

Pei Evaluation Service® is an accredited ISO Standard 17065 Product Certifier, accredited by the IAS. This **Assembly Evaluation Report** represents a system that **Pei ES** has Evaluated. This **Assembly Evaluation Report** in no way implies warranty for these products or relieves **United States Gypsum Company** of their liabilities for their products and this system. This **AER** is an official document if it is within one year of the Initial or Re-Approval date.

Initial Approval

April, 2018

Re-ApprovedSee all **Pei ES** Listings at: www.p-e-i.com**Report Owner****United States Gypsum Company**550 West Adams Street
Chicago, IL 60661**Approved Assembly****USG Roof Deck Assemblies****USG Balcony/Walking Deck Assemblies****For Evaluation Report Questions**usg4you@usg.com

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USG Contact: Manny Hurtado, Building Codes Manager

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1. Wind Uplift Resistance
2. 300 Lbs. maintenance worker concentrated load

Code Compliance**2015 International Building Code® (IBC)**
Section 1504.3.1 Roof Deck Weather Protection**Standards Tested To**

1. The **USG** Roof Assemblies have been evaluated to *FM 4474 American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures*.
2. UL 580 - Tests for Uplift Resistance of Roof Assemblies
3. *TAS 114* Test Procedures for Roof System Assemblies in the High Velocity Hurricane Zone Jurisdiction in accordance with the 2012 and 2015 International Building Code® (IBC) Section 1504.3.1.
4. Approved walking deck systems have been evaluated to *ICC-ES AC39 Acceptance Criteria for Walking Decks* to show compliance with the intent of the 2012 and 2015 IBC.

Roof System Types

1. The **direct to deck roof system** is constructed of a base layer mechanically attached directly to the roof framing with an approved roof membrane adhesively attached to the base layer.
2. The **built up roof system** is constructed of a base layer mechanically attached directly to the roof framing. An approved insulation board is adhesively or mechanically attached to the base layer. An approved insulation cover board is adhesively attached to the insulation or mechanically attached to the base layer. An approved roof membrane is adhesively attached to the insulation cover board or insulation.

Component DescriptionsThe following list is a general description of each layer of the approved **USG Roofing Systems**.**1. Base Layer**

USG Structural Panel Concrete Roof Deck is a noncombustible concrete sheathing panel used in conjunction with cold-formed steel, wood, or hot rolled steel framing to form a load bearing structural roof system. **USG** Structural Panel Concrete Roof Deck is a nominal 3/4" [19mm] thick x 4' [1220mm] wide x 8' [2440mm] long. Roof deck panels have either a Tongue and Groove edge along the 8' [2440mm] sides or square edge. See PEI ES report # PER-14076 for more details.

2. Insulation

An Approved Roof insulation Board with a current product Evaluation Report for Roof applications.

3. Insulation Cover Board

USG Securock Brand Gypsum-Fiber Roof Board is a high performance roof board for use in low-slope roofing applications to provide insulation board protection and provide a bonding surface for the roof membrane. This roof board is FM approved and meets FM Class 1.

4. Mechanical FastenersA fastener is applied through the cover board and insulation into the base layer. An insulation plate is used with the fastener to distribute the load. The insulation plate minimum size is controlled by the full scale testing used in this **AER**.

5. Adhesive

An Approved Roof membrane Adhesive with a current product Evaluation Report for Roof applications used to bond membrane, insulation, cover board and base layer.

6. Roof Membrane

An Approved Roof membrane that was tested in combination with an adhesive and base layer or insulation cover board within the submitted full scale roof assembly tests. The roof membrane must have a current product Evaluation Report for Roof applications.

