

DIVISION 07 - THERMAL & MOISTURE PROTECTION**DESIGN CRITERIA**

General Design Requirements:

1. When designing roof access ladders and stairways to roof shall not be alternating tread type.
2. Provide 18 gauge flashing at roof locations accessible to students or building occupants to prevent damage and vandalism.
3. All rooftop mounted equipment shall be mounted on platforms.
4. All platforms (curbs) shall be a minimum of 8 inches in height from the finished roof surface. Walk-pads shall be provided from roof access points to and around all rooftop equipment.
5. All conduits and piping shall have a 4 inch minimum height and all conduit and piping supports shall be made from DURA-BLOK as supplied by Cooper B-Line, Inc. Roof Topper by Arlington, Safety Yellow Pipeguard, or equal.

For renovation projects: When rooftop equipment is removed from roof, all associated components shall be removed as well. This includes: complete removal of any curbs, supports, piping, conduits, electrical lines, blocking, etc.

Fall Protection: All areas that expose workers to a fall of six feet or greater shall be protected by parapet walls or permanent guardrails that comply with Cal OSHA Title 8 section 3209. When guardrails or parapets are not feasible, provide one of the following:

1. Horizontal Lifelines as part of a complete fall arrest system that is compliant with Cal OSHA Title 8 section 1670 designed by a "Qualified Person" as defined by ANSI/ASSE Z359.0-2007-2.109.
2. Anchorages that comply with Cal OSHA Title 8 section 1670 as designed by a "Qualified Person" as defined by ANSI/ASSE Z359.0-2007-2.109.

DAMPPROOFING AND WATERPROOFING**07 10 00**

For more information, refer to the University's Standard Specification Section 07 25 00 Water Resistive Barrier System.

SHEET WATERPROOFING**07 13 00**

On all below grade applications: Prior to installation of any product all areas shall be clean and have an approved primer applied per manufacturer's specification. All non-exposed areas shall be a minimum of 40mil self-adhering sheet, composed of butyl rubber based adhesive, backed by a layer of protection board separating it from contact with soil or other damaging properties. Grace Ice & Water Shield self-adhered underlayment; or equal. For special applications only, consult University's Representative before applying.

WATER REPELLENTS**07 19 00**

All exterior exposed masonry and concrete (to receive no other finish) shall be treated with a clear penetrating waterproofing.

COMPOSITION ROOFING**07 31 13**

Composition roofing shall be installed in accordance with current NCRA guidelines for installation and shall have a minimum 40 year warranty. Composition roofing Systems shall meet the following standards:

1. UL 997
2. ASTM D3018 TYPE 1
3. ASTM D3161 TYPE 1, CLASS F
4. ASTM D3462

Fasteners shall be in accordance with the manufacturer's specifications for application.

Type 30 felt underlayment or better shall be used. For special applications consult University's Representative before applying.

CLAY AND CONCRETE TILE ROOFING**07 32 00**

All roofing tile shall be installed in accordance with the manufacturer specifications.

A minimum of two layers Type 30 Felt underlayment or better shall be installed. For special applications, consult University's Representative before applying.

Tiles shall be installed on an elevated battened system. For special applications, consult University's Representative before installing.

Fasteners shall be in accordance with the manufacturer specifications for the application used.

WOOD SHINGLE ROOFING**07 31 29.13**

FIRE-RETARDANT SHINGLES: A fire-retardant roof covering that is at least Class C shall be installed.

VALLEY FLASHING: Flashing shall not be less than 26-gauge and shall extend 11-inches (8-inches for shingles) from the centerline each way. End laps shall not be less than 4-inches. A 36-inch-wide, 30-pound felt underlayment shall be placed under the metal flashing.

WOOD SHINGLE APPLICATION: Shingles shall be laid with a side lap of not less than 1-1/2-inch between joints in adjacent courses and not in direct alignment in alternate courses. Spacing between shingles shall be approximately 1/4-inch. Each shingle shall be fastened with two nails positioned approximately 3/4-inch from each edge and approximately 1-inch above the exposure line. Starter courses at the eaves shall be doubled. Fasteners shall be long enough to penetrate into the sheathing 3/4-inch or through the thickness of the sheathing, whichever is less.

FASTENERS, TREATED SHINGLES: Due to the corrosive nature of the treating material used for treated shakes or shingles, the fasteners used shall be hot-dipped galvanized, aluminum or stainless steel.

