Wisconsin Roofing Contractors Association
May Membership Meeting
Menomonee Falls, WI – May 13, 2014

Update on technical issues

Mark S. Graham
Associate Executive Director, Technical Services
National Roofing Contractors Association

Topics

- LTTR
- Asphalt
- Designers/consultants
- Questions

New LTTR values for polyiso.

NRCA

Revision to the PIMA Quality Mark^{cm} program

- Report LTTR values based upon:
  - ASTM C1303-11
  - CAN/ULC-S770-09
- Effective date of January 1, 2014

4

NRCA

New minimum LTTR values

PIMA Quality Mark^{cm} program (minimum values)

Revised LTTR values		
Thickness (inches)	**New LTTR values per inch thickness**	**New LTTR values per thickness**
1	5.6	5.6
2	5.7	11.4
3	5.8	17.4
4	5.9	23.6

"Tech today," *Professional Roofing,* August 2013

5

Board tolerances

- ASTM C1289:
  - Board length and width: ±¼ inch
  - Thickness tolerance: "…shall not exceed ⅛ in. (3.2 mm), and the thickness of any two boards shall not differ by more than ⅛ in (3.2 mm)…
- Equivalent LTTR of thickness tolerance: ±0.7
- Equivalent LTTR of 0.1-in-thickness: 0.56

NRCA

NRCA recommends designers specify polyisocyanurate insulation by thickness – not R-value or LTTR.

7

NRCA

Some cautions

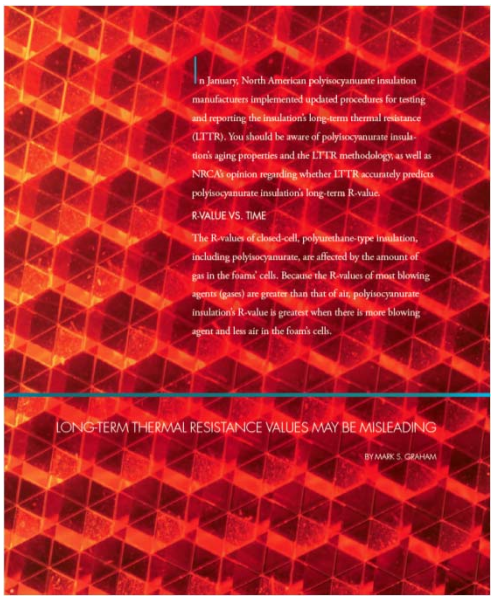
Design/bid/construction scenarios:

- Projects designed in 2013, but will be constructed in 2014
- Projects bid in 2013, but will be constructed in 2014
- Projects designed and bid in 2014 using outdated LTTR values

8

NRCA

Professional Roofing, May 2014



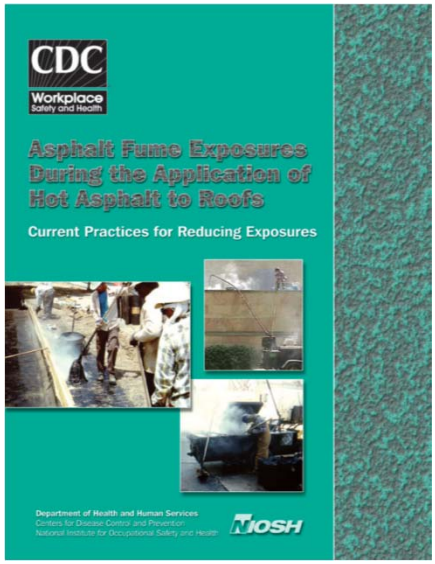
NRCA

Asphalt

NRCA

Asphalt

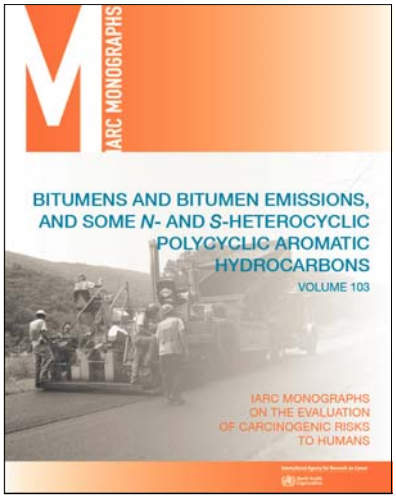
June 2003



NRCA

Asphalt

May 2013



IARC Monograph – 103:

- Group 2A –Probably carcinogenic to humans
- Pgs. 160 – 165 specific to "Roofing workers exposed to bitumens"

No new regulation (yet)

12

NRCA

NRCA's asphalt testing

NRCA

NRCA asphalt testing -- 1989

- 26 asphalt samples
- EVTs:
  - Type III (125 cps) 400 – 430 F
  - Type III (75 cps) 420 – 470 F
  - Type IV (125 cps) 420 – 455 F
  - Type IV (75 cps) 445 – 485 F
- FPs:
  - Not reported

14

NRCA

NRCA asphalt testing -- 2000

- 19 asphalt lots sampled
- EVTs:
  - Type III (mop) 390 – 440 F
  - Type III (spreader) 415 – 475 F
- FPs: 585 – 640 F
- ASTM D312 compliance:
  - 10 of 19 did not comply

15 NRCA

NRCA asphalt testing – 2014 (to date)

- 14 asphalt lots (7 suppliers) sampled
- EVTs:
  - Type III (mop) 424 – 462 F
  - Type III (spreader) 452 – 486 F
  - Type IV (mop) 455 – 482 F
  - Type IV (spreader) 480 – 506 F
- FPs: 615 – 660 F
- 10 of 14 do not comply with ASTM D312's physical property requirements

16 NRCA

Proposed revision to ASTM D312

- Maximum heating temp.: 550 F (575 F min. FP)
- Maximum EVTs:
  - Type III (mop) 430 F
  - Type III (spreader) 455 F
  - Type IV (mop) 470 F
  - Type IV (spreader) 485 F
- Lot-specific package labeling of EVT

17 NRCA

NRCA's interim recommendations

- Consult manufacturers' installation requirements and MSDS.
- Carefully select asphalt
- Beware of actual FPs; max. heating temp. should be FP – 25 F
- Beware of actual EVTs
- Make field crews aware

18 NRCA

Industry Issue Update

May 2014

INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Asphalt Health and Safety Issues

Changing values and guidelines will affect applications

May 2014

Asphalt has been one of the fundamental products used in the manufacture and construction of roof systems in the U.S. Even with the development and maturation of single-ply membrane roof systems and other alternative products, asphalt use continues to be widespread in the U.S. Asphalt is used in the manufacture of asphalt shingles, polymer-modified bitumen sheet products and certain roof coating products. In field applications, hot-applied asphalt is used for adhering base sheets, vapor retarders, insulation layers and polymer-modified bitumen sheets; interply moppings between ply sheets in built-up membrane construction; and as a membrane surfacing, commonly with aggregate.

Although asphalt has been used in the U.S. roofing industry for years, health and safety concerns when using hot asphalt and changes to asphalt's physical properties are issues of which users need to be aware.

HEALTH AND SAFETY

Roofing professionals have long recognized many of the health and safety concerns relating to using hot asphalt, and asphalt's odor when heated to elevated temperatures is objectionable to some people.

For more than 20 years, NRCA has worked closely with asphalt suppliers, product manufacturers, the United Union of Roofers, Waterproofers & Allied Workers, the Asphalt Roofing Manufacturers Association (ARMA) and the Asphalt Institute through an informal partnership to represent the roofing industry to government bodies studying health and safety aspects of hot-applied asphalt. This has included individual and joint research and outreach efforts.

An important combined effort includes development of the National Institute for Occupational Safety and Health's document "Asphalt Fume Exposures During the Application of Hot Asphalt to Roofs—Current Practices for Reducing Exposures" that provides industry guidelines for the safe use of hot asphalt. Its provisions have been incorporated into most asphalt suppliers' and product manufacturers' installation guidelines and their safety data sheets (SDSs).

In October 2011, the World Health Organization's International Agency for Research on Cancer (IARC) issued a conclusion stating occupational exposures to oxidized bitumens and their emissions during roofing applications probably are carcinogenic to humans (Group 2A). Oxidized bitumens include mopping asphalt used on roof systems.