Table 1 - Uniform Uplift Load Performance
USG Structural Panel Concrete Roof Deck

Span Rating ²	Uplift Capacity ³ (lb/ft ²)			
	8/12	8/8	6/6	4/4
24" [609.6mm]	257 [12.3 kPa]	330 [15.8 kPa]	330 [15.8 kPa]	330 [15.8 kPa]
32" [812.8mm]	192 [9.2 kPa]	240 [11.5 kPa]	240 [11.5 kPa]	240 [11.5 kPa]
48" [1219.2mm]	128 [6.1 kPa]	150 [7.2 kPa]	150 [7.2 kPa]	150 [7.2 kPa]

Notes:

1. Listed values are ultimate and do not include factors of safety
2. Two framing spans minimum per panel piece for span ratings of 24" [812.8mm]. Otherwise, Mid span blocking required for single span conditions
3. Uplift capacity based upon the worst case of panel flexure, pull-over of a #8 wafer head screw with a min. head diameter of 0.306" [7.77mm], #8 screw withdrawal from minimum 16ga steel with a minimum yield strength of 50 ksi, and roof system assembly testing in accordance with FM 4474. Screw nominal withdrawal capacity taken as 171 pounds based on AISI S100 Section E4.

Approved Direct to Deck Roof Systems; see Illustration No. 1

Table 2 - 135 psf Direct to Deck Roof Systems

Membrane Manufacturer		Adhesive	
Carlisle SynTec Systems	45 mil Sure-Seal NR EPDM	Carlisle SynTec Systems	EPDM X-23 LVOC Bonding Adhesive
			EPDM/TPO 1168 Bonding Adhesive
			Sure-Seal 90-8-30A Bonding Adhesive
		Mule-Hide	Acrylic Water Based Bonding Adhesive
			FR Bonding Adhesive
			KingsTree Shur-Gard Bonding Adhesive
	45 mil Sure-Weld TPO	Carlisle SynTec Systems	EPDM/TPO 1168 Bonding Adhesive
			Sure-Weld LVOC TPO/EPDM Bonding Adhesive
			Sure-Weld TPO Bonding Adhesive
50 mil Sure-Flex PVC	Carlisle SynTec Systems	Sure-Flex LVOC PVC Bonding Adhesive	
Duro-Last	40 mil PVC	Duro-Last	Duro-Last SB IV LVOC PVC Bonding Adhesive
	50 mil Duro-Tuff PVC	Duro-Last	SB IV LVOC PVC Bonding Adhesive
Firestone Building Products	45 mil UltraPly TPO	Firestone Building Products	Firestone UltraPly Bonding Adhesive
	60 mil UltraPly TPO SA	-	-
GAF	45 mil EverGuard TPO	GAF	EverGuard LVOC TPO Bonding Adhesive
			EverGuard SBA 1121 Bonding Adhesive
	50 mil EverGuard PVC	GAF	EverGuard 2331 PVC Bonding Adhesive
60 mil EverGuard Freedom TPO HW	Johns Manville	Asphalt Primer	
Johns Manville	45 mil EPDM	Johns Manville	EPDM Water Based Membrane Adhesive
		Mule-Hide	FR Bonding Adhesive
			KingsTree Shur-Gard Bonding Adhesive
	45 mil TPO	Johns Manville	Membrane Adhesive (TPO & EPDM)
			LVOC Membrane Adhesive (TPO & EPDM)
50 mil PVC	Johns Manville	PVC LVOC Membrane Adhesive	
Seaman Corporation	36 mil FiberTite	Seaman Corp.	FTR 190e Bonding Adhesive
	45 mil FiberTite	Seaman Corp.	FTR 190e Bonding Adhesive
Sika Sarnafil	60 mil Sarnafil SPL	Sika Sarnafil	Sarnacol 2170 Membrane Adhesive
Soprema	60 mil Sentinel P150	Soprema	Sentinel S Bonding Adhesive
	60 mil Sentinel G150	Soprema	Sentinel S Bonding Adhesive

Note: Listed membrane thicknesses are minimums.

