TESTING APPLICATION STANDARD (TAS) No. 110-2000

TESTING REQUIREMENTS FOR PHYSICAL PROPERTIES OF ROOF MEMBRANES, INSULATION, COATINGS AND OTHER ROOFING COMPONENTS

1. General

1.1 Approved roof assemblies and the Roofing Components therein shall be in compliance with the applicable ASTM Standards, and those outlined in this Testing Application Standards herein. Products not addressed herein shall be tested according to the authority having jurisdiction.

2. Conventional Asphalt Built-up and Modified Bitumen Roof Assemblies

2.1 Conventional built-up and modified bitumen roof assemblies shall be tested in compliance with the requirements set forth in TAS 114.

2.2 Roofing components within asphalt built-up and modified bitumen roof assemblies shall be in compliance with the following requirements, as applicable.

PRODUCT	TEST STANDARD
Membrane or Roll Roofing Products	
Asphalt Cap Sheets	D 228
Asphalt Coated Fiberglass Base Sheet	D 4601
Asphalt Glass Felt for Roofing	D 2178
Asphalt Coated Fiberglass Vented Base	D 4897
Asphalt Coated Organic Base Sheet	D 2626
Asphalt Organic Roll Roofing	D 371
Asphalt Saturated Felt (Spec.)	D 250
Asphalt Saturated Felt	D 226
Roll Roofing, Glass Mat, Granule Surface	D 3909
Roll Roofing, Organic, Smooth Surface	D 224
Roll Roofing, Organic, Granule Surface	D 6380 Class M
Modified Bitumen Membranes	D 5147 D 6162 D 6163 D 6164
Mechanically Attached Anchor or Base Sheets	TAS 117(B)
Other Components	
Asphalt Used In Roofing	D 312
Asphalt Roof Cement (Asbestos Free)	D 4586

PRODUCT	TEST STANDARD
Membrane or Roll Roofing Products	
Asphalt Lap Cement	D 4022
Cement Wet/Underwater Application	D 3409
Emulsified Asphalt Adhesive	D 3747
Asphalt Primer	D 41
Lap Cement Used in Asphalt Roll Roofing	D 3019
Mineral Aggregate	D 1863
Insulation	See Section 8 herein
Fasteners, Stress Plates, etc.	See Section 13 herein

3. Coal-Tar Pitch Built-up Roof Assemblies:

3.1 Coal-tar pitch built-up roof assemblies shall be tested in compliance with the requirements set forth in TAS 114.

3.2 Roofing components within coal-tar pitch built-up roof assemblies shall be in compliance with the following requirements, as applicable.

PRODUCT	TEST STANDARD
Membrane or Roll Roofing Products	
Coal-Tar Roofing Felts	D 4990
Coal-Tar Saturated Felts	D 227
Mechanically Attached Anchor or Base Sheets	TAS 117(B)
Other Components	
Coal-Tar Pitch	D 450
Coal-Tar Roof Cement	TAS 142
Coal-Tar Primer	D 43
Insulation	See Section 8 of this Protocol
Fasteners, Stress Plates, etc.	See Section 13 of this Protocol

[1] Dynamic pull-over testing of all anchor or base sheets used in Approved roof assemblies shall be in compliance with TAS 117(B).

4. Single-Ply Roof Assemblies:

4.1 Single-ply roof assemblies shall be tested in compliance with the requirements set forth in Testing Application Standard TAS 114.

4.2 Roofing components within single-ply roof assemblies shall be in compliance with the following requirements, as applicable.

5. Liquid Polyethylene Roof Assemblies:

5.1 Liquid applied neoprene and chlorinated polyethylene membrane (CPM) roof assemblies shall be tested in compliance with the requirements set forth in TAS 114.

5.2 Liquid applied neoprene and chlorinated polyethylene membrane (CPM) shall be in compliance with ASTM D 3468.

PRODUCT	TEST STANDARD
Membrane Products	
Thermoplastic Sheet Roofing (Spec.)	D 4434
Vulcanized Rubber Sheet Roofing - EPDM (Spec.)	D 4637
Poly-isobutylene Sheet Roofing - PIB (Spec.)	D 5019
Polyethylene Chlorinated Polyethylene Sheet Roofing – CMS (Spec.)	D 5019
Hypalon Sheet Roofing	D 5019
Thermoplastic Olefin Elastomer Sheet Roofing - TPO	TAS 131
All Single-Ply Membranes	TAS 117(B)
Other Components	
Sealants	TAS 132
Insulation	See Section 7 of this Protocol
Fasteners, Stress Plates, etc.	See Section 12 of this Protocol

[1] Dynamic pull-over testing of single-ply membranes TAS 117(B) is not required for those mechanically attached single-ply roof assemblies tested for uplift pressure resistance in compliance with Appendix 'B' of TAS 114.

