Appendix:

Fall Arrest or Save Evaluation Report

You Tube Animation: https://www.youtube.com/watch?v=z7aLremYEuQ

Date and Time: **10-1-2007 09:47am**

Type of Construction: **Residential framing, single family home**

Fall Incident

The employee was working on the top plate of a one story structure during truss erection. He was moving into position to assist in staging oriented strand board (OSB) sheathing that was being lifted by a mobile crane. He was walking on the top plate and as he stepped over the entryway door he slipped or lost his balance and fell sideways over the top plate. The fall was arrested by a personal fall arrest system (PFAS) attached to a three truss bar anchor system. The employee was rescued within a minute. As required by statute, the incident was fully investigated and all employees were questioned as relevant.

Additional Details

Wall height: 9 feet

Weather: Sunny with slight breeze. Not considered of any consequence to the incident

Employee: Age 31, 5 feet 8 inches, 220 pounds. Seven years' experience working as framer

Language: Spanish (Mexico)

Size of Crew: Six workers

Time on Task: 9 days working on this particular job

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not practical, slide guards to prevent material falling, controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Safety Bar (three truss bar system)

Anchorage Details

Super Anchor Safety Bar was used with temporary bracing installed on truss system (see attached photos of the incident scene) according to field interpretation of the SBCA BCSI B2.

Incident Scene

Carefree, Arizona

Single story single family structure

Roof pitch: 4/12

Wall heights: 9 feet

Phase of Construction Proximate to Incident

Erection of manufactured roof trusses. The incident occurred immediately after trusses had been installed and temporarily braced during the staging of material (OSB sheathing) at several locations. No sheathing had been installed at any location on the main span roof structure.

Description of How Incident Occurred

According to the worker, he was moving into position to assist in staging sheathing being lifted by a mobile crane. He was walking on the top plate. As he stepped into place across (and over) the entryway door he either lost his balance and fell sideways over the front or slipped sideways on the top plate over the edge of the front exterior wall. The location of the fall was over a window opening to the right of the front end (facing the structure) home entryway.

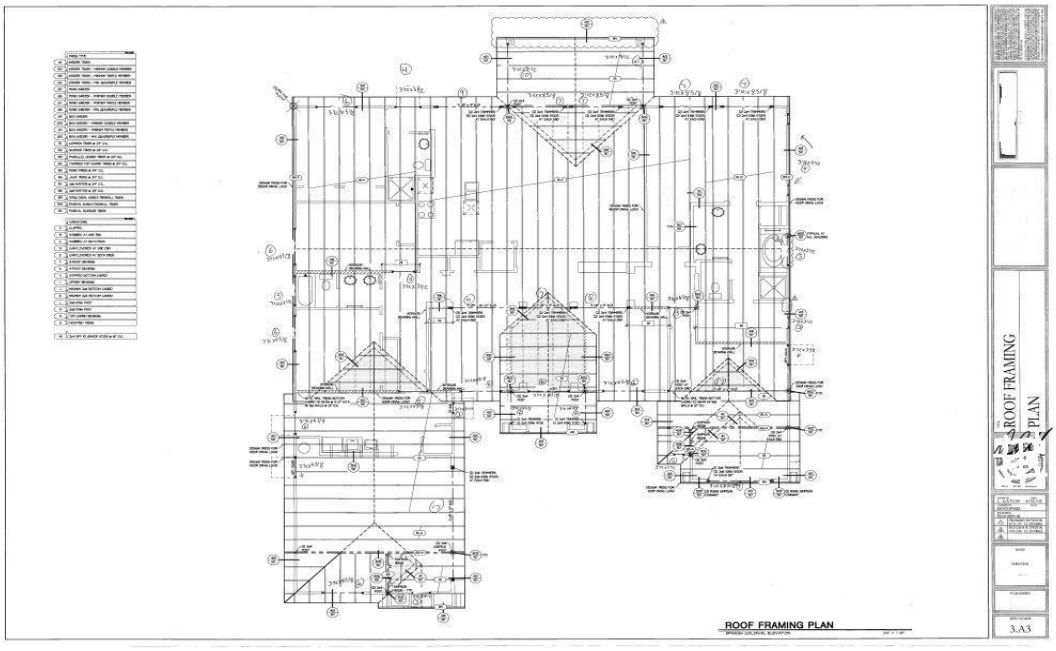
Rescue

After the incident, the worker and his rescuer provided information as to where and how far the worker fell before the system arrested his fall.

Description of Injuries

No injuries reported or discovered by licensed medical provider.

Truss System Blueprint



Scene Documentation

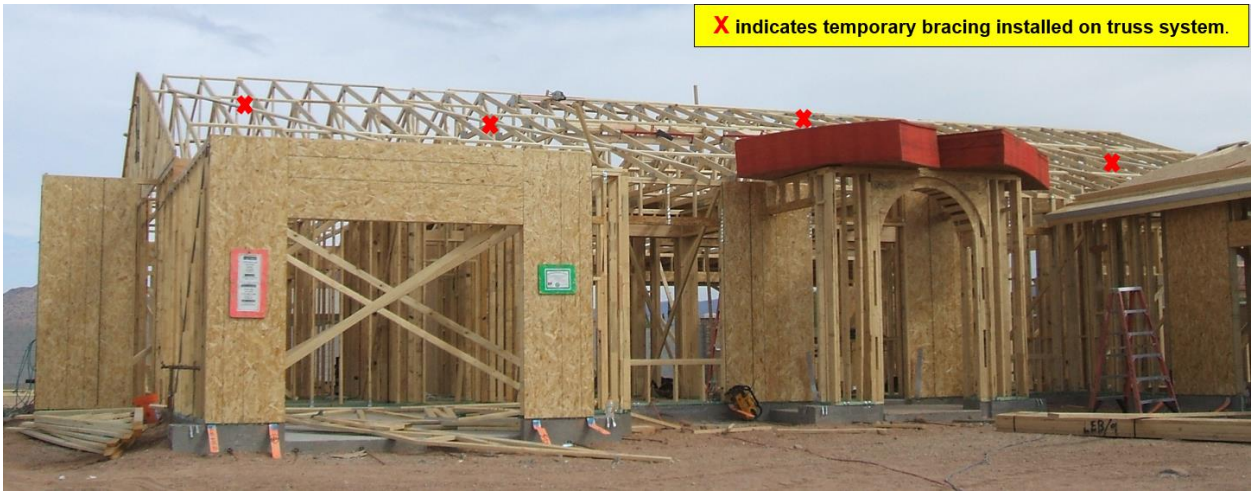


Figure 1. House in Frame just after trusses erected and set. Stack of OSB above entryway to the right was being put into position when worker fell.

Figure 2. PFAS anchor and SRL used by the worker. All equipment left in place for photo.

Figure 3. Underside of truss system and anchor used in arrested fall.

Figure 4. SRL cable and snap hook where fall was arrested. Note proximity to truss top chord and wall and path of lanyard over truss tail.

Figure 5. Worker who fell demonstrating his final position and subsequent rescue. After the arrested fall, both workers demonstrated the rescue at a similar location. The worker who fell is shown in the following figure demonstrating his height above the ground where he came to rest and reenacting with the other worker how he was rescued.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker misstepped or lost his balance and fell off a top plate from a standing position.
- At the time, he was approximately 18 feet laterally from the anchor and 10 feet down slope. Approximately 20 feet of lanyard was extended.
- Because the lanyard was attached to the worker's D-ring, the lanyard was initially angled upward, then dropped and laid atop the roof trusses as he fell.
- The worker fell between truss tails. As he fell, the lanyard passed over the truss tail into the corner created by the tail and top plate and limited the amount of swing. (See Figure 4)
- As the worker's D-ring passed the truss tail, the lanyard begin to pay out from the SRL.
- The worker was found hanging with his D-ring approximately 2 feet below the top plate.
- It is estimated that the free fall and arrest distances were approximately 5 feet and 2 feet, respectively.
- Other than the impact load indicators on the SRL and full body harness showing an impact occurred, examination of the Safety Bar and trusses to which it was connected did not exhibit deformation or any signs an arrested fall had occurred.
- A separate field evaluation was performed by the truss manufacturer and corroborated no damage to the structure had occurred as a result of the arrest.
- From a starting position of 9 feet, had the worker not been wearing a PFAS, he would have hit the ground at 24 feet per second or 16 miles per hour.

Fall Arrest or Save Evaluation Report

You Tube Animation:

Date and time: **1-22-2008 09:15 am**

Type of Construction: **Residential Framing, single family home**

Fall Incident

The employee was working on the second floor of a two-story structure, guiding a load of material being lifted onto the decking by a mobile crane. Guardrails had been erected around the entire structure as fall protection, but were removed in some areas to facilitate the staging of panelized wall sections, which is what the crane was lifting onto the second floor. As the worker was looking up toward the load, he stepped backward over the leading edge of the decking where the guard rails had been removed. Due to the restraint imposed on his D-ring from the PFAS, the worker did not fall backward, potentially landing on his back. Instead, his PFAS engaged and kept him close to the edge. As he fell down along the edge of the structure his fall protection system allowed him to remain upright against the structure. Accordingly, he was able to extend his arms and caught himself on the floor he was previously standing on. Although the injuries were minor, as required by statute, the incident was fully investigated. All employees were questioned and equipment was removed from service.

Additional Details

Wall height: 8 feet plus 20 inch floor trusses

Weather: Cold with clear skies. Not considered of any consequence to the incident

Employee: Age 19, 6'-2", 165 pounds. Less than two years' experience working as framer

Language: English (USA)

Size of Crew: Four workers

Time on Task: 4 days working on this particular job

Training: CFR 1926 Subpart M Fall Prevention training, use of guardrails and use of PFAS

Fall Prevention Measures

Ladders where feasible; guard rails on all second floor exposed leading edges, PFAS where ladder access or guard rails not practical, slide guards to prevent material falling, controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Form-It (Previously 3K)

Anchorage Details

The anchor, which cost about $5.00, was meant to be temporary and was installed over floor decking directly over a structural floor truss.

Incident Scene

Queen Creek, Arizona

Two story single family structure.

Roof pitch: 4/12

Wall heights: 8 feet plus 20 inches (height of floor trusses)

Phase of Construction Proximate to Incident

Fully sheathed floor trusses; erection of second floor walls via the use of panelized walls built offsite.

Description of How Incident Occurred

According to the worker and witnesses, he was using a rope to guide materials onto the deck of the second floor of the structure. As he was looking up he became unaware that he was moving toward an area of the deck where the guard rails had been removed. Because the worker was looking up, he did not notice the warning line painted on the deck. He walked backwards right over the area of the deck which had a clear painted warning - six feet in length and written on the floor - telling workers not to step in the area. He states that the SRL engaged so he did not fall backwards and that allowed him to catch the floor by extending his arms.

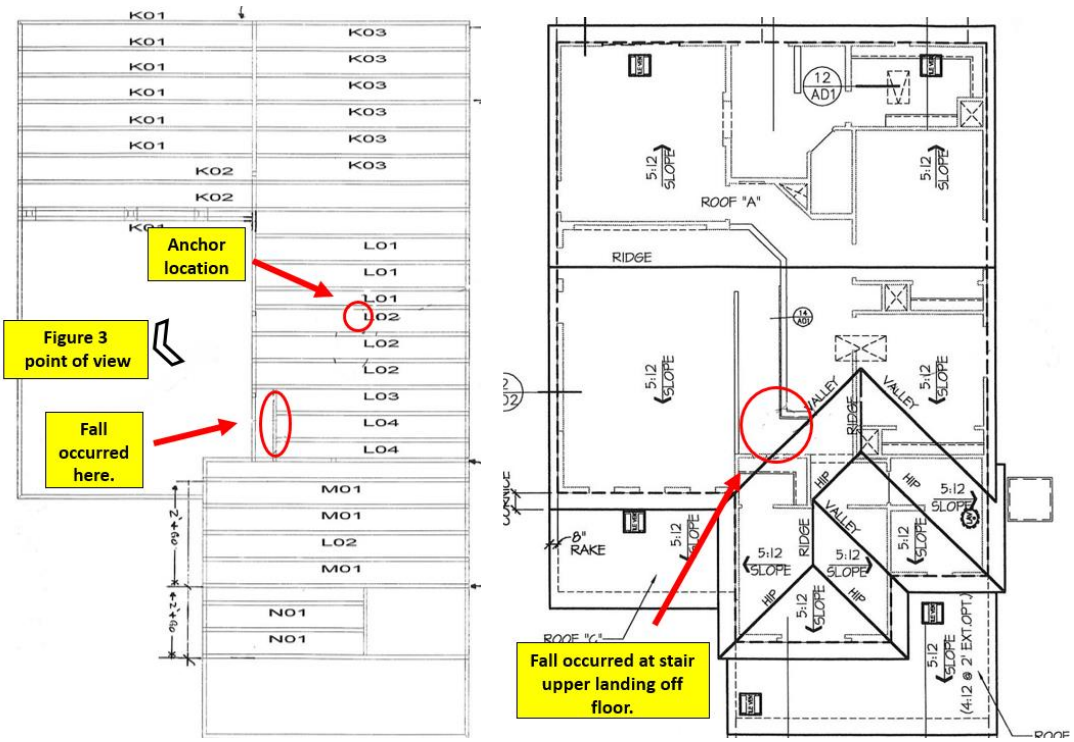
Rescue

Since the worker was able to rescue himself there is little to report. It should be noted that the worker did report to a heath care provider after the incident.

Description of Injuries

The worker sustained very minor contusions on his stomach and chest as a result of his fall along the edge of the floor where he had been standing. The best description of the injury would be that it was similar to a friction burn.

Truss System Blueprint



Scene Documentation

Figure 1. Taken the following afternoon just after panel walls erected.

Figure 2. Ground floor view of deck edge where worker stepped off backwards.

Figure 3. Anchor location.

Figure 4. Close up of $5.00 anchor

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker's fall was a step backwards off an edge. Although his PFAS did not arrest him per se, the SRL locked in time to control his kinematics and prevented from falling backward. Instead, he fell straight down and was able to catch himself with his arms on the edge of the decking.
- The anchor was bent toward the direction of the area where the worker fell.
- Neither impact load indicator on the SRL or full body harness was triggered. Upon inspection by a qualified person, the system components were kept in use with the exception of the anchor which was removed from service.
- From the second floor deck height of 9.7 ft, had the worker continued his motion without being arrested, it is highly likely he would have experienced an uncontrolled fall, contacting the concrete slab in a supine or head down position at 25 feet per second or 17 miles per hour.

Fall Arrest or Save Evaluation Report

You Tube animation: https://www.youtube.com/watch?v=3Lx5ds_1Al8

Date and Time: **8-19-2008** **06:30am (started at 5 am)**

Type of Construction: **Residential Framing, single family home**

Fall Incident

The worker was walking down the sheathed portion of the roof and caught his foot on a nail head. The nail head caused him to trip and loose his balance; he then went over the edge of the roof eave. His PFAS engaged and arrested his fall before he came into contact with the ground.

Additional details

Wall height: 9'1"

Weather: Hot, partly cloudy in the morning clearing by midday. Not considered of any consequence to the incident.

Employee: Age 55, 120 pounds. Ten + years' experience working in construction

Language: Spanish (Mexico)

Size of Crew: Five workers

Time on Task: Eight days working on this particular job site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not feasible, 2x6 slide guards to prevent material falling from roof to lower levels, controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft. Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Form-It (Previously 3K)

Anchorage Details

Form-It was installed over sheathed and braced trusses in accordance with manufacturer instructions. Of note is that of the 10 nails required to install the anchor, three were missing.

Incident Scene

Chandler, Arizona

Roof pitch: 4/12

Wall heights: 9 ft. ceiling throughout

Phase of Construction Proximate to Incident

Fully sheathed and braced trusses. Final day of roof sheathing. Of the five person crew, four were up on the roof completing tasks such as over framing, cutting vent holes, drip edge installation, etc. Slide guards had been installed at all areas in accordance with OSHA regulations (except that they were 2x6 not 2x4).

Description of How Incident Occurred

This incident had two witnesses in addition to the saved worker. One statement was from a worker on the same level who corroborated the workers' statement that he caught his foot on a nail and tripped. The second statement was from a worker on the ground in an area below the workers finishing roof sheathing activities. His comments indicate that the worker not only seemed to trip on something farther up the roof near the ridge, but that as the worker stumbled down the roof slope, he also seemed to trip on the slide guard on the roof. Photos of the actual slide guard referenced by the second witness indicate damage from something hitting or dislodging the slide guard. The slide guards were typically installed two feet back from the roof edge.

