RAMTECH LABORATORIES, INC.

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February 24, 2003

Ted Anderson
Battens Plus, Inc.
8979 Caselman Road
Sacramento, CA 95829

Re: Class A Classification
Laboratory Number 12263/1873

Dear Mr. Anderson:

Ramtech Laboratories, Inc., at your request, conducted the Class A Roof Classification Series of roof fire test on Lite Weight Concrete Flat Tile installed on Plastic Battens. The tiles used in the tests were purchased from a distributor by Battens Plus and delivered to Ramtech Laboratories, Inc.

Tile description: MonierLifetile Lite weight concrete flat tiles. Flat tiles measured 13 inches wide by 16-1/2 inches long. The tiles weigh approximately 6.93 pounds each and manufactured by MonierLifetile LLC. The tiles were purchased by Battens Plus and delivered to Ramtech Laboratories, Inc. by representative of Battens Plus.

Plastic Batten description: Plastic battens are 1-1/2 inches wide by ½ inch thick. The batten has a top and bottom skins approximately 0.044 inch thick and 0.038-inch thick vertical stiffeners spaced 0.41-inch on centers. The battens were manufactured by Interplast Group LTD. of Lolita, Texas for Battens Plus. The battens were independently sampled by Ronald I. Ogawa, P. E. of Inspection Concepts, Inc. representing Ramtech Laboratories, Inc. on September 17, 2002 at the Interplast Group plant, Lomita, Texas. The battens were received by Ramtech Laboratories, Inc. on November 15, 2002.

The test was conducted according with UBC Standard 15-2. (UBC Standard 15-2 is similar to ASTM E-108 and NFPA 258)

Ramtech Laboratories fabricated four Class A Burning Brand Exposure decks. The testing was conducted between February 19 and February 20, 2003. The results of the roof fire test is described below:

CLIENT: BATTENS PLUS
DATE OF TEST: Deck #1 (2/19/03), Deck #2 (2/19/03), Deck 3 (2/19/03), Deck 4 (2/19/03), Deck 5 (2/20/03)
TYPE OF TEST: CLASS A BURNING BRAND, ASTM E-108/UBC STD. 15-2
REASON: CLASS A RATING REQUIRED BY AC-200
LABORATORY NUMBER: 12263/1873

TASK	YES	NO
CHECK DECK PREPARATION FOR CLASS A	X	
CHECK PROPER SELECTION OF UNDERLAYMT	X	
CHECK INSTALLATION OF ROOFING	X	
CHECK PLACEMENT OF DECK ON FIXTURE	X	
CHECK SLOPE OF TEST DECK	5:12	
CHECK WIND VELOCITY 12MPH±. 5 MPH	1040 FPM	
DECK PLACED AT 60 INCHES FROM AIR DUCT	X	

IF ANY NO RESPONSE, EXPLAIN BELOW:

UNDERLAYMENT = TYPE 30 FELT, ASTM D226, ICBO ES 5434, FONTANA – VULCA SEAL

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	DECK #1	DECK #2
Brand Wt.	1983GRAMS	2048 GRAMS
Brand Ignition	1. Each face for 60 seconds 2. Each edge for 45 seconds 3. Each face for 60 seconds	1. Each face for 60 seconds 2. Each edge for 45 seconds 3. Each face for 60 seconds
Start Time	2/19/03/9:30 AM	2/19/03/10:31 PM
Temp./RH	58°F./86%	63°F./71%
Time:	**DECK #1-Battens Plus w/Monier Ltwt**	**DECK #2-Battens Plus w/Monier Ltwt**
0:00	Place brand on deck, top of brand 3 inches above plywood joint. Brand placed between tile joint	Place brand on deck, top of brand 3 inches above plywood joint. Brand placed between tile joint
1:00 1:20	Loud popping sound from tile Brand fully engulfed, flame lick past deck	Brand burning vigorously, flame already licking beyond end of deck. Small pop sd.
2:00	Very loud popping sound. Sounds like tile blow out.	Very loud popping sound. Surface of tile blow out. Moved brand slightly.
3:00 4:00 6:00	Top of tile explodes. Some tile material visible under brand area. Light smoke or steam from underlayment. Brand collapse, no visible evidence of battens melting.	Bottom of tile blow out visible. Underlayment (UL) smoking, now heavy. Large hole in tile. UL now exposed directly to brand.
7:00 8:00 11:00	Surface of tile blackened in heat affected area. Deck underside still cool to touch. Smoke/steam light to moderate. Underside of plywood deck slightly warm to touch. No charring or asphalt staining. Another loud popping sound. All hot embers, approx. 10% of brand remain. DU now warm to touch	 UL now flaming. Matter of time before failure. Test stopped due to tile failure.
14:00	UL smoke/steam continues. DU still warm to touch.	
18:00	Smoke/steam from UL diminishing.	
19:00	One small ember remain.	
20:30	All embers out.	
22:00 23:00	No further smoke/steam. No flaming or smoke from plywood joint. Test terminated.	
25:00 30:30		
32:00		
	Tile surface had blowout. Several small pieces of tile found on Underlayment. Battens melted in the heat affected area. All cells closed. Only slight asphalt stain on plywood.	Large hole in tile causing the brand to communicate directly into the cavity. This caused the Underlayment to ignite ultimately causing burn through of plywood.