6. Spray-Applied Polyurethane Foam Roof Assemblies:

6.1 Spray-applied polyurethane foam roof assemblies shall be tested in compliance with the applicable requirements set forth in TAS 114. As an alternative to uplift pressure resistance tests noted in TAS 114, spray-applied polyurethane foam roof assemblies may be tested for uplift pressure resistance in compliance with UL 1897.

6.1.2 RAS 109 includes requirements regarding field uplift resistance testing in compliance with TAS 124 and small scale adhesion testing in compliance with TAS 109(A). These tests shall be performed based on requirements set forth in RAS 109.

6.2 Spray-applied polyurethane foam shall be in compliance with the following physical property requirement.

Physical Property	Test Standard	Requirement
Water Absorption (@ 73.4°F + 3.6°F for 96 hours @ 2 in. head)	D 2842	max. 0.10 psf (surface area) or max. 1.0% (by volume)
Dimensional Stability (@160°F and 100% relative humidity for 28 days)	D 2126	max. 15% by volume
Water Vapor Permeability (@ 74°F)	E 96	max. 2.5 perm·inch
Compressive Strength (@ yield parallel to rise)	D 1621	min. 40 psi
Tensile Strength	D 1623	min. 60 psi
Shear Strength	C 273	min. 35 psi
Closed Cell Content	D 1940 D 2856	min. 90%
Uplift Resistance	TAS 114 or UL 1897	min. -45 psf

7. Coatings:

7.1 Roof coatings shall be in compliance with the following requirements, as applicable.

Product	Test Standard
Liquid Applied Acrylic Roof Coating Used in Polyurethane Foamed Roofing	ASTM D 6083
White Elastomeric Roof Coating	ASTM D 6083
Coal-Tar (Cutback) Roof Coating	TAS 141
Non-Fibered Roof and Foundation Coating	TAS 140
White Roof Patch	TAS 139
Aluminum Pigmented Emulsified Asphalt Roof Coating	TAS 138
Asphalt Roof Coating (Asbestos Free)	D 4479
Emulsified Bitumen Roof Coatings	D 1227

8. Roofing Insulation:

8.1 Roofing insulation products shall be approved for use with specific roof assembly and shall be listed in such roof assembly Product Approval.

8.2 Roof and sheathing insulation products used in approved roof assemblies shall be in compliance with the following requirements, as applicable.

Physical Property	Test Standard	Requirement
Expanded Polystyrene (EPS)		
Standard Specification	C 578	Type IX
Density	C 303	nom. 1.8 lbs/ft^3
Compressive Strength	D 1621	min. 25 psi
Flexural Strength	C 203	min. 50 psi
Thermal Resistance	C 518	
Water Absorption	C 272	max. 2.0%
Water Vapor Permeance	E 96	max. 2.5 perm
Dimensional Stability	D 2126	max. -2%
Flame Spread	E 84	max. < 75
Extruded Polystyrene (XPS)		
Standard Specification	C 578	Type IV
Density	C 303	nom. 1.6 lbs
Compressive Strength	D 1621	min. 20 psi
Flexural Strength	C 203	min. 50 psi
Thermal Resistance	C 518	
Water Absorption	C 272	max. 0.30%
Water Vapor Permeance	E 96	max. 1.0 perm
Dimensional Stability	D 2126	max. 2%
Flame Spread	E 84	max. < 75
Fiberglass/Mineral Woodfiber		
Standard Specification	C 726	
Compressive Strength	C 165	min. 30 psi
Thermal Resistance	C 518	
Water Absorption	C 209	max. 10%
Water Vapor Permeance	E 96	max. 0.3 perm
Flame Spread	E 84	max. 20
Linear Expansion	C 208 Class C & E	max. 0.5%
Wood Fiberboard		
Standard Specification	C 209	
Water Absorption	C 209	max. 10%
Compressive Strength	C 165	nominal 30 psi
Thermal Resistance	C 518	
Perlite		
Standard Specification	C 728	
Compressive Strength	C 165 Procedure "A"	min. 35 psi
Flexural Strength	C 203	min. 40 psi
Tensile Strength	C 209	575 lb/ft^2
Thermal Resistance	C 518	
Water Absorption	C 209	max. 1.5%
Water Vapor Permeability	C 355	max. 25 perm-inch
Dimensional Stability	D 2126	max. 2%
Flame Spread	E 84	max. < 75