The second witness indicated that the worker did have a slight swing fall because of the lateral distance between his SRL/anchor location and where he went over the edge; they were not perpendicular to the slope of the roof. Photos taken at the site illustrate the approximate length of the swing fall which did not have any effect on the worker completing a successful arrest.

The worker stated that he hit his ankle on a window sill during his fall. This was corroborated by the second witness on the ground. The worker did not complain of excessive pain and did not seek medical treatment for his ankle. Upon removal of the worker's shoe there did appear to be a slight contusion but there was no swelling. The worker returned to work and went right back on the roof with new equipment.

Damage to the anchor and slide guard, and location of nail described by the worker and the witnesses indicate the direction of fall, minor swing, and full arrest consistent with witness and worker statements.

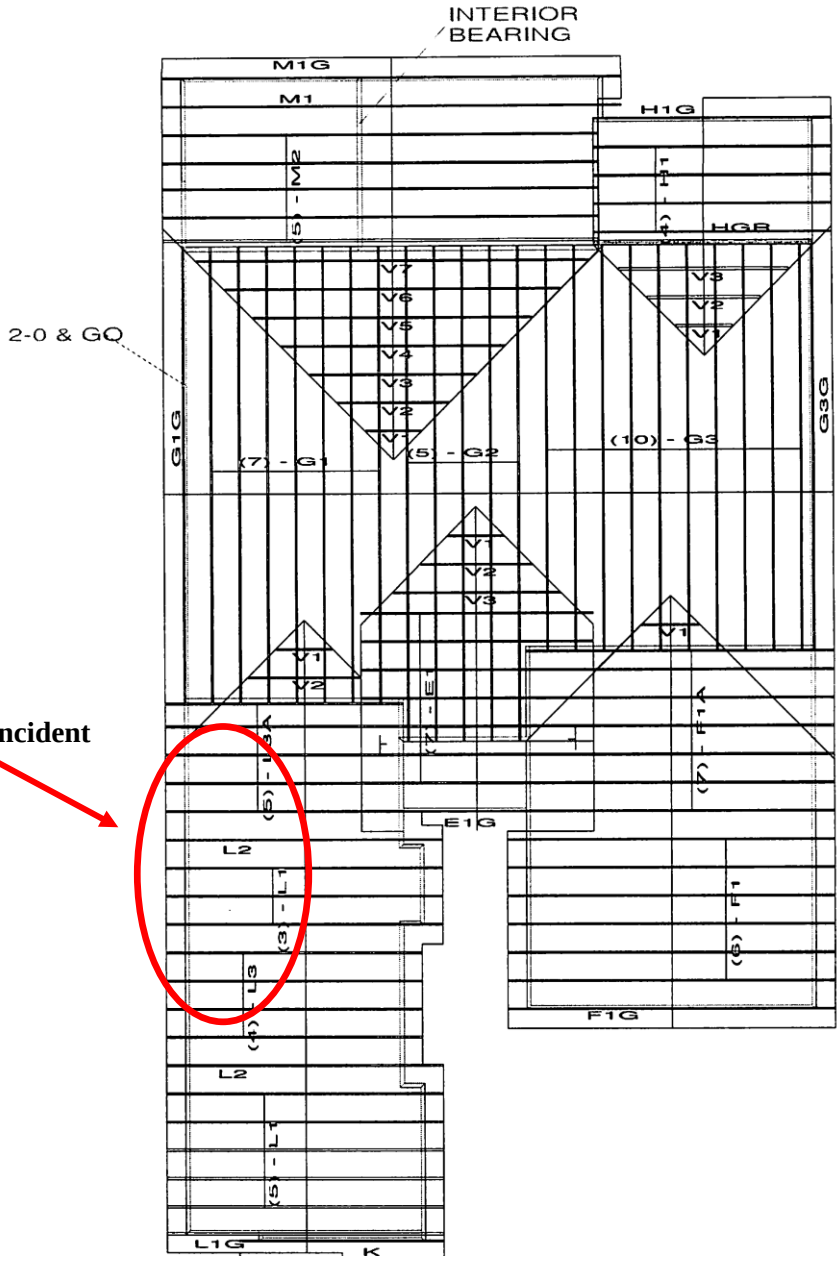
Rescue

After the incident, the worker was rescued with the assistance of the second witness who lifted up the worker so that the first witness could unhook the worker from his anchor. Approximately 30 seconds to one minute elapsed between the fall and rescue.

Description of Injuries

Slight contusion of ankle. No other injuries mentioned.

Truss System Blueprint



Location of Incident

The figure below is an example of calculations from a truss that was part of the system to which the anchor was attached and installed on the roof system in accordance with manufacturer instructions – except for the missing three nails.

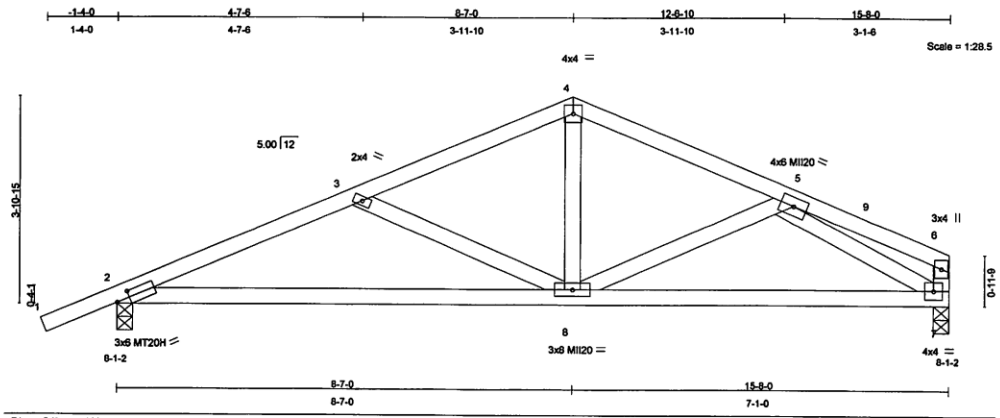


Plate Offsets (X,Y): [2:0-3-0,0-1-8]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	16.0	Plates Increase	1.25	TC	0.57	Vert(LL)	-0.12	2-8	>999	360	MT20	185/144
TCDL	18.0	Lumber Increase	1.25	BC	0.49	Vert(TL)	-0.27	2-8	>693	240	MT20H	148/108
BCLL	0.0 *	Rep Stress Incr	NO	WB	0.25	Horz(TL)	0.03	7	n/a	n/a	MII20	185/144
BCDL	6.0	Code IRC2006/TPI2002		(Matrix)							Weight: 57 lb	

LUMBER
TOP CHORD 2 X 4 SPF 1450F 1.3E
BOT CHORD 2 X 4 SPF 1450F 1.3E
WEBS 2 X 4 HF/SPF Stud/STD

BRACING
TOP CHORD Structural wood sheathing directly applied or 5-11-9 oc purlins, except end verticals.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS (lb/size) 2=737/0-3-8, 7=726/0-3-8
Max Horz 2=100(LC 5)
Max Uplift2=-285(LC 5), 7=-207(LC 6)

FORCES (lb) - Maximum Compression/Maximum Tension
TOP CHORD 1-2=0/35, 2-3=-1177/336, 3-4=-827/229, 4-5=-825/230, 5-9=-237/62, 6-9=-300/74, 6-7=-245/88
BOT CHORD 2-8=-308/1028, 7-8=-218/854
WEBS 3-8=-361/205, 4-8=-48/383, 5-8=-201/162, 5-7=-791/250

NOTES
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-05; 90mph; h=250ft; TCDL=6.0psf; BCDL=3.6psf; Category II; Exp C; enclosed; MWFRS; cantilever left and right exposed ; end vertical left and right exposed; Lumber DOL=1.25 plate grip DOL=1.25.
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) All plates are MT20 plates unless otherwise indicated.
5) This truss requires plate inspection per the Tooth Count Method when this truss is chosen for quality assurance inspection.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 1-0-0 wide will fit between the bottom chord and any other members.
7) This truss is designed in accordance with the 2006 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
8) Hanger(s) or other connection device(s) shall be provided sufficient to support concentrated load(s) 129 lb down and 45 lb up at 14-0-0 on top chord. The design/selection of such connection device(s) is the responsibility of others.
9) In the LOAD CASE(S) section, loads applied to the face of the truss are noted as front (F) or back (B).

Scene Documentation

The following photographs document the area and circumstances of the arrested fall.

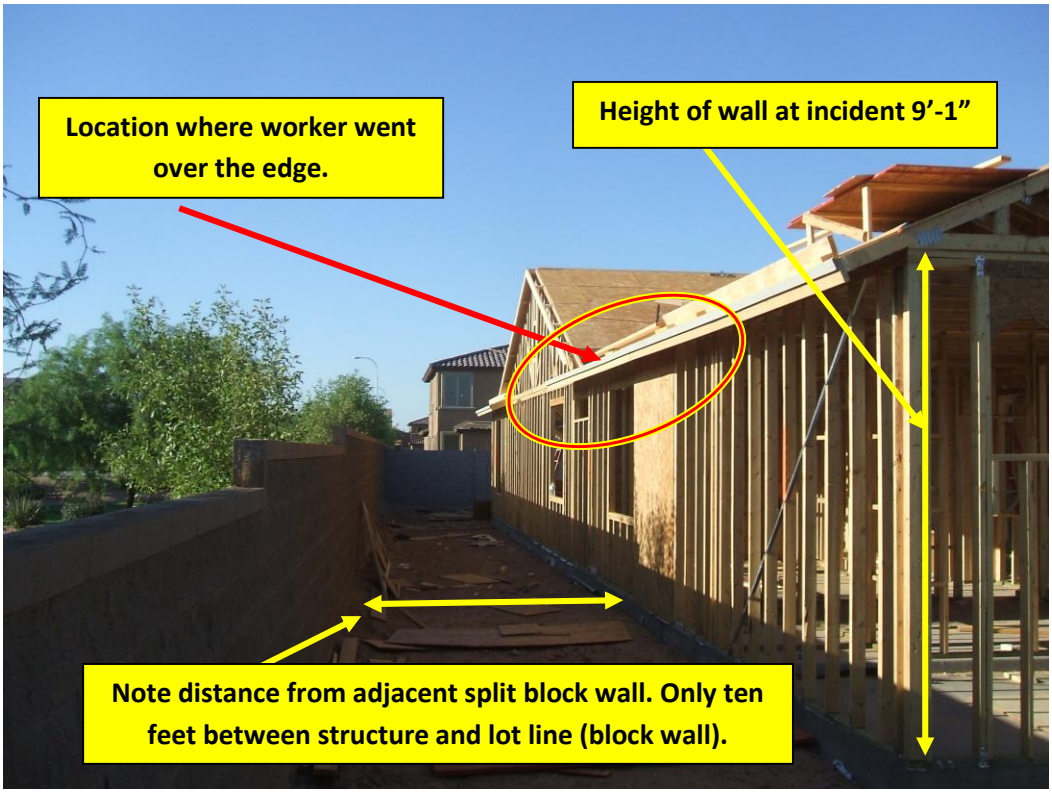


Figure 1. Condition of construction on date of incident

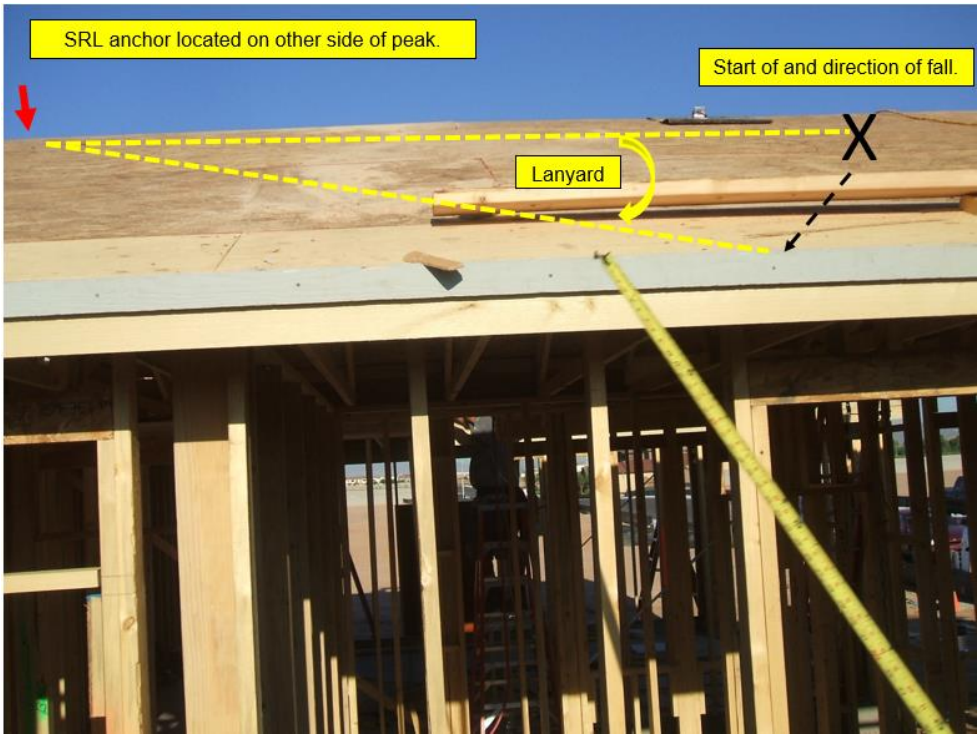


Figure 2. View from below where worker went over edge of roof

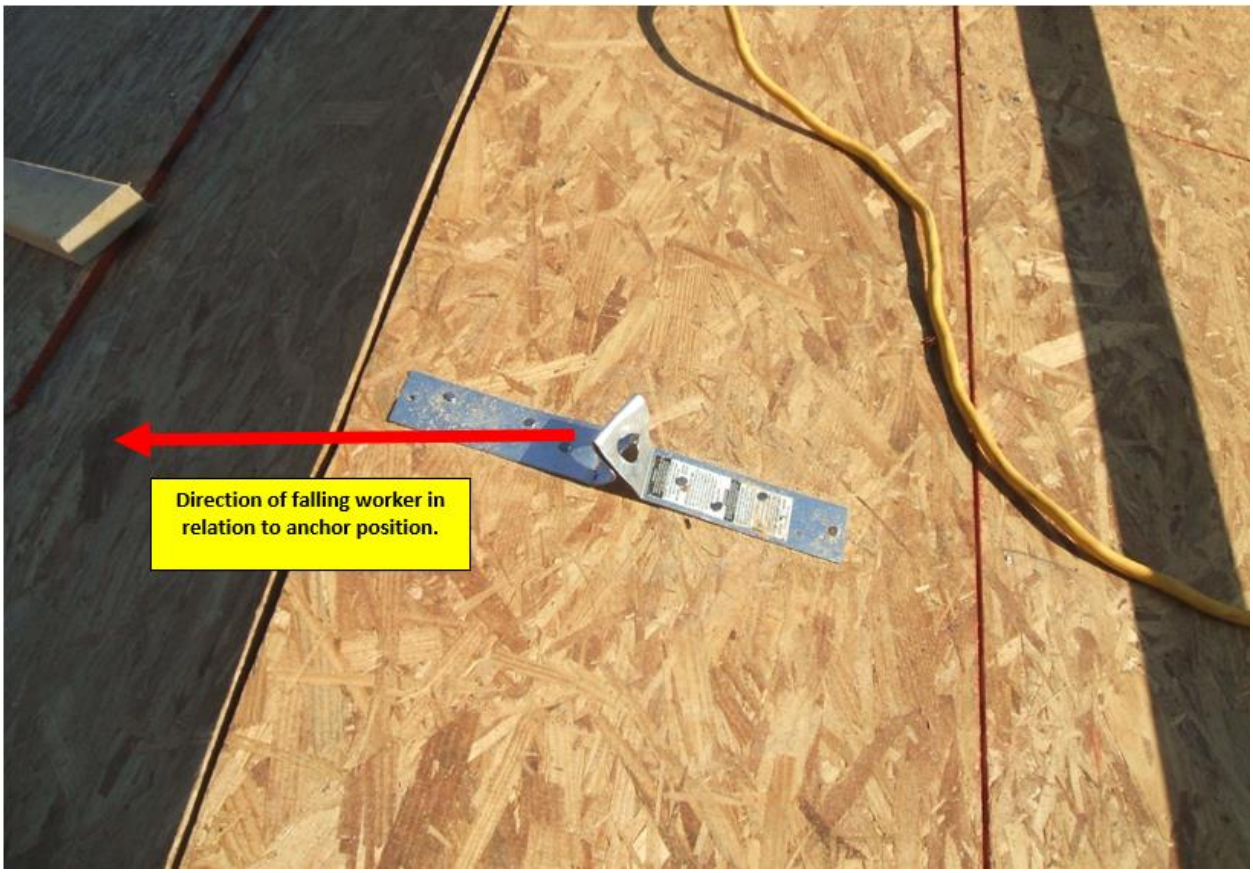


Figure 3. Anchor in proximity to ridge.

