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This specification utilizes the Construction Specifications Institute's (CSI) 3-Part formatting. The specification is a manufacturer-specific product specification to be used by design professionals as a guide specification. Editing notes are indicated in *red italics* and precede specification text. Delete editing notes in final specification. Metric conversion, where used, is soft metric conversion.

This specification specifies environmentally sustainable renewable-based spray foam insulation by Icynene Inc. Revise section number and title below to suit project requirements.

The specified product may contribute to the following credits/points for the respective rating system:

LEED NC Submittals:

- EA Credit 1: Optimize Energy Performance
- MR Credit 2: Construction Waste Management
- MR Credit 5: Regional Materials
- MR Credit 6: Rapidly Renewable Materials
- IEQ Credit 7.1: Thermal Comfort
- ID Credit 1: Innovation in Design

LEED for Homes Rating System Submittals:

- EA Credit 1.1: Performance of ENERGY STAR Homes (or EA 2-10 Pathway)
- EA Credit 2.1: Basic Insulation
- EA Credit 3: Air Infiltration
- EA Credit 5.1 and 5.2: Heating and Cooling Distribution System
- MR Credit 2.2: Environmentally Preferable Products
- MR Credit 3.2: Construction Waste Reduction
- EQ Credit 1: ENERGY STAR with Indoor Air Package (Pathway)
- EQ Credit 10: Garage Pollutant Protection

LEED for Schools Rating System Submittals:

- EA Credit Prerequisite 2: Minimum Energy Performance
- EA Credit 1: Optimize Energy Performance
- MR Credit 5: Regional Materials
- MR Credit 6: Rapidly Renewable Materials
- IEQ Credit 4: Low Emitting Materials
- IEQ Credit 7.1: Thermal Comfort – Design
- IEQ Credit 9: Enhanced Acoustical Performance

- IEQ Credit 10: Mold Prevention
- ID Credit 1: Innovation in Design

NAHB National Green Building Standard (ICC-700-08) Submittals:

- Credit 606.1: Renewable Materials
- Credit 607.1: Resource - Efficient Materials
- Credit 608.1: Indigenous Materials
- Credit 701.4.5: Insulation and Air Sealing
- Credit 702: Performance Path (Energy) or 703 Prescriptive Path
- Credit 704.6.1: Performance Verification
- Credit 704.6.2: Third Party Testing
- Credit 704.6.2.1: Building Envelope Air Leakage
- Credit 901.3: Garages – Air Barrier
- Credit 901.11: Insulation – Emissions
- Credit 902.11: Perimeter of Living Space Sealed
- Credit 903.4: Conditioned Crawlspace is Sealed
- Credit 903.5: Building Materials – No Visible Mold

Collaborative for High Performance Schools (CHPS) Submittals:

- Credit LE 13.1: Innovation
- Credit EE 1.0: Minimum Energy Performance
- Credit EE 1.1: Superior Energy Performance
- Credit ME 2.1: Construction Site Waste Management
- Credit ME 4.2: Rapidly Renewable Materials
- Credit ME 4.3: Organically Grown Materials
- Credit ME 5.1: Environmentally Preferable Materials
- Credit EQ 2.2: Low Emitting Materials
- Credit EQ 3.0: Minimum Acoustical Performance
- Credit EQ 3.1: Improved Acoustical Performance
- Credit EQ 4.0: ASHRAE 55, Thermal Comfort Code Compliance and Moisture Control

SECTION 07 21 29
SPRAYED INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Contractual Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Renewable-based, low density, open celled, flexible, all water- blown polyurethane foam insulation.
- B. Related Sections:

List sections here as applicable to Project

1. Division 01 Section "LEED Requirements" for additional LEED requirements.
 2. Division 07 Section _____
 3. Division 07 Section _____
 4. Division 07 Section _____
 5. Division 07 Section _____
 6. Divisions 21 through 23 Mechanical Documents
- C. Coordinate mechanical ventilation and fresh air supply with Mechanical sections and ASHRAE Guidelines for optimum indoor air quality.