Approved Mechanically Attached Roof Systems; see Illustration No. 2

1. All mechanically attached roof systems utilize SFS's TPR Peel Rivet system. Rivet length selection depends upon the combined thickness of the Concrete Roof Deck Panel, Insulation and roof cover board used in the selected assembly. See Table 3 of this **AER**
2. Fastener layout to follow Figure 1 of this **AER**

Table 3 - SFS Peel Rivet Length Selector

Order Code	Length	Min. Clamping Length	Max. Clamping Length
TPR-L-6,3x102 Peel Rivet	4"	1-5/8"	3"
TPR-L-6,3x127 Peel Rivet	5"	2-5/8"	4"
TPR-L-6,3x152 Peel Rivet	6"	3-5/8"	5"
TPR-L-6,3x178 Peel Rivet	7"	4-5/8"	6"
TPR-L-6,3x203 Peel Rivet	8"	5-5/8"	7"
TPR-L-6,3x229 Peel Rivet	9"	6-5/8"	8"
TPR-L-6,3x254 Peel Rivet	10"	7-5/8"	9"

Figure 1 - Fastener layout

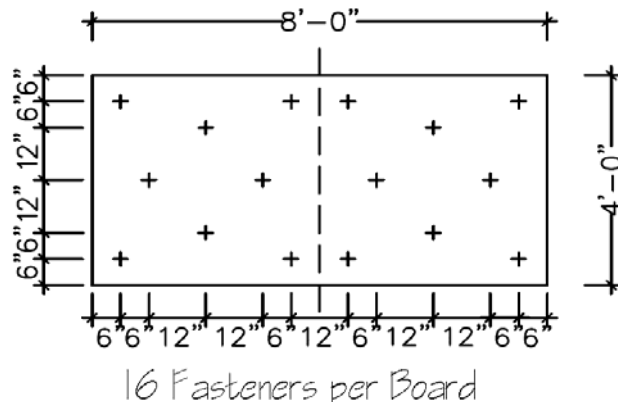
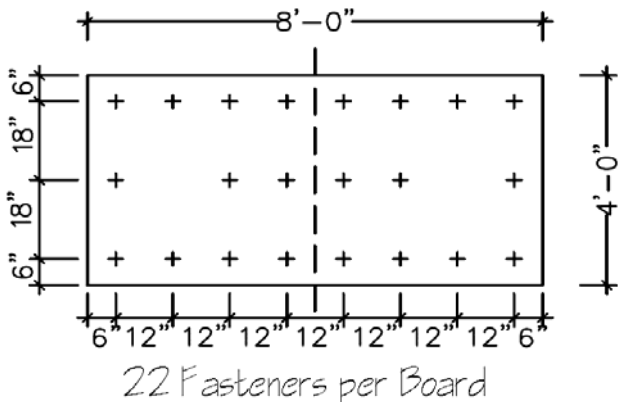
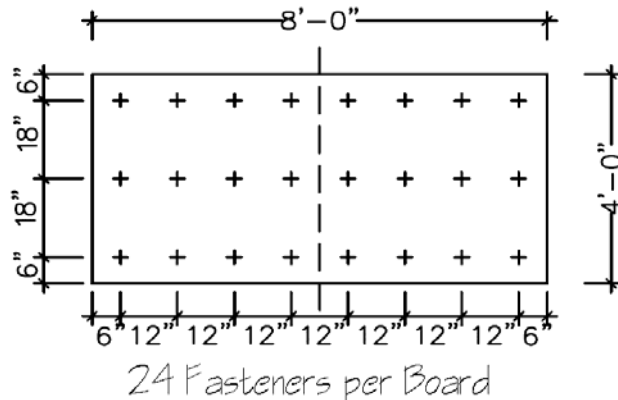
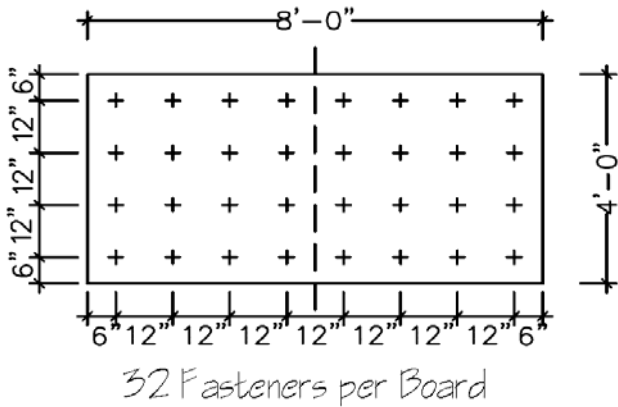


Figure 1 - Fastener layout (continued)