Figure 4. Anchor deformation after incident. Circles denote missing nails.

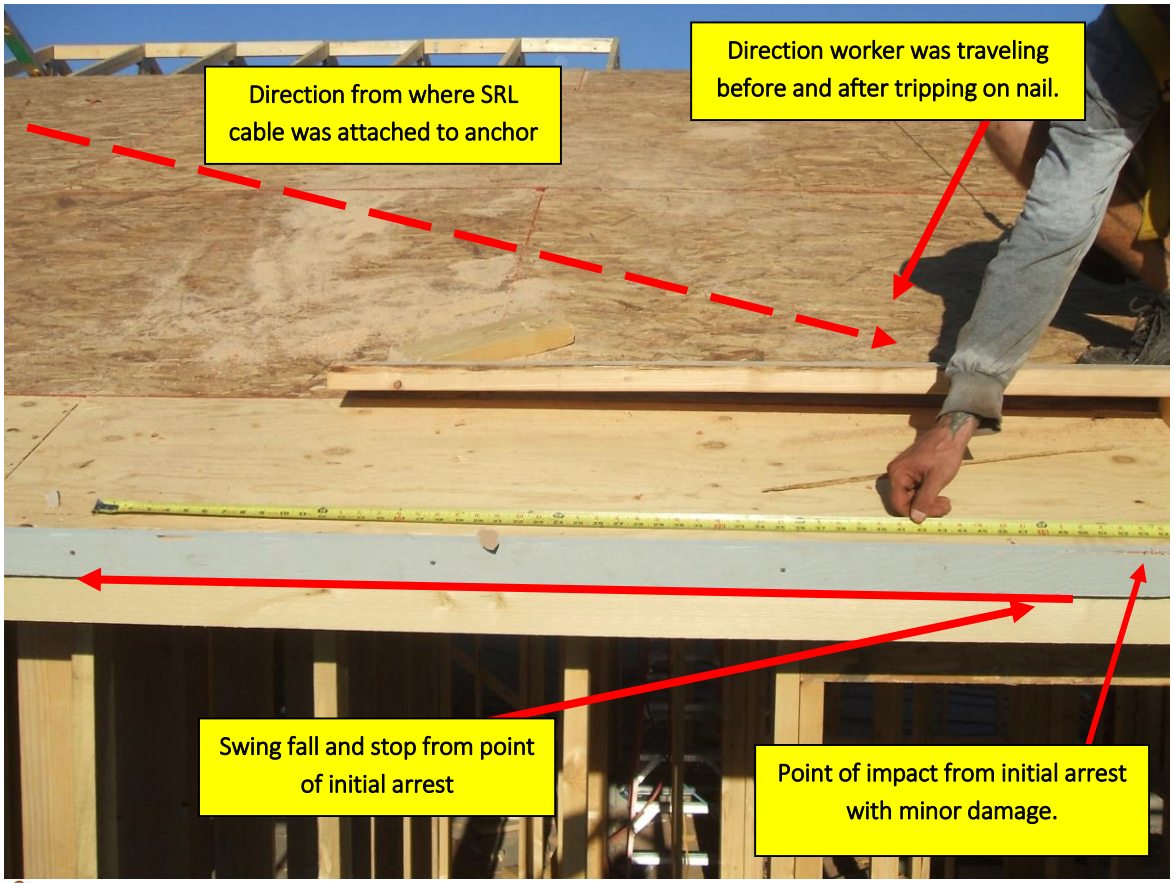


Figure 5. Motion of swing fall including minor shingle mold damage.

Load Analysis

This arrested fall had circumstances that it made it more interesting than most. Of note:

- The worker was walking down the roof when he tripped on a nail head and pitched over the edge. This initial momentum added to the kinetic energy that was finally arrested by the SRL.
- At the time he tripped, the worker had approximately 18 feet of lanyard pulled from the SRL.
- The worker was approximately 14 feet laterally from the anchor.
- Because the lanyard was attached to his D-ring, the lanyard was initially horizontal, and as the worker fell past the edge of the roof, the lanyard angled downward until it was laying along the roof.
- As the worker went past the roof edge, the lanyard began to pull out then locked.
- As illustrated in Figure 5, the lanyard slid along the shingle mold in the direction of the anchor on the edge of the roof for approximately 4½ feet until the worker came to rest.
- Because the worker's ankle contacted the window sill, he came to rest with his D-ring approximately 32 inches below the edge of the roof.
- The distance traveled vertically was approximately 52 inches.
- The arrest distance is not known because the vertical distance includes free fall, swing, and arrest. Determining the swing distance is a geometry problem but there is not sufficient information to solve it.
- The impact load indicator on the SRL and full body harness indicated an impact occurred.

Fall Arrest or Save Evaluation Report

You Tube Animation: https://www.youtube.com/watch?v=N0tuUReTtCU

Date and Time: **6-17-2009 06:15am (starts at 5 am)**

Type of Construction: **Residential Framing, single family home**

Fall Incident

The worker was nailing 2x4 fascia and installing pressure blocks/ freeze boards between the second floor roof rafter tails. He stood up on the wall so he could make a cut but lost his balance when he moved too quickly. As he tried to regain his footing, he stepped on one of the previously installed pressure blocks which blew out. He fell backward over and along the edge of the wall between the fascia and the wall edge.

Additional Details

Wall height: 18 feet - 11 inches

Weather: Clear and hot. Not considered of any consequence to the incident.

Employee: Age 33, height Approx. 6 feet; Seven years' experience working as framer.

Language: English (USA)

Size of Crews: Five workers

Time on Task: Eight days working on this particular job site.

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS had been provided.

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not feasible, guard rails at all second levels and at window openings, slide guards to prevent material falling from roof to lower levels, controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Safety Bar (three truss bar system)

Anchorage Details

Super Anchor Safety Bar was used with temporary bracing installed on truss system (see attached photos of the incident scene) in accordance with manufacturer's instructions.

Incident Scene

Peoria, Arizona

Two-story single family structure

Roof pitch: 4/12

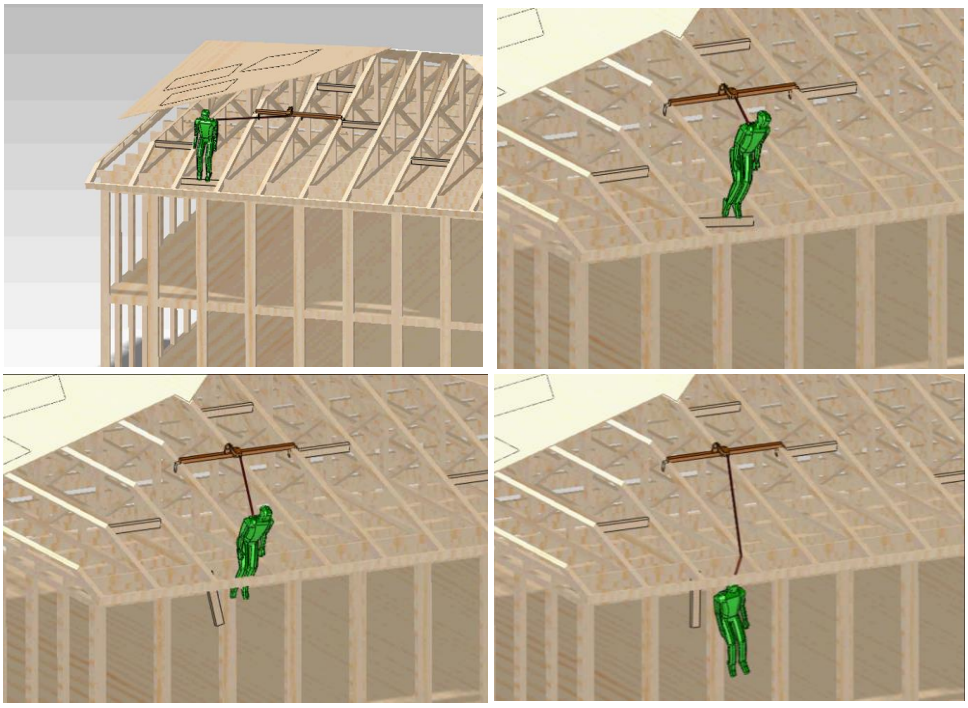
Wall heights: 9 feet first level, 8 feet second level

Phase of Construction Proximate to Incident

Braced and unsheathed trusses. Second day after roof trusses were installed by mobile crane. The incident occurred at the rear of the structure on the northwest corner of the second floor roof. Sheathing had been installed at several locations toward the front of the structure at those areas classified as the first floor roof. No sheathing had been installed at any location on the main span roof structure (second floor roof).

Description of How Incident Occurred

The cause of the fall was the employee's failure to correctly nail a block (commonly referred to in the trade as "short nailed"). Because it was not nailed correctly, when the worker stepped on the block it became unfastened from the wall, causing him to fall. The kinematics of the arrested fall are demonstrated in the following sequence.



Sequence of fall kinematics

Using a ladder to access that area would not have been a safe option because the employee would have been required to lean away from the ladder, in contrast to manufacturer recommendations and OSHA guidelines. Additionally, if the worker used a ladder in such a way to install fascia, he would have to reach over the edge of the wall and thereby be at risk without fall protection. Scaffold brackets at the time

of the incident were not a viable alternative because they would require more support (set up time and removal time) from trade partners which, in the market at the time, was highly unlikely.

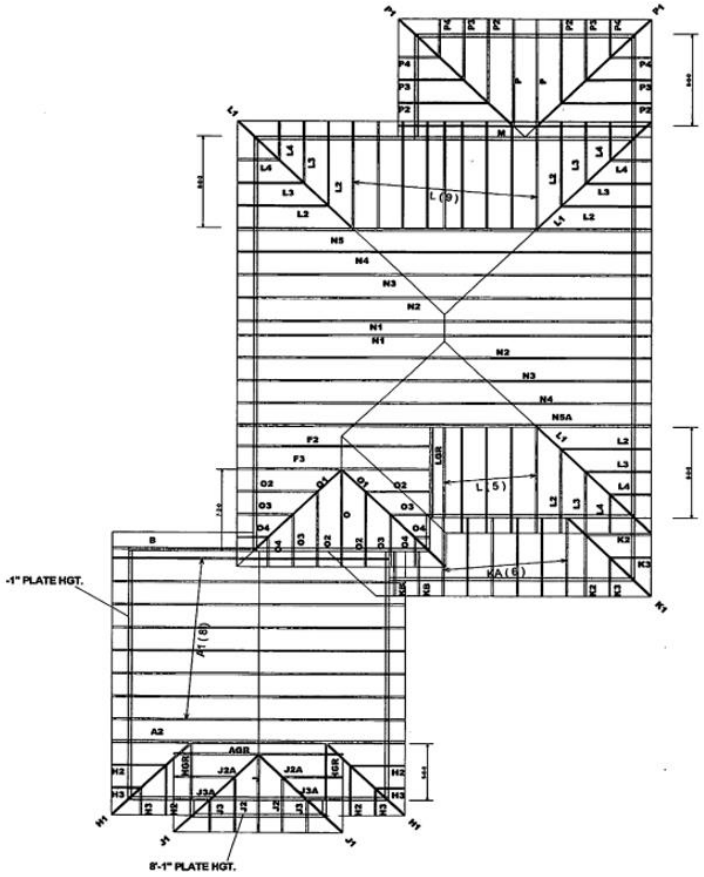
Rescue

After the incident, the worker was rescued with the assistance of fellow crew members who provided support as the worker climbed back onto the wall and then down through the trusses via an 8-foot step ladder.

Description of Injuries

Right lower leg minor cut (first aid) and pressure from arrested fall on lower torso without injury.

Truss System Blueprint



The figure below is an example of calculations from a truss that was part of the system to which the anchor was attached and installed on the roof system in accordance with manufacturer instructions.

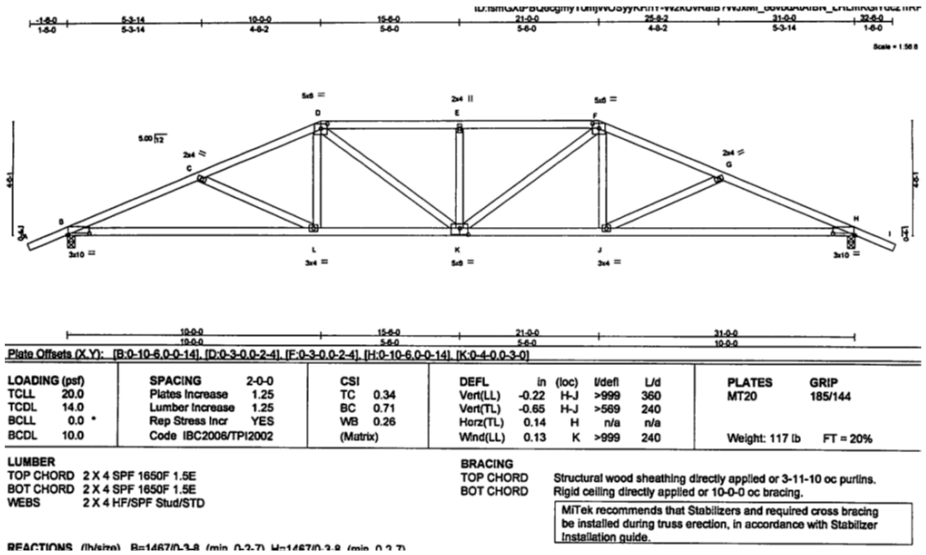


Plate Offsets (X,Y): [B:0-10-6,0-0-14], [D:0-3-0,0-2-4], [F:0-3-0,0-2-4], [H:0-10-6,0-0-14], [K:0-4-0,0-3-0]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plates Increase	1.25	TC	0.34	Vert(LL)	-0.22	H-J	>999	360	MT20	185/144
TCDL	14.0	Lumber Increase	1.25	BC	0.71	Vert(TL)	-0.65	H-J	>569	240		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.26	Horz(TL)	0.14	H	n/a	n/a		
BCDL	10.0	Code IBC2006/TPI2002		(Matrix)		Wind(LL)	0.13	K	>999	240	Weight: 117 lb	FT = 20%

LUMBER
TOP CHORD 2 X 4 SPF 1650F 1.5E
BOT CHORD 2 X 4 SPF 1650F 1.5E
WEBS 2 X 4 HF/SPF Stud/STD

BRACING
TOP CHORD Structural wood sheathing directly applied or 3-11-10 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

Scene Documentation

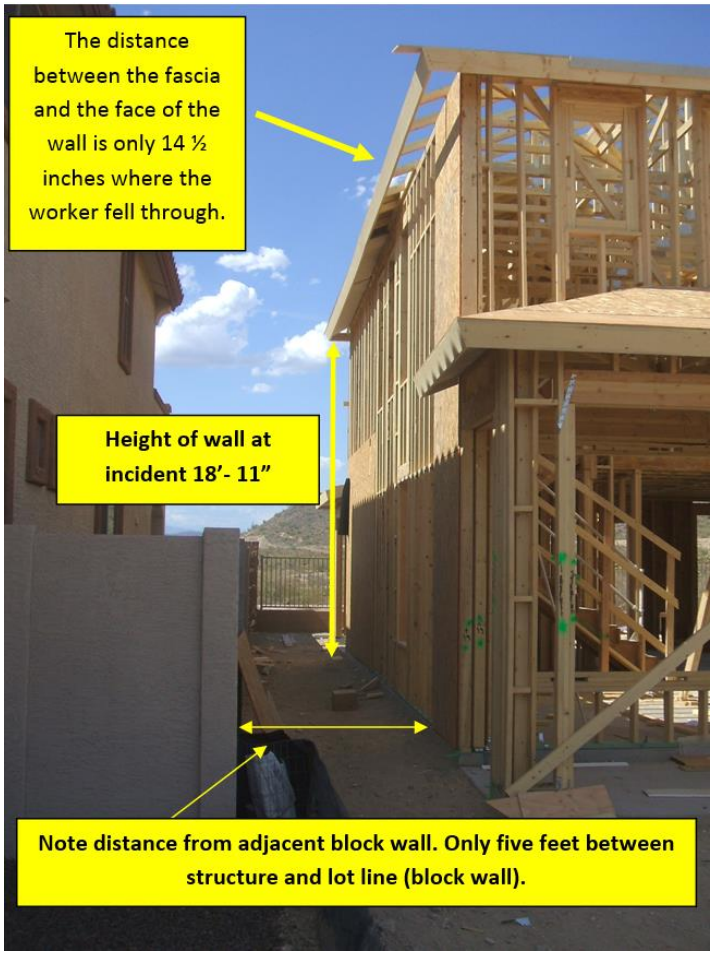


Figure 1. Day after fall arrest: house after installation of new blocks and fascia. .