1.3 REFERENCES

- A. American Society for Testing and Materials International (ASTM)
1. ASTM C 518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 2. ASTM C 1338: Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
 3. ASTM D 6866: Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis
 4. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials
 5. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials
 6. ASTM E 283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 7. ASTM E 2178: Standard Test Method for Air Permeance of Building Materials

1.4 SUBMITTALS

- A. Product Data for each type of insulation product specified.
- B. Product test reports performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.
- C. Evaluation Report: Evidence of compliance of foam-plastic insulations with International Building Code (IBC), International Residential Code (IRC), International Energy Conservation Code (IECC).
- D. Manufacturer's certificate certifying insulation provided meets or exceeds specified requirements.
- E. Installer's certificate showing the Icynene installation certification.
- F. LEED NC (v3) Submittals:

Edit the following for actual credits being achieved:

1. MR Credit 5, Regional Materials: Product Data indicating location of material manufacturer for regionally manufactured materials. Include statement indicating cost and distance from manufacturer to Project. Also include the percentage (by weight) of material that is extracted, harvested, or recovered and manufactured locally.
 2. Credit MR 6, Rapidly Renewable Materials: Product Data indicating the percentage of rapidly renewable materials in the spray insulation, including a statement indicating costs for rapidly renewable material.
- G. LEED for Homes Rating System Submittals:
- Edit the following for actual credits being achieved:*
1. EA Credit 2, Basic Insulation: Product data showing R-value for sprayed insulation.
 2. MR Credit 2.2, Environmentally Preferable Products: Product Data substantiating sprayed insulation complies with CA practice for testing of VOC's from building materials using small chambers.
- H. LEED for Schools Rating System Submittals:
- Edit the following for actual credits being achieved:*
1. MR Credit 5, Regional Materials: Product Data indicating location of material manufacturer for regionally manufactured materials. Include statement indicating cost and distance from manufacturer to Project. Also include the percentage (by weight) of material that is extracted, harvested, or recovered and manufactured locally.
 2. Credit MR 6, Rapidly Renewable Materials: Product Data for rapidly renewable materials, including a statement indicating costs for rapidly renewable material.
 3. IEQ Credit 4: Low Emitting Materials: Product data showing compliance with California DHS/EHLB/R174.
- I. NAHB National Green Building Standard (ANSI ICC-700-08) Submittals:
- Edit the following for actual credits being achieved:*
1. Credit 606.1, Biobased Products: Product data confirming spray insulation contains biobased content per USDA criteria (7 CFR Part 2902).
 2. Credit 608.1, Indigenous Materials: Product Data indicating location of material manufacturer for regionally manufactured materials.
 3. Credit 703 Prescriptive Path: Product Data confirming the sprayed insulation is Grade 1.
 4. Credit 901.11: Insulation – Emissions: Product Data confirming sprayed insulation contains emission levels that comply with the requirements of CA/DHS 01350.
- J. Collaborative for High Performance Schools (CHPS-06) Submittals:
- Edit the following for actual credits being achieved:*
1. Credit ME 4.2, Rapidly Renewable Materials: Product Data indicating the percentage of rapidly renewable materials in the spray insulation, including a statement indicating costs for rapidly renewable material.

2. Credit ME 4.6, Alternative: Environmentally Preferable Materials: Product data confirming spray insulation has been certified under applicable Environmentally Preferable Products (EPP) certification program.
3. Credit EQ 2.2, Low Emitting Materials: Product Data confirming sprayed meets the CHPS Low Emitting Materials criteria Section 01350 - for use in a typical classroom as described in a CA/DHS Standard Practice.

K. Sample warranty

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Product produced in an ISO 9001 registered factory.
- B. Single Source Responsibility: Single source product from one manufacturer.
- C. Installer Qualifications: Engage an Icynene Licensed Dealer (installer) who has been trained and certified by Icynene Inc.
- D. Fire-Test-Response Characteristics: Provide materials specified as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 1. Surface-Burning Characteristics: ASTM E 84
- E. Toxicity/Hazardous Materials
 1. Provide products that contain no urea-formaldehyde
 2. Products and equipment requiring or using CFCs, HCFCs, or HFCs during the manufacturing or installation process will not be permitted
 3. Provide products that contain no PBDE's
 4. Provide products that are "Low-emitting"

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers written instructions for handling and protection prior to and during installation.
- B. Store both components in a temperature controlled area between 60 deg F (15 deg C) and 90 deg F (32 deg C). Do not allow product to freeze.
- C. Use only those components that are supplied by the Manufacturer.