Physical Property	Test Standard	Requirement
Polyisocyanurate		
Density	D 1622	nominal 2 pcf
Compressive Strength	D 1621	min. 18 psi
Thermal Resistance	C 518 PIMA CP 101	report
Water Absorption	C 209	max. 1.0%
Water Vapor Permeance	E 96	max. 1.0 perm
Dimensional Stability (7Days)	D 2116	max. 2%
Flame Spread	E 84	max. < 75
Spread of Flame (with Roof Cover)	E 108	min. Class 'B'

9. Fiber Cement, Discontinuous Roof Assemblies

9.1 Fiber cement, discontinuous roof assemblies shall be installed in compliance with the requirements set forth in the roof assembly Product Approval.

Product	Test	Test Standard
Fiber Cement Roof Assembly	Wind Driven Rain Resistance	TAS 100
Fiber Cement Roofing Products	Physical Properties	TAS 135
Mechanical Attached Fiber Cement Tile or Shake Roof Assemblies (Uplift Based System)	Static Uplift Resistance	TAS 102(A) (See TAS 135 for details)
Mechanically Attached, Clipped Fiber Cement Tile or Shake Roof Assemblies (Uplift Based System)	Static Uplift Resistance	TAS 102(A) (See TAS 135 for details)
Fiber Cement Panel Roof Assemblies	Uplift Pressure Resistance	E 330 (See TAS 135 for details)
Underlayment		
Self-Adhered Underlayments	Physical Properties	TAS 103
Nail-On Underlayments	Physical Properties	TAS 104
Asphalt Based Underlayments	Physical Properties	See Section 2 of this Protocol
Attachment Components		
Nails, Screws, Clips, etc.	Corrosion Resistance	Appendix E of TAS 114

All Underlayments with exposure limitation in excess of 30 days must submit enhanced Accelerated Weathering testing in conjunction with applicable Physical Properties testing. Exposure limitations up to a maximum of 180 days will be established through ASTM D 4798 as outlined in ASTM D 5147 for 1000 hours (cycle A); pass /fail established by physical properties testing of the weathered samples. Physical property testing where specimen size will not fit into the accelerated weathering device may be omitted.

9.2 All fiber cement, discontinuous roof assemblies, and the roofing components therein, shall be tested in compliance with the following requirements, as applicable.

10. Non-Rigid, Discontinuous (Shingle) Roof Assemblies:

10.1 Non-rigid, discontinuous roof assemblies shall be installed in compliance with the requirements set forth in the roof assembly Product Approval.

10.2 All non-rigid, discontinuous roof assemblies, and the roofing components therein, shall be tested in compliance with the following requirements, as applicable.

Product	Test	Test Standard
Non-Rigid, Discontinuous Roof Assembly	Wind Driven Rain Resistance	TAS 100
Non-Rigid, Discontinuous Roof Assembly	Wind Resistance	TAS 107
Non-Rigid, Discontinuous Roof Assembly	Fire Resistance min. Class 'B'	E 108 min. Class 'B'
Granule Surfaced, Glass Felt Asphalt Shingles	Physical Properties	D 3462
Granule Surfaced, Class 'A' Asphalt Shingles Fiberglass Reinforced	Physical Properties	D 3018 TAS 135
Composite Shingles Fiber Cement Shingles	Physical Properties	TAS 135
Metal Shingles	Salt Spray and Accelerated Weathering	B 117 and G 23
Underlayment		
Self-Adhered Underlayments	Physical Properties	TAS 103
Nail-On Underlayments	Physical Properties	TAS 104
Asphalt Based Underlayments	Physical Properties	See Section 2 of this Protocol
Attachment Components		
Nails, Screws, Clips, etc	Corrosion Resistance	Appendix E of TAS 114

All Underlayments with exposure limitation in excess of 30 days must submit enhanced Accelerated Weathering testing in conjunction with applicable Physical Properties testing. Exposure limitations up to a maximum of 180 days will be established through ASTM D 4798 as outlined in ASTM D 5147 for 1000 hours (cycle A); pass/fail established by physical properties testing of the weathered samples. Physical properties testing where specimen size will not fit into the accelerated weathering device may be omitted.