Figure 2. Similar equipment used during incident and removed from service

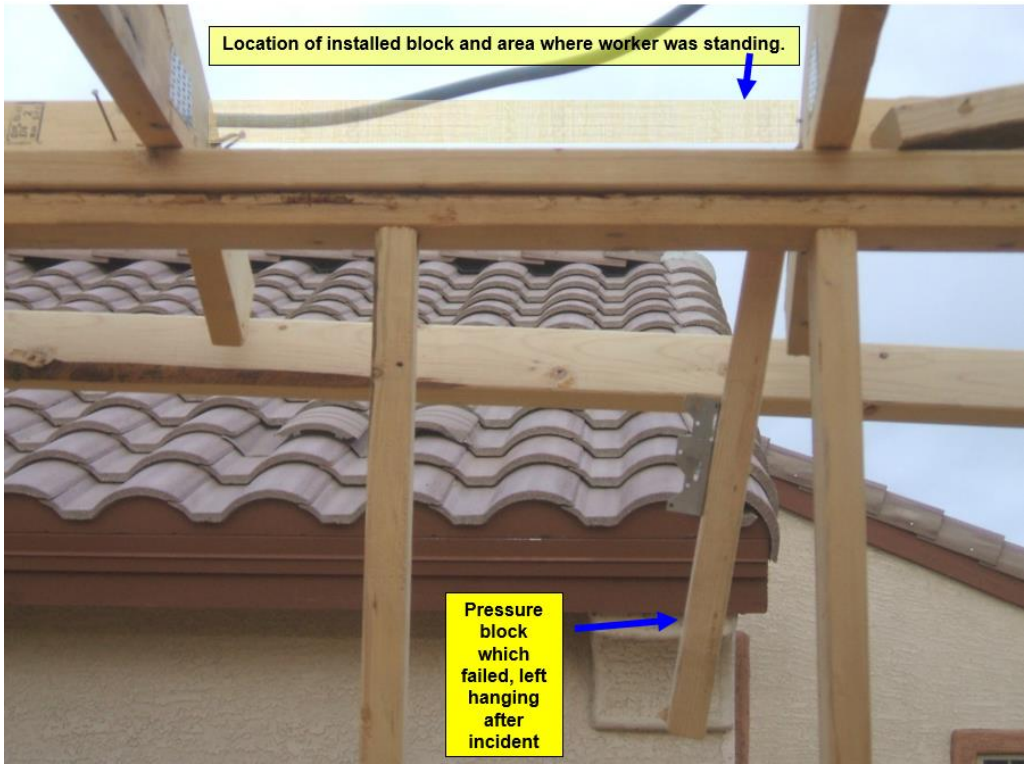


Figure 3. Location of incident from second floor vantage point as seen on date of incident.

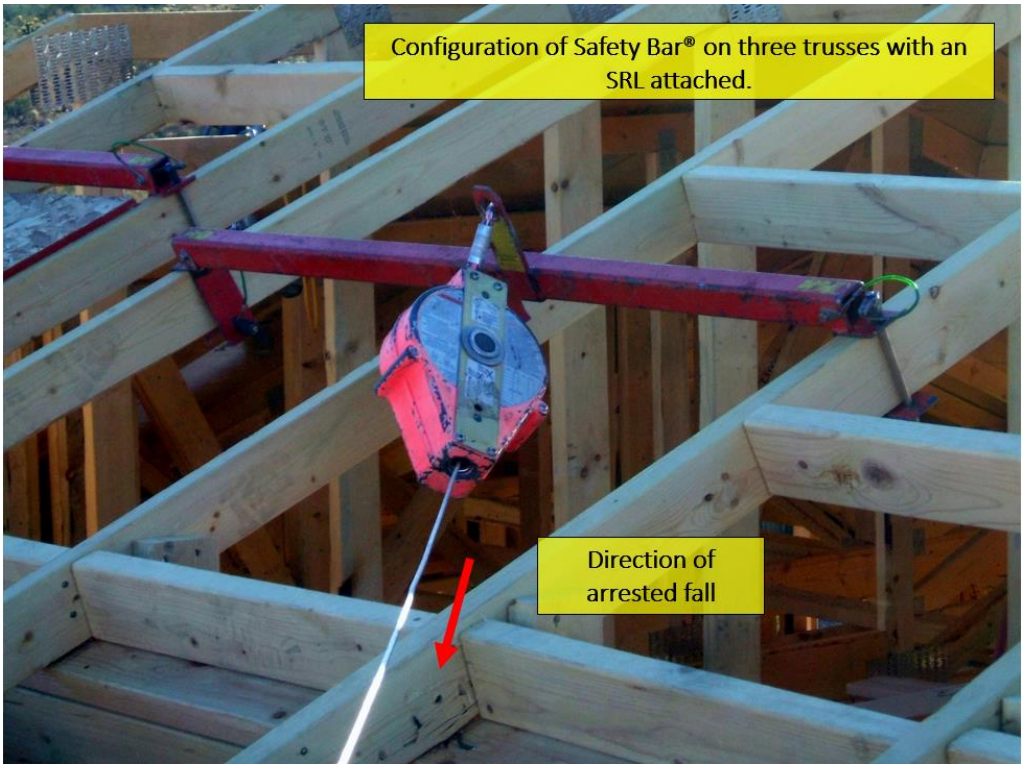


Figure 4. Illustration of how anchor was installed with SRL lanyard extended on day of incident.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker's fall was a step-off from the standing position.
- Because the lanyard was attached to the worker's D-ring, the lanyard was initially angled upward then dropped and laid atop the trusses as he fell.
- As the worker's D-ring passed the edge where he had been standing, the lanyard begin to pay out from the SRL.
- The worker was found hanging with his D-ring approximately 6 inches below the plate line.
- It is estimated that the free fall and arrest distances were approximately 60 inches (distance from D-ring to workers feet) and 6 inches, respectively.
- Other than the impact load indicators on the SRL and full body harness showing an impact occurred, examination of the Safety Bar and trusses to which it was connected did not exhibit deformation or any signs an arrested fall had occurred. None of the trusses or metal truss plates showed signs of any impact.
- Free falling from 19 feet without fall protection would have caused the worker to strike the ground at approximately 35 feet per second or 24 miles per hour

Fall Arrest or Save Evaluation Report

You Tube Animation: https://www.youtube.com/watch?v=jhyLyFoaSM4

Date and Time: **7-10-2009 07:30am (starts at 5 am)**

Type of Construction: **Residential Framing, single family home**

Fall Incident

The worker and his foreman were sheathing the garage trusses. It was the worker's first day using a personal fall arrest system on wood frame construction. The worker temporarily installed a piece of 4x8x½ inch sheathing with two 8d galvanized nails at the bottom corners of the sheet. Before putting additional nails on the top of the sheet, the worker stood up on the sheet and began to walk. As he walked on the temporarily nailed sheet, the nails failed and the sheet slid out from under the worker. The force and motion from his feet being on the sheet as it kicked out from under him caused the worker into a supine position and he fell through the roof trusses. His PFAS engaged and arrested his fall.

Additional Details

Wall height: 9 feet

Weather: Partly cloudy/ sunny and hot. Not considered of any consequence to the incident

Employee: Age 32, Approx. Height 6 feet, 4 months experience working as framer

Language: English (USA)

Size of Crew: Five workers

Time on Task: Five days working on this particular job site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not feasible, slide guards to prevent material falling from roof to lower levels, controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Form-It (Previously 3K)

Anchorage Details

Form-It was installed over partially sheathed and braced trusses in accordance with manufacturer instructions. Truss system was partially sheathed and braced according to field interpretation of SBCA BCSI B2.

Incident Scene

Peoria, Arizona

Two-story single family structure

Roof pitch: 4/12

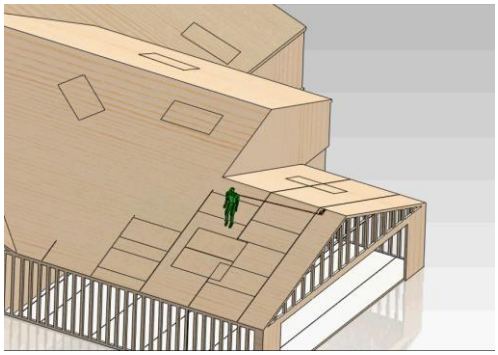
Wall heights: 9 feet first level, 8 feet second level

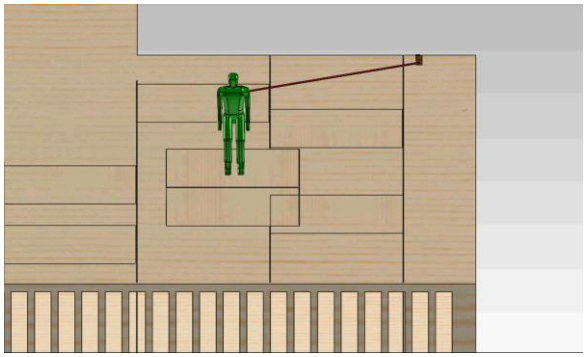
Phase of Construction Proximate to Incident

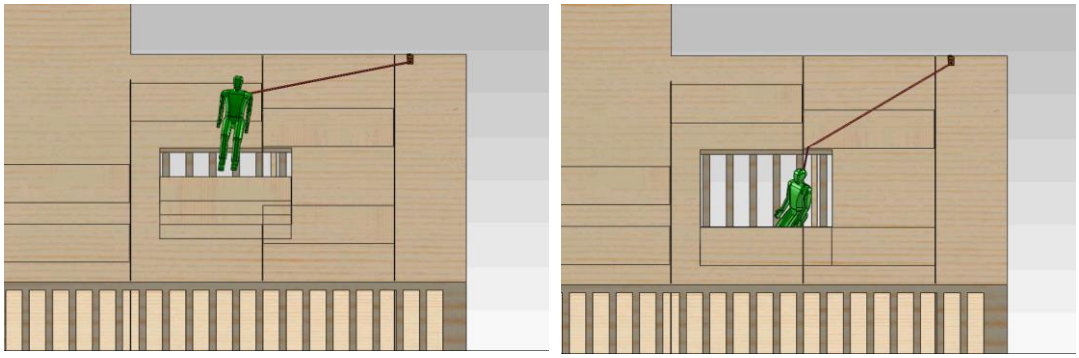
Braced partially sheathed trusses. Second day after roof trusses were installed by mobile crane. OSB sheathing was being installed on the garage trusses by the foreman and the worker.

Description of How Incident Occurred

Upon review of the incident and report made by the foreman (who watched the entire incident only six feet in front of him), it was determined that the fall protection system acted exactly as designed. The worker, whose previous construction experience was in steel erection, was not fully aware of wood frame techniques to comprehend how important it was to properly secure sheathing. Although the worker stated he had experience with using PFAS in steel construction, this was the worker's first day using fall protection systems in residential construction. The kinematics of the arrested fall are demonstrated in the following sequence.







Sequence of fall kinematics

Without the use of PFAS, it is likely the worker's injuries would have been severe, given he was falling flat on his back from 13 feet (9 feet wall plus height of truss).

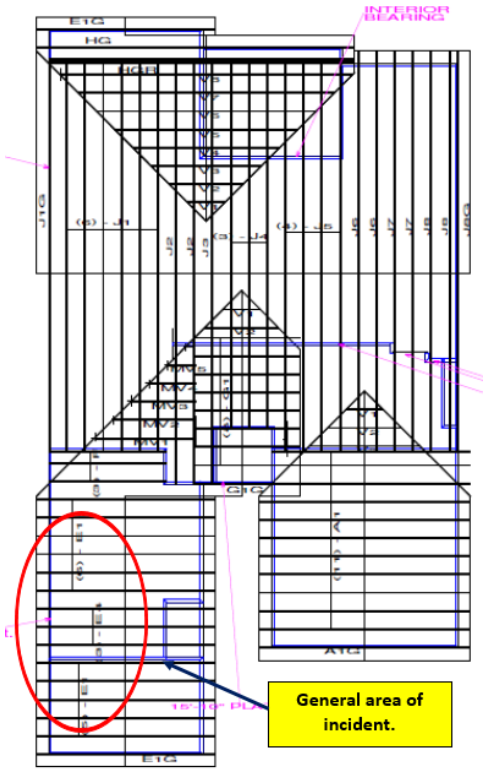
Rescue

After the incident, the worker was rescued with the assistance of fellow crew members on the ground (including a company superintendent on location) who erected an 8-foot step ladder next to the worker. The worker was conscience and able to step onto the ladder then get released from the SRL snap hook.

Description of Injuries

No injuries reported.

Truss System Blueprint



The following figure is the trusses from the incident. The anchor point was installed into the top cord of a braced and partially sheathed truss system over the garage of the structure.

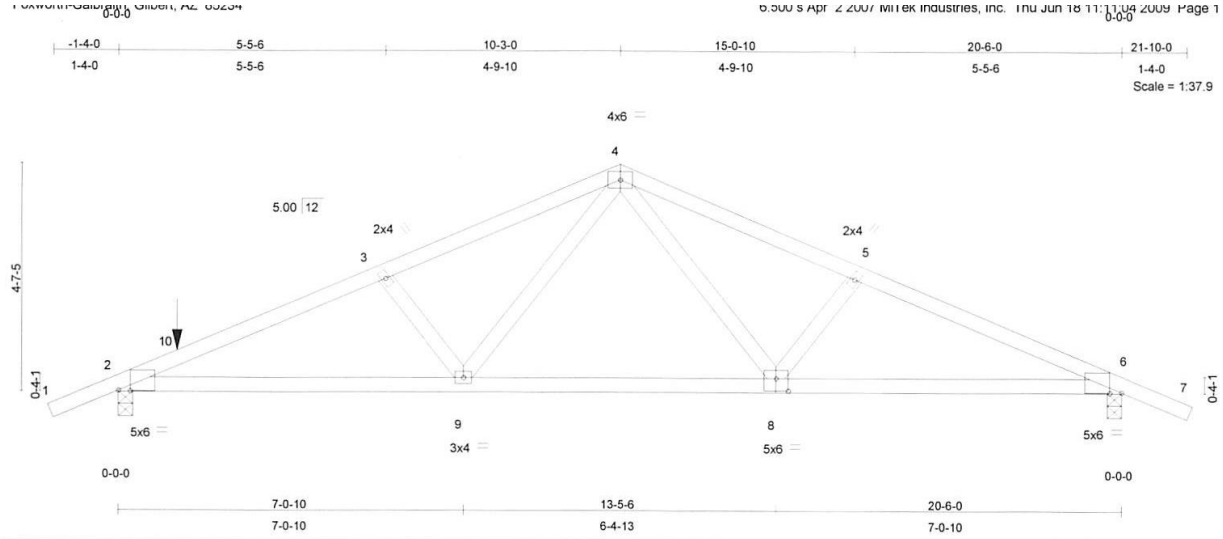


Plate Offsets (X,Y): [2:0-2-14,0-0-2], [6:0-2-14,0-0-2], [8:0-3-0,0-3-0]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	16.0	Plates Increase	1.25	TC	0.70	Vert(LL)	0.13	2-9	>999	360	MT20	185/144
TCDL	18.0	Lumber Increase	1.25	BC	0.74	Vert(TL)	-0.31	2-9	>779	240		
BCLL	0.0 *	Rep Stress Incr	NO	WB	0.36	Horz(TL)	0.07	6	n/a	n/a		
BCDL	6.0	Code IRC2006/TPI2002		(Matrix)							Weight: 70 lb	

LUMBER
TOP CHORD 2 X 4 SPF 2100F 1.8E
BOT CHORD 2 X 4 SPF 1450F 1.3E
WEBS 2 X 4 HF/SPF Stud/STD

BRACING
TOP CHORD Structural wood sheathing directly applied or 4-0-8 oc purlins.
BOT CHORD Rigid ceiling directly applied or 7-10-7 oc bracing.