Note: Due to failure of MonierLifetile Liteweight tile on Deck 2, Deck 5 will be tested.

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	DECK #3 – Battens Plus/Monier Ltwt tile	DECK #4 – Battens Plus/Monier ltwt Tile
Brand Wt.	209 GRAMS	2026 GRAMS
Brand Ignition	1. Each face for 60 seconds 2. Each edge for 45 seconds 3. Each face for 60 seconds	1. Each face for 60 seconds 2. Each edge for 45 seconds 3. Each face for 60 seconds
Start Time	2/19/03/12:50 PM: Tested by RIO & JB	2/19/03/ 2:15 PM Tested by RIO & JB
Temp. /RH	66°F. /64%	67°F. /63%
Time:	**DECK #3-Plastic Battens**	**DECK #4-Plastic battens**
0:00	Place brand on deck, top of brand 3 inches above plywood joint. Brand placed over tile joint	Place brand on deck, top of brand 3 inches above plywood joint.
2:00 2:30	Very load popping sound. Appear to be surface blow off but not visible due brand. Another load pop.	Louder popping sound. No evidence of tile blow off.
3:00 3:30	Tile surface blew out but not completely through as noted in Test No. 2. 3rd loud pop.	No change. No smoking. No evidence of plastic batten melting. Very loud popping sound. Frt. of brand starting to collapse. Rear of bad still intact.
5:00	DU cool to touch. Brand collapsed no outline of initial brand shape. Small debris on UL. Due blow off.	Smoke/steam for UL starting. Light to moderate.
7:00	Deck underside slightly warm to touch. Smoking or steam from underpayment still moderate. Evidence of batten melting visible.	
9:00 11:00	Batten melted under brand area but shape still intact. Tiles still engaged. DU warm to touch. Batten melts w/slight compression at tile bearing points. Asphalt stain visible at plywood joint from underside. No flaming, UL still cooking.	DU warm to touch. Moderate smoking from UL. Brand is all hot embers. Tiles still intact. Plastic batten melting under heat affected area. Smoke/steam still moderate. No visible sign of tile blow off. Slight asphalt stain on plywood joint.
12:00	Smoke moderate. Underlayment heating up due radiant heat from tiles. Light smoke visible from plywood joint from underside of deck.	
16:00	Deck underside still warm to touch. Top layer of concrete tile blown off. However, tile still intact. Some debris on UL, which indicate some blow off, occurred on the underside of tile.	Smoke continues. 4 doz. Hot embers remain.Deck underside still warm to touch. Tiles in good condition. More pronounced batten melting at heat affected area.
17:00	3-doz small hot embers remain. Smoke continues from plywood joint. No charring or flaming from deck underside.	
19:00 20:30	DU warm to touch. Two small embers remain. Smoke/steam stopped. Smoke from plywood joint stop.	3 small embers remain. Smoke diminishing. DU still warm to touch. Melt of batten more visible. No further asphalt staining on plywood joint. All embers out. Corner of tile broke . Smoke out.
21:30 22:00	All embers out. Smoke/steam out.	All embers out. No more smoking from UL. No flaming.
22:30 24:00	All visible smoke stop. All stop, test terminated. Removed tile and underlayment. Only slight asphalt stain on plywood surface. Plastic batten melted under brand area. Tile surface blown	All stop. Test terminated. Removed tile. Only slight asphalt stain on underlayment surface. Plastic batten melted directly under brand area.

