STANDARDS FOR NEW ROOFING CONSTRUCTION, RE-ROOFING CONSTRUCTION, AND ROOFING SYSTEM GUARANTEE REQUIREMENTS – July 2019

Responsible Organization: Office of Facilities Planning
Instructions: This Manual supersedes the DGS Procedure Manual for Professional Services dated July 2015. Please recycle the superseded document.

1. GENERAL

1.1 FOR NEW BUILDING PROJECTS, the selection of either a steep slope or low slope roofing system shall be based on the results of a 60 year life cycle cost analysis. This analysis shall consider the scope impact on building structural, mechanical and electrical systems required to configure the building for a steep slope and a low slope roofing system, as well as the maintenance and replacement intervals and costs for both roofing systems.

1.2 FOR ROOF REPLACEMENT PROJECTS, the selection of the replacement roofing system shall be based on an evaluation of costs associated with factors affecting the proposed system, including span dimension, structural condition, foundation design/capacity, and disposition or accommodation of roof top equipment.

1.3 ROOFS ON NEW CONSTRUCTION shall be pitched to drains or gutters, with the roof slope achieved structurally.

1.4 REFERENCES TO NATIONAL STANDARDS DOCUMENTS such as the American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Factory Mutual System (FM), Underwriters' Laboratories (UL), International Building Code (IBC), American Institute of Steel Construction Manual (AISC), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), National Roofing Contractors Association (NRCA), National Institute of Standards and Technology (NIST), Asphalt Roofing Manufacturers= Association (ARMA), etc., shall be interpreted to refer to the most current edition or revision in effect at the time a design is in progress as this takes precedence.

1.5 ALL MATERIALS used for roofing systems shall be asbestos free.

1.6 A SITE VISIT to verify existing conditions and dimensions shall be made for all roof replacement and roof repair projects even when as-built drawings are provided. Where composition, thickness or make up of the existing roof system or any of its components cannot be determined by visual means alone, an exploratory investigation shall be conducted, to include dismantling or opening up a representative portion of the roof system. Patch and make watertight all areas disturbed during investigation.

2. STEEP SLOPE ROOFS

2.1 STEEP SLOPE ROOFS with a minimum slope of 2-1/2 inches per foot, may be finished with a standing seam metal or sheet metal system or a fiberglass shingle system surfaced with ceramic coated mineral aggregate. All steep slope roofs must have a full width (36") of modified bitumen ice dam protection membrane installed at all eaves and valleys.

2.2 STANDING SEAM METAL ROOFING SYSTEMS shall be fabricated metal panel systems from nominal 22 gauge G-90 galvanized steel conforming to ASTM A446 Grade A and ASTM A525. Alternative panel thickness of 24 gauge or 20 gauge may be considered based on an evaluation of roof framing and purlin spacing. All standing seams shall be double locked with a seam height no greater than 12 inches.

The system shall conform to the requirements of ANSI Publication A 58.1, the IBC Chapter 15, and the American Institute of Steel Construction Manual. The panels shall have a UL Class 120 rating and the

structural uniform uplift load capacity shall be in accordance with ASTM E330. The finish shall be equal to at least 70% Kynar and shall be tested in accordance with ASTM procedures. The system shall have a 20 year manufacturer's weatherproof warranty. The Kynar color finish shall also be covered by a 20 year manufacturer's warranty.

2.3 ASPHALT SHINGLES shall be reinforced with fiberglass wind resistant type, UL Class A, and comply with ASTM D3462 and ICBO ES AC 127. Shingle manufacturer shall provide a 40 (+) year warranty (minimum) covering repair or replacement of defective shingles as necessary to eliminate leaks. Ventilation must be accounted for, per shingle manufacturers recommendations. Metal drip edges must be installed on all eave and rake edges.

2.4 SPECIAL ROOFS: Under special conditions relating to aesthetic compatibility with surrounding buildings or historical consideration, the use of clay tiles, slate tiles, or cedar shakes may be deemed appropriate. In these cases specifications and details shall be developed in strict accordance with applicable national standards. The roofing tile or slate manufacturer/quarrier shall provide material defects warranty coverage of 20 years minimum to 50 years or more based on the specific roof material and facility under consideration.

2.5 STEEP SLOPE ROOFS shall be provided with adequate means for interior ventilation through eave or soffit louvers, ridge vents, ventilation boards and thermostatically controlled power fans to prevent moisture condensation and excessive heat under roofing or sheathing. Insulation shall be provided in the attic space above the ceiling and shall achieve an insulation value of R-38.