REACTIONS (lb/size) 2=1574/0-3-8, 6=951/0-3-8
Max Horz 2=74(LC 5)
Max Uplift 2=-674(LC 5), 6=-404(LC 6)

FORCES (lb) - Maximum Compression/Maximum Tension
TOP CHORD 1-2=0/35, 2-10=-2153/824, 3-10=-1844/723, 3-4=-1621/671, 4-5=-1466/604, 5-6=-1684/640, 6-7=0/35
BOT CHORD 2-9=-654/1709, 8-9=-300/1042, 6-8=-484/1485
WEBS 3-9=-490/314, 4-9=-279/653, 4-8=-183/446, 5-8=-339/248

NOTES
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-05; 90mph; h=25ft; TCDL=6.0psf; BCDL=3.6psf; Category II; Exp C; partially; MWFRS gable end zone; cantilever left and right exposed ; end vertical left and right exposed; Lumber DOL=1.33 plate grip DOL=1.33.
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) This truss requires plate inspection per the Tooth Count Method when this truss is chosen for quality assurance inspection.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 1-0-0 wide will fit between the bottom chord and any other members.
6) This truss is designed in accordance with the 2006 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
7) Hanger(s) or other connection device(s) shall be provided sufficient to support concentrated load(s) 699 lb down and 304 lb up at 1-3-0 on top chord. The design/selection of such connection device(s) is the responsibility of others.
8) In the LOAD CASE(S) section, loads applied to the face of the truss are noted as front (F) or back (B).

Scene Documentation

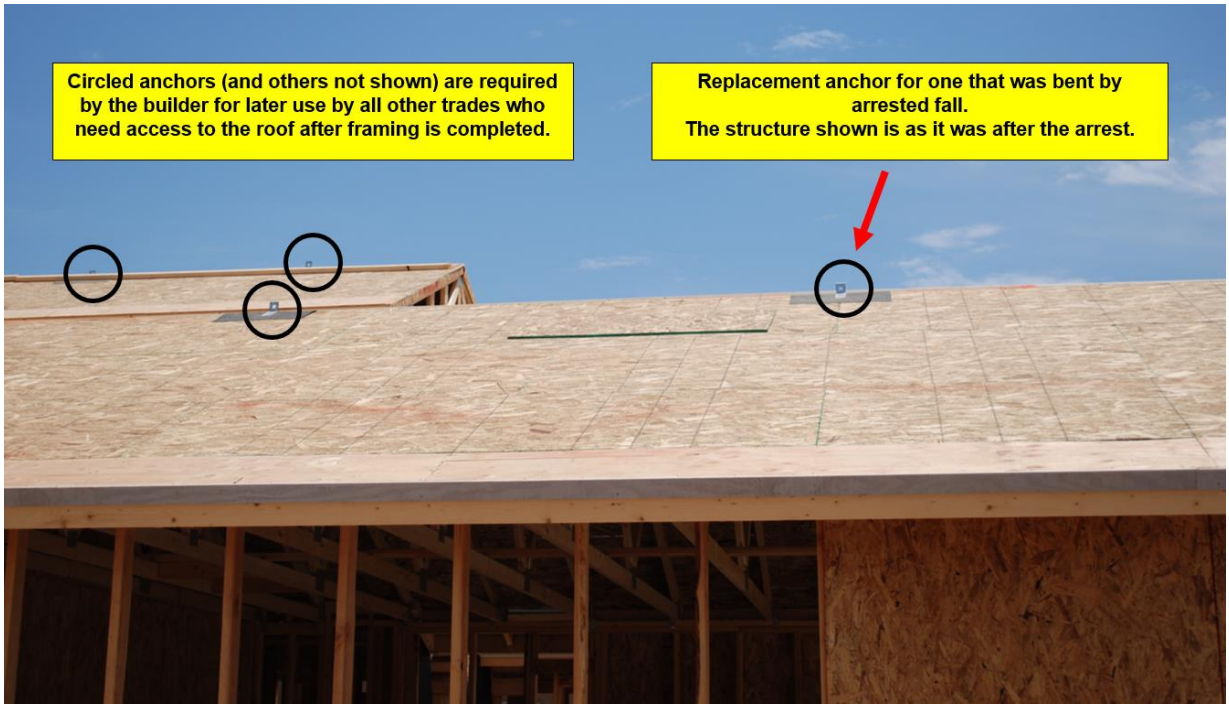


Figure 1. Structure from incident taken 4 days later

Figure 2. Another view of the completed structure. Circles denote anchors.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker's fall was a slip and backwards fall when the sheet kicked forward from under him.
- He began to fall in quasi-supine position while his hard hat missed the edge of the hole.
- Because the lanyard was attached to the worker's D-ring, the lanyard was initially angled upward then dropped and laid on the sheathing as he fell.
- As the worker's D-ring passed the edge where he had been standing, the lanyard begin to pay out from the SRL.
- As the SRL arrested his fall through the D-ring, his feet swung down and the worker was found hanging with his D-ring "approximately 4-½ feet below the plate line" as relayed by a witness. This total fall distance would most likely be due to the skewed angle between the worker and the location of the anchor.
- The impact load indicators on the SRL and full body harness showed an impact had occurred. The anchor was bent and replaced. Examination of the sheathing around the location of the anchor and the trusses below (including the metal truss plates) did not show any signs an arrested fall had occurred.
- Without a PFAS, the worker would have experienced an uncontrolled fall between the trusses and would have hit the concrete slab at approximately 27 feet per second or 18 miles per hour - possibly in a supine position.

Fall Arrest or Save Evaluation Report

Date and Time: **8-17-2009 02:00 PM (starts at 6 am)**

Type of Construction: **Residential Framing, two story, single family home**

Fall Incident

The worker was walking across a sheeted second story roof and took a step across some unsheathed trusses. As the worker stepped forward, the trusses spread apart and caused the worker's foot to slip off a truss. The worker fell between the trusses where there was no sheathing. The PFAS system engaged and the worker was able to pull himself back up through the trusses.

Additional Details

Wall height: 9 feet 1 inch plus 8 feet 1 inch

Weather: Hot, partly cloudy in the morning clearing by midday. Not considered of any consequence to the incident.

Employee: Three years' experience working in construction.

Language: English (USA)

Size of Crew: Seven workers

Time on Task: Seven days on this site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS had been provided.

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not feasible, guard rails erected on all second floor leading edges and window openings, 2x6 slide guards to prevent material falling from roof to lower levels, controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft Ultra Lok™ with 3/16 stainless steel wire rope lanyard

No description of anchor provided in field report. It is assumed either a Super Anchor® - Form-It (Previously 3K) or Safety Bar was used as those were the only anchors available to workers at the time.

Anchorage Details

Form-It or Safety Bar would have been installed per manufacturer information. Roof and truss system would have been sheathed and braced accordingly.

Incident Scene

Chandler, Arizona

Roof pitch: 4/12

Wall heights: 9 ft. first floor ceiling, 8 ft. second floor ceiling plus floor truss height.

Phase of Construction Proximate to Incident

Installation of roof sheathing over main span of second floor trusses.

Description of How Incident Occurred

There was very little investigation by field personnel on this incident aside from the initial field incident witness report sent to the corporate office. It is likely that without a witness there would have been no report of incident made to the supervisor. As stated above, the worker was walking on a sheathed area of roof and fell between trusses in an unsheathed area when the trusses separated. The harness did not show an impact on the indicator but the SRL did revealed conformation of an impact on the SRL impact indicator. No additional investigation was possible because the worker and the witness left employment with the company immediately after the structure was completed. Although the specific location of the incident is not known, we were able to determine in the records what phase of construction was underway at the time of incident and so a general location and configuration of construction is known.

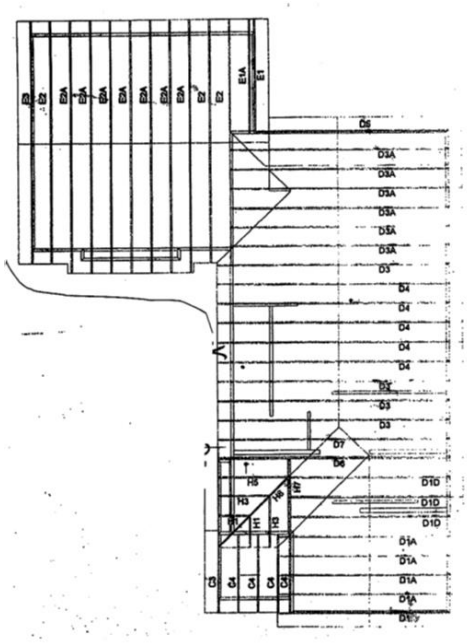
Rescue

According to the field incident report, the worker was able to pull himself back onto the roof by climbing the truss webbing and internal truss bracing.

Description of Injuries

Minor scrape to left leg, treated as first aid in the field. No other injuries mentioned.

Truss System Blueprint



The figure below is an example of calculations from a truss that was part of the system to which the anchor was attached and installed on the roof in accordance with manufacturer instructions.

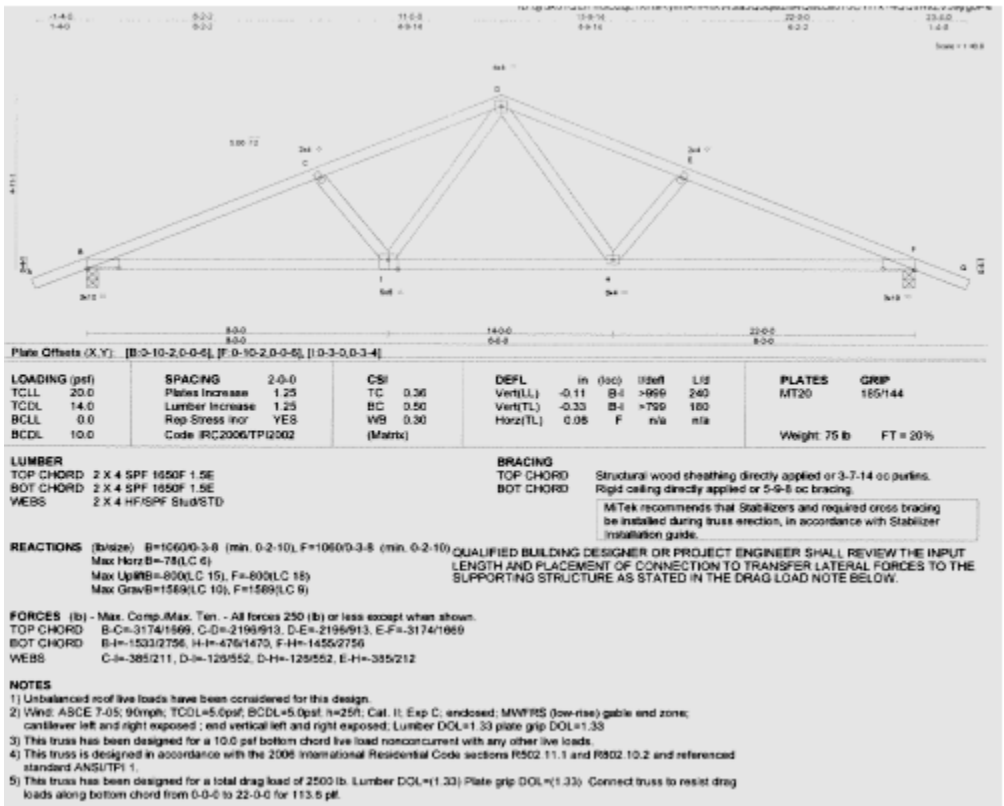


Plate Offsets (X,Y): [B:0-10-2,0-0-6], [F:0-10-2,0-0-6], [I:0-3-0,0-3-4]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plates Increase	1.25	TC	0.36	Vert(LL)	-0.11	B-I	>999	240	MT20	185/144
TCDL	14.0	Lumber Increase	1.25	BC	0.50	Vert(TL)	-0.33	B-I	>799	180		
BCLL	0.0	Rep Stress Incr	YES	WB	0.30	Horz(TL)	0.08	F	n/a	n/a		
BCDL	10.0	Code IRC2006/TPI2002		(Matrix)							Weight: 75 lb	FT = 20%

LUMBER
TOP CHORD 2 X 4 SPF 1650F 1.5E
BOT CHORD 2 X 4 SPF 1650F 1.5E
WEBS 2 X 4 HF/SPF Stud/STD

BRACING
TOP CHORD Structural wood sheathing directly applied or 3-7-14 oc purlins.
BOT CHORD Rigid ceiling directly applied or 5-9-8 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS (lb/size) B=1060/0-3-8 (min. 0-2-10), F=1060/0-3-8 (min. 0-2-10)
Max Horz B=-78(LC 6)
Max Uplift B=-800(LC 15), F=-800(LC 16)
Max Grav B=1569(LC 10), F=1569(LC 9)

QUALIFIED BUILDING DESIGNER OR PROJECT ENGINEER SHALL REVIEW THE INPUT LENGTH AND PLACEMENT OF CONNECTION TO TRANSFER LATERAL FORCES TO THE SUPPORTING STRUCTURE AS STATED IN THE DRAG LOAD NOTE BELOW.

FORCES (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD B-C=-3174/1699, C-D=-2196/913, D-E=-2196/913, E-F=-3174/1669
BOT CHORD B-I=-1533/2756, H-I=-476/1470, F-H=-1455/2756
WEBS C-I=-385/211, D-I=-126/552, D-H=-126/552, E-H=-385/212

NOTES
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-05; 90mph; TCDL=5.0psf; BCDL=5.0psf; h=25ft; Cat. II; Exp C; enclosed; MWFRS (low-rise) gable end zone; cantilever left and right exposed ; end vertical left and right exposed; Lumber DOL=1.33 plate grip DOL=1.33
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) This truss is designed in accordance with the 2006 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
5) This truss has been designed for a total drag load of 2500 lb. Lumber DOL=(1.33) Plate grip DOL=(1.33) Connect truss to resist drag loads along bottom chord from 0-0-0 to 22-0-0 for 113.6 plf.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker was attempting to step on a truss when it moved, he lost his footing and fell between the trusses.
- The worker was able to extricate himself and climbed back onto the roof.
- Other than the witness statement, the only physical evidence that an arrested fall occurred was the impact load indicators on the SRL and full body harness. There was no residual damage to the roof structure.
- Without a PFAS, the worker would have experienced an uncontrolled fall between the trusses and would have hit the first floor deck at approximately 27 feet per second or 18 miles per hour.

Fall Arrest or Save Evaluation Report

You Tube Animation: https://www.youtube.com/watch?v=inIW5VqhJAU

Date and Time: **4-9-2012 10:00 am (start at 7:00 am)**

Type of Construction: **Light Commercial Wood Frame Structure**

Fall Incident

The worker was assisting a coworker in moving a roof joist. As the worker was kneeling down over the leading edge, the sheathing fell out from under him and he fell face-first over the edge. The PFAS engaged and pulled him upright before bringing him to a stop.

Additional Details

Ceiling height: 14 feet

Weather: Hot, partly cloudy in the morning clearing by midday. Not considered of any consequence to the incident.

Employee: Age 19, 175 pounds. 1 year experience working in construction

Language: English (USA)

Size of Crew: Seven workers

Time on Task: Nine days working on this particular job site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS had been provided.

Fall Prevention Measures

Personnel Lifts were used to access areas and install rafters, beams, etc. Workers in lifts were restrained in accordance with OSHA standards. Ladders used when feasible. Fall restraint systems were used where workers had to perform tasks on ladders when there was possibility of loss of balance. Controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft. Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Form-It (Previously 3K)

Anchorage Details

Form-It anchor was installed over ½ - inch OSB sheathed over dimensional 2x10 rafters in accordance with manufacturer instructions. The joists at the location of the anchor were fully sheathed in accordance with architectural details provided by the architect and engineer on record.