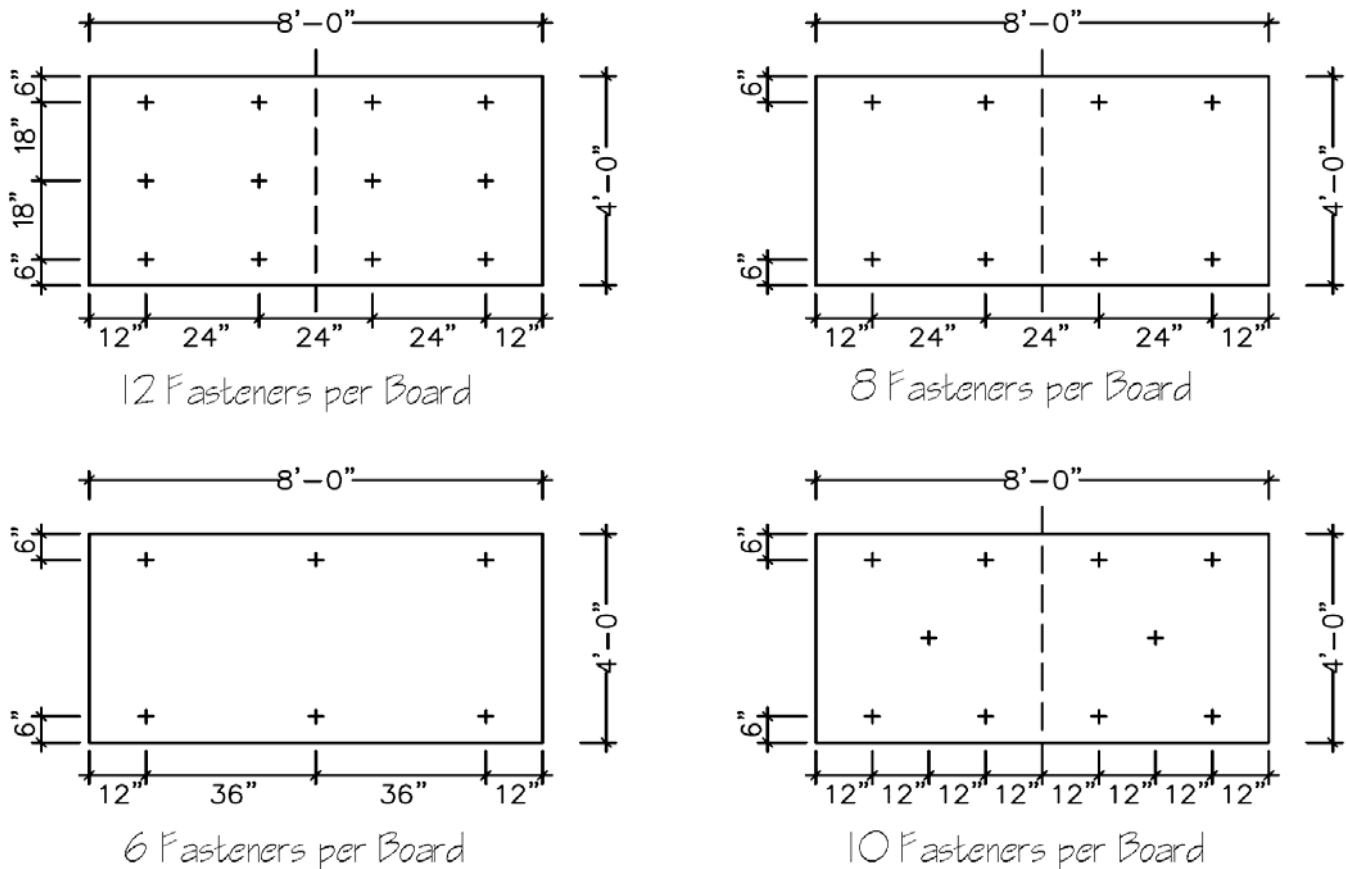


Table 4 - Approved Insulation Plates

Manufacturer	Description
Firestone	Isosfast Insulation Plate
OMG	3" Galvalume Steel Plate
DekFast	Galvalume Steel Hex Galvalume Steel 3" Round
Tru-Fast	MP-3
UltraFast	Metal Plate (Square)