1.7 PROJECT CONDITIONS

- A. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

1.8 WARRANTY

- A. Manufacturer's standard limited lifetime warranty.
- B. Refer to www.Icynene.com for full warranty terms.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Polyurethane Spray Insulation: ICYNENE LD-R-50™ by Icynene.

2.2 MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. ICYNENE LD-R-50™ Spray Insulation: renewable-based, low-density, open-cell material conforming to the following:
1. Renewable Content: Exceeds 7.0 percent according to ASTM D 6866
 - a. Renewable-based, 0.5 lb./cu. ft., all water-blown spray foam insulation and air barrier material.
 - b. Product formulation using high-yield, natural castor oil in place of a portion of the petroleum-based polyol.
 2. Thermal Resistance (R-Value/inch @75 deg F): ASTM C 518; 3.7 hr/sq ft/degree F/BTU
 - a. Heat Flow Reduction:

1)	Through 1 inch:	75 percent
2)	Through 3.5 inches	93 percent
3)	Through 5.5 inches	95 percent
4)	Through 10.5 inches	98 percent
 3. Air Permeance (for 5.5 inches of material): ASTM E 2178; 0.0085 L/s-m² @75 Pa
 4. Air Permeance (for 3 inches of material): ASTM E 283: less than 0.02 L/s-m² @ 75 Pa
 5. Water Vapor Transmission (for 2 inches of material): ASTM E 96; 17 perms [1005 ng. / (Pa.s.m²)]
 6. Flame Spread and Smoke Developed Rating: ASTM E 84
 - a. Flame Spread: Less than 25
 - b. Smoke Development: Less than 450
 7. Bacterial and Fungal Growth and Food Value: ASTM C 1338; not a source of food for mold (no growth)
- C. Product Description:
1. ICC-ES SAVE: (Verification of Attributes Report) VAR-1002
 2. Exceeds ICC-SAVE and USDA BioPreferredSM standards for a renewable-based product
 3. Collaborative for High-Performance Schools (CHPS) “Low-emitting material” per CA 01350 Criteria
 4. Effective vapor-permeable (“breathing”) air barrier material that can move with the building to maintain the air barrier characteristic for the life of the building.

2.3 SOURCE QUALITY CONTROL

- A. Product produced in an ISO 9001 registered factory.

PART 3 - EXECUTION

SPRAYED INSULATION

ICYNENE LD-R-50™
 Latest Revision: September 4, 2009

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3.1 EXAMINATION

- A. Examine substrates and conditions, under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.
 - 1. Review placement area to determine final location will not be within 3 inches of heat emitting devices where the temperature is in excess of 200 deg F as per ASTM C 411 or in accordance with applicable codes.
 - 2. Review placement area to determine final location will not be on the exterior.

3.2 PREPARATION

- A. Clean substrates and cavities of loose materials capable of interfering with insulation installation.

3.3 APPLICATION

- A. Site apply liquid components manufactured by Icynene Inc. and installed by an Icynene Licensed Dealer.
- B. Apply insulation to substrates in compliance with manufacturer's written instructions.
- C. Apply insulation to produce thickness required for indicated R Value.
 - 1. R-13 is achieved at 3 1/2 inches
 - 2. R-20 is achieved at 5 1/2 inches
- D. Extend insulation in thickness indicated to envelop entire area to be insulated.
- E. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

3.4 REPAIRS

- A. Any repairs must be effected by an Icynene Licensed Dealer.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse.

END OF SECTION 07 21 29

The specification writer/design professional is responsible for product selection, including use and application of this information and this specification should be adopted for each project where applicable. Icynene shall be held harmless for any damages resulting from the use of this specification guide.