

MEMORANDUM

DATE: July 14, 2009

TO: Mr. Steve Labovitz

RE: Lackawanna County Stadium - Phase 1 Rehabilitation
Recommendations for General Maintenance Repairs
EwingCole Project No. 20090323

This memorandum serves to address the four items in our Facility Assessment Report we identified could be repaired as part of the normal, routine maintenance of the facility. They were listed in the Architectural portion of the *Present Conditions Section*; specifically, items A-A thru A-D.

During our July 1, 2009 visit to the stadium, we performed a more extensive review of each of these items to assist Mandalay Baseball Properties and the Stadium Authority in immediately addressing the present conditions.

The results of our findings are as follows:

A-A Repair of loose/non-functioning stadium seating:

There are several components associated with the loose and non-functioning seating. First, the stadium seat pans do not automatically retract to the upright position. This is likely caused by either a rusted or broken seat spring, or a broken internal casting component, or both. When the seat pan does not retract fully, it poses a code violation by reducing the effective clear exit width required in the seating aisles.

We did not codify the number or location of broken seat pans because it is rather obvious which ones are broken. Our casual observation would indicate the quantity to be somewhere in the range of 400-500 seats.

In addition to the broken seat pans, there were other repairs found to be necessary for the stadium seating. They included, loose seat stanchions and broken plastic seat backs and pans. The attached spreadsheet titled "Lackawanna Co. Stadium Seating Repair Chart" dated 7/14/09 identifies the location and type of seat repair.

A-B Repair of loose railings in seating bowl:

There are a number of locations where loose railings were found; specifically, the intermediate 'mid-rail' at the seating aisles was found to be missing anchors at the top connection to the concrete fascia wall. The attached spreadsheet titled "Stadium Concrete and Railing Repair Chart" identifies the locations where railings were found to be loose. Photographs accompany the spreadsheet to better illustrate the existing condition.

We have provided a detail for the recommended anchor to secure the loose railing - refer to "**Repair Type 4**" on **Sketch SK-3** attached. We have also provided the recommended **Hilti brand 'Kwik bolt'** anchor to be used.

A-C Remediate tripping hazards in bowl & concourses due to loose, broken or uneven concrete, and/or failed topping material:

The attached spreadsheet titled "Lackawanna Co. Stadium Concrete and Railing Repair Chart" identifies the locations where concrete was found to be loose, broken or uneven which poses a potential tripping hazard to patrons.

For areas of broken concrete, we have developed recommended repair details – refer to **Sketches SK-1, SK-2 and SK-3, dated 7/14/09**. The repairs are categorized by type, Type 1, 1A, 2 & 3, depending on the severity of the existing condition.

We have also provided product literature for the different recommended **Sika brand** repair mortars for the various repair types.

Additionally, for reference, we have provided before and after photos of another stadium project to demonstrate the recommended procedures and technique for making the repairs.

Most areas of uneven concrete were due to heaving of previously patched concrete. For those conditions, the uneven surface should be ground down level with the adjacent surface. A variation no greater than 1/8" between adjacent surfaces should be left after grinding, as required by code.

A-D Secure unlocked fire extinguisher cabinets and loose compressed gas tanks:
All of the wall-mounted, fire extinguishers behind the last row of seating in the lower and upper bowl were found to be sitting loose within unlocked cabinets. Further, the glass window was missing from the cabinet doors.

In our assessment report, we recommended that the cabinet doors and locks be fixed; however, further review of current building codes has revealed that fire extinguishers are not required to serve the seating bowl; rather, they are only required to serve the concession stands and other back-of-house spaces. As such, we now recommend the fire extinguisher cabinets simply be removed, so as to avoid unintended use of the extinguishers by the public.

Through-out the facility, many freestanding compressed gas tanks were found to be unsecured. These should be adequately secured as required by NFPA 55. Chapter 7.1.4.4 states, "*Compressed gas containers, cylinders, and tanks in use or in storage shall be secured to prevent them from falling or being knocked over by corraling them and securing them to a cart, framework, or fixed object by use of a restrain.*" If the tanks contain propane, then they too should be secured in a similar manner, as required under NFPA 58. Propane tanks shall not be in direct contact with soil.

Stair to Bullpen Roof

In addition to the four items above, there is another item we recommend be added to the list of repairs that can easily be performed by Mandalay's maintenance staff – removal of the stair to the roof of the bullpens in both left and right fields.

Upon closer inspection, we found the bullpen roofs to be inadequately structured and unsafe to be occupied by people. The roof structure would have to be reinforced, or modified, and the roof decking demolished and replaced, in order to make the roof a safe place to occupy. Also, a code compliant railing would need to be provided, which would need to be structurally attached through the roof decking to the framing below.

Given the time and expense it would take to reconstruct/reinforce the two roofs to be code complaint, we recommend the immediate removal of stair and rooftop railing, rather than replacing the stair, as recommended in our assessment report. The existing condition is unsafe, not code compliant and poses a serious liability to the teams, the Owner and Operator of the stadium.

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Follow-up with Mandalay

Following our walk through, Peter Welsh and I met with Kristen Rose, Jeremy Ruby and Joe Villano to discuss the extent of the five items described above, which included walking portions of the lower seating bowl to point out examples of the conditions found. We told them that the bullpen stairs should be removed immediately and that no one should be allowed to occupy those roofs.

During our review, Mandalay indicated they would likely not be able to make all of the repairs before the end of the season, particularly the seat repairs, partly due to lack of spare parts and partly due to insufficient manpower. The manufacturer of the seats long ago went out of business, so replacement parts are hard to source. It remains to be seen if Mandalay has enough spare parts in their current inventory to repair all of the broken seats. Even if they do have an adequate supply of spare parts, they feel that their staff may not have enough time to repair all of them before the end of the season. Whatever the case, the repairs should begin immediately.

Though Mandalay expressed concern that the seating repairs would exceed their annual budget allocated for maintenance of those elements, we still feel that those and the other repairs should be done as part of the routine maintenance of the building, since they pertain to normal stadium elements that must be routinely inspected for fan safety and welfare - i.e. seats, steps, railings, etc.

All of the items listed above were identified in our report to be addressed as part of the ongoing, routine maintenance of the stadium; therefore, they were not included in our estimated budget for the 'Immediate' repairs.

In closing, we understand that you will provide copies of this memo, along with the attachments, to the Stadium Authority and Mandalay to serve as a reference tool as they embark on the general maintenance repairs identified in our assessment report.

We would be happy to discuss this memo and our recommendations should you have any questions. Please don't hesitate to call.

EwingCole



Craig J. Schmitt, RA
Principal

DIRECT 215.409.4264
FAX 215.574.9163

CS/mm

cc: Mr. Steve Resnick - Resnick Amsterdam Leshner, PC
Peter Welsh - EwingCole

LACKAWANNA COUNTY STADIUM

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SEATING REPAIR CHART

LOWER BOWL

Section	Row - Seat	Repair Necessary
Section 100	M-9	Loose Standards / Missing Anchor Bolts / Cracked Seat Backs
Section 101	A-1	
Section 101	G-3	
Section 101	L-3	
Section 102	I-11	
Section 102	M-12	
Section 102	O-2	
Section 102	O-12	
Section 102	O-13	
Section 103	N-6	
Section 105	D-7	
Section 105	E-1	
Section 106	N-4	
Section 111	A-1	
Section 114	A-4	
Section 114	A-8	
Section 125	A-6	
Section 125	F-5	
Section 128	M-6	
Section 130	J-5	
Section 131	D-3	
Section 131	E-7	
Section 131	F-4	
Section 138	J-4	
Section 138	K-3	
Section 139	G-5	
Section 139	G-10	
Section 139	H-11	

UPPER BOWL

Section 303	B-1	Loose Standard
Section 305	C-2	Cracked Seat
Section 305	D-2	Cracked Seat
Section 306	B-2	Cracked Seat
Section 306	C-4	Loose Seat
Section 306	D-1	Broken Standard
Section 306	F-1	Cracked Seat
Section 306	H-1	Cracked Seat
Section 306	K-1	Broken Seat

LACKAWANNA COUNTY STADIUM

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SEATING REPAIR CHART

Section 307	G-1	Cracked Seat
Section 307	N-3	Cracked Back
Section 308	C-1	Cracked Back
Section 308	F-1	Cracked Seat
Section 308	G-1	Cracked Back
Section 308	G-2	Cracked Back
Section 308	H-1	Cracked Back
Section 308	H-5	Cracked Back
Section 308	I-1	Cracked Back and Seat
Section 309	C-6	Loose Back
Section 309	E-1	Cracked Back
Section 309	E-2	Cracked Back
Section 309	F-6	Cracked Seat
Section 309	F-7	Cracked Seat
Section 309	G-2	Cracked Back
Section 309	H-1	Cracked Back
Section 309	I-3	Cracked Back
Section 309	I-5	Cracked Back
Section 309	J-7	Loose Back and Seat
Section 309	K-10	Loose Back
Section 310	C-3	Loose Back Standard
Section 310	C-4	Loose Back Standard
Section 310	F-2	Cracked Back and Seat
Section 310	F-3	Cracked Back and Seat
Section 310	H-1	Cracked / Loose Back
Section 310	N-4	Detached Standard
Section 310	N-5	Detached Standard
Section 311	C-4	Cracked Back
Section 311	D-1	Cracked Seat
Section 311	F-1	Cracked Back
Section 311	F-2	Cracked Back
Section 311	F-4	Cracked Back
Section 312	C-11	Cracked Back
Section 312	C-12	Cracked Back
Section 312	G-1	Cracked Back
Section 312	G-3	Cracked Back
Section 312	G-4	Cracked Back
Section 312	G-5	Cracked Back
Section 312	G-7	Cracked Back
Section 312	H-1	Cracked Back
Section 312	H-2	Cracked Back
Section 312	H-3	Cracked Back
Section 312	H-4	Cracked Back
Section 312	H-5	Cracked Back