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	DECK #5 – Battens Plus/Monier Ltwt tile	
Brand Wt.	2090 GRAMS	
Brand Ignition	1. Each face for 60 seconds 2. Each edge for 45 seconds 3. Each face for 60 seconds	
Start Time	2/19/03/3:50 PM: Tested by RIO & JB	
Temp. /RH	61°F. /63%	
Time:	**DECK #5-Plastic Battens w/Moniker Litwt tile**	
0:00	Place brand on deck, top of brand 3 inches above plywood joint. Brand placed over tile joint	
0:48 1:00	Very load popping sound. Appear to be surface blow off but not visible due brand. Another load pop.	
4:00	Tile keeps making popping sound. However, cannot determine if tile surface has blown off.	
5:30	DU cool to touch. Moderate smoke/steam from UL due to radiant heat.	
7:00	Deck underside slightly warm to touch. Smoking or steam from underlayment still moderate. Evidence of batten melting visible.	
9:00	Batten melted under brand area but shape still intact. Tiles still engaged. DU warm to touch.	
12:15	Smoke moderate. Underlayment heating up due radiant heat from tiles. Light smoke visible from plywood joint from underside of deck. Further evidence of batten melting but still hold shape.	
16:00	Deck underside still warm to touch. However, tile still intact. Smoke/steam diminishing.	
19:00	DU warm to touch. Three small embers remain. Smoke/steam stopped. Smoke from plywood joint stop.	
21:30	All embers out. Smoke out	
22:30 24:00	DU cooler All visible smoke stop. All stop, test terminated. Removed tile and underlayment. Only slight asphalt stain on plywood surface. Plastic batten melted under brand area. Tile surface intact.	

- **Observation**:
  - Tiles had major surface blow off under heat affected area and stayed intact except for tiles tested in test no. 2.
  - Very little smoking from the underlayments.
  - • Surface color of liteweight weight concrete tiles in the heat affected areas only.
  - Slight surface staining of plywood deck by asphalt from underlayment melting on the plywood surface.
  - Plastic battens melted under the brand area but kept concrete tiles engaged at their lug position.

The heat-affected area was confined to the immediate area of the brand placement and marginally above the brand. There was some major cracking of the products and but no displacement the product observed during or after the tests. Removal of the Regular weight concrete tiles and the Type 30 underlayment indicates the plywood deck has small light asphalt staining with no charring. The plastic battens melted but only under the heat affected area. The Concrete tiles did not slide or dislodge from initial position. Based on the results of these Class A Burning Brand Tests, it is our professional opinion that the Battens Plus plastic battens meet the Class A Burning Brand Requirements when installed with liteweight weight concrete tiles over Type 30/ASTM D226 underlayment on 15/32" thick CDX plywood.

Ten tiles were weighed prior to conducting Roof Classification Test. The average weight of the Moniker Liteweight Flat tile was 6.93 pounds. Assuming 90 tiles per square, the calculated tested tile weight is 6.3 pounds per square feet.

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INTERMITTENT-FLAME EXPOSURE TEST AND RESULT (Tested 2/19/03 AND 2/20/03)

Two test deck specimens, with Battens Plus plastic battens and MonierLifetile lite weight concrete flat tiles were subjected to the fifteen cycles Class A Intermittent-Flame Exposure Test. The plastic battens were fastened to the plywood deck with 16 gage x 1-inch crown x 1-1/4-inch long staples spaced at 6 inches on center. The crown of the staple was oriented parallel to the length of the battens (perpendicular to the vertical stiffeners). The framework was moved to 33 inches from the air duct as required by the standard. The test deck was exposed to fifteen, 4-minute cycles composed of 2 minutes of 1400^{O}F flame application followed by 2 minutes flame off. The wind continued during the off cycle. Test 1IF was started at 4:25 PM, 2/19/03 and Test 2IF was started at 9:30 AM, 2/20/2003.