3 LOW SLOPE ROOFS

3.1 LOW SLOPE ROOFS shall be required to have a minimum slope of 1/4 inch per foot. New buildings shall be designed to achieve the minimum slope of 1/4 inch per foot structurally. Existing buildings may have to be provided with tapered insulation to achieve the minimum slope. Lightweight concrete shall not be used to create slope.

3.2 PRIOR TO PLACEMENT OF INSULATION and the roofing system, all low slope roof decks shall have:

A. Steel Deck: 1" perlite insulation mechanically fastened and 2 plies of fiberglass felts.

B. Concrete Deck: Asphaltic primer and 2 plies of fiberglass felts.

C. Nailable Decks: (other than Wood, Lightweight Concrete, Gypsum, and Tectum) Rosin-sized sheathing paper, 75 lb. ventilated base sheet, mechanical fasteners dictated by deck type, and 2 plies of fiberglass felts.

D. Wood Decks: Mechanically fasten 1" thick perlite insulation to deck and install 2 plies of fiberglass felts with hot asphalt.

(1) If wood deck is less than 3/4" thick, nail base sheet to deck and install 2 plies of fiberglass felt over base sheet.

3.3 ON LOW SLOPE ROOFS from 1/4 inch per foot to 2-1/2 inches per foot all felt plies shall be back-nailed on slopes greater than 2 inches per foot and the following roofing system shall be used:

A. Four Ply Built-up System: The system consists of four plies of roofing felts alternately placed, overlapped and saturated with hot asphalt bitumen. Gravel surfacing to be set in hot asphalt. Roofing felts shall be glass fiber and meet the requirements of Tables 1 and 2 ASTM D-2178 Type VI (Asphalt Impregnated). Steep roofing asphalt shall conform to ASTM D-312, Type III.

B. Single-Ply Membranes: Thermoplastic Polyolefin (TPO) membrane roof assemblies are acceptable, as long as all warranty requirements listed in 3.3C are met. All other single-ply

membranes, as well as vegetative ("green") roof assemblies, will be considered in some circumstances.

C. Warranty: The roofing system shall be covered by a 20 year Total System, No Dollar Limit (NDL) Warranty and must include all flashings and sheet-metal work. All materials and workmanship are to be fully guaranteed by the roofing manufacturer issuing the warranty. All materials must be manufactured by the manufacturer who is to supply the warranty. Any materials that are not made by the Roofing Materials Manufacturer but submitted for approval must be accompanied by a letter from the Roofing Materials Manufacturer issuing the 20 year NDL warranty, stating that this material is suitable for use with their system and fully covered under their 20 year NDL warranty.

4 INSULATION

4.1 ALL LOW SLOPE ROOFING SYSTEMS shall include insulation. The majority of insulating value shall be accomplished with the necessary thickness of flat poly-isocyanurate boards. Where necessary, roof slope shall be developed with tapered perlite or tapered poly-isocyanurate board. Organic insulation material shall not be used under built-up roofs. Light weight concrete insulating fill is not acceptable. In all cases a minimum 1/2" cover board must be installed over the Isocyanurate insulation. Perlite and "Densdeck" are acceptable cover board materials.

4.2 HEAT TRANSMISSION: Insulation heat transmission values shall be established in accordance with the Energy Conservation Guidelines, Chapter V and Code Update of 2019 DGS Procedures Manual. For new buildings the suggested insulation value of the roof area envelope is R-30CI (Cont. Insul.) for low slope roofs. For roof replacements/renovations on older buildings, a lower "R" value will be considered.

4.3 STRUCTURAL: The first ply of insulation systems over metal decks and wood decks shall be mechanically fastened using steel fasteners acceptable to the manufacturer furnishing guarantee of roofing system. Insulation shall also be installed in accordance with Factory Mutual System Class 120 wind uplift guidelines.

4.4 INSULATION shall be applied in several layers, with the joints staggered, in accordance with the manufacturer's recommendation.

4.5 COMPATIBILITY: Insulation material installed between the roof deck and the roof ply shall be compatible with the roof ply material and asphalt bitumen binder or other adhesive used in the roofing system.

4.6 WARRANTY: Insulation materials shall be considered an integral component of the roofing system, and shall be furnished or approved by the roofing system manufacturer, and shall be covered fully by the roofing system warranty.

5 FLASHING

5.1 BASE FLASHING is part of the roofing system and shall meet requirements of manufacturer furnishing roofing system. Where roof meets a parapet or adjacent building wall, the base flashing shall extend up the wall at least 8 inches, but generally not more than 14 inches unless necessary to be consistent with existing conditions or design requirements. If flashing height is greater than 14 inches, a 2 piece flashing system may be required.