LACKAWANNA COUNTY STADIUM

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SEATING REPAIR CHART

Section 312	H-6	Cracked Back
Section 312	H-9	Cracked Back
Section 312	I-2	Cracked Back
Section 312	I-3	Cracked Back
Section 312	M-3	Cracked Back
Section 312	M-4	Cracked Back
Section 312	M-11	Cracked Back
Section 313	C-3	Loose Seat
Section 313	C-8	Cracked Seat
Section 313	D-3	Loose Back
Section 313	D-7	Loose Back
Section 313	D-8	Loose Standard
Section 313	G-5	Cracked Back
Section 313	G-6	Cracked Back
Section 313	I-2	Cracked Back
Section 313	I-3	Cracked Seat
Section 313	J-6	Loose Seat
Section 313	J-8	Cracked Back
Section 313	J-9	Cracked Back
Section 313	L-4	Loose Back
Section 313	L-6	Cracked Back
Section 313	L-7	Cracked Back
Section 313	L-8	Cracked Back
Section 313	L-9	Cracked Back
Section 313	L-10	Cracked Back
Section 313	L-11	Cracked Back
Section 315	D-3	Loose Seat Back
Section 315	D-4	Loose Seat Back
Section 315	F-1	Loose Standard / Cracked Seat
Section 315	F-2	Cracked Seat
Section 315	F-3	Cracked Seat
Section 315	J-1	Loose Standard
Section 315	L-3	Loose Standard
Section 315	L-4	Loose Standard
Section 315	L-6	Loose Standard
Section 315	N-1	Loose Standard
Section 315	N-5	Loose Standard
Section 315	N-6	Loose Standard
Section 316	I-1	Cracked Seat
Section 316	I-8	Loose Back
Section 317	I-1	Loose Standard
Section 317	I-8	Cracked Back
Section 317	N-1	Loose Standard
Section 317	N-9	Loose Standard

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SEATING REPAIR CHART

Section 318	F-2	Loose Standard	
Section 318	F-3	Loose Standard	
Section 318	F-7	Loose Standard	
Section 318	F-8	Loose Standard	
Section 318	G-1	Cracked Back	
Section 318	K-8	Loose Seat	
Section 318	N-8	Loose Standard	
Section 318	N-9	Loose Standard	
Section 319	C-1	Loose Back	
Section 319	C-4	Loose Back	
Section 319	I-4	Cracked Back	
Section 319	K-1	Loose Standard	
Section 319	N-1	Loose Standard	
Section 319	N-2	Loose Standard	
Section 319	N-3	Loose Standard	
Section 319	N-4	Loose Standard	
Section 319	N-5	Loose Standard	
Section 319	N-6	Loose Standard	
Section 320	J-1	Loose Standard	
Section 320	N-1	Loose Standard	
Section 320	N-2	Loose Standard	
Section 320	N-3	Loose Standard	
Section 320	N-4	Loose Standard	
Section 320	N-5	Loose Standard	
Section 320	N-6	Loose Standard	
Section 322	N-7	Loose Standard	
Section 322	M-9	Loose Standard	
Section 325	G-3	Loose Standard	
Section 325	I-1	Loose Standard	
Suite Level			
Suite #7	Row 1-Seat 2	Loose Back	
Suite #8	Row 2-Seat 1	Cracked Back	

LACKAWANNA COUNTY STADIUM
STADIUM CONCRETE AND RAIL REPAIR CHART

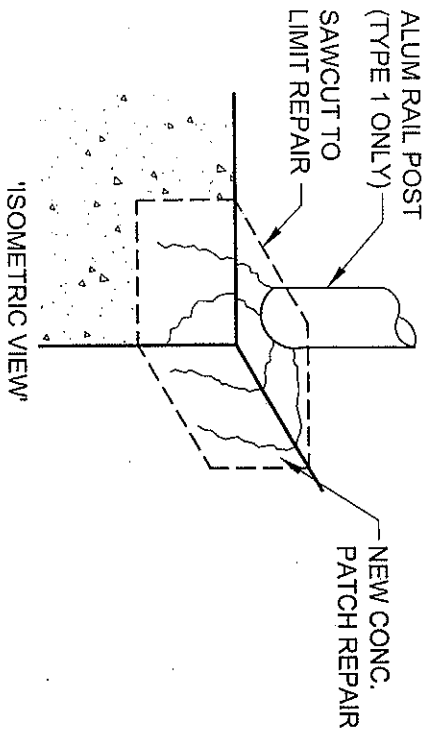


Location	Section	Row	Seat	Repair Type	Image number
Lower Bowl	131/Vom			Type 2 - Horizontal	2009-07-01-001
Upper Bowl	325-326	L		Type 1A	2009-07-01-002
Upper Bowl	Vom 3B			Type 1 / 4	2009-07-01-004
Upper Bowl	Vom 3B			Type 1 / 4	2009-07-01-005
Upper Bowl	308			Type 4	2009-07-01-007
Upper Bowl	307			Type 4	2009-07-01-008
Upper Bowl	306			Type 4	2009-07-01-009
Upper Bowl	305			Type 4	2009-07-01-010
Upper Bowl	304			Type 4	2009-07-01-011
Upper Bowl	303			Type 4	2009-07-01-012
Upper Bowl	302			Type 4	2009-07-01-013
Upper Bowl	301			Type 4	2009-07-01-014
Upper Bowl	326	A		Type 2	2009-07-01-016
Lower Bowl	139	I		Type 1	2009-07-01-092
Lower Bowl	133-132	J (Aisle)		Type 2	2009-07-01-096
Lower Bowl	130	B	4	Type 1A - Remove Obsolete Rail Sleeve	2009-07-01-097
Lower Bowl	130	B	8	Type 1A	2009-07-01-100
Lower Bowl	131-130	J		Type 2	2009-07-01-104
Lower Bowl	123-122	J		Type 1A	2009-07-01-108
Lower Bowl	121-120	G		Type 3	2009-07-01-109
Lower Bowl	119	K		Type 1A / 3	2009-07-01-112
Lower Bowl	119-118	L		Type 1A	2009-07-01-115
Lower Bowl	119-118	D-G		Type 1A / 3	2009-07-01-116
Lower Bowl	119-118	D-G		Type 1A	2009-07-01-119
Lower Bowl	117-116	E		Type 1A	2009-07-01-123
Lower Bowl	117-116	F		Type 1A	2009-07-01-124
Lower Bowl	117-116	G		Type 3	2009-07-01-125

LACKAWANNA COUNTY STADIUM STADIUM CONCRETE AND RAIL REPAIR CHART

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Location	Section	Row	Seat	Repair Type	Image number
Lower Bowl	116-115	K	8 / 9	Type 1A Type 1A - Remove Obsolete Rail Sleeve	2009-07-01-126
Lower Bowl	109	B		Type 1	2009-07-01-129
Lower Bowl	Party Deck			Type 1	2009-07-01-132
Upper Bowl	Upper Con. Near 333			Type 1	2009-07-01-139/140
Upper Bowl	333/334 Vom			Type 2 - Horizontal	2009-07-01-143
Upper Bowl	331	G		Type 1A	2009-07-01-145
Upper Bowl	331	H	1	Type 1A	2009-07-01-146
Upper Bowl	330 A Vom			Type 1A	2009-07-01-147
Upper Bowl	329 A Vom			Type 1A	2009-07-01-148
Upper Bowl	328 A Vom			Type 1A	2009-07-01-149
Upper Bowl	328	E	1	Type 1A	2009-07-01-150
Upper Bowl	323	A (Aisle)		Type 1A / 3	2009-07-01-151
Upper Bowl	315			Type 1	2009-07-01-154
Upper Bowl	313	I (Aisle Stair)	1	Type 1A	2009-07-01-155
Upper Bowl	313	I (Aisle Stair)	1	Type 1 / 4	2009-07-01-157
Upper Bowl	308	C	1	1A	2009-07-01-159



REPAIR TYPE '1' & '1A'

'FORMED PATCH REPAIR'