At no time during the conduct of the intermittent Flame Exposure Test did any of the Lite weight concrete tiles tested show any signs of distress. Slight color change was noticeable only in the heat-affected area for the tested assembly. Virtually no smoke was visible from the edges of test deck during the entire test and the underside of the deck remained cool to warm during the entire test. The plastic battens performed well and no evidence of concrete tiles slipping of dislodging from their position were observed.

It should be noted that none of the test decks, after the fifteen cycles of flame exposure, showed any evidence of displacement, sliding, spalling, or flaming on the underside of the decks. It was also noted that there were some discoloration of the heat-affected area and a total absence of lateral flame spread. No charring but with some discoloration of the plywood deck observed. After removal of the concrete tile, only slight melting and some compression due to tile, weight was observed on the plastic batten. The tested decks met the requirements for Class "A" Intermittent Flame Exposure.

The results of Fire Classification test, in accordance with ASTM E-108/UBC Standard 15-2 for Class A Burning Brand and Class A Intermittent Flame Exposure, indicate the Battens Plus plastic batten, installed over a Type 30 underlayment (ASTM D226) and Lite weight concrete tiles weighing 6.3 pounds per square feet meets the Class A Roof Fire Classification.

Reported by:

REGISTERED PROFESSIONAL ENGINEER
RONALD I. OGAWA
No. 16286
Exp. 6-30-
CIVIL
STATE OF CALIFORNIA

Ronald I. Ogawa, P. E.
Laboratory Consultant

Reviewed and Approved by

Steve Berggren
Laboratory Administrator

Encl. Attachment A –Photographs (1-16) – 4 pages

DESCRIPTION OF PHOTOGRAPHS

1. Slope of test deck monitored before start of each test. Slope set at 5:12, which is most critical.
2. Ignition sequence of Class A burning brand.
3. Placing the flaming brand on the test deck. Brand place with the rear edge of the brand 3 inches above the horizontal plywood deck joint.
4. View of flaming Class A brand with flame licking past end of deck.
5. View of area between underlayment and underside of concrete tile showing start of melting of the plastic batten.
6. Asphalt from underlayment causing stain of plywood joint.
7. Surface condition of concrete tile after Burning Brand test. Note the surface blow off of tile under brand area.
8. Test No. 2 where Concrete tile blow off caused hole in tile ultimately causing failure of test. Failure of tile prompts testing fifth deck.
9. Backside of Liteweight tile showing the tile section blow off.
10. Another view of tile surface after completion of test. Tile stayed intact until tile removal operation.
11. Close up of extent of melting of plastic batten. This condition typical.
12. Flame pattern of intermittent flame exposure test. Temperature of thermocouple ranged from 1380 degrees F to 1490 degrees F.
13. View of intermittent flame from opposite side.
14. Surface condition of intermittent flame exposure test. Only slight color change. Some tile surface blow off but plastic batten held tile with melting under heat affected area.
15. Removal of concrete tiles shows only slight melting of plastic battens. No extreme melting as indicated after burning brand test. Evidence of some compression of battens due to heat at concrete bearing areas.
16. Close up of the extent of melting and condition at concrete tile bearing areas after Intermittent Flame Exposure test.