In May 2013, IARC issued a report of its findings and conclusion, IARC Monograph Volume 103, "Bitumens and Bitumen Emissions, and Some N- and S-Heterocyclic Polycyclic Aromatic Hydrocarbons." Although the timing of this report was not surprising, NRCA believes IARC's research is not definitive.

With the IARC determination, in the coming years U.S. government and scientific groups such as the National Toxicology Program and the American Conference of Governmental Hygienists will make their own assessments.

ASPHALT TESTING

Originally published in 1929, the U.S. product standard for oxidized asphalt used in roofing is ASTM D312, "Standard Specification for Asphalt Used in Roofing." The current edition was published in 2000 and reapproved in 2006.

ASTM D312 provides for four types of asphalt—Types I, II, III and IV—based upon the asphalt's physical properties. An asphalt's tested softening point, hardness (penetration) and ductility properties dictate its type.

ASTM D312 also requires asphalt to have a minimum 500 F flash point (FP). The standard currently does not prescribe minimum or maximum values for an asphalt's equiviscous temperature (EVT); it simply requires asphalt suppliers report the asphalt's EVT on the package labeling or bill of lading.

In 1989, NRCA conducted a temperature-viscosity data study of 26 asphalt samples procured from around the U.S. EVT data from the samples are provided in Figure 1. The 1989 study was limited to EVT testing and did not include FP testing or testing of other physical properties to determine compliance with ASTM D312.

In 2000, NRCA conducted a limited study of 19 lots of Type III asphalt procured from around the U.S. EVT and FP data for these samples are provided in Figure 2. Ten of the 19 samples analyzed did not meet the physical property requirements of ASTM D312, Type III.

This year, NRCA conducted limited testing of 14 lots of Types III and IV asphalt obtained in late 2013 from roofing contractors'

NRCA and ARMA have proposed a revision to ASTM D312

NRCA

Responsibilities of Designers/Consultants

NRCA

Designers' role in proper wind design

- Specification of, for example, "…FM 1-90…" alone is not proper wind design
- Specification of a wind warrantee alone is not proper wind design

21

NRCA

The building code is clear on responsibilities

22

NRCA

International Building Code

IBC 2012, Chapter 15-Roof Assemblies and Rooftop Structures

1504.1 Wind resistance of roofs. Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3 and 1504.4.

23

NRCA

International Building Code

IBC 2012, Chapter 16-Structural loads

Section 1603

CONSTRUCTION DOCUMENTS

1603.1 General. *Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

[continued…]

24

NRCA

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force resisting system of the structure:

1. Ultimate design wind speed, V_{ult}, (3-second gust), miles per hour (km/hr) and nominal design wind speed, V_{asd}, as determined in accordance with Section 1609.3.1.
2. *Risk category.*
3. Wind exposure. Where more than one wind exposure is utilized, the wind exposure and applicable wind direction shall be indicated.
4. The applicable internal pressure coefficient.
5. Components and cladding. The design wind pressures in terms of psf (kN/m^2) to be used for the design of exterior component and cladding materials not specifically designed by the *registered design professional*.

25

NRCA

NRCA recommendation

- Seek out clarifications from Designers
- Use www.roofwinddesigner.com

NRCA

“Tech today” column, March 2014

TECH TODAY

Specifying wind design

Many roof system designers inadequately address wind loads in contract documents

by Mark S. Graham

NRCA is receiving an increasing number of reports indicating project drawings and specifications incompletely, inadequately or inaccurately address proper wind design for low-slope membrane roof systems. Some designs, according to reports, only include a specification requirement for the roof system manufacturer to provide a wind warranty.

But there are minimum requirements for proper wind design of low-slope membrane roof systems.

Code requirements

Building codes typically provide specific requirements for reporting design loads, including wind loads, in contract documents.

Specifying wind speed warranties is not a substitute for code-required wind design data

The *International Building Code®, 2012 Edition* (IBC 2012), Chapter 16-Structural Design, Section 1603-Contract Documents, indicates contract documents need to include a roof system's live load, snow load data, wind design data and any special loads.