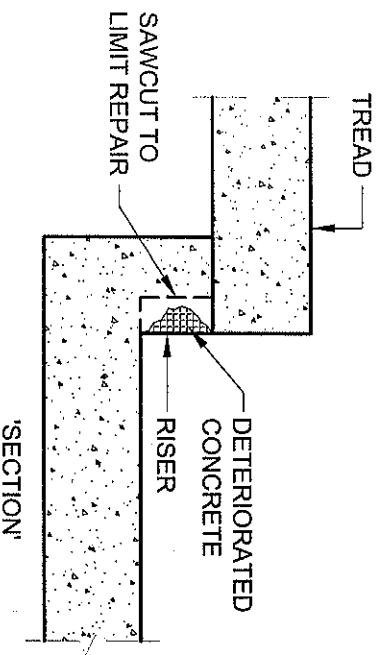
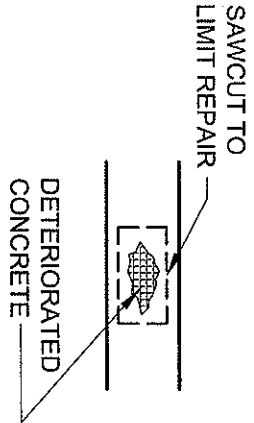
CONCRETE REPAIR (W/ FORMS)

1. BREAK OUT EXISTING LOOSE CONCRETE.
2. SAWCUT TO 1/2" DEPTH IN SOUND MATERIAL JUST BEYOND DETERIORATED EDGES TO LIMIT REPAIR & TO CREATE A CLEAN EDGE AT THE CONCRETE SURFACE FOR FINISHING.
3. REMOVE ANY REMAINING LOOSE MATERIAL. ROUGHEN ALL CONC. SURFACES AS PREPARATION TO RECEIVE PATCHING MATERIAL.
4. CLEAN ALL CONCRETE REINFORCEMENT, RAILING AND OTHER EMBEDDED MATERIAL.
5. COAT RAIL SURFACE WITH SIKADUR 32 HI MOD. COAT REBAR WITH SIKA ARMATEC 110.
6. PRIME PREPARED CONCRETE SURFACE WITH SCRUB COAT OF SIKA QUICK 1000 PRIOR TO PLACEMENT OF THE PATCHING MATERIAL.
7. PATCH CONCRETE WITH SIKA QUICK 1000 FOR REPAIRS UP TO 1 INCH THICKNESS, USE SIKA QUICK 1000 EXTENDED WITH 3/8" COARSE AGGREGATE FOR REPAIR GREATER THAN 1 INCH THICKNESS. USE APPROPRIATE FORMWORK TO REQUIRED SIZE PER MANUF. APPLICATION PROCEDURES. ALTERNATIVELY USE SIKACRETE 211, ONE COMPONENT POURABLE CONCRETE MIX.
8. PROTECT AND MOIST CURE PER MANUF. RECOMMENDATIONS.
9. INSTALL COVE SEALANT AT RAIL BASE WITH SIKAFLEX 2C POLYURETHANE SEALANT.
10. INSTALL SEALANT MATERIAL (SIKA FLEX 2C) FOR LENGTH OF TREAD & RISER WHERE REPAIR OCCURS ADJACENT TO EXISTING SEALANT JOINT LOCATIONS.

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PROJECT	PROJECT NO.	DWG. DATE
LACKAWANNA COUNTY STADIUM	20090323	07/14/09
PHASE 1 REHABILITATION	REF. DWG.	REV. DATE
DRAWING TITLE	SCALE	
REPAIR TYPE '1' & '1A'	N.T.S.	DRAWING NO.
	DWN. BY	
	ZBN	

SK-1



REPAIR TYPE '2'
 'NON-FORMED PATCH REPAIR'

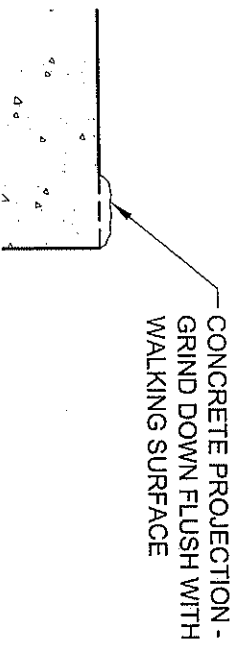
CONCRETE REPAIR

1. SAWCUT TO 1/2" DEPTH IN SOUND MATERIAL JUST BEYOND DETERIORATED EDGES TO LIMIT REPAIR & TO CREATE A CLEAN EDGE AT THE CONCRETE SURFACE FOR FINISHING.
2. ROUGHEN CONCRETE SURFACE.
3. REMOVE ALL LOOSE MATERIAL.
4. CLEAN ALL CONCRETE AND REINFORCEMENT.
5. COAT REBAR WITH SIKA ARMATEC 110.
6. APPLY SCRUB COAT OF SIKA QUICK 1000 TO CONCRETE PRIOR TO PLACING OF REPAIR MATERIAL.
7. APPLY SIKA REPAIR 223 REPAIR MORTAR FOR VERTICAL SURFACES & 222 REPAIR MORTAR FOR HORIZONTAL SURFACES INTO SUBSTRATE FILLING ALL VOIDS - SCREED OFF EXCESS. INSTALL PER MANUF. APPLICATION PROCEDURES.
8. PROTECT AND MOIST CURE PER MANUF. RECOMMENDATIONS.
9. INSTALL SEALANT MATERIAL (SIKA FLEX 2C) WHERE APPLICABLE AT EXISTING JOINT LOCATIONS.

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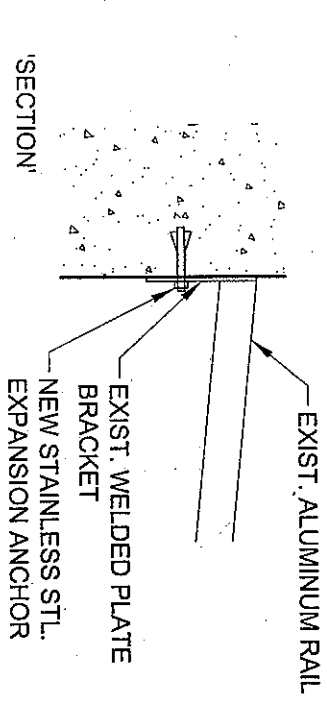
PROJECT LACKAWANNA COUNTY STADIUM PHASE 1 REHABILITATION	PROJECT NO. 20090323	DWG. DATE 07/14/09
DRAWING TITLE REPAIR TYPE '2'	REF. DWG. SCALE	REV. DATE
	DWNL. BY ZBN	DRAWING NO.
		SK-2



LOCALIZED GRINDING OF UNEVEN CONCRETE SURFACES. TYP. AT PATCHES IN STAIR AISLES.

'SECTION'

REPAIR TYPE '3'



INSTALL NEW 3/8" STAINLESS STL. EXPANSION ANCHOR IN EXISTING PRECAST WALL. DRILL NEW HOLE IN SOUND CONCRETE FOR 2 1/2" EMBEDMENT. ANCHOR SHALL BE HILTI KWIK BOLT 3 WITH WASHER AND LOCKNUT.

'SECTION'

REPAIR TYPE '4'

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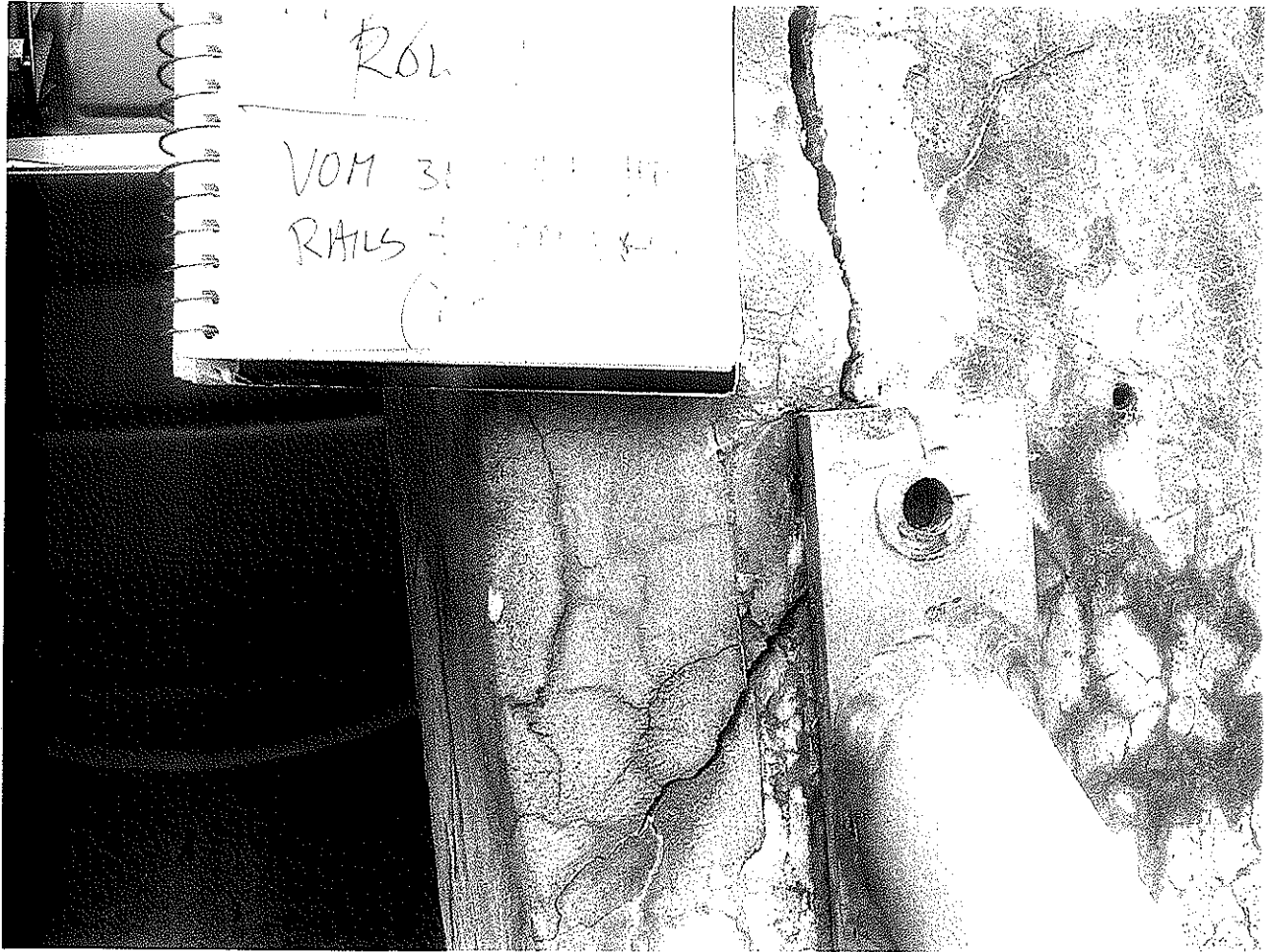
PROJECT LACKAWANNA COUNTY STADIUM PHASE 1 REHABILITATION DRAWING TITLE REPAIR TYPE '3' & '4'	PROJECT NO. 20090323	DWG. DATE 07/14/09
REF. DWG. SCALE DWN. BY	N.T.S. ZBN	REV. DATE DRAWING NO.
		SK-3