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BATTENS PLUS - LAB#


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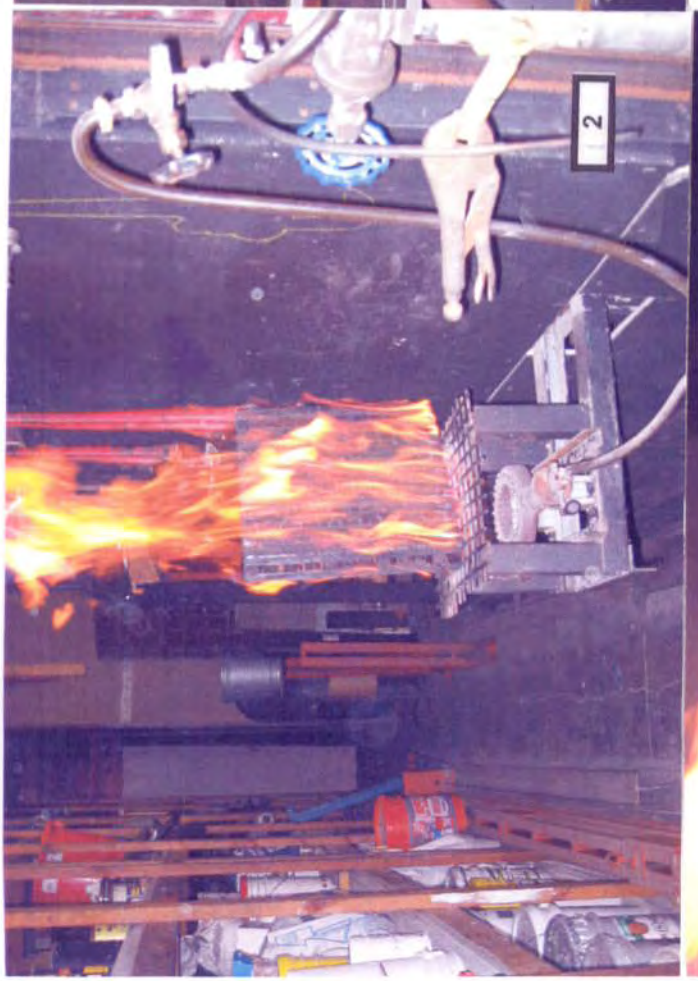
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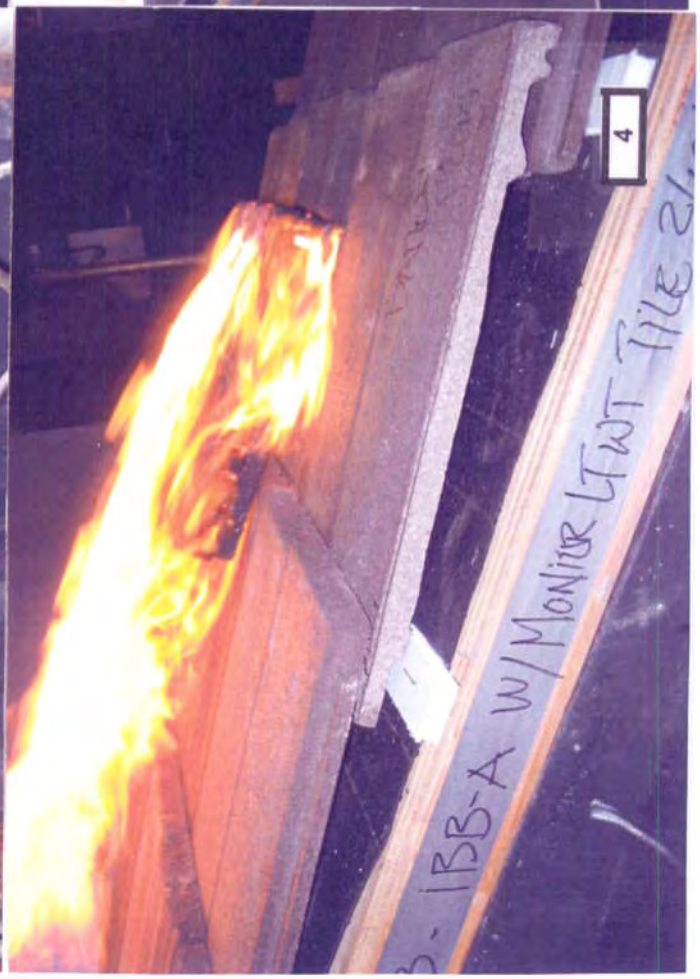
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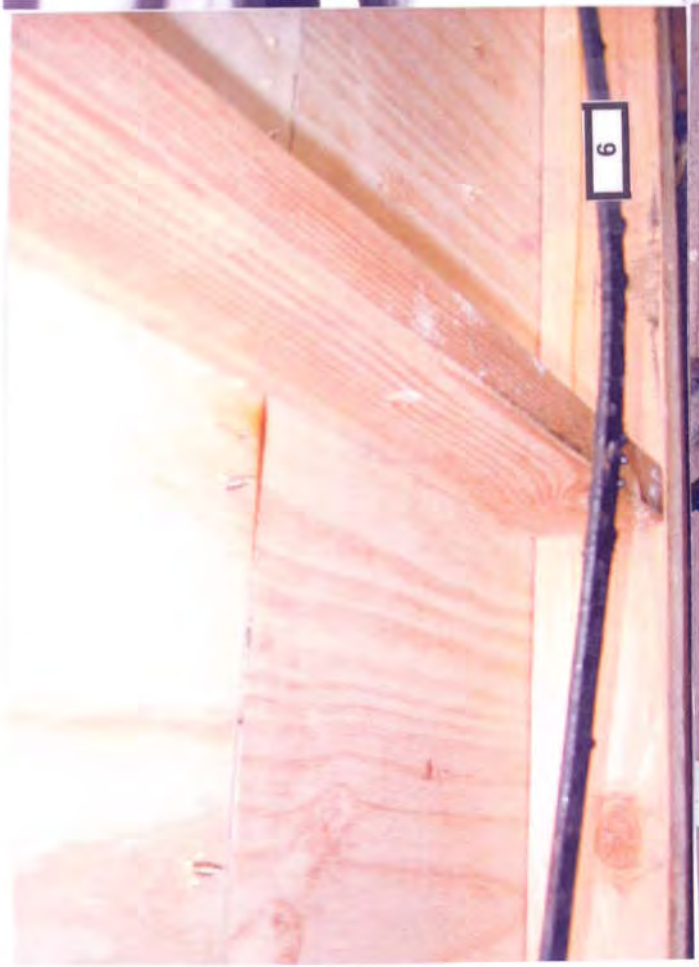
IBB-A W/Monitor LT WT Tile