Table 5 - Mechanically Attached Wind Uplift Values, psf

Roof Cover Board	Fasteners per 4X8 Sheet						
	32	24	22	16	10	8	6
1/4" Securock Gypsum Fiber	135	105	90	90	90		
3/8" Securock Gypsum Fiber	135	120	120	120	90	90	
1/2" Securock Gypsum Fiber	270	120	165	120	90	90	75
5/8" Securock Gypsum Fiber	270	165	165	120	90	90	90

Bold Values shown are Tested Values

**Table 6 - Approved Membranes and Adhesives to Securock Gypsum Fiber Roof Cover Boards
270 psf and under approved membranes**

Membrane Manufacturer		adhesive
Firestone Building Products	BASEGARD SA	Self Adhered (SA Primer, no heat)
	MB Base SA	Self Adhered
	SBS Base	Firestone LiquiGuard Membrane Adhesive
		Firestone MB Cold Adhesive
		Type III Hot Asphalt
	SBS Torch Base	Firestone MB Cold Adhesive
	Torch Applied	
Johns Manville	DynaBase	MBR Bonding Adhesive
		Premium Cold Application
		Hot Asphalt
	DynaGrip/DynaWeld	Self Adhered/Torch Applied
	DynaPly	MBR Bonding Adhesive
		Hot Asphalt
DynaWeld	Premium Cold Application	
	Torch Applied	
SiPlast	Paradiene 20	Siplast PA-311 Cold Adhesive
Soprema	Elastophene Sanded	FM Adhesive
	Elastophene Sanded	FM Adhesive (VOC)

165 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Multi-Ply Glass	Hickman Base Sheet Adhesive
	Performance Ply	Hickman Base Sheet Adhesive
DerbiGum	Derbibase	Permastic
Firestone Building Products	BASEGARD SA	Self Adhered (heat activated)
	MB Base SA	Self Adhered (SA Primer)
	V-Force	Self Adhered (SA Primer)
Johns Manville	Bicor S	Torch Applied
	DynaPly	MBR Cold Application Adhesive
	GlasBase Plus	Hot Asphalt
Simon Roofing Products	Multi-Ply Glass CL	Multi-Ply Adhesive S.F.
	Multi-Ply Glass CL	Hickman Base Sheet Adhesive
	Pika Ply Hi-Tek 60, Type II	Hickman Base Sheet Adhesive
		Multi-Ply Adhesive S.F.

135 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Multi-Ply Glass	Pika Ply Adhesive
		Multi-Ply Adhesive S.F.
	Performance Ply	Multi-Ply Adhesive
GAF	Ruberoid 20 Base Sheet	Matrix Select SBS Adhesive 102
Johns Manville	JM APP Base	MBR Cold Application Adhesive
		Premium Cold Application
		Torch Applied
	JM Bicor S	Premium Cold Application
		MBR Cold Application Adhesive

**Table 7 - Approved Membranes and Adhesives to Securock Gypsum Fiber Roof Cover Boards
270 psf and under approved membranes**

Membrane Manufacturer		adhesive
Firestone Building Products	RubberGard MAX 75	Firestone Water Based Bonding Adhesive S
		Firestone Water Based Bonding Adhesive P
	UltraPly TPO 45	Firestone Single-Ply LVOC Bonding Adhesive
		Firestone Water Based Bonding Adhesive S
		Firestone Water Based Bonding Adhesive P
		Firestone UltraPly Bonding Adhesive
	UltraPly TPO SA 45	Self Adhered (Single-Ply QuickPrime Plus Primer)
		Self Adhered (QuickPrime Plus Primer)
	UltraPly TPO XR115 60	Firestone XR Bonding Adhesive
		Firestone XR Stick Membrane Adhesive
		Type III Hot Asphalt
	Certainteed	Flintastic SA PyBase
GAF	EverGuard Freedom PVC 50	EverGuard PVC Bonding Adhesive (Solvent Based)
	EverGuard Freedom TPO	Self Adhered
	EverGuard PVC 51	EverGuard PVC Bonding Adhesive
GenFlex	GenFlex RM	All Purpose Water Based Bonding
Johns Manville	PVC Fleece Backed	JM PVC Adhesive (Water Based)
	TPO 45	JM PVC Adhesive (Low VOC)
		JM PVC Adhesive (Solvent Based)
	TPO FB 100	JM PVC Adhesive (Water Based)
Seaman Corporation	FiberTite	FTR-190 Bonding Adhesive
		FTR-290 Bonding Adhesive
Soprema	Elastophene 180 Sanded	Hot Asphalt