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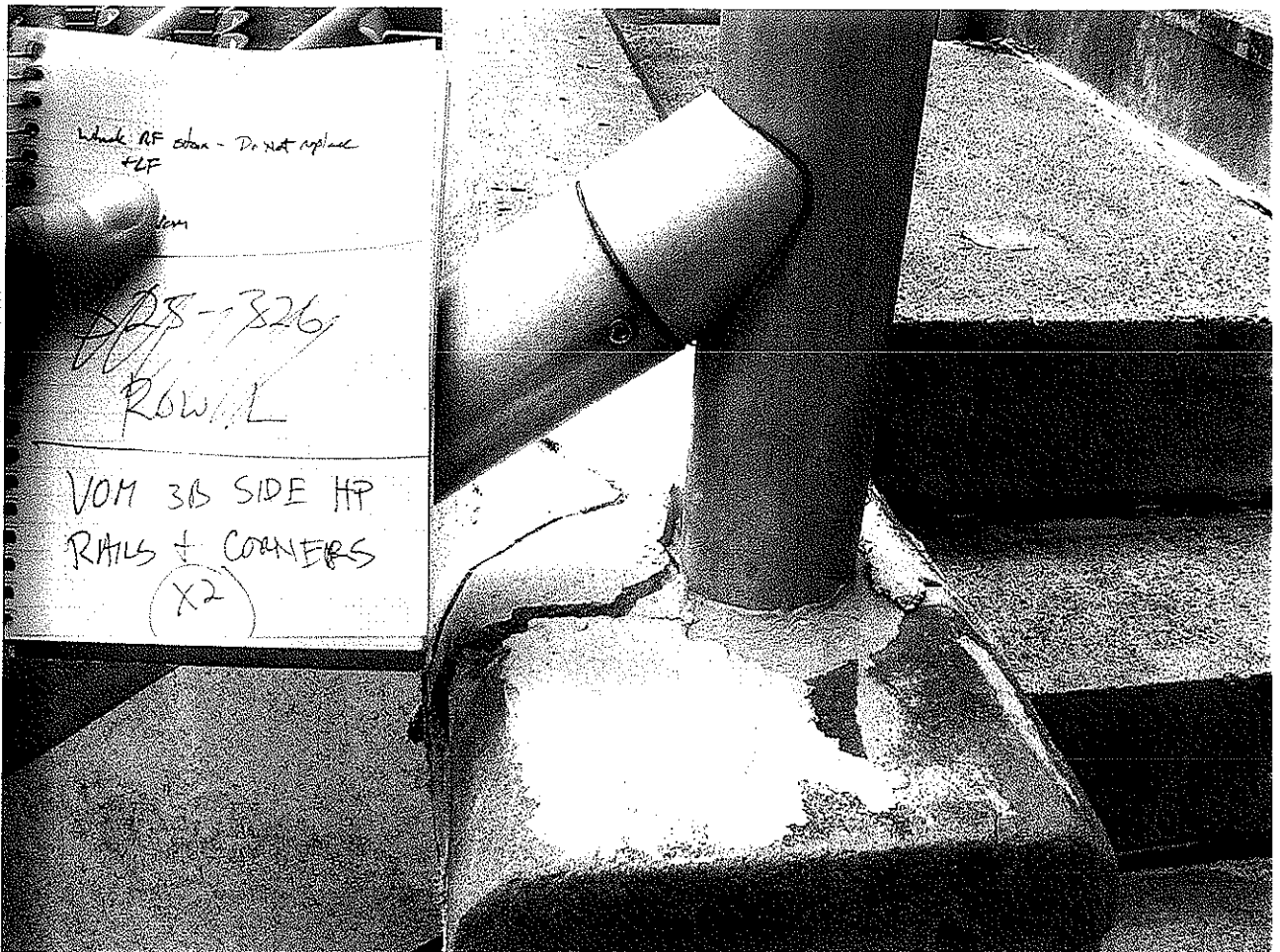


2009-07-01-002.jpg
1 / 23



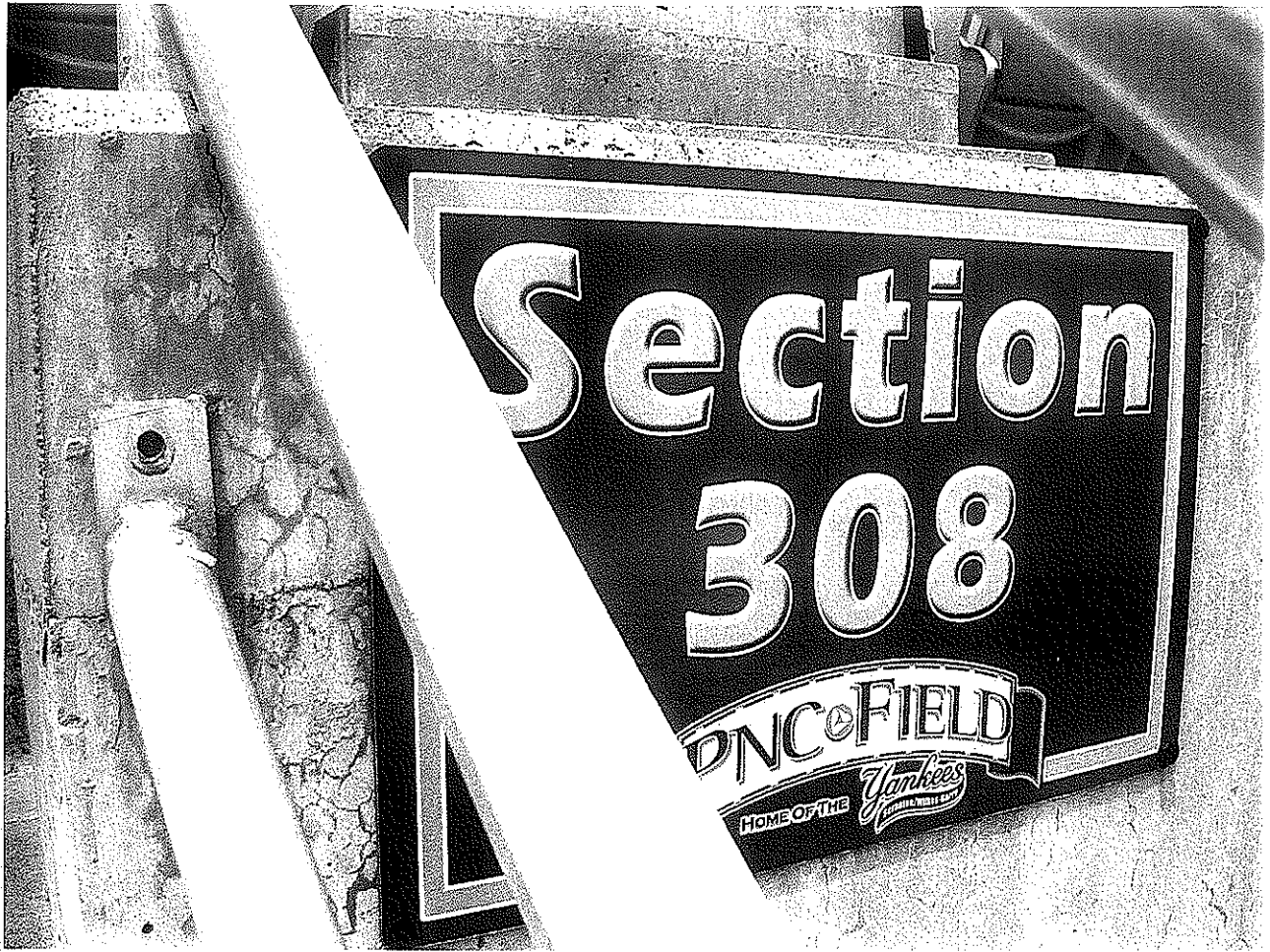
ROW
VOM 3B SIDE HP
RAILS + CORNERS
(X2)

2009-07-01-004.jpg



Whole AF clean - Do not replace
+LF
len
~~AS-326~~
ROW
VOM 3B SIDE HP
RAILS + CORNERS
(X2)

2009-07-01-005.jpg
2 / 23



2009-07-01-007.jpg



2009-07-01-008.jpg
3 / 23



2009-07-01-009.jpg



2009-07-01-010.jpg
4 / 23



2009-07-01-011.jpg



2009-07-01-012.jpg
5 / 23

FORMED REPAIR

COMPLETED
PATCH.