5.2 OTHER FLASHING: Other than base flashing - metal flashing, including expansion joint flashing, shall be in accordance with SMACNA Standards and the NRCA Roofing and Waterproofing Manual and fully covered under the 20 year NDL warranty.

5.3 PITCH POCKETS SHALL BE AVOIDED. Where that is not possible, pitch pockets shall be filled with a pourable urethane sealer. Roof penetrations will be flashed with preformed flexible flashing, using clamps and tents, unless the penetration is such a complex shape that a pitch pocket is required.

5.4 ALL PARAPET WALLS must be covered with a metal coping cap over a peel and stick type modified bitumen membrane and any necessary wood blocking/nailers, etc.

6 ROOF DRAINS

6.1 ROOF DRAINS shall be provided with shallow sumps, gravel stops, and minimum 4.0 pound lead flashing in accordance with the NRCA Roofing and Waterproofing Manual and the International Plumbing Code.

6.2 ROOF DRAINS shall be located wherever possible at the low points, and crickets must be provided between drains in structurally formed valleys and around any structure impeding the flow of water in the drain field to assure positive water flow to the drains.

6.3 ROOF DRAINAGE PATTERNS should be designed to locate roof drains at the mid-points between columns and beams. Overflow scuppers should be provided through perimeter parapet walls, or overflow relief drains should be provided at roof drain locations, to relieve storm water build-up caused by clogged roof drains.

6.4 ROOF DRAINAGE that is directed to exterior downspouts, splash blocks shall be provided at all ground discharge points. Where possible, downspouts may discharge directly into a storm drainage system.

6.5 GENERAL DESIGN AND INSTALLATION OF ROOF DRAINAGE SYSTEM shall comply with Section 1502 of IBC, and Section 1106 and 1108 of IPC.

7 ROOF ACCESS

7.1 PERMANENT ACCESS to all roof areas from the inside of the building shall be provided (with a roof hatch and a ship type ladder) for all buildings over two stories high with low slope roofs.

7.2 ROOF ACCESS for one and two story buildings with low slope roofs and for buildings with steep slope roofs will be evaluated based on building and roof configuration and roof type.

7.3 EXTERIOR ACCESS must be provided for all multi-level roofs from the second story up.

8 ROOF MOUNTED EQUIPMENT

8.1 ROOF MOUNTED EQUIPMENT shall be minimized; penthouse enclosures of equipment are preferred.

8.2 ROOF MOUNTED EQUIPMENT shall be installed on curbs and provided with suitable vibration isolation devices and proper flashing.

8.3 IF IT IS NECESSARY TO MOUNT EQUIPMENT ABOVE THE ROOF, without using a curb, sufficient clearance shall be provided under the equipment to permit maintenance of the roofing system, as well as adequate clearance for future roof replacement.

8.3 EQUIPMENT SCREENS must be provided to conceal all roof top equipment.

8.4 INORGANIC WALKING PADS shall be provided from roof access to roof mounted equipment. Modified bitumen membrane is acceptable.

9 CONTRACTOR'S GUARANTEE

9.1 THE CONTRACTOR must have at least 5 years' experience installing the type of roofing they are bidding on.

9.2 THE CONTRACTOR must be a NDL certified roofing system installer for at least 5 years continuously (currently), and must provide to the State a current letter from a roofing materials

manufacturer stating this and that their workmanship, including flashings and sheet-metal work, will be fully covered by the Manufacturer's 20 year NDL warranty, without exception.

9.3 THE CONTRACTOR must also provide the State with a minimum 2 year workmanship guarantee.

10 GREEN ROOFING SYSTEMS (see section 3.3B)

10.1 GREEN ROOFING SYSTEMS shall comply with the requirements of 2018 International Building Code (IBC), Chapters 15 and 16, and High Performance Green Building Program of 2019 DGS Procedure Manual. All systems must comply with ANSI/SPRI VF-1 and current ANSI wind design guidelines.

10.2 INTENSIVE GREEN ROOFS shall be designed for uniform design live load in the landscaped area as indicated in section 1607.13.3.1 of IBC 2018. The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil.

10.3 EXTENSIVE GREEN ROOFS shall be designed for a minimum uniform live load of 100 psf as per Table 1607.1 of IBC 2018.

10.4 THERMO PLASTIC SINGLE PLY ROOFING shall comply with Chapter 15 of the IBC and shall have a minimum slope of 1/4" + 1'-0" (2%). The roof covering shall comply with ASTM D6878.

10.5 PHOTOVOLTAIC PANELS AND MODULES installed on a roof shall comply with requirements of IBC 2018 and International Fire Code.

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