165 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Sure-Flex PVC	Sure-Flex PVC Bonding Adhesive
	Sure-Weld	Aqua Base 120 Bonding Adhesive
Certainteed	Black Diamond Base Sheet	Self Adhered
Duro-Last	50 mil PVC	Duro-Last SB II Adhesive
		Duro-Last WB II Adhesive
Firestone Building Products	RubberGard MAX 75	Firestone BA-2004(T) Bonding Adhesive
	UltraPly TPO 45	Firestone Single-Ply LVOC Bonding Adhesive 1168
	UltraPly TPO SA 45	Self Adhered
	UltraPly TPO XR115 60	Firestone I.S.O. Spray S Adhesive
GAF	EverGuard Freedom TPO	Self Adhered
	EverGuard TPO	EverGuard TPO #1121 Bonding Adhesive
GenFlex	GenFlex RM	GenFlex RM Bonding Adhesive
Johns Manville	EPDM NR	JM EPDM Membrane Adhesive (Water Based)
	PVC	JM PVC Adhesive (Water Based)
		JM PVC Adhesive (Low Solvent Based)
TPO 45	JM PVC Adhesive (Water Based)	
Sarnafil	G410	Sarnacol 2121
		Srnacol 2170
Seaman Corporation	Style 80-M FB	FTR-490 Bonding Adhesive

135 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Carlisle Sure-Seal FR Nonreinforced	90-8-30A Solvent Based Bonding Adhesive
Firestone Building Products	RubberGard MAX 75	Firestone Single-Ply LVOC Bonding Adhesive 1168
	Standard RubberGard	RubberGard BA 2004
GAF	Liberty SBS Base/Ply Sheet Colvent SA	Self Adhered
Johns Manville	EPDM NR	JM EPDM Membrane Adhesive (Solvent Based)
		JM EPDM Membrane Adhesive (Low VOC)
Mule-Hide	Standard Black EPDM Membrane	Mule-Hide Water Based Bonding Adhesive
Polyglass	ElastoFlex SA V FR Base	Self Adhered

Special Case Roof Systems

Table 8 - Special Case Roofing Systems

Pressure, psf	System Description
300 psf	Mechanically attached 1/2" Securock Gypsum Fiber Roof Cover Board with 32 fasteners per 4' X 8' sheet. Built up roof consisting of 0.045" Firestone SBS Glass Torch Base torch applied to the cover board. Firestone SBS FR Torch was then torch applied over the base ply
180 psf	Mechanically attached 1/2" Securock Gypsum Fiber Roof Cover Board with 32 fasteners per 4' X 8' sheet. Built up roof consisting of Firestone SBS Base adhesively applied to the cover board with Firestone Multi Purpose MB Cold Adhesive. Firestone SBS FR was then adhesively applied over the base ply using Firestone Multi Purpose MB Cold Adhesive.
120 psf	Carlisle Insulbase insulation adhesively applied to the Concrete Roof Deck panels with Royal Adhesive-Mellenium One Step Foamable Adhesive (2-Part) with a ribbon spacing of 18". Carlisle 45mil Sure-Seal membrane bonded to the polyiso with Sure Seal EPDM 90-8-30A Bonding Adhesive.

Approved Walking Deck Systems

- Soprema Fully Reinforced Balcony/Parking System** - One (1) layer of Alsan RS 276 Primer, two (2) layers of Alsan RS 230 Field with Alsan RS Fleece installed with first layer and covered with second layer, and three (3) layers of Alsan RS 233 Self-Leveling Mortar made with Alsan RS 210 and Alsan RS 223.