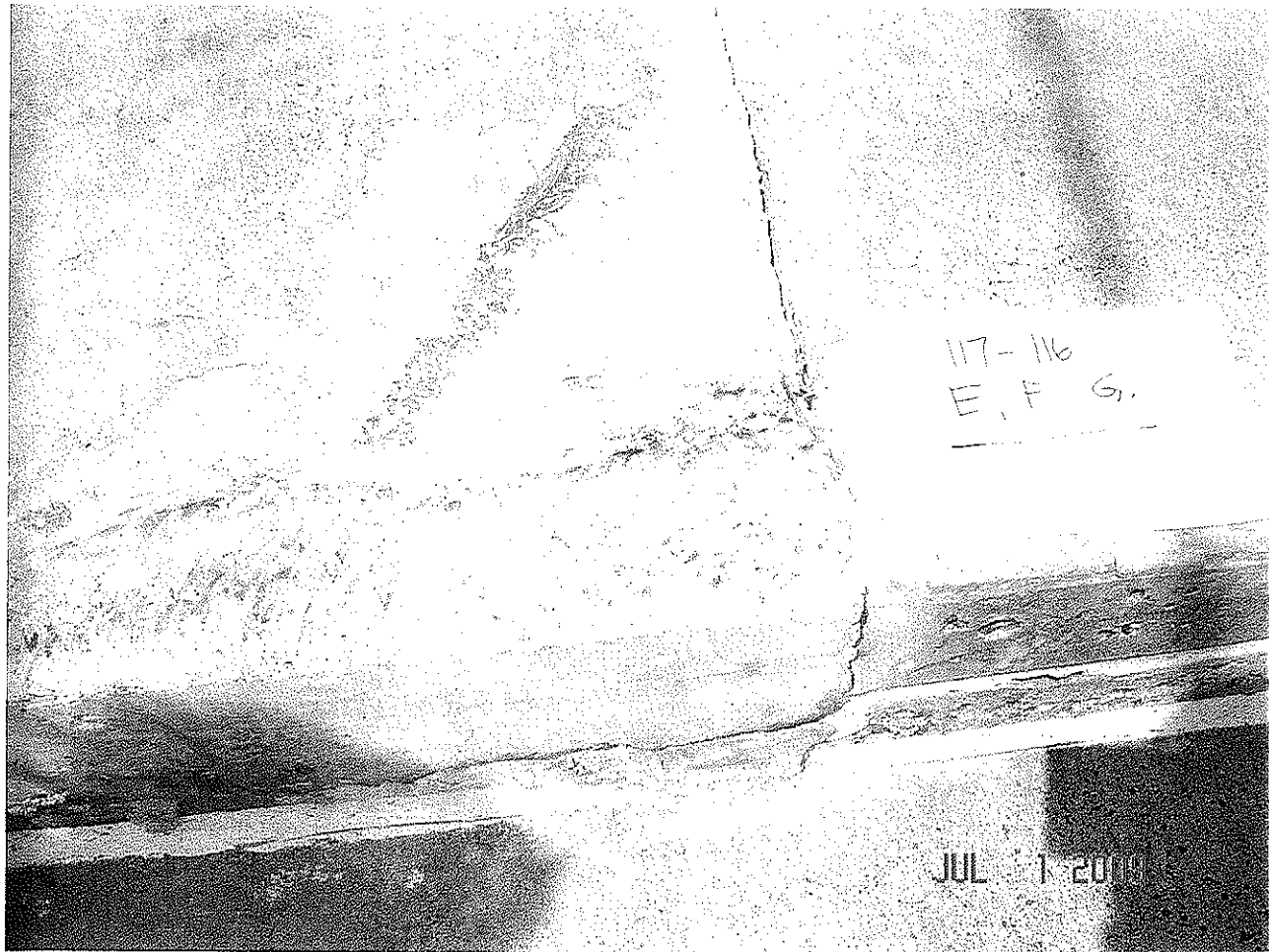


FORMBOARDS

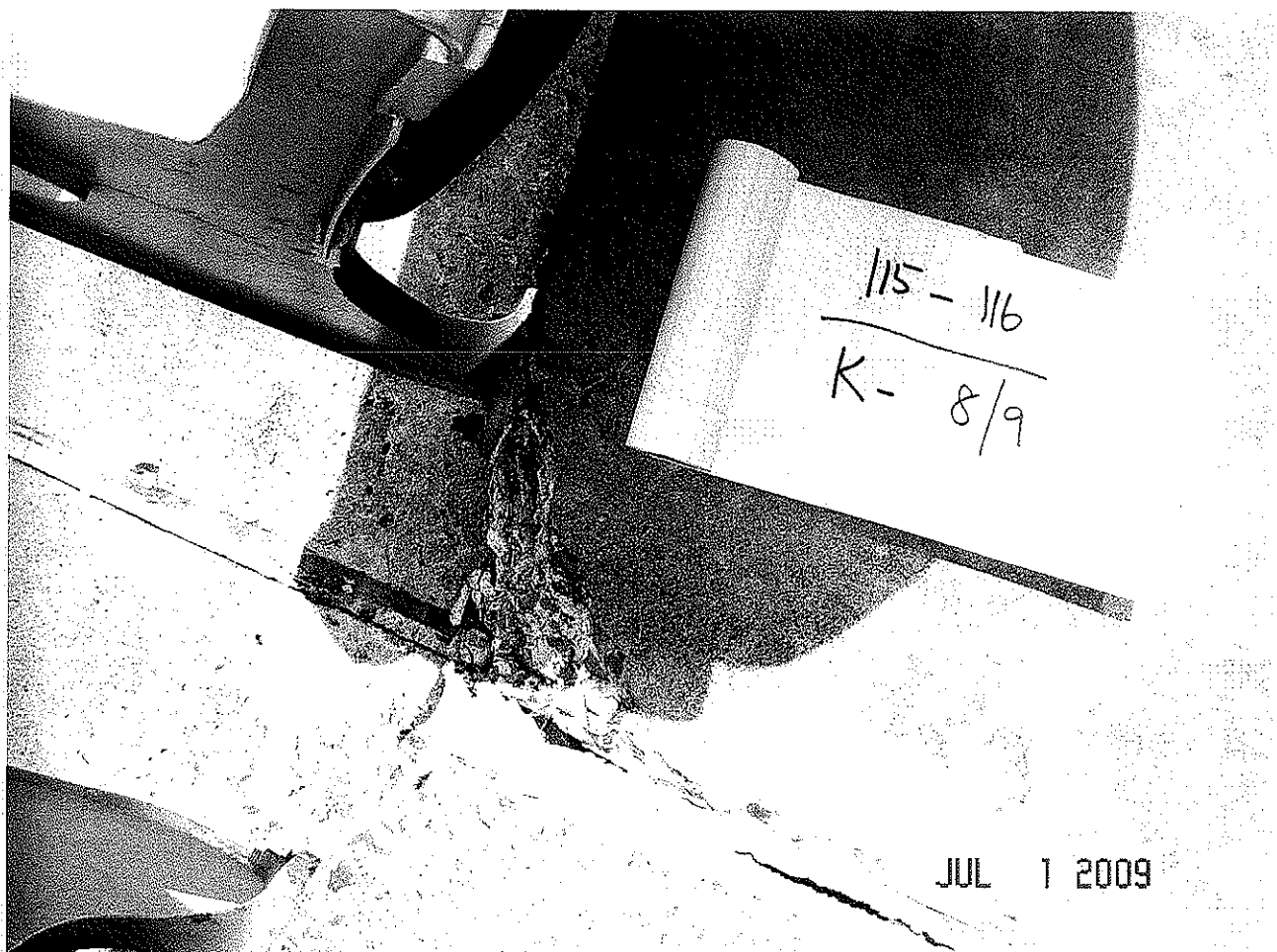


COMPLETED REPAIR

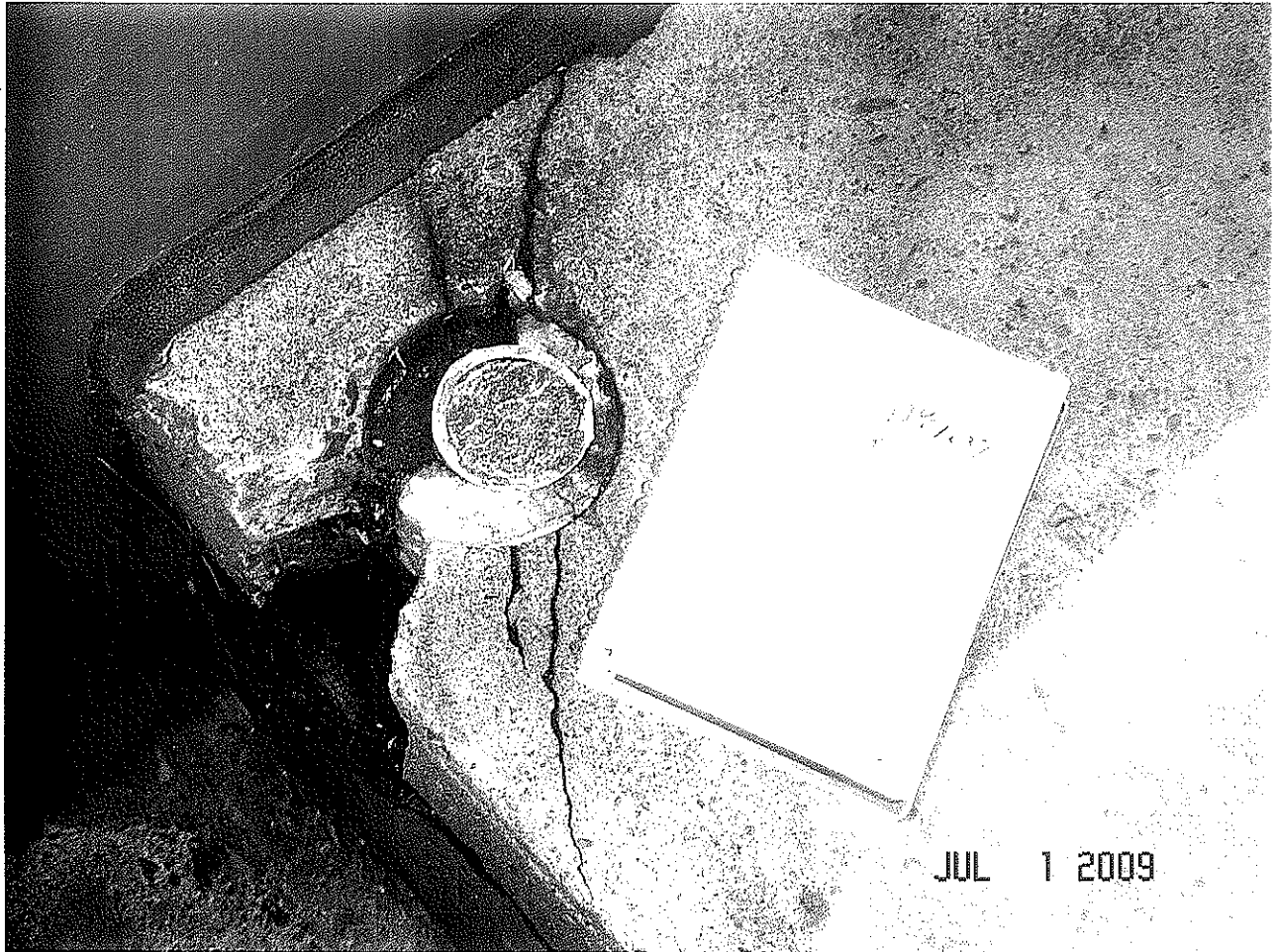