11. Rigid, Discontinuous (Tile) Roof Assemblies:

11.1 Rigid, discontinuous roof assemblies shall be applied in compliance with the requirements set forth in the roof assembly Product Approval.

11.2 All rigid, discontinuous roof assemblies, and the roofing components therein, shall be tested in compliance with the following requirements, as applicable.

Product	Test	Test Standard
Mechanically Attached Rigid, Discontinuous Roof Assembly	Wind Driven Resistance	TAS 100
Mechanically Attached Rigid, Discontinuous Roof Assembly	Static Uplift Resistance	TAS 102
Mechanically Attached Clipped, Rigid, Discontinuous Roof Assembly	Static Uplift Resistance	TAS 102(A)
Mortar or Adhesive Set Tile Roof Assembly	Static Uplift Resistance	TAS 101
Rigid, Discontinuous Roof Assembly	Wind Tunnel Performance	TAS 108
Rigid, Discontinuous Roof Assembly	Air Permeability	TAS 116

Notes:
1. Wind tunnel testing of rigid, discontinuous roof assemblies is optional and is only applicable to systems having rigid components which meet the size constraints set forth in TAS 108.
2. Air permeability testing of rigid, discontinuous roof assemblies is only applicable to those systems which are to be tested in compliance with TAS 108 and is not required for those systems generally considered to be air permeable. This is a test to confirm the roof assembly would apply to wind tunnel testing.
3. All Underlayments with exposure limitation in excess of 30 days must submit enhanced Accelerated Weathering testing in conjunction with applicable Physical Properties testing. Exposure limitations up to a maximum of 180 days will be established through ASTM D 4798 as outlined in ASTM D 5147 for 1000 hours (cycle A); pass/fail established by physical properties testing of the weathered samples. Physical properties testing where specimen size will not fit into the accelerated weathering device may be omitted.

12. Steel:

12.1 Galvanized steel shall be in compliance with Standard A 525.

13. Mechanical Attachment Components:

13.1 All nails, metal fasteners, batten bars and stress distribution plates shall be tested for corrosion resistance in compliance with Appendix E of TAS 114.

13.1.1 All roofing nails and tin-caps shall be tested for corrosion resistance in compliance with TAS 114 Appendix E, Section 2 (ASTM G 85).

13.1.2 All roof tile nails or fasteners, except those made of copper, monel, aluminum, or stainless steel, shall be tested for corrosion resistance in compliance with TAS 114 Appendix E, Section 2 (ASTM G 85), for salt spray for 1000 hrs.

13.2 Fasteners for attachment of anchor or base sheets, insulation products or single-ply membranes to various substrates shall be tested for withdrawal resistance in compliance with TAS 117(A).

13.3 Metal stress plates, whether separate or integral to a particular fastener, shall be tested in compliance with TAS 117(B) with various anchor or base sheets or sin-

Product	Test	Test Standard
Concrete Roof Tile	Physical Properties	TAS 112
Clay Roof Tile	Physical Properties	C 1167
Fiberglass Reinforced Composite Tile	Physical Properties	TAS 135
Fiber Cement Tile or Shakes	Physical Properties	TAS 135
Slate	Physical Properties	C 406
Underlayment		
Self-Adhered Underlayments	Physical Properties	TAS 103
Nail-On Underlayments	Physical Properties	TAS 104
Asphalt Based Underlayments	Physical Properties	See Section 2 of this Protocol
Attachment Components		
Nails, Screws, Clips, etc.	Corrosion Resistance	Appendix E of TAS 114
Mortar (for use in mortar set tile Roof System Assemblies	Physical Properties	TAS 123
Adhesive (for use as a repair or supplemental attachment component)	Physical Properties	TAS 123(A)

gle-ply membranes (i.e. the type of product the plate is design to attach) to determine the dynamic pull-through performance of the particular membrane with the particular stress plate.

13.3.1 For single-ply membranes, if the mechanically attached, single-ply roof assembly is tested for dynamic uplift pressure resistance in compliance with Appendix B of TAS 114, then no dynamic pull-through testing is required for the metal stress plate/membrane combination used in the dynamic uplift pressure testing.

13.4 Metal and plastic stress plates, whether separate or integral to a particular fastener, shall be tested in compliance with TAS 117(C) to determine the dynamic pull-off performance of the particular stress plate.

13.4.1 For single-ply membranes, if the mechanically attached, single-ply roof assembly is tested for dynamic uplift pressure resistance in compliance with Appendix B of TAS 114, then no dynamic pull-off testing is required for the metal or plastic stress plate/membrane combination used in the dynamic uplift pressure testing.