Incident Scene

Scottsdale, Arizona

Roof pitch: ½ inch per foot "flat" roof

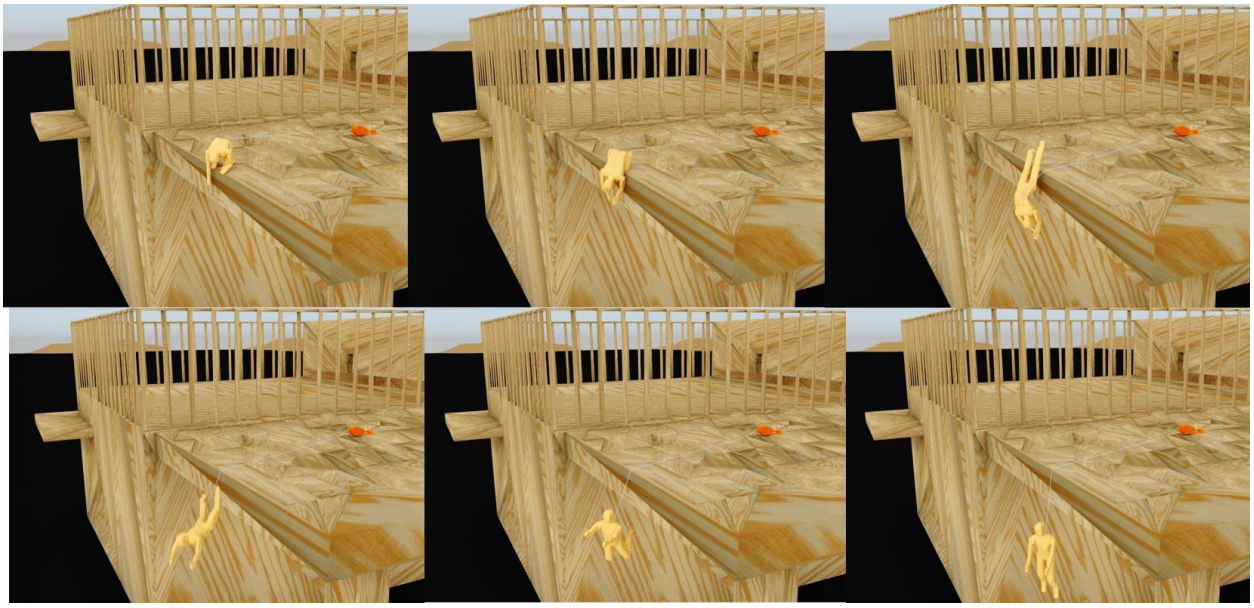
Wall heights: 14 feet – 8 inches to top of deck

Phase of Construction Proximate to Incident

Final phase of joist sheathing installation and minor structural framing adjustments.

Description of How Incident Occurred

There was a witness who watched the entire event while standing three feet in front of the worker. According to the witness, the worker went to the leading edge of the structure to assist with the moving of a roof joist. The two workers were going to remove the joist and reposition it later. According to the worker who fell, he leaned out over the edge and grabbed the joist so that when the nails that were securing the rafter were removed, the rafter would not fall on his coworker. Unfortunately, the rafter was partially supporting the sheathing the worker was kneeling on as he leaned over the edge. Immediately upon the removal of the last fastener, the sheathing beneath the worker broke from his weight. Because he was leaning forward, the worker began falling face-first to the ground below. The following sequence demonstrates the worker's fall.



Demonstration of fall kinematics

According to the witness and the worker, the PFAS immediately engaged and arrested his fall. The correct positioning of the harness on the worker and its snug fit allowed the system to pull the worker upright just below the roof edge.

After the incident the worker described that his only fear was whether he had his harness fitted correctly, as he knew he was about to have an arrested fall to his pelvic area. According to the worker he was not afraid of falling because he knew he was protected by the PFAS.

The anchor involved in the arrest was photographed three days earlier during a routine safety inspection of the site by company safety personnel. A photo of the anchor before and after is available for this report.

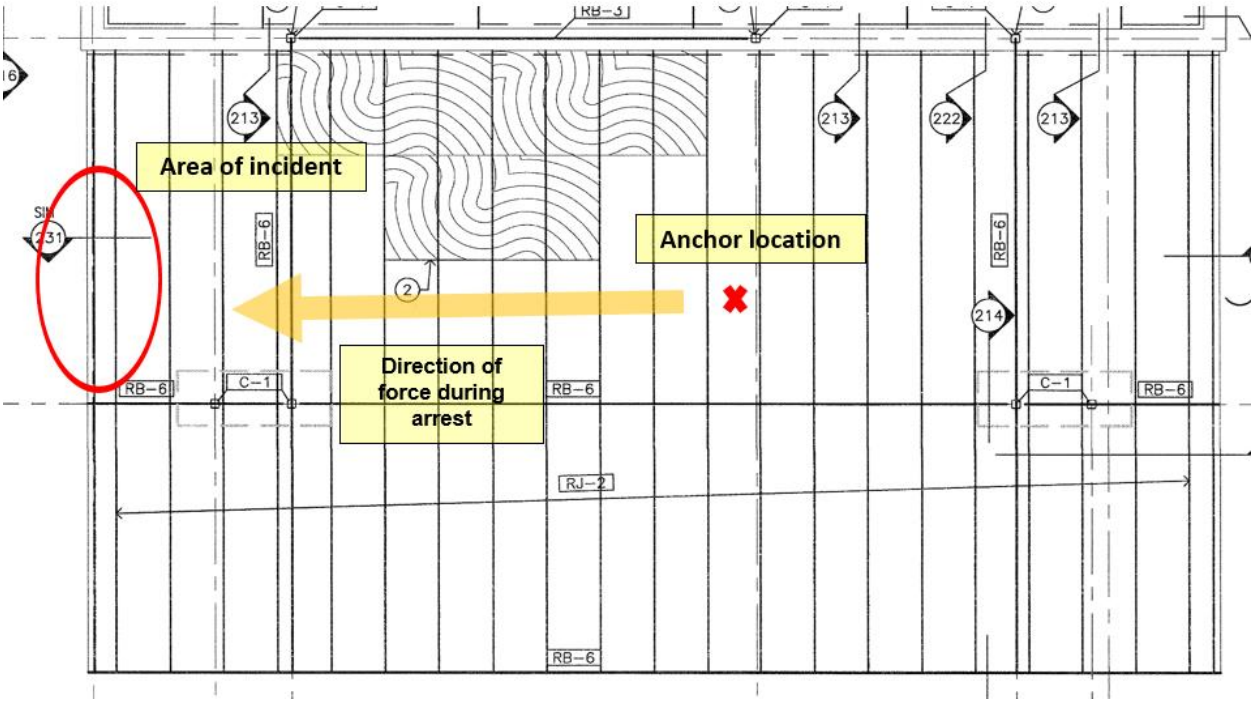
Rescue

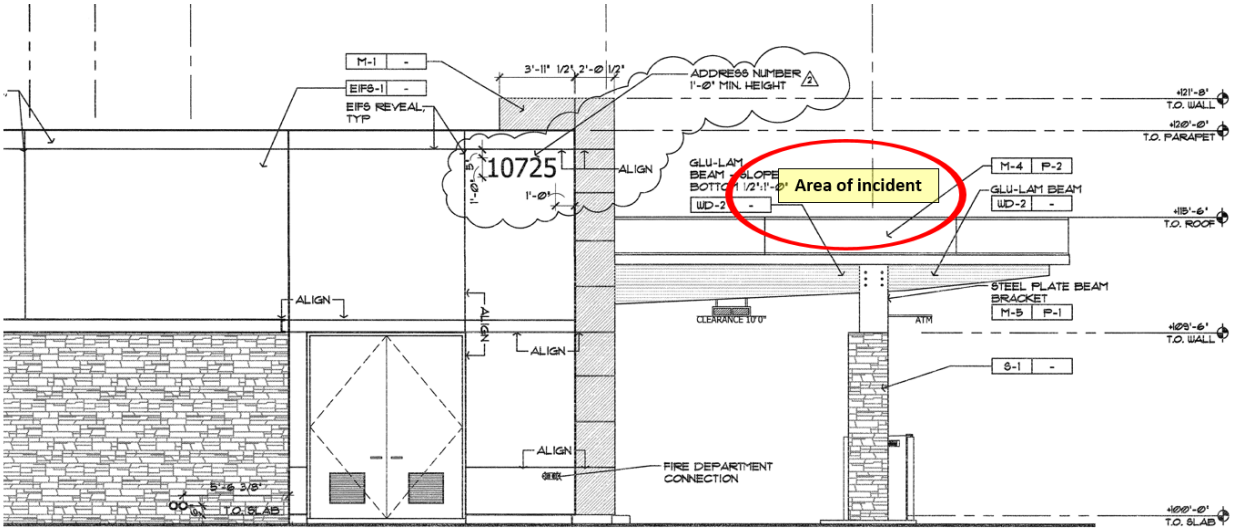
The worker was immediately rescued by his coworker by the use of the personnel lift on site. After sitting for about 30 minutes, the worker returned to the job.

Description of Injuries

No injuries reported.

Roof System Blueprint/Structural Pages





Scene Documentation

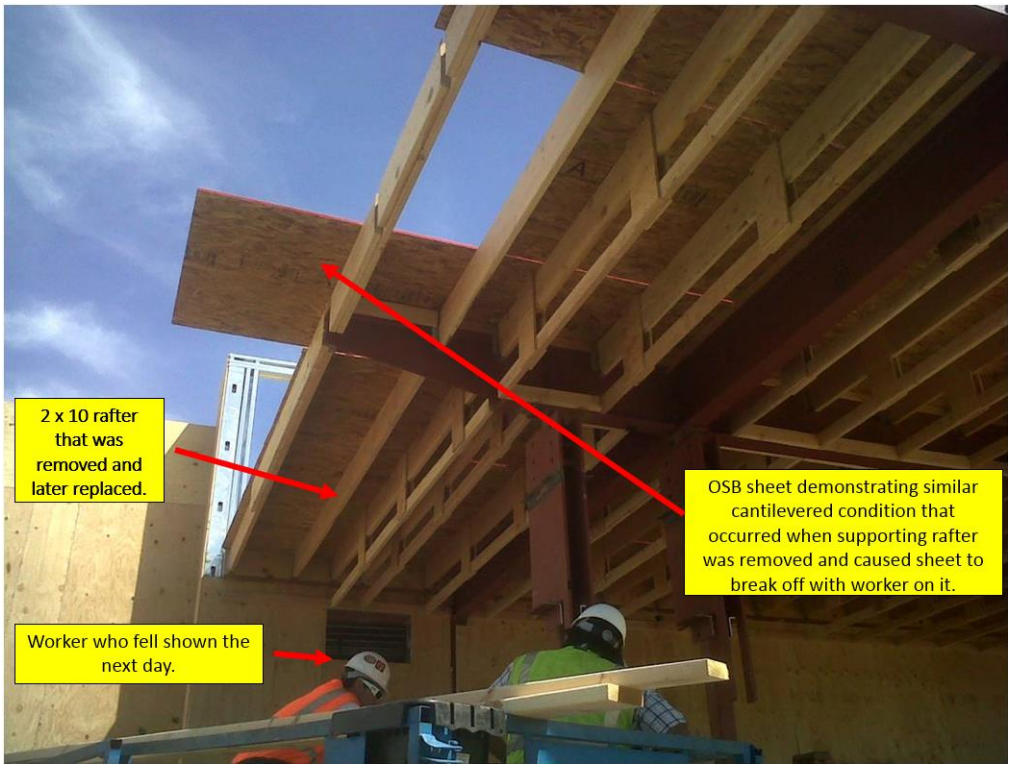


Figure 1. Demonstration of conditions that occurred to cause fall.

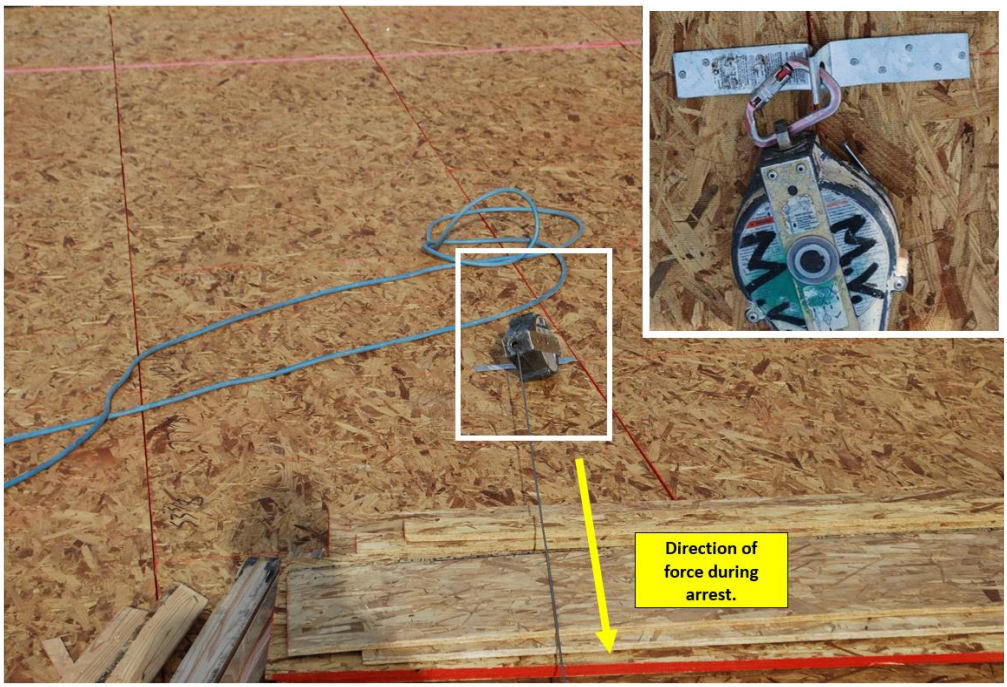


Figure 2. Demonstation of direction of load applied to SRL and anchor.
Inset: SRL and anchor three days before incident.

Figure 3. Roof area day after incident. No damage or deflection of roof. No withdrawal of anchor from OSB sheathing.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker was crouched down and leaning over the edge of the deck.
- At the time, he had approximately 25 feet of lanyard extended from the SRL.
- When the OSB broke, he pitched forward head first.
- Because the lanyard was attached to the worker's D-ring, the lanyard was initially angled upward then dropped and laid atop the deck as he fell.
- As the worker pitched off the deck, the lanyard passed over the edge and began to pay out from the SRL.
- The sudden motion caused the SRL to engage and begin to arrest the worker in a line of action from his D-ring back up to the anchor.
- The worker began to slow and his lower body continued to swing down until the worker came to a stop. He was found hanging with his D-ring below the deck.
- Because there was no report of abrasions to the worker's legs from contact with the roof edge, he was likely clear of the edge when he was arrested.
- It is estimated that the combined free fall and arrest distance was approximately 4 to 5 feet.
- Other than the impact load indicators on the SRL and full body harness showing an impact occurred, examination of the roof deck did not exhibit deformation or any signs an arrested fall had occurred.
- From a height of 14.75 feet, had the worker not been wearing a PFAS, he would have hit the ground at 31 feet per second or 21 miles per hour and most likely in a head down orientation.

Fall Arrest or Save Evaluation Report

You Tube Animation: https://www.youtube.com/watch?v=fMo45TO8oRs

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Date and Time: **7-26-2012 10:45 am (start at 5:00 am)**

Type of Construction: **Single Family Residential**

Fall Incident

The worker was finishing nailing down previously installed roof sheathing. As the worker was bent over walking down the slope of the roof using a pneumatic nail gun, he either lost his balance or slipped down the roof. Due to the direction of the worker in relation to the location of the SRL, as he began falling forward down the roof, the system engaged immediately and stopped him from going over the roof edge.

Additional Details

Eave Height: 8 feet

Weather: Hot, partly cloudy in the morning clearing by midday. Not considered of any consequence to the incident.

Employee: Age 47, 185 pounds. 10 plus years' experience in construction.

Language: Spanish (Mexico) Primary, English (USA) Secondary

Size of Crew: Four workers

Time on Task: Six days working on this particular job site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not practical. Slide guards to prevent material falling to lower levels and controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft. Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - RS-20 (part #2816)

Anchorage Details

Super Anchor RS-20 # 2816 was installed over sheathed and braced trusses in accordance with manufacturer instructions.

Incident Scene

Peoria, Arizona

Roof pitch: 4/12

Wall height: 8 ft.

Phase of Construction Proximate to Incident

Roof trusses fully sheathed and permanent bracing installed. Final nailing of roof after sheathing installed. Typically sheathing is secured with enough nails to prevent dislodging. Final nailing is not done sporadically because it is often inefficient. After roof sheathing installation is complete, workers go back and, in one continuous cycle, nail the entire roof with a bump fire pneumatic nail gun.

Description of How Incident Occurred

According to the statements from the worker during the initial interview, he was stopped from actually going over the roof edge by the equipment. The worker's description was that he was "just stumbling" down the roof. The worker's harness did not show an impact on the indicator but the SRL did show an impact on the indicator. So, at the very least, there was enough force put on the system to register an impact had occurred. Regardless, both components were removed from service per manufacturer recommendations and the anchor removed from the roof after the investigation.

During the investigation of the incident, it was determined the restrained fall did occur in close proximity to the ladder access point on the roof. Given the amount of force required to show an impact on the SRL, it is unlikely that the worker only "stumbled and fell to his knees" but rather stumbled and then had a full force loss of control and fell forward causing the system to engage and prevent the worker from continuing down the roof and over the edge.