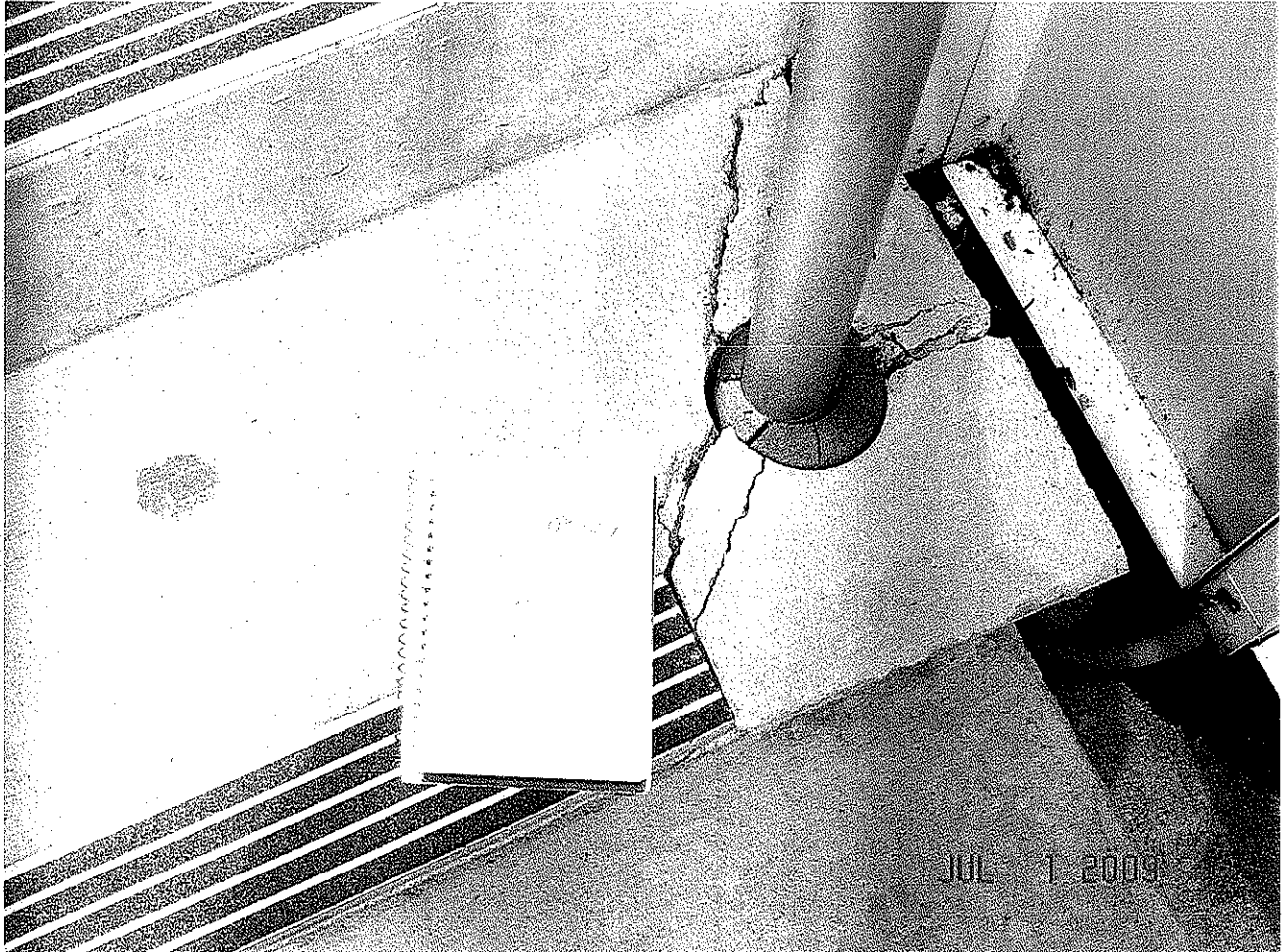
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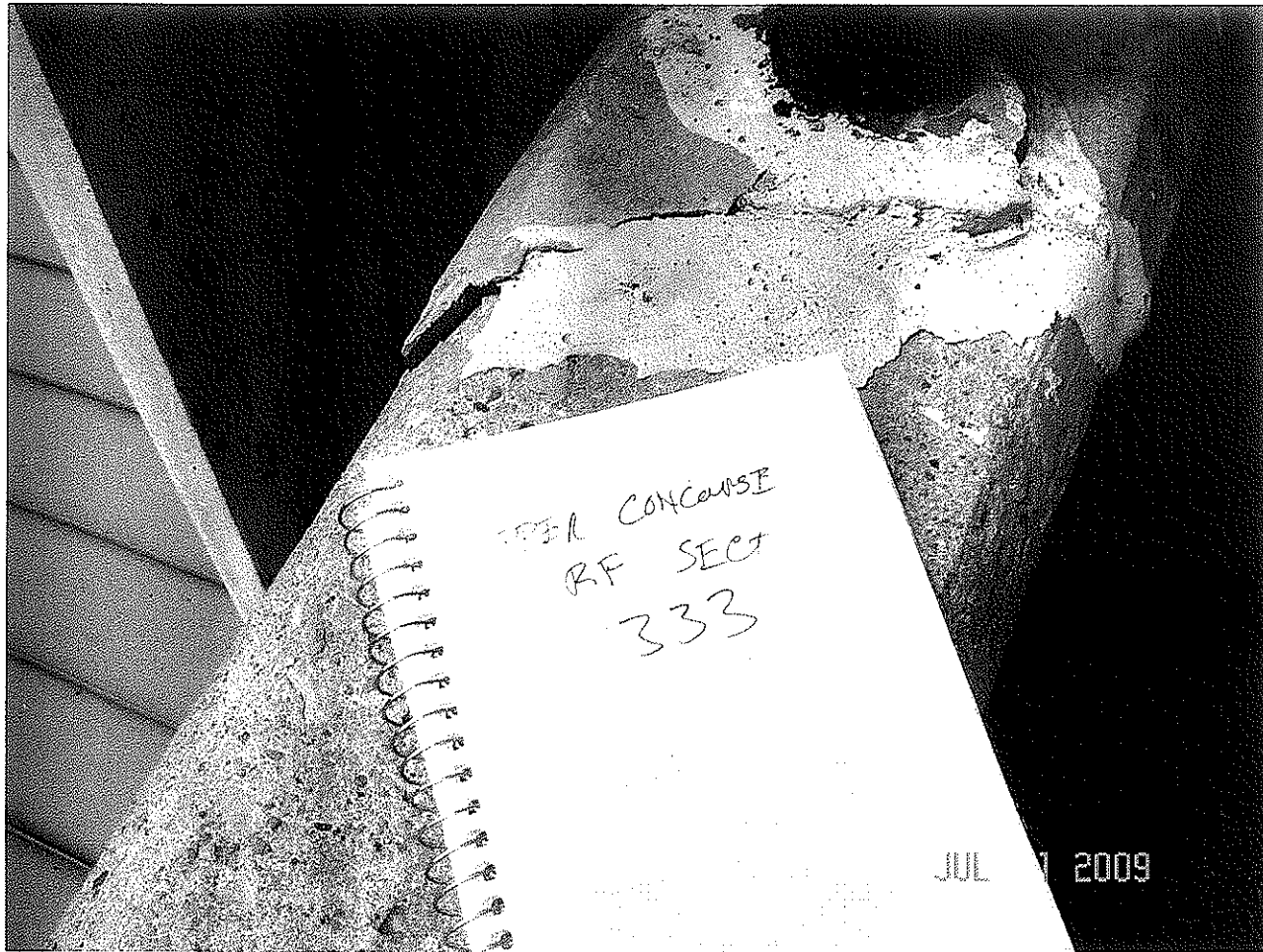
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14 / 23