Required wind design data includes identifying the ultimate design wind speed, nominal design wind speed, risk category, wind exposure and applicable internal pressure coefficient. For component and cladding systems that are not specifically designed by a registered design professional, design wind pressures in terms of psf (pounds per square foot) also are required. Roof systems typically are considered component and cladding systems. Design wind pressures in the field, perimeter and corner regions of roof areas should be noted in contract documents.

IBC's previous editions include similar contract document requirements.

For new construction projects, design loads most commonly will be identified on structural drawings in the project drawing set. For projects without specific structural drawings, design loads may be provided on architectural drawings or drawing notes or in project specifications.

ANSI/SPRI ES-1

ANSI/SPRI ES-1, "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems," which is referenced in IBC 2012, includes two primary elements: determination of design wind loads at roof edges (fascia, copings) and testing for resistance loads of copings and fascia.

Designers should not simply specify compliance with ANSI/SPRI ES-1 in project specifications; they should determine and clearly include design wind loads at roof edges in contract documents.

IBC 2012 indicates in Section 1504.5 Edge Securement for Low-slope Roofs design wind loads should be determined using the ultimate design wind speed and IBC 2012's Chapter 16, which is based on ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures."

IBC 2012 references ANSI/SPRI ES-1-03. ANSI/SPRI ES-1-03 is based upon ASCE 7-02, which is not an ultimate design wind speed-based method. Therefore, the design wind load determination method contained in ANSI/SPRI ES-1 does not satisfy IBC 2012's requirements for design wind loads at roof edges.

Design wind loads at roof edges should be determined using IBC 2012's Chapter 16 and be clearly noted in contract documents.

Responsibilities

Designers should not place the responsibility for determining roof system or individual component design wind loads on manufacturers, component suppliers or installers, or roofing contractors.

Also, designers' sole reliance on specifying wind speed warranties is not a substitute for code-required wind design data. Such warranties typically do not address consideration of ultimate and nominal design wind speeds, building height, risk category, wind exposure and internal pressure coefficients applicable to the specific building necessary for properly determining roof systems' design wind loads.

Responsibility for properly determining and clearly identifying wind design data, including design wind loads for roof systems, is required by the building code and is clearly that of roof system designers. Designers may retain a structural engineer or qualified consultant to help them fulfill their design responsibilities.

To help designers determine wind loads for commonly encountered low-slope roof systems, NRCA, the Midwest Roofing Contractors Association and North/East Roofing Contractors Association have developed and offer a free online application, Roof Wind Designer.

Roof Wind Designer is a web application that allows users to determine design wind loads using ASCE 7-, "Minimum Design Loads for Buildings and Other Structures," 2005 or 2010 editions.

Roof Wind Designer is accessible at www.roofwinddesigner.com.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

16 www.professionalroofing.net MARCH 2014

NRCA

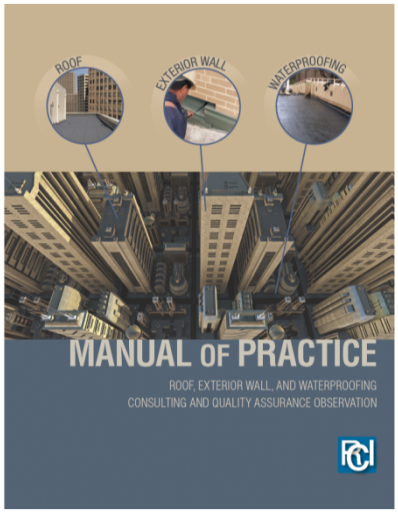
Concerns with rooftop quality assurance observers (QAOs)

28

A QAO is not a “field superintendent”
and should never direct roofing work/operations

29

RCI

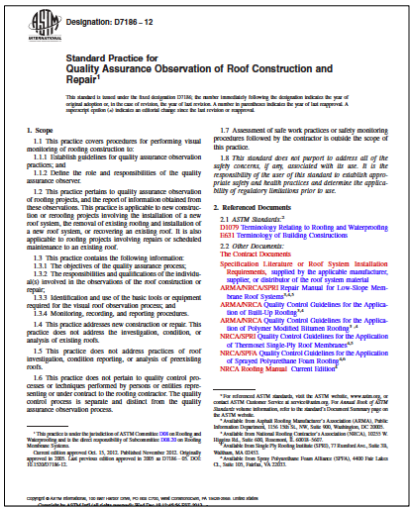


Manual of Practice:

- Sec. 1: Introduction
- Sec. 2: Recommended practices for consulting
- Sec. 3: Recommended practices for QAO
- Sec. 4: Specialized areas of practice
- Appendixes

30

ASTM D7186-12



Designation: D7186 – 12

Standard Practice for Quality Assurance Observation of Roof Construction and Repair[1]

This standard is issued under the fixed designation D7186; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures for performing visual monitoring of roofing construction to:

1.1.1 Establish guidelines for quality assurance observation practices; and

1.1.2 Define the role and responsibilities of the quality assurance observer.

1.2 This practice pertains to quality assurance observation of roofing projects, and the report of information obtained from these observations. This practice is applicable to new construction or reroofing projects involving the installation of a new roof system, the removal of existing roofing and installation of a new roof system, or recovering an existing roof. It is also applicable to roofing projects involving repairs or scheduled maintenance to an existing roof.

1.3 This practice contains the following information:

1.3.1 The objectives of the quality assurance process;

1.3.2 The responsibilities and qualifications of the individual(s) involved in the observations of the roof construction or repair;

1.3.3 Identification and use of the basic tools or equipment required for the visual roof observation process; and

1.3.4 Monitoring, recording, and reporting procedures.

1.4 This practice addresses new construction or repair. This practice does not address the investigation, condition, or analysis of existing roofs.

1.5 This practice does not address practices of roof investigation, condition reporting, or analysis of preexisting roofs.

1.6 This practice does not pertain to quality control processes or techniques performed by persons or entities representing or under contract to the roofing contractor. The quality control process is separate and distinct from the quality assurance observation process.

1.7 Assessment of safe work practices or safety monitoring procedures followed by the contractor is outside the scope of this practice.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1079 Terminology Relating to Roofing and Waterproofing

E631 Terminology of Building Constructions

2.2 *Other Documents:*

The Contract Documents

Specification Literature or Roof System Installation Requirements, supplied by the applicable manufacturer, supplier, or distributor of the roof system material

ARMA/NRCA/SPRI Repair Manual for Low-Slope Membrane Roof Systems[3,4,5]

ARMA/NRCA Quality Control Guidelines for the Application of Built-Up Roofing[3,4]

ARMA/NRCA Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing[3,4]

NRCA/SPRI Quality Control Guidelines for the Application of Thermoset Single-Ply Roof Membranes[4,5]

NRCA/SPFA Quality Control Guidelines for the Application of Sprayed Polyurethane Foam Roofing[4,6]

NRCA Roofing Manual: Current Edition[4]

[1] This practice is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.30 on Roofing Membrane Systems.

Current edition approved Oct. 15, 2012. Published November 2012. Originally approved in 2005. Last previous edition approved in 2005 as D7186 – 05. DOI: 10.1520/D7186-12.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Asphalt Roofing Manufacturer's Association (ARMA), Public Information Department, 1156 15th St., NW, Suite 900, Washington, DC 20005.

[4] Available from National Roofing Contractor's Association (NRCA), 10255 W Higgins Rd., Suite 600, Rosemont, IL 60018-5607.

[5] Available from Single Ply Roofing Institute (SPRI), 75 Rumford Ave., Suite 3B, Waltham, MA 02453.

[6] Available from Spray Polyurethane Foam Alliance (SPFA), 4400 Fair Lakes Ct., Suite 105, Fairfax, VA 22033.

- Experience
- Role: observe and report
- Reporting procedures
- QAO shall maintain on-site contract documents
- QAO shall have insurance
- QAO shall provide and maintain PPE and fall protection equipment

31

"Tech today" column, February 2014

TECH TODAY

Quality-assurance guidelines

Quality-assurance observers have specific project roles and responsibilities

by Mark S. Graham

Proper quality assurance during roof system installation can be an important element for long-term performance.