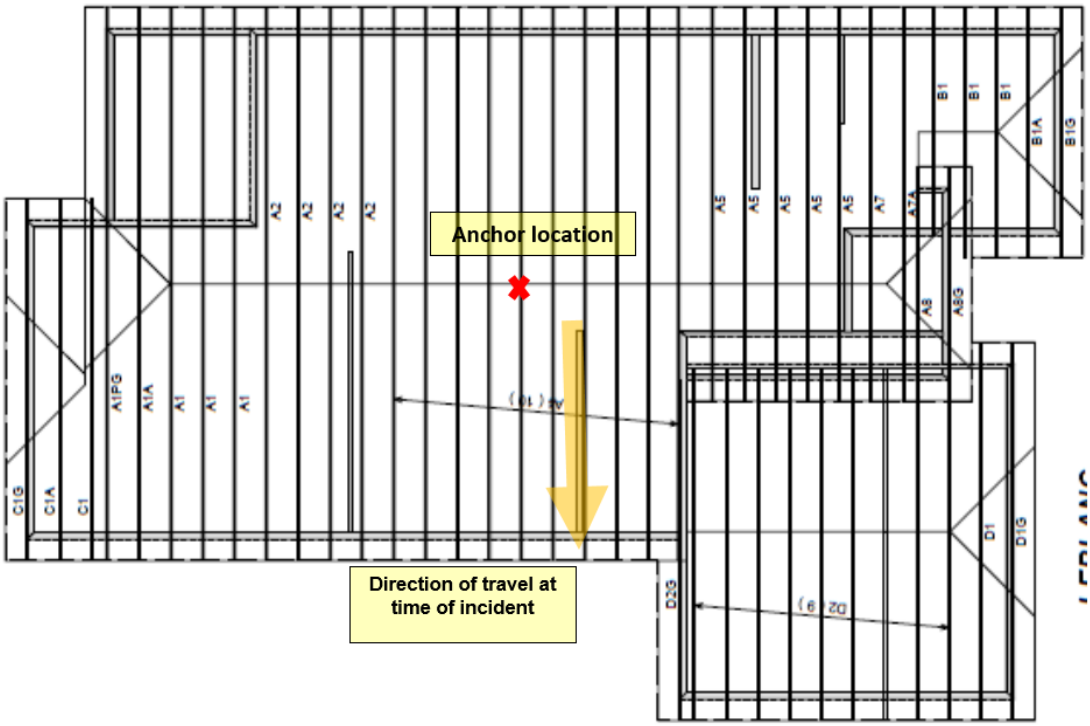
Rescue

Since the worker did not actually go over the edge, he was able to recover and disengage his equipment from the roof. He then immediately went down off the roof and reported the incident to his foreman.

Description of Injuries

The worker reported discomfort in his ankle associated with a slight strain. He provided self-treatment with cold and heat during the evening and reported the pain had subsided the following day.

Roof System Blueprint



The figure below is an example of calculations from a truss that was part of the system to which the anchor was attached through the sheathing and installed on the roof system in accordance with manufacturer instructions.

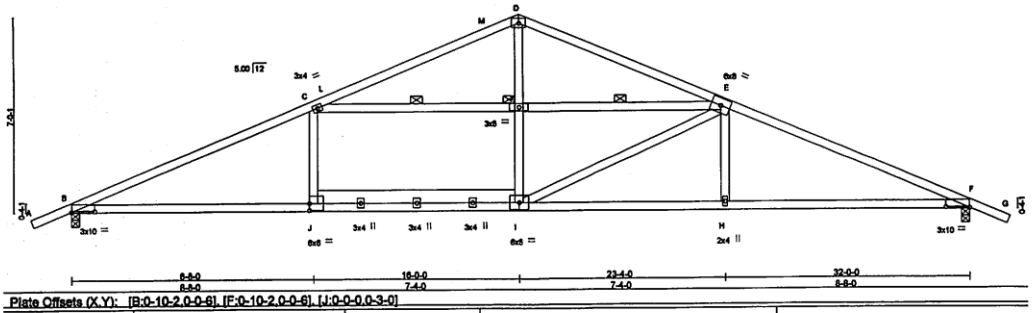


Plate Offsets (X,Y): [B:0-10-2,0-0-6], [F:0-10-2,0-0-6], [J:0-0-0,0-3-0]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plates Increase	1.25	TC	0.93	Vert(LL)	0.19	B-J	>999	240	MT20	185/144
TCDL	14.0	Lumber Increase	1.25	BC	0.76	Vert(TL)	-0.55	B-J	>698	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.68	Horz(TL)	0.14	F	n/a	n/a		
BCDL	10.0	Code IRC2006/TPI2002		(Matrix)							Weight: 133 lb	FT = 0%

LUMBER
TOP CHORD 2 X 4 SPF 1650F 1.5E
BOT CHORD 2 X 4 SPF 1650F 1.5E
WEBS 2 X 4 HF/SPF Stud/STD *Except*
I-J: 2 X 6 SPF 1650F 1.5E

BRACING
TOP CHORD Structural wood sheathing directly applied.
BOT CHORD Rigid ceiling directly applied or 5-6-12 oc bracing.
WEBS 1 Row at midpt C-K, E-K
JOINTS 1 Brace at Jt(s): K

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS (lb/size) B=1593/0-3-8 (min. 0-3-4), F=1556/0-3-8 (min. 0-3-4)
Max Horz B=-104(LC 17)
Max Uplift B=-837(LC 15), F=-837(LC 18)
Max Grav B=1977(LC 10), F=1977(LC 9)

QUALIFIED BUILDING DESIGNER OR PROJECT ENGINEER SHALL REVIEW THE INPUT LENGTH AND PLACEMENT OF CONNECTION TO TRANSFER LATERAL FORCES TO THE SUPPORTING STRUCTURE AS STATED IN THE DRAG LOAD NOTE BELOW.

FORCES (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD B-C=-4055/1715, C-L=-1713/845, L-M=-1645/796, D-M=-1057/356, D-E=-1652/765, E-F=-4046/1717
BOT CHORD B-J=-1548/3570, I-J=-979/3017, H-I=-878/3006, F-H=-1445/3561
WEBS C-J=0/295, C-K=-1798/568, I-K=-40/455, D-K=-47/479, E-K=-1782/593, E-H=0/292, E-I=-506/561

Scene Documentation

Figure 1. Image taken the day following the incident.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker was bent over and walking down the roof when he stumbled and was arrested by the SRL.
- At the time he stumbled, the worker had between 12 and 18 feet of lanyard pulled from the SRL.
- There was sufficient arresting force applied in this incident to trip the indicator on the SRL.
- The amount of force required to trip an SRL indicator is above the free-hanging body weight of a worker. This indicates the worker's momentum from stumbling forward was added to his body weight when he was arrested.
- The kinematics and physical evidence indicate that it is likely the worker lost control when he initially fell forward. Given that he was headed downslope and the surface on which he was working was smooth sheathing, without protuberances or structures to stop him, he would have continued past the roof edge had the PFAS not arrested his motion.
- Without the PFAS, the worker's initial speed would have been additive to his final freefall velocity and he would have struck the ground at approximately 25 feet per second.

Fall Arrest or Save Evaluation Report

You Tube Animation: https://www.youtube.com/watch?v=2Pkr6aTihQE

Date and Time: **12-21-2012 3:30 pm (start at 7:00 am)**

Type of Construction: **Single Family Residential**

Fall Incident

Worker was installing OSB sheathing on a single story garage roof. As he was backing up toward the roof slope to lift the next piece of OSB on the roof, he stepped toward and into an area of the roof which had not been sheathed. He fell backwards into the open section through the trusses. His fall was arrested by the PFAS he was using.

Additional Details

Eave Height: 9 feet

Weather: Cold morning followed by cool afternoon. Not considered any consequence to incident.

Employee: 5 foot – 6 inches, 160 pounds. 6 plus years' experience in construction.

Language: Spanish (Mexico) Primary, English (USA) Secondary

Size of Crew: Nine workers

Time on Task: Five days working on this particular job site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not practical. Slide guards to prevent material falling to lower levels and controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

DBI/SALA 30 ft. Ultra Lok™ with 3/16 stainless steel wire rope lanyard

Super Anchor® - Form-It (Previously 3K)

Anchorage Details

Form-It was installed over sheathed and braced trusses in accordance with manufacturer instructions.

Incident Scene

Goodyear, Arizona

Roof pitch: 3/12 at location of incident

Wall heights: 9 feet

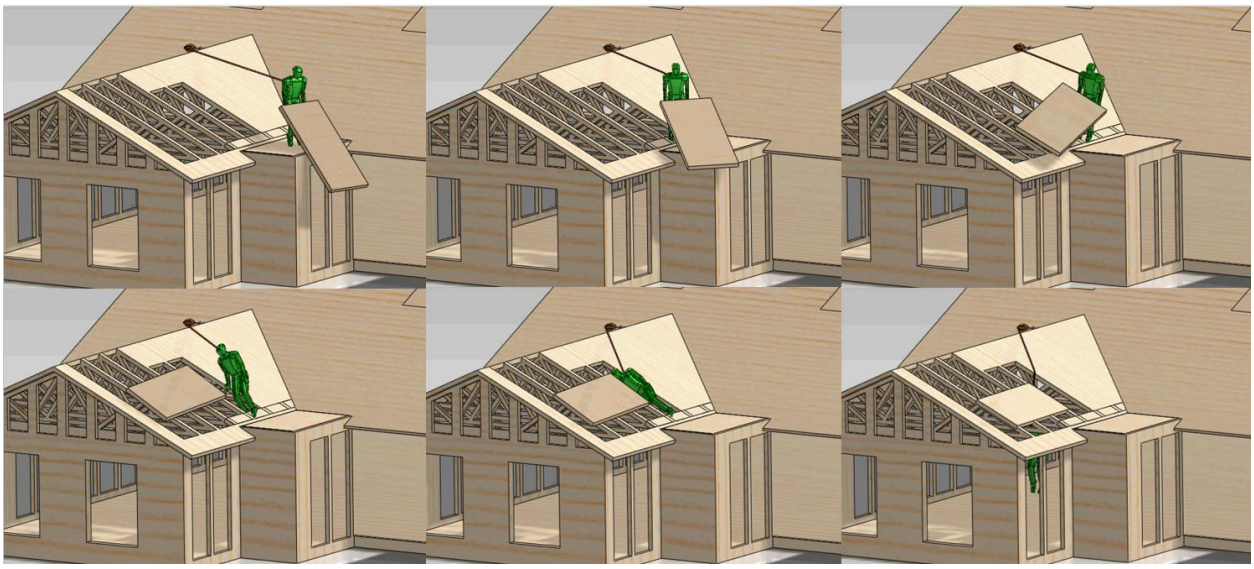
Phase of Construction Proximate to Incident

Workers were installing sheathing in preparation to over-frame the garage with portions of the entry tower.

Description of How Incident Occurred

The phase of construction was expedited by the builder because the structure was to be a model. There were workers performing tasks at every area of the structure. There were two and a half times the amount of workers building this structure than for any other typical house of relative size.

According to the statement by the worker, at the time of the incident he was lifting a sheet of OSB onto the roof to be installed. At one point the worker says he was walking backwards up the roof. As he was heaving the 4x8 sheet of material, he stepped into an area that had not been sheathed. As he fell through the opening between the trusses, he dropped the OSB and it slid down the roof. The PFAS engaged the worker and arrested the fall at the point where the worker fell below the truss top chord. The kinematics of the fall are illustrated in the following sequence.



The only witnesses to the incident were two workers who heard the falling worker being arrested and the OSB hitting the ground. They only saw the arrested worker suspended by this PFAS.

Both the SRL and the harness fall indicators showed an impact. All components of the PFAS were removed from service.

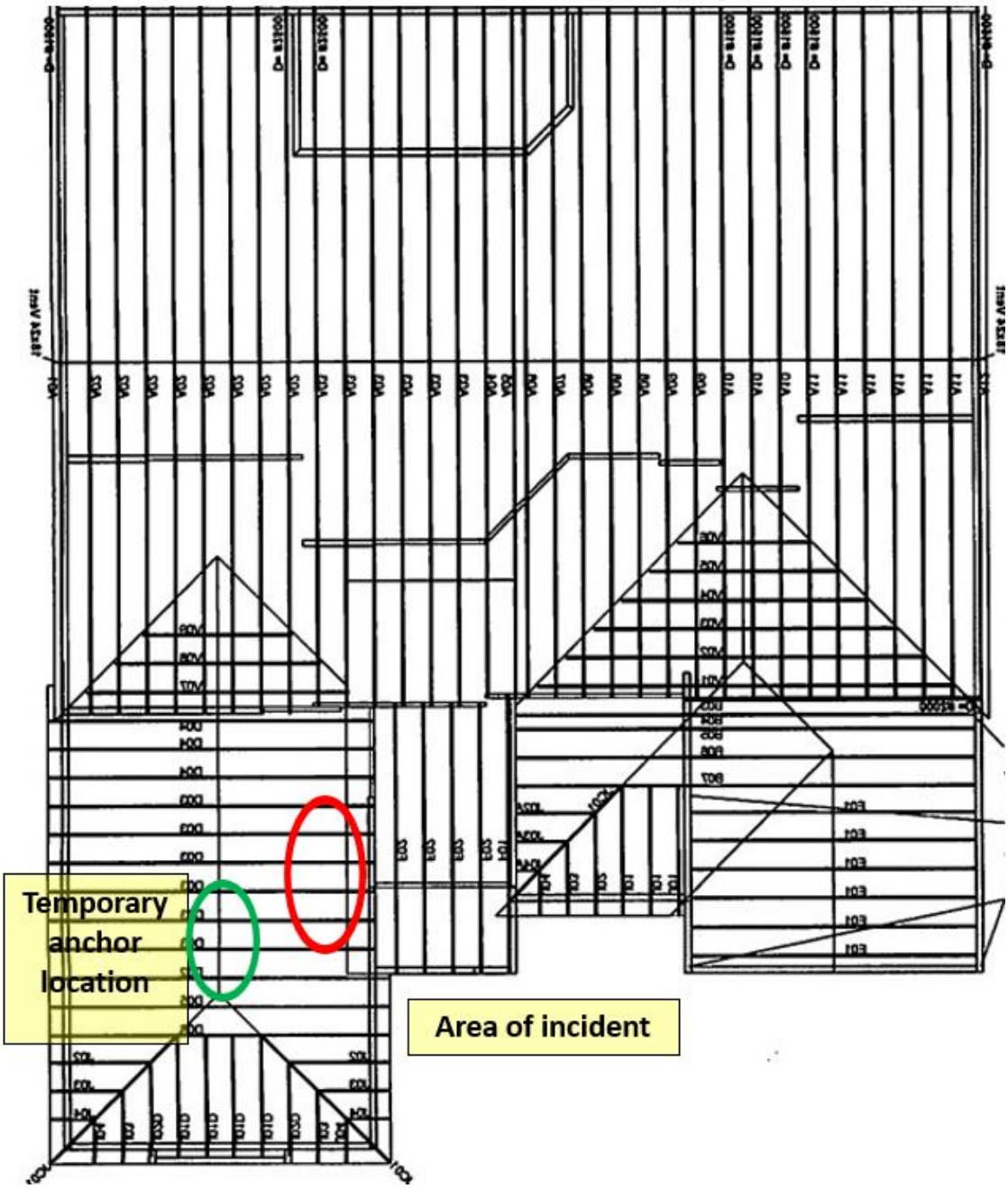
Rescue

Two workers on the ground heard the incident and immediately went to the worker to provide assistance. The worker was provided a ladder to climb down and one of the rescuers disconnected the SRL from the worker's D-ring.

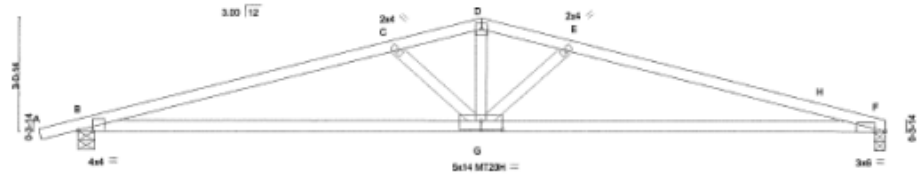
Description of Injuries

The worker stated that he had no injuries and did not seek medical treatment. The witness' statements corroborate this.

Roof System Blueprint/Truss Layout



The figure below is an example of calculations from a truss that was part of the system to which the anchor was attached through the sheathing and installed on the roof system in accordance with manufacturer instructions.