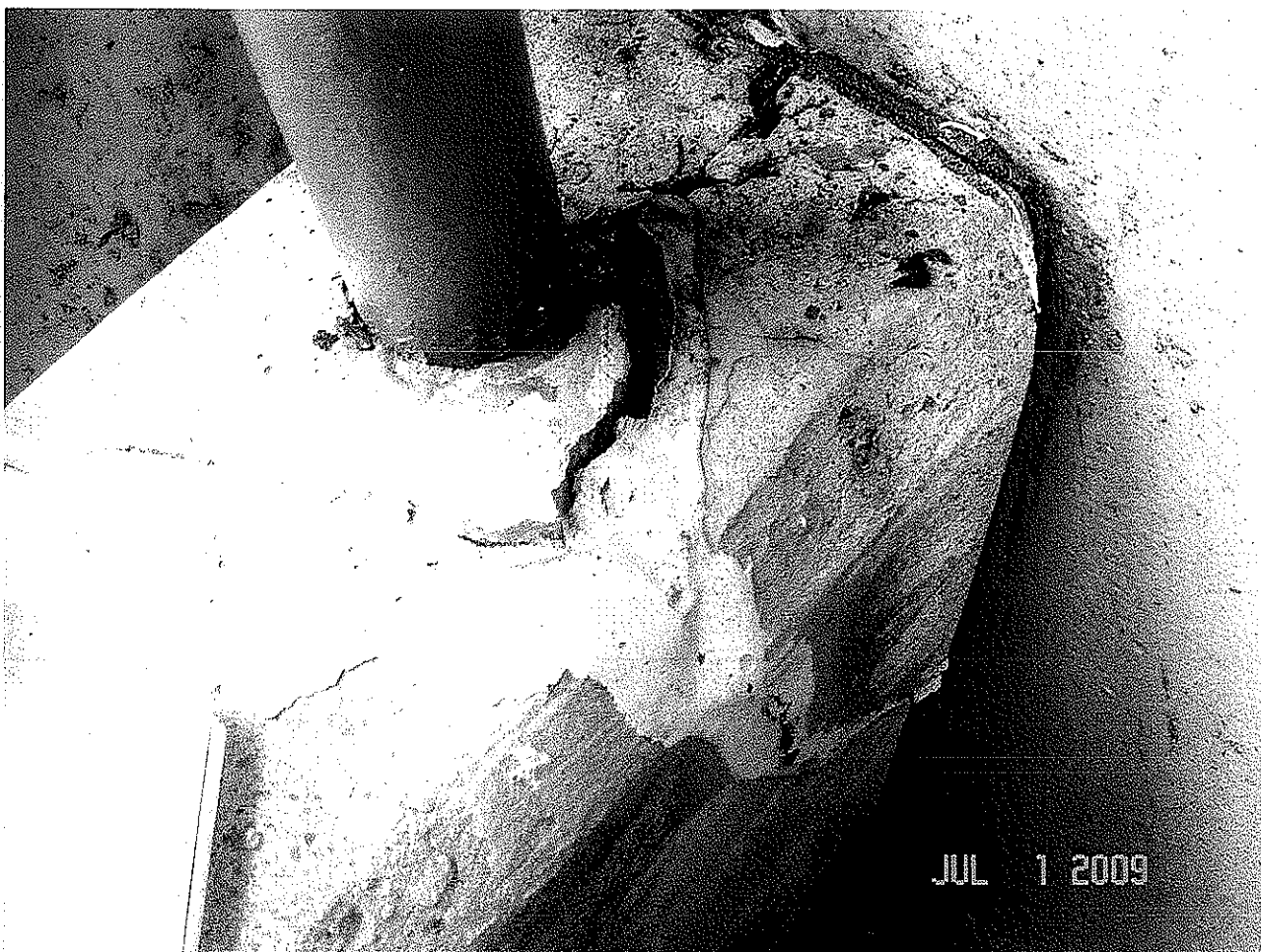
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2009-07-01-132.JPG
15 / 23