5


7
BB-A W/MOUNTING TILE 2/19/03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BB-A 2/19/03 - BATTENS PLUS


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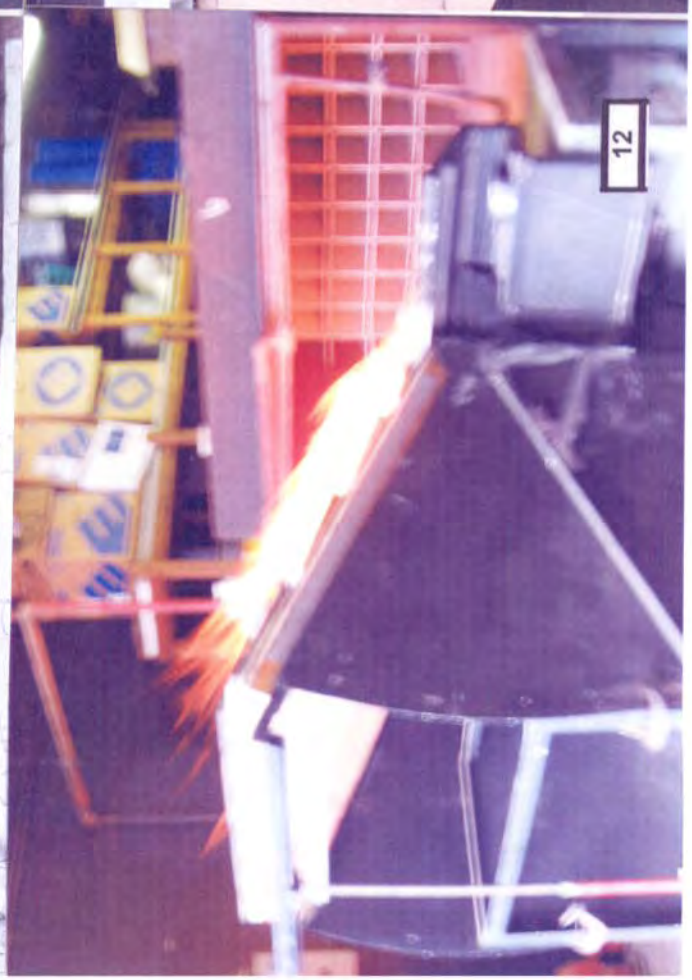