WOOD SHAKE ROOFING**07 31 29.16**

FIRE-RETARDANT SHINGLES: A fire-retardant roof covering that is at least Class C shall be installed.

WOOD SHAKE APPLICATION: Shakes shall be laid with a side lap of not less than 1-1/2-inch between joints in adjacent courses. Spacing between shakes shall be not less than 3/8-inch or more than 5/8-inch except for treated shakes, which shall have a spacing of not less than 1/4-inch

or more than 3/8-inch. Shakes shall be fastened with two nails only, positioned approximately 2-inches above the exposure line. The starter course at the eaves shall be doubled using shakes or shingles as the bottom course. Fasteners shall be long enough to penetrate into the sheathing 3/4-inch or through the thickness of the sheathing, whichever is less.

VALLEY FLASHING: Flashing shall not be less than 26-gauge and shall extend 11-inches from the centerline each way. End laps shall not be less than 4-inches.
A 36-inch-wide, 30-pound felt underlayment shall be placed under the metal flashing.

FASTENERS, TREATED SHAKES: Due to the corrosive nature of the treating material used for treated shakes or shingles, the fasteners used shall be hot-dipped galvanized, aluminum or stainless steel.

ROOFING AND SIDING PANELS	07 40 00
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All metals used shall be prefinished Zinalume/Galvalume sheetmetal or G-90 galvanized steel in minimum 24 gauge as described in ASTM A792.

METAL PANEL ROOFING	07 41 13
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Standing seam roofing system shall consist of integral self-locking seams with a minimum seam height of 1-3/4 inches. Standing seam roofing system shall have no exposed fasteners. Panels shall have clips designed to allow for thermal expansion and contraction.

Type 30 felt underlayment or better. For special applications, consult University’s Representative before applying. Sealants shall be gunnable grade single component polyurethane caulk or gunnable grade butyl. Tape Sealant shall be Butyl.

Manufacturer shall provide a standard 35 year coating performance warranty. All installations shall be in accordance with specified manufacturer guidelines.

SINGLE-PLY MEMBRANE ROOFING	07 54 00
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Polyvinyl Chloride (PVC) Single-Ply Membrane Roofing System (SMR) is the standard thermoplastic membrane roofing system for low sloped applications. Thermoplastic Olefin (TPO) membranes are not approved for Campus installations. SMR systems shall be fully adhered or mechanically fastened qualifying for a UL Class A Roof Covering with Factory Mutual 1-90 Windstorm Classification as needed to meet the current code requirements for the ultimate design wind speed designated for the building classification. The SMR system shall be covered by the material manufacturer’s 20-Year Total System Warranty covering all roofing components installed above the roof deck upon completion and acceptance of Work.

All roofing systems shall meet ASTM standards per their respective systems. Roofing materials shall meet ASTM D4434, minimum 60 mil thickness and have a Solar Reflectance Index (SRI) as required below for a minimum of 75 percent of the roof surface. (Product shall meet current CA Title 24 Requirements for reflectivity.)

Roof Type	Slope	SRI
Low-Sloped Roof	≤ 2:12	78
Steep-Sloped Roof	> 2:12	29

For special applications, consult University's Representative before applying. All installations shall be in accordance with manufacturer recommendations.

Products: The following SMR systems are listed to establish a standard of quality:

1. Plasticized Polyvinyl Chloride (PVC): Sarnafil S327, manufactured by Sarnafil, Inc.; EGSR-60 Roofing Membrane distributed by Everguard/GAF; or equal.

Emissions: The following maximum emissions are listed in grams per liter.

1. Trowelable Mastic and Pitch Pocket Sealant: 450
2. Sealant: Refer to Section 07 92 00 Water Resistive Barrier System
3. Adhesive: 250

ROOF SPECIALTIES AND ACCESSORIES	07 70 00
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Roof Hatches:

1. Standard Roof Hatch size is 30 inches by 36 inches. For special applications or sizes, consult the University's Representative. Roof hatches that are larger than the standard size shall require hydraulic or spring loaded hinges.
2. Roof hatches shall be designed to comply with Cal OSHA Title 8 section 3212 and to provide safe egress and ingress through roof and access hatches
3. Roof hatches shall be designed such that opening and closing of the roof hatch can be done with three points of contact on the ladder at all times.
4. Where no roof hatch is provided, a fixed ladder shall be provided that complies with Cal OSHA Title 8 section 3277.
5. Consideration shall be given for the safe exit and approach to the hatch and ladder. The roof hatch shall be located such that there is a sufficient clear space directly in front of the ladder at the roof level.