Quality assurance—unlike quality control, which is performed by roofing contractors—is the responsibility of a building owner or his or her designated representative, such as a licensed design professional, roof consultant or general contractor. The purpose of quality assurance is to verify the scope and intent of a project's contract documents are being met and roof system materials are being installed in accordance with contract documents, manufacturers' installation instructions and accepted industry practices.

The most effective means of providing quality assurance is visually observing materials and procedures

NRCA asserts the most effective means of providing quality assurance is by visually observing materials and procedures used at the time of roof system installation. The person performing visual observation often is referred to as a quality-assurance observer (QAO).

ASTM D7186

ASTM D7186, "Standard Practice for Quality Assurance Observation of Roof Construction and Repair," establishes the role and responsibilities of those performing quality-assurance observation, as well as procedures for observation and reporting.

A QAO's function is to provide on-site observation and reporting of a roof system's construction process in a clear, accurate and objective manner; a QAO should not direct or order any work. A QAO should:

- Observe and record the general condition of the job site and roof areas under construction and materials used and stored
- Note pre-existing property damage or damage that can occur and the substrate condition and repair or replacement procedures
- Observe and record the installation of roofing materials and any other components specified in the contract documents, and flashing installation and detailing
- Record weather conditions, roofing crew size, foreman's name and all job-site visitors

A QAO should prepare a daily written report with photographs; this report should be made available to all parties involved in the roofing project. A copy of the report should be provided to the roofing contractor no later than the commencement of work the following day. ASTM D7186 includes sample pre-construction damage, material delivery, daily construction and progress summary, and unit cost tracking report forms for use by QAOs when completing the documentation necessary to provide proper quality assurance.

A QAO also should keep on-site copies of contract documents, including project specifications, the roof plan, construction detail drawings and any addenda, as well as stamped material submittals and minutes from the pre-bid, pre-construction and project meeting minutes.

A QAO is responsible for providing and maintaining the tools and equipment required to perform his or her work, including any necessary safety equipment, such as personal protective equipment and fall protection. A QAO should follow all applicable safe work practices.

A QAO or the firm providing the quality-assurance observations must provide insurance and submit a certificate of insurance showing coverage for workers' compensation, comprehensive general liability, automobile insurance and, if applicable, professional liability insurance. Insurance limits shall be the statutory amounts or higher amounts if required in the contract.

NRCA guidelines

ASTM D7186 references the following NRCA documents that provide industry-accepted guidelines for evaluating roof system application:

- *Quality Control Guidelines for the Application of Built-up Roofing*
- *Quality Control Guidelines for the Application of Polymer-modified Bitumen Roofing*
- *Quality Control Guidelines for the Application of Thermoset Single-ply Roof Membranes*
- *Quality Control Guidelines for the Application of Spray Polyurethane Foam-based Roofing*
- *Quality Control Guidelines for the Application of Asphalt Shingle Roof Systems*

NRCA recommends those documents be used with ASTM D7186 to provide effective quality assurance.

When a QAO will be present on a job site, NRCA recommends his or her role be clearly defined and understood by all parties, including the building owner, licensed design professional, general contractor or construction manager, and roof consultant. NRCA encourages referencing ASTM D7186 for this purpose.

All NRCA documents referenced can be purchased by accessing the NRCA Bookstore at shop.nrca.net. ●●●

MARK S. GRAHAM is NRCA's associate executive director of technical services.

12 www.professionalroofing.net FEBRUARY 2014

NRCA's recommendations

- Confirm/clarify QAO's role and responsibilities
- Use "Tech today" column and/or ASTM D7186
- Get QAO's daily reports
- Document any situation where a QAO directs your work/operations

33

Summary

- LTTR issues
- Asphalt changes
- Designer/consultant responsibilities

34

NRCA

Questions?

35

NRCA

Mark S. Graham
Associate Executive Director, Technical Services
National Roofing Contractors Association
10255 West Higgins Road, 600
Rosemont, Illinois 60018-5607

(847) 299-9070
1-800-323-9545
(847) 299-1183

www.nrca.net
mgraham@nrca.net
Twitter: www.twitter.com/MarkGrahamNRCA

36