15-year Guarantee Standards (coming soon)
  o General requirements for Designers and Applicators
    ▪ Design considerations
    ▪ replacement roofing
    ▪ Hot Works (for both designers and Contractors)
    ▪ Workmanship
    ▪ RoofStar Guarantee: Coverage and Limitations
Single Ply Roof Systems: highlights

Part 1: General

★ For all Waterproofing Roof Systems:
  o RoofStar 15-year Guarantee Standards (coming soon)
  o General requirements for Designers and Applicators
  o Integrity Scans
    Required when overburdens
    ▪ exceed 150 mm (6”) in depth, regardless of who installed them
    ▪ of any depth are installed by someone other than an RCABC Member Contractor
Single Ply Roof Systems: highlights

Part 1: General

★ For all Waterproofing Roof Systems:
  o RoofStar 15-year Guarantee Standards (coming soon)
  o General requirements for Designers and Applicators
  o Integrity Scans
  o Electronic Leak Detection (ELD)
    ▪ optional for roofs (mandatory for grade-level waterproofing)
    ▪ strongly recommended when the space below the roof are sensitive and highly vulnerable to damage
      ▪ Examples: hospitals, fire stations, police stations, data centres (High Importance buildings)
Single Ply Roof Systems: highlights

Part 1: General

★ Integrity Scans and ELD
Single Ply Roof Systems: highlights

Part 2: Supporting Decks and Walls

★ For all Waterproofing Roof Systems:
  o New: minimum thickness of 12.7 mm (1/2”) for wood decks, unless the roof is designed for wind resistance (see Part 3)
Single Ply Roof Systems: highlights

Part 2: Supporting Decks and Walls

★ Electrical conduit and roof systems
  o Roofing fasteners can wreak havoc with energized electrical circuits
  o Charged wiring damaged by roofing fasteners may
    ▪ injure workers
    ▪ result in a structure fire, often years after the injury to the wire
Single Ply Roof Systems: highlights
Part 2: Supporting Decks and Walls

★ Electrical conduit and roof systems
  o New Construction – RGC Standards require placement of electrical circuits well away from roof assemblies
    ▪ Improves building safety
    ▪ Makes it possible to replace even a portion of the roof system without damaging the electrical system
Single Ply Roof Systems: highlights

Part 3: Securing the Roof Assembly

⭐ Focused on the wind resistance requirements of the BC Building Code (2018) (Parts 4 and 5)
  o Applicable to new and replacement roofing
  o Articulates three principal pathways for compliance:
    ▪ a Tested Assembly
    ▪ an Assembly with Proven Past Performance
    ▪ a custom-engineered Assembly

⭐ Help with interpreting the Code

⭐ Links to system test reports

📞 Call us for help
Single Ply Roof Systems: highlights

Part 3: Securing the Roof Assembly

☆ Fasteners
  o Gauge – see Tested Assembly
  o RGC Standard minimums
    ▪ #12 - Insulation
    ▪ #14 – Membrane attachment
  o Penetration into the deck
    ▪ Steel – ¾”
    ▪ Plywood – ¾”
    ▪ Wood – 1”
Single Ply Roof Systems: highlights

Part 3: Securing the Roof Assembly

★ Fasteners
  o Gauge – see Tested Assembly
  o RGC Standard minimums
    ▪ #12 - Insulation
    ▪ #14 – Membrane attachment
      ▪ the ‘linebacker’ fastener: thicker shoulders & neck
  o Penetration into the deck
    ▪ Steel – ¾”
    ▪ Plywood – ¾”
    ▪ Wood – 1”
Single Ply Roof Systems: highlights

Part 6: Air and Vapour Controls

★ Supports designs complying with Parts 5 and 10 of the BC Building Code (Energy Step Code)

★ Focused on the designer’s concerns
  o Limits material choices based on constructability
  o Affirms that the choice to use air or vapour controls remains with the Design Authority

★ min. 2 mm thickness for temp. roof

★ Includes guidance for the Contractor
Single Ply Roof Systems: highlights

Part 7: Insulation

★ Supports designs intended to meet the Energy Step-Code requirements (including Passive House)
  o Requirements for layering when effective thermal resistance exceeds R-15
  o Required staggered and offset joints
Part 7: Insulation