11-0-0 22-0-8
11-0-0 11-0-8

Plate Offsets (X,Y): [B:0-4-12,Edge], [F:0-3-4,Edge], [G:0-7-0,0-3-0]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plates Increase	1.25	TC	1.00	Vert(LL)	-0.28	F-G	>933	360	MT20	185/144
TCDL	14.0	Lumber Increase	1.25	BC	0.83	Vert(TL)	-0.84	F-G	>311	240	MT20H	139/108
BCLL	0.0 *	Rep Stress Incr	NO	WB	0.42	Horz(TL)	0.09	F	n/a	n/a		
BCDL	10.0	Code IRC2012/TPI2007		(Matrix)		Wind(LL)	0.14	B-G	>999	240	Weight: 82 lb	FT = 20%

LUMBER
TOP CHORD 2x4 SPF 1650F 1.5E *Except* D-F: 2x4 SPF 2100F 1.8E
BOT CHORD 2x4 SPF 2100F 1.8E
WEBS 2x4 HF Stud

BRACING
TOP CHORD Structural wood sheathing directly applied.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.
MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS (lb/size) F=1004/0-3-8 (min. 0-1-9), B=1045/0-5-8 (min. 0-1-10)
Max Horz B=57(LC 8)
Max Uplift F=-156(LC 5), B=-242(LC 4)

FORCES (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD B-C=-2575/465, C-D=-2062/330, D-E=-2068/307, E-F=-2623/492
BOT CHORD B-G=-437/2431, F-G=-426/2484
WEBS D-G=-224/1211, E-G=-734/342, C-G=-663/315

Scene Documentation

Figure 1. Similar home model.

Load Analysis

Based on the available information, this arrested fall featured the following:

- The worker misstepped or lost his balance and fell backwards or sideways between two trusses.
- At the time, he was slightly downslope from the anchor and approximately 10 feet of lanyard was extended.
- Because the SRL was above the worker, the lanyard was angled downward and laid atop the sheathing as he fell between the sheathed roof area and the open truss (see illustration above).
- As he fell, the lanyard between the edge of the sheathed area and the worker's D-ring created a pendulum condition and likely caused a swinging motion after the arrest.
- The total fall distance is not known, but the worker was extricated with a step ladder.
- The lack of reported injuries indicates the worker fell safely between the trusses.
- The impact load indicators on the SRL and full body harness showed an impact occurred. No information is available about the anchor, although there were no reported repairs needed on the structure.
- Without a PFAS, the worker would have experienced an uncontrolled fall between the trusses and would have hit the concrete slab at approximately 27 feet per second or 18 miles per hour possibly in a prone to inverted posture.

Fall Arrest or Save Evaluation Report

Date and time: **5-20-2013 2:15 PM (start at 6:00 am)**

Type of Construction: **Single Family Residential**

Fall Incident

Worker was installing oriented strand board (OSB) sheathing on the southeast side of a single story roof. A gust of wind picked up and hurled (toward the worker) two sheets of OSB staged on the rear patio. As the material was coming toward the worker he instinctively tried to get out of the way by jumping off the roof. At the moment one of the sheets of OSB struck him and while he was leaping, his PFAS engaged and stopped him from falling to the ground. The force of the jump and engaging of the SRL pulled him toward the sheathed portion of the roof and out of the way of the other sheet of OSB.

Additional Details

Eave Height: 9 feet

Weather: Warm morning/ hot afternoon. Wind gusts in the afternoon. Weather was a direct contributor to this incident.

Employee: 40 years old, 6'-2", 165 pounds. 6 plus year experience in construction

Language: Spanish Primary (Mexico) English Secondary (USA)

Size of Crew: Five workers

Time on Task: Four days working on this particular job site

Training: CFR 1926 Subpart M Fall Prevention training and use of PFAS

Fall Prevention Measures

Ladders where feasible; PFAS where ladder access not practical. Slide guards to prevent material falling to lower levels and controlled access zone to restrict area from untrained workers.

Equipment

DBI/ SALA Delta II Unisex Harness

Super Anchor® Sidewinder Self Retracting Lifeline 50" Galvanized 3/16 cable y

Super Anchor® - Form-It (Previously 3K)

Anchorage Details

Form-It (previously 3K) was installed over sheathed and braced trusses in accordance with manufacturer instructions. Truss system was partially sheathed and braced in according to field interpretation of SBCA BCSI B2.

Incident Scene

Gilbert, Arizona

Roof pitch: 4/12

Wall heights: 9 ft.

Phase of Construction Proximate to Incident

Temporarily braced and partially sheathed trusses. Sheathing of roof following the erection of manufactured trusses.

Description of How Incident Occurred

The foreman on the site was able to see most of the incident as he was in the back of the lot working on the ground. The information provided in the report stated that wind was a factor in this incident. Historical records indicate wind gust of up to 25 mph in some locations in Gilbert on that day.

According to the witnesses, the worker did appear to try and leap out of the way of the flying material. Given the slope of the roof and direction from where the material was heading, it is likely the worker would have been knocked off or leaped off the roof if not for the PFAS engaging.

Both the workers SRL and full body harness showed an impact on the unit indicators. The anchor showed some distortion.

All equipment and the anchor was removed from service.

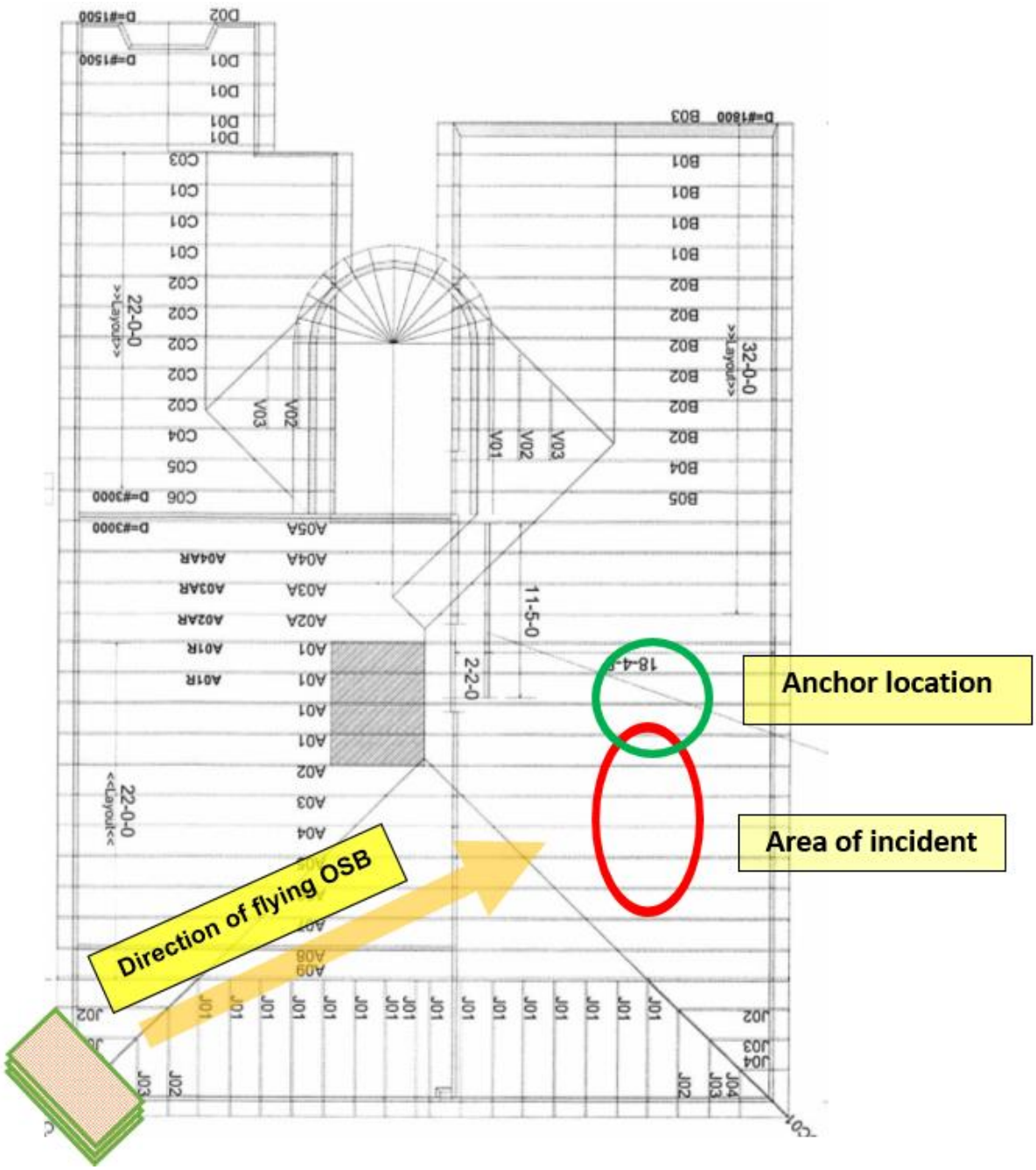
Rescue

Two workers on the ground heard the incident and immediately went to the worker to provide assistance. The worker was provided a ladder to climb down by one worker and the other disconnected the SRL from the arrested worker's D-ring.

Description of Injuries

The worker stated that he had no injuries and did not seek medical treatment. The witness statements corroborate no appearance of injuries.

Roof System Blueprint/Truss Layout



The figure below is an example of calculations from a truss that was part of the system to which the anchor was attached through the sheathing and installed on the roof system in accordance with manufacturer instructions.

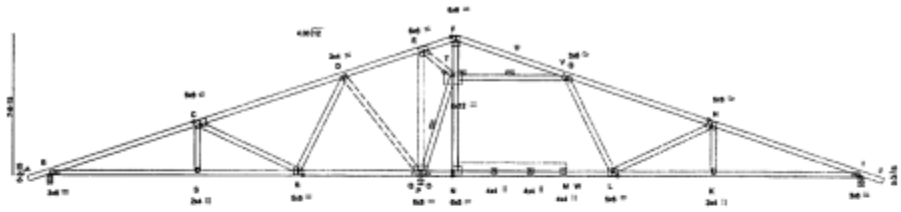


Plate Offsets (X,Y): [C:0-3-8,0-3-4], [H:0-3-0,0-3-4], [I:0-2-8,0-1-8], [L:0-3-0,0-3-0], [N:0-0-0,0-3-0], [P:0-4-0,0-2-4], [R:0-3-0,0-3-0], [T:0-6-0,0-2-4]

LOADING (psf)		SPACING	2-0-0	CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	16.0	Plates Increase	1.25	TC	0.69	Vert(LL)	-0.21	L-N	>999	360	MT20	185/144
TCDL	14.0	Lumber Increase	1.25	BC	0.71	Vert(TL)	-0.55	L-N	>532	240		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.83	Horz(TL)	0.05	I	n/a	n/a		
BCDL	10.0	Code IRC2006/TPI2002		(Matrix)		Wind(LL)	0.19	K-L	>999	240	Weight: 193 lb	FT = 20%

LUMBER
TOP CHORD 2 X 4 SPF 1650F 1.5E
BOT CHORD 2 X 4 SPF 1650F 1.5E
WEBS 2 X 4 HF Stud "Except"
P-T: 2 X 4 SPF 1650F 1.5E, M-N: 2 X 6 SPF 1650F 1.5E

BRACING
TOP CHORD Structural wood sheathing directly applied or 4-6-8 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing. Except:
6-0-0 oc bracing: P-R.
WEBS 1 Row at midpt G-T, P-T
JOINTS 1 Brace at Jt(s): T
MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS (lb/size) B=521/0-3-8 (min. 0-1-8), P=2791/(0-3-8 + bearing block) (req. 0-4-10), I=829/0-3-8 (min. 0-1-8)
Max HorzB=111(LC 3)
Max UpliftB=-205(LC 3), P=-399(LC 5), I=-240(LC 4)
Max GravB=579(LC 9), P=2791(LC 1), I=894(LC 10)

FORCES (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD B-C=-805/248, C-D=0/433, D-E=-117/1168, E-F=-395/2857, F-U=-395/2827, U-V=-432/2744, G-V=-457/2584, G-H=-937/160, H-I=-1769/361
BOT CHORD B-S=-256/695, R-S=-260/689, Q-R=-570/217, P-Q=-570/217, O-P=0/472, N-O=0/472, M-N=0/496, M-W=0/496, L-W=0/496, K-L=-256/1930, I-K=-254/1606
WEBS C-S=0/312, C-R=-948/338, D-R=-101/835, D-P=-838/320, E-P=-411/1959, E-T=-2203/513, N-T=0/479, F-T=-2068/309, G-T=-2921/592, G-L=-85/685, H-L=-825/352, H-K=0/324, P-T=-4273/681

Scene Documentation

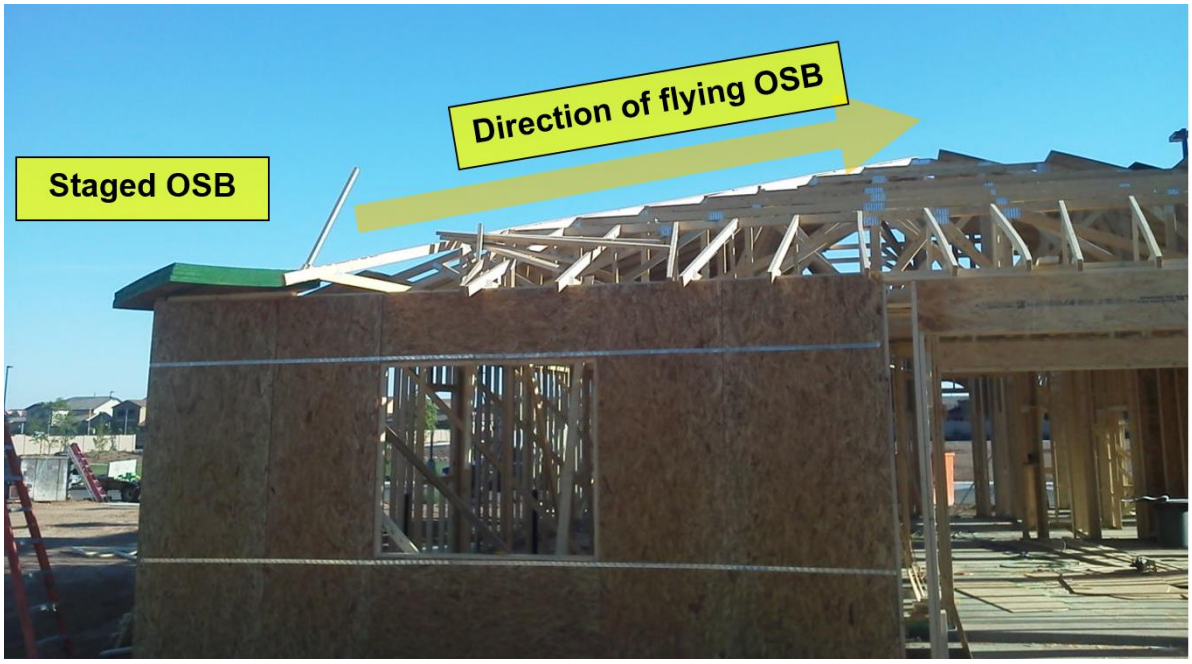


Figure 1. Path of OSB when caught by the wind.

Figure 2. Area where worker attempted jumped to avoid flying OSB.

Load Analysis

This arrested fall had the following circumstances of note:

- When the worker perceived that he was going to be struck by a sheet of flying OSB, he unintentionally headed toward the edge of the roof.
- At the location where he almost jumped, the worker had approximately 12 feet of lanyard pulled from the SRL.
- The SRL is designed to lock upon sudden payout of the lanyard, as when a fall occurs. Apparently, the worker's motion during his attempt to get out of the way of the flying OSB was not only rapid enough to lock the SRL but also moved with enough force to cause all equipment impact indicators to trigger in addition to deforming the anchor. Witnesses did describe the worker as looking like he was attempting to leap off the roof, but the SRL brought him to sudden stop before that could happen.
- The impact indicator on the SRL and full body harness, and the anchor indicated a load had been applied to the system. Without the use of the PFAS, the worker may have gone off the roof in a controlled leap. A 9-foot drop added to his initial speed would result in a feet-first impact of greater than 16 miles per hour.
- It is likely that the energy from the worker leaping and force of the OSB hitting the worker contributed to the evidence of a high impact to the equipment and anchor.
- Irrespective of the amount of force exerted on the system, there was no damage to the roof and the anchor did not separate from the OSB and structure upon impact on the system.

- The impact indicator on the SRL and full body harness, and the anchor indicated a load had been applied to the system. Without the use of the PFAS, the worker may have gone off the roof in a controlled leap. A 9-foot drop added to his initial speed would result in a feet-first impact of greater than 16 miles per hour.