14. Attic Ventilation Products:

14.1 All approved attic ventilation products (i.e. soffit vent strips, ridge vents, static vents, louvers, turbines and/or powered vents) shall be sized and installed in compliance with the requirements set forth in the Product Approval.

14.2 Approved attic ventilation products shall be in compliance with the following requirements, as applicable.

15. Metal Panel Roof Assemblies:

15.1 All structural and nonstructural metal panel roof assemblies, and the roofing components therein, shall be tested in compliance with the following requirements, as applicable.

Product	Test	Test Standard
Attic Ventilation Products (*soffit vent strips, ridge vents, static vents, louvers, turbines, powered vents, etc.*)	Wind and Wind-Driven Rain Resistance	TAS 100(A)
'Small' Protruding Ridge Ventilation Products (*static vents, louvers, turbines, powered vents, etc.*)	Increased Wind Speed Resistance	TAS 100(A)
'Large' Protruding Ridge Ventilation Products (*turbines, powered vents, etc.*)	Pressure Resistance	TAS 100(B)
Plastic Ridge Vents	Sunlight Resistance	D 1929
Plastic Ridge Vents	Burning Resistance	D 635

Product	Test	Test Standard
Structural and Non-Structural Metal Panel Roof Assembly	Standard Requirements	TAS 125
Structural and Non-Structural Metal Panel Roof Assembly	Fire Resistance	E 108 (min. Class “B”)
Structural and Non-Structural Metal Panel Continuous Roof Assembly	Accelerated Weathering	G 23 or G 26 (2000 hours)
Structural or Non-Structural Metal Panels	Salt Spray	B 117 (1000 hours)
Insulated Metal Panels	Thermal Value	C 518 (report)

16. Edge Metal and Flashings:

16.1 Edge metal and flashings and their installation shall be in compliance with the requirements set forth in RAS 111.

16.1.1 Edge metal, including drip edge/gravel stop and metal profiles, may be tested for attachment performance in compliance with TAS 111(A) and TAS 111(B), the results from which shall be used to determine adequate attachment to resist wind induced upward and

outward forces, as set forth in Chapter 16 of this code.

16.1.2 Coping caps shall be tested for attachment performance in compliance with TAS 111(C), the results from which shall be used to determine adequate attachment to resist wind induced upward and outward forces, as set forth in Chapter 16 *Florida Building Code, Building*.

17. Non-Rigid Tiles/Shakes/Slate/Shingles Products (Plastic):

17.1 Non-Rigid, discontinuous roof assemblies shall be applied in compliance with the requirements set forth in the roof assembly Product Approval.

17.2 All non-rigid, discontinuous roof assemblies, and roofing components therein, shall be tested in compliance with the following requirements, as applicable.

Product	Test	Test Standard
Non-Rigid, Discontinuous Roof Assembly	Wind Driven Rain Resistance	TAS-100
Plastic Tile/Shake/Slate Systems	Uplift Performance	TAS-125
Plastic Tile/Shake/Slate	Outdoor Exposure Xenon Arc	G 26 (6500 watts) Test Method 1 or G155 (4500 hours)
	Tensile Test	D 638 (+/- 10% allowable difference between exposed and non-exposed samples)
	Flexural Test	C 158 (+/- 10% allowable difference between exposed and non-exposed samples)
Plastic Tile/Shake/Slate	Self Ignition	D 1929 (greater than 650°F)
Plastic Tile/Shake/Slate	Smoke Density Rating	E 84 (rating less than 450) or D2843 (rating less than 75)
Plastic Tile/Shake/Slate	Rate of Burning	D 635 (Class C1 or C2)
Underlayment		
Self Adhered Underlayments	Physical Properties	TAS-103
Nail-On Underlayments	Physical Properties	TAS-104
Asphalt Based Underlayments	Physical Properties	See Section 2 of this Protocol
Attachment Components		
Nails, Screws, Clips, etc.	Corrosion Resistance	Appendix E of TAS 114

All Underlayments with exposure limitation in excess of 30 days must submit enhanced Accelerated Weathering testing in conjuntion with applicable Physical Properties testing. Exposure limitations up to a maximum of 180 days will be established through ASTM D 4798 as outlined in ASTM D 5147 for 1000 hours (cycle A); pass/fail established by physical properties testing of the weathered samples. Physical properties testing where specimen size will not fit into the accelerated weathering device may be omitted.