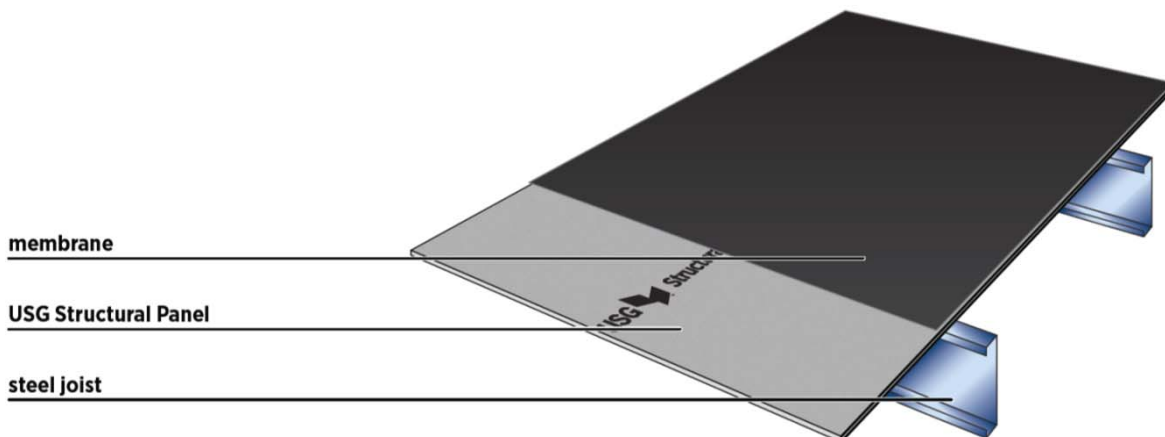


Illustration No.1

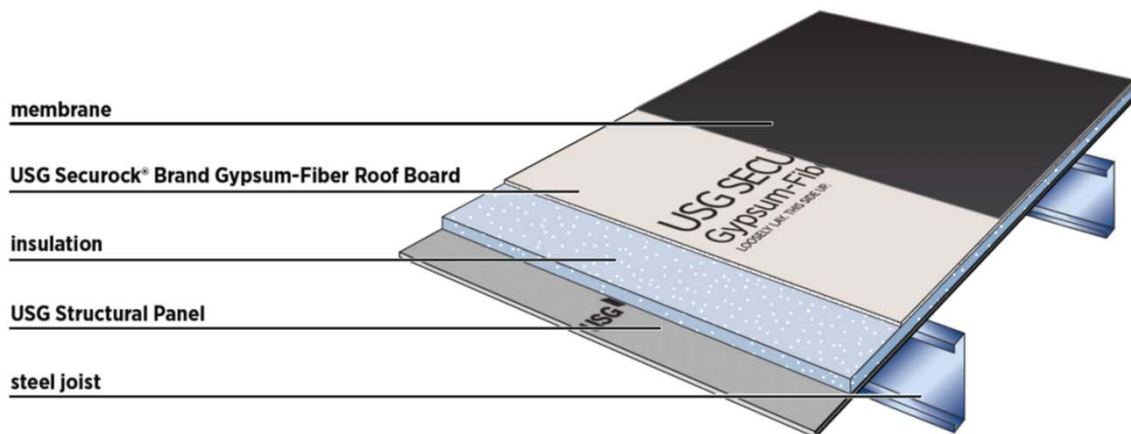


Illustration No.2

Product Labeling

The following components specified in the **USG** Roof Deck, Balcony/Walking Deck Systems that are covered by this **AER**, must be marked showing evidence of a current Product Evaluation Program by an accredited Agency.

1. **USG Securock Brand Gypsum-Fiber Roof Cover Board**
2. **USG Structural Panel Concrete Roof Deck**
3. **Roof Membrane Component**
4. **Roof Membrane Adhesive**
5. **Rigid Insulation**

Product Documentation

1. An Assembly Evaluation Service Agreement between **Pei Evaluation Service®** and **United States Gypsum Company**
2. **USG** Roof System Installation Guidelines. Guidelines must be easily available to installers.
3. Various Test Reports & Third Party Product Evaluation reports Used as Verification of Fire Resistance, wind uplift Resistance and Concentrated Loading.