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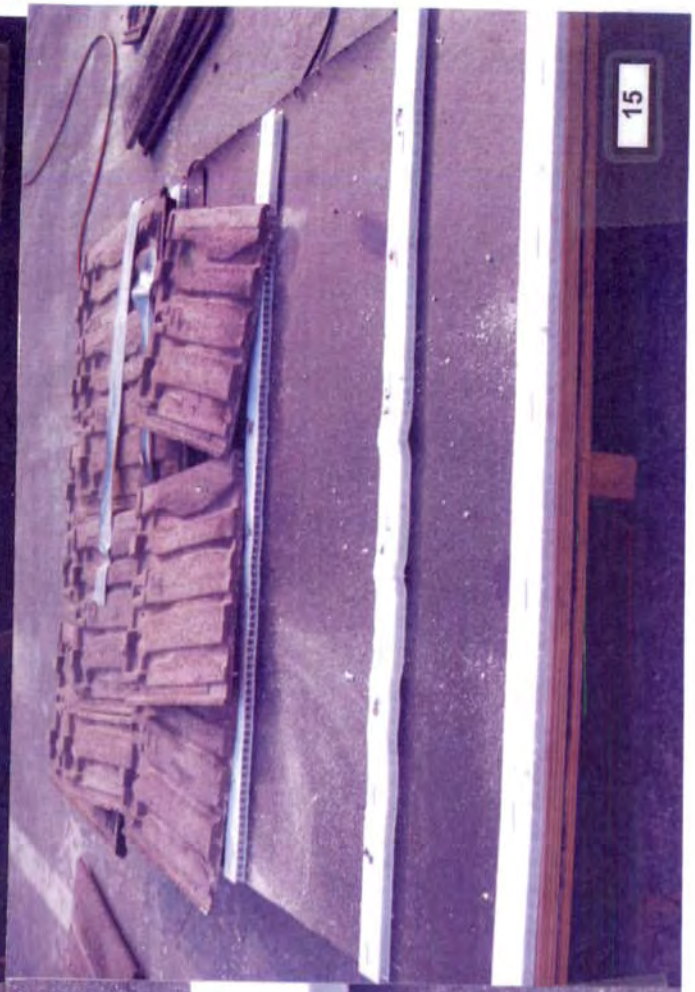
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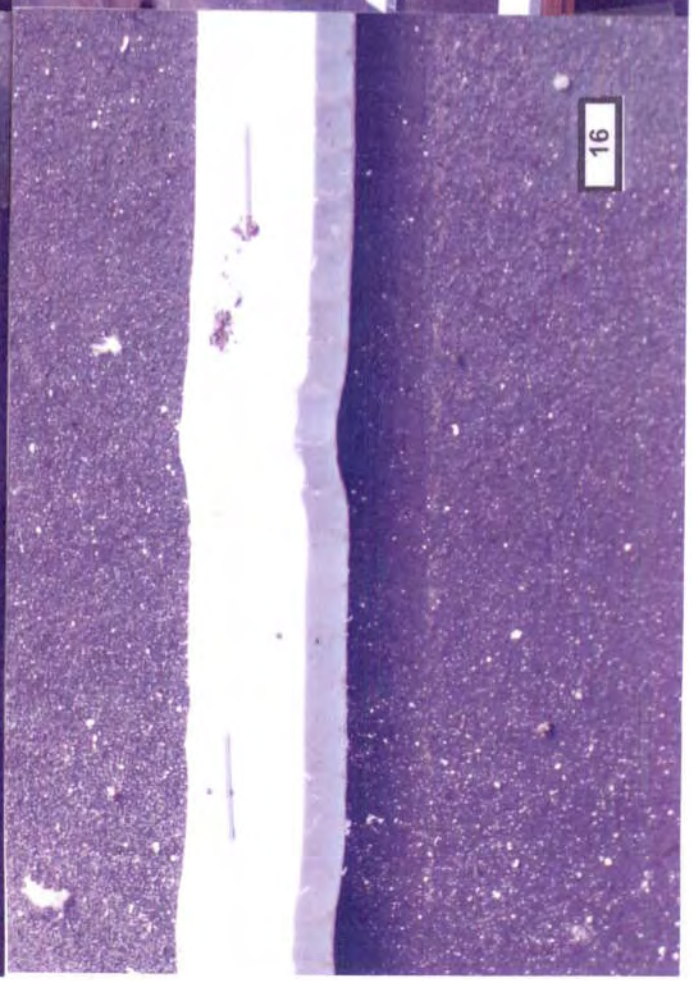
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