ROOF ANCHORS AND ACCESSORIES	07 72 69
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A. GENERAL

All fall protection systems shall comply with Federal OSHA and Cal OSHA Title 8 requirements, in which the most stringent shall apply. Whenever possible, projects shall be designed in such a way that specialty equipment and/or personal protective equipment shall not be required for fall protection. <https://www.ecfr.gov/cgi-bin/text-idx?SID=f5a6aa0fc0bd289292b25de5e2d94743&mc=true&node=sp29.5.1910.d&rgn=div6> Compliance may be a combination of 42-inch parapets, guardrails or low profile anchorage points. No exceptions unless authorized by University's Representative. For additional information, refer to the University's Standard Specification Section 07 72 69 Roof Anchors and Accessories.

When an alternative fall protection system is agreed by University's Representative, the project shall strictly adhere to the following requirements for all permanently installed fall protection equipment, including anchors, horizontal lifelines, vertical lifelines, fall arrest, restraint, or positioning, ladder safety systems, and other active fall protection systems in accordance with the latest revision of the ANSI 359.6 standard.

B. THE DESIGN PROFESSIONAL SHALL:

1. Identify where fall protection is required and review with University Representative.
2. Define the type of fall protection system being designed (fall arrest, restraint or positioning).
3. Confirm system components shall meet the ANSI Z359 standard.
4. Provide dedicated fall protection drawings showing the layout of the system.
5. The structural engineer to provide calculation for following:
 - A. Minimum required strength of anchorages
 - B. Sizes and minimum breaking strengths
 - C. Maximum arrest load (MAL)
 - D. Maximum loading on all components demonstrating the fall protection equipment/system will meet the lb.-f requirements as designed and defined in Table 1 below
 - E. Detail drawing and additional requirements to meet the project needs.
6. Provide necessary specification.
7. Require Contractor to provide shop drawing and calculations.
8. Fall protection design can be a deferred submittal. Consult with University’s Representative for direction to clearly identify submittal requirements.

TABLE 1

Fall Protection System	Certified Anchor	Non-Certified Anchor
Fall arrest	2 times max. arresting force	5000 lb
Work positioning	2 times foreseeable force	3000 lb
Fall restraint	2 times foreseeable force	1000 lb
Rescue	5 time applied load	3000 lb
Horizontal lifeline	2 times max. line load	Not applicable

C. INSTALLING CONTRACTOR REQUIREMENTS:

1. Identify fall protections systems (i.e. anchors, horizontal lifelines, vertical lifelines, fall arrest, restraint, or positioning, ladder safety systems, and other active fall protection systems).
2. Shall be responsible for providing documentation illustrating ANSI Z359.6 compliance.
3. Demonstrate compliance with design requirements.
4. Show number of workers and provide minimum/maximum forces the system is designed to support in the event of a fall to include the following:

- A. Maximum arrest force (MAF)
- B. Deployment of energy absorbers
- 5. Show compliance with Table 1 shown above.
- 6. Provide the manufacturer, make/model and serial numbers of all system components being installed.
- 7. Provide shop drawing with supporting details and calculations.
- 8. Provide for horizontal lifelines to include the following data:
 - A. Sag, deflections, elongation and fall arrest
 - B. Harness effect and D-ring slide
 - C. Temperature impacts
 - D. Clearance requirements given these factors.
- 9. Provide additional items to meet ANSI and project specific requirements for acceptance.
- 10. Provide the manufacturer’s instructions for inspection and maintenance.
- 11. Certify compliance with ANSI Z359.6 and submit certification for acceptance.

JOINT SEALANTS	07 92 00
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Detail all special conditions. All materials used shall be top-of-the line available suited for the conditions being sealed and in compliance with the following VOC requirements.

Sealants	Max g/L
Architectural	250
Non-membrane Roof	300
Single Ply Roof Membrane	450
Other	420
Sealant Primers	
Architectural – nonporous	250
Architectural – porous	775
Modified Bituminous	500
Other	750
Requirements from South Coast Air Quality District Rule 1168 (01/07/05) except for aerosol adhesive requirements which come from Green Seal Standard GS 36 (10/19/00). Applicable definitions apply.	

End of Division 07