★ Our standards are supported by research projects we fund and directly participate in
  o Working with the NRC to determine Effective R-values
    ▪ Conventional roofs by late 2020
      • Lost heat energy can be as much as 15%
    ▪ PMRAs by 2024
  o CSA Committee work:
    ▪ Commercial roof energy performance
    ▪ Roof resiliency (includes long-term thermal performance)
Part 7: Insulation

FYI, not a Beauty Queen™ mattress... as much as 15% thermal loss due to bridging (NRC study)

Thermal bridging revealed in snow cover
Single Ply Roof Systems: highlights

Part 7: Insulation

Thermal bridging can be mitigated by designing a hybrid system of securement, also called PARS (Partially Adhered Roof System)
Single Ply Roof Systems: highlights

Part 8: Insulation overlays

★ Protection for heat-sensitive insulation
  - Ensures great membrane performance
  - Enhances the thermal performance of the roof system
Single Ply Roof Systems: highlights

Part 8: Insulation overlays

★ This can happen when heat-sensitive insulation deforms and melts from solar gain…

EPS, one type of heat-sensitive foam insulation, has a ‘service temperature’ of 70-75°C. When it shrinks under high temperatures, membranes can “rack” and tear.
Single Ply Roof Systems: highlights

Part 9: Field membranes

- Thickness requirements based on assembly type
- Additional RoofStar 15-year Standards (separate table)

Table 9.1 Single-ply Membranes: RoofStar 5 and 10-Year Guarantee
All thicknesses shown are in mm

<table>
<thead>
<tr>
<th>Membrane Type, Reinforcement &amp; Grade</th>
<th>Conventionally Insulated or Uninsulated Waterproofing Systems (Roofs)</th>
<th>Gutters</th>
<th>Roof as a Platform</th>
<th>Grade-level Water-proofing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loose-laid</td>
<td>Mechanically Fastened</td>
<td>Self-adhered</td>
<td>Adhered (Compact or PMRA)</td>
</tr>
<tr>
<td>EPDM (reinforced)</td>
<td>1.143 (45)</td>
<td>1.524 (60)</td>
<td>1.52 (60)</td>
<td>1.143 (45)</td>
</tr>
<tr>
<td>EPDM (unreinforced)</td>
<td>1.143 (45)</td>
<td>N/A</td>
<td>1.524 (60)</td>
<td>1.143 (45)</td>
</tr>
<tr>
<td>TPO</td>
<td>1.143 (45)</td>
<td>1.143 (45)</td>
<td>1.524 (60)</td>
<td>1.143 (45)</td>
</tr>
<tr>
<td>PVC</td>
<td>1.27 (50)</td>
<td>N/A</td>
<td>1.27 (50)</td>
<td>2.67 (105)</td>
</tr>
</tbody>
</table>
Designated walkways – required when serviceable equipment must be accessed at least once per month
Single Ply Roof Systems: highlights

Part 10: Perimeters and Walls

☆ Parapets are not mandatory – a roof edge may be finished flush with the field surface (metal edge flashing)

☆ When parapets are specified, they must be at least 125 mm (5”) high

☆ When parapets are designed to contain ballast or overburden, the minimum height increases to 200 mm (8”)
Single Ply Roof Systems: highlights

Part 11: Drains and Penetrations

★ Expanded standards for the design of drainage
  - Overflows highlighted – used primarily to keep the roof from collapsing
  - Cross-references the BC Plumbing Code and BC Building Code
Single Ply Roof Systems: highlights

Part 11: Drains and Penetrations

So this doesn’t happen…

Photo Credit:
Chamberlin Roofing & Waterproofing
Single Ply Roof Systems: highlights

Part 12: Protected Membrane Roofs / Gutters

☆ Expanded standards for design and construction
☆ PMRAs
  o Drainage required beneath insulation
  o Air space required above insulation
  o Detailed application standards for constituent materials
Single Ply Roof Systems: highlights

Part 12: Protected Membrane Roofs / Gutters

☆ Gutters

Example from ASM Construction Details
Single Ply Roof Systems: highlights

Part 14: The Roof as a Platform

★ Vegetated roofs
Single Ply Roof Systems: highlights

Part 14: The Roof as a Platform

★ Urban rooftop farms
Single Ply Roof Systems: highlights

Part 14: The Roof as a Platform
☆ Amenity spaces
Single Ply Roof Systems: highlights

Part 14: The Roof as a Platform

★ Recreation areas
Single Ply Roof Systems: highlights

Part 14: The Roof as a Platform

★ Pools and water features
Single Ply Roof Systems: highlights

Part 14: The Roof as a Platform
☆ Photovoltaics
The RCABC supports vegetated roofs
- involved with the City of Vancouver to develop policy and standards
- collaborators with Green Roofs for Healthy Cities
- a member of the BC Chapter of GRiT (Green Roof Information Think-tank)
- a member of Canada Green Building Council
- Expanding Association membership that includes qualified installers
- Design and Construction Standard for ‘Green’ Roofing (in development)
Hot Works and Fire Risk Mitigation
Expanding safety on the roof
Hot Works and Fire Risk Mitigation

★ RCABC has been a leader for over 10 years in addressing Torch Safety through prescriptive application methods reinforced by Policy

★ That policy is now enhanced by a mandatory Hot Works Program that applies to all system types

★ Launched in 2019, the Program constitutes 5 key components:
Hot Works and Fire Risk Mitigation

1. Policy

☆ Policy drives the Hot Works Program, which is a compulsory requirement of membership
Hot Works and Fire Risk Mitigation

2. Education

★ Enhanced education and training that goes beyond the basics
Hot Works and Fire Risk Mitigation

3. Standards and application alternatives

- Material and application guidance for sensitive roof details that require alternative measures to protect vulnerabilities from heat
- Part 10 of the SBS Standard includes Alternative Membrane Flashing Approaches
  - Pre-flashing
  - Picture-framing
Hot Works and Fire Risk Mitigation

3. Standards and application alternatives

☆ Example #1: pre-flashing approach

Four steps

Step 1 → Step 4
Hot Works and Fire Risk Mitigation

3. Standards and application alternatives

☆ Example #2: picture-frame approach (step 1)
3. Standards and application alternatives

★ Example #2: picture-frame approach (step 2)
Hot Works and Fire Risk Mitigation

4. Enhanced insurance requirements
5. Membership accountability

RCABC Member accountability
- Enforced through random site visit compliance audits conducted by competent, trained RCABC staff
- Focused on general site safety with a specific focus on Hot Works risk management
- Real-time feedback for the Contractor
- Supported by established disciplinary policy
On the horizon: Codes and the future of roof performance
We have our eyes on the future

The RCABC on the national stage

☆ We work closely with the National Research Council (NRC), funding and participating in numerous working committees
  o Photovoltaic wind resistance
  o Asphalitic cover board standards
  o SIDGERS (the originators of CSA-A123.21)
  o Energy efficient commercial roof design
  o Climate resilience standards (wind, precipitation and thermal performance)

☆ This committee work often turns into standards that are developed by CSA Standards Committees…
We have our eyes on the future

The RCABC on the national stage

★ We participate in numerous CSA Standards committees
  o A123 roofing committee (oversight for all CSA standards)
  o Performance/Application Standards
    ▪ A123.21 Dynamic Wind Resistance
    ▪ A123.24 Wind resistance of Modular Vegetated Roof Systems
    ▪ A123.51/52 Asphalt Shingles
  o Material Standards
    ▪ A123.1/A123.5 Asphalt Shingles
    ▪ A123.22 Eave Protection Membrane
    ▪ A123.23 Modified Bitumen Membranes
We have our eyes on the future

We want to make a difference

🌟 When Building Codes are behind the times and allow the lowest common denominator to prevail, no one wins

- We are at the table on numerous fronts to improve roofing standards across the country
- It’s coming! The National Building and Energy Codes will eventually reflect the work we are engaged in, together with the NRC and the CSA Group, to raise the bar for roofing
- When you specify a RoofStar Guarantee, you support our work beyond British Columbia’s borders to see this vision through to fruition
We’re here to help

RCABC resources

☆ pro bono project reviews

☆ technical support for
  o Design Authorities
  o Member Contractors
  o Roof Observers
  o General Contractors

Call us for assistance: (604) 882-9734

➢ Laurence Matzek – Director, RoofStar Guarantee Program
➢ Doug Wells – RoofStar Technical Advisor
➢ James Klassen – RoofStar Technical Advisor
Roofing.

*It’s what we do.*

**Technical Department**

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