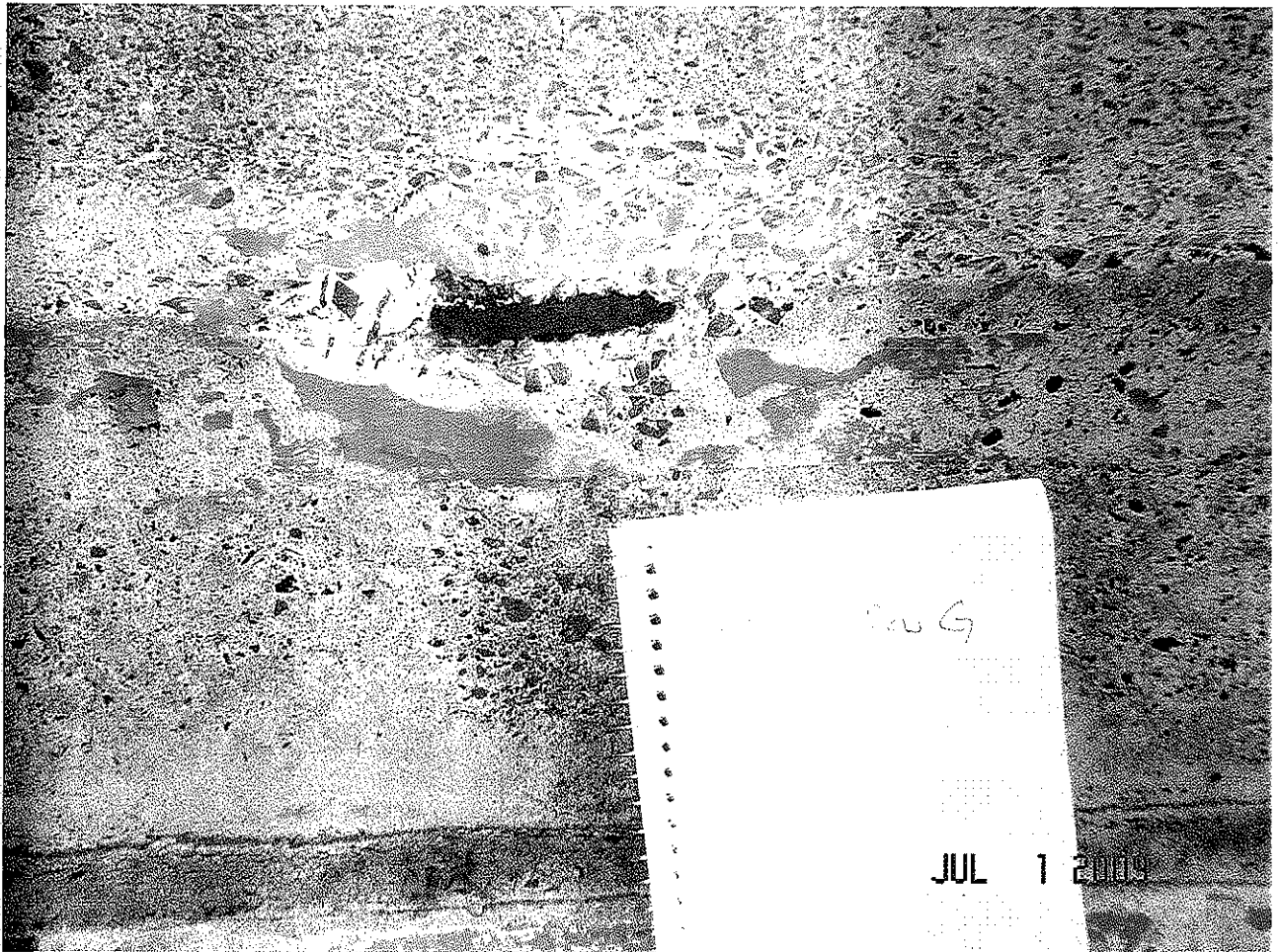
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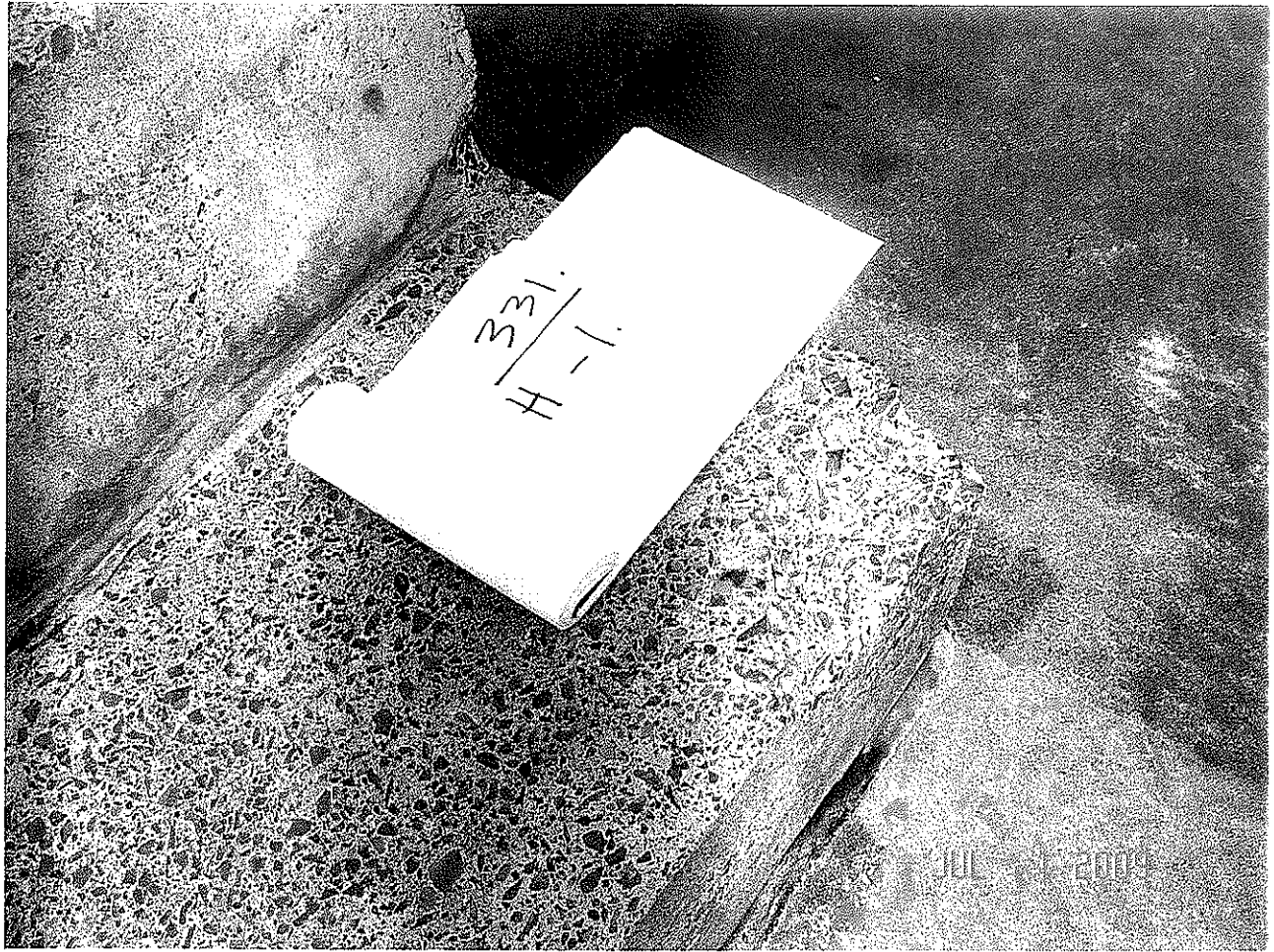
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16/23



2009-07-01-143.JPG



2009-07-01-145.JPG
17/23



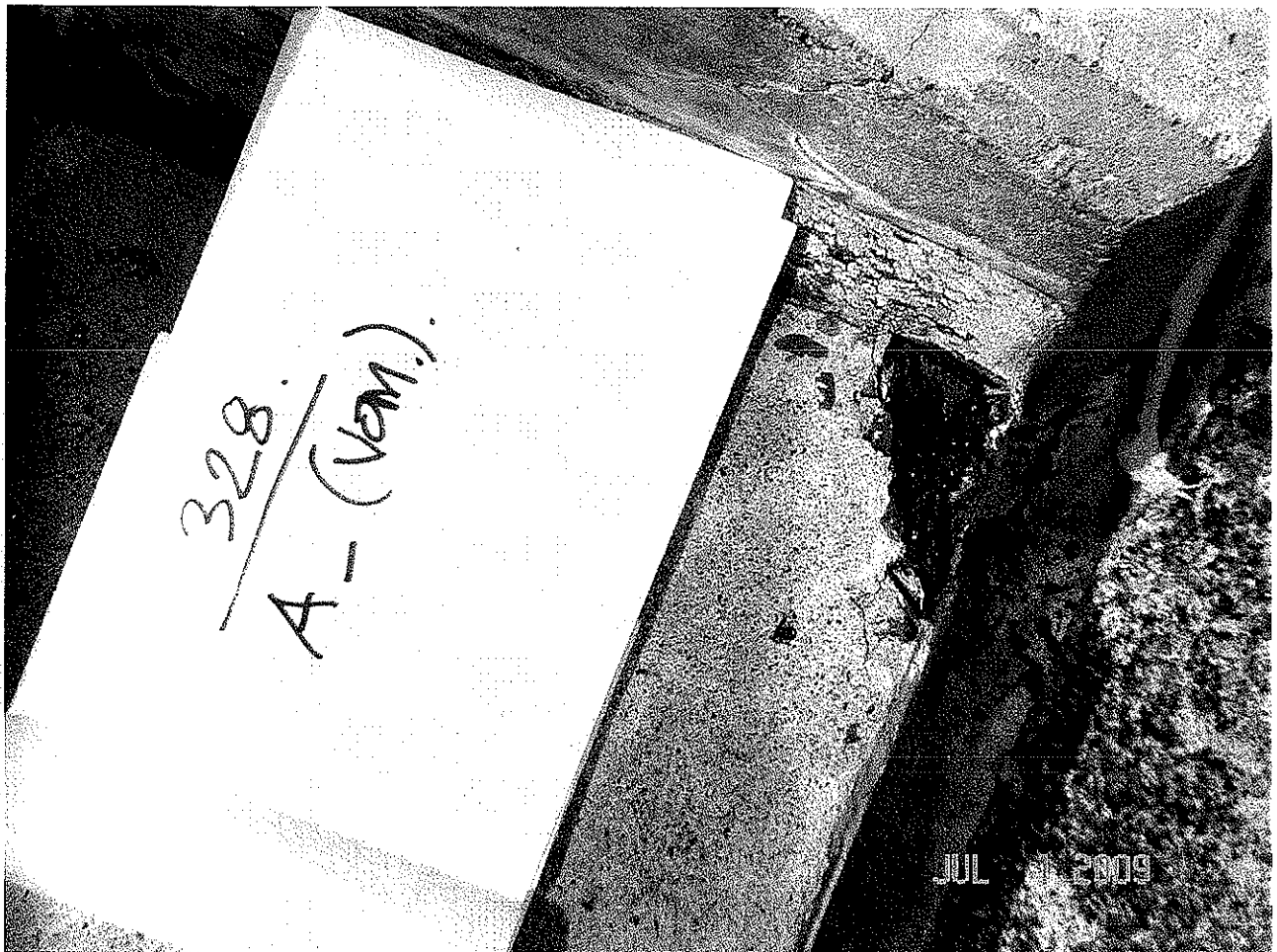
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2009-07-01-147.JPG
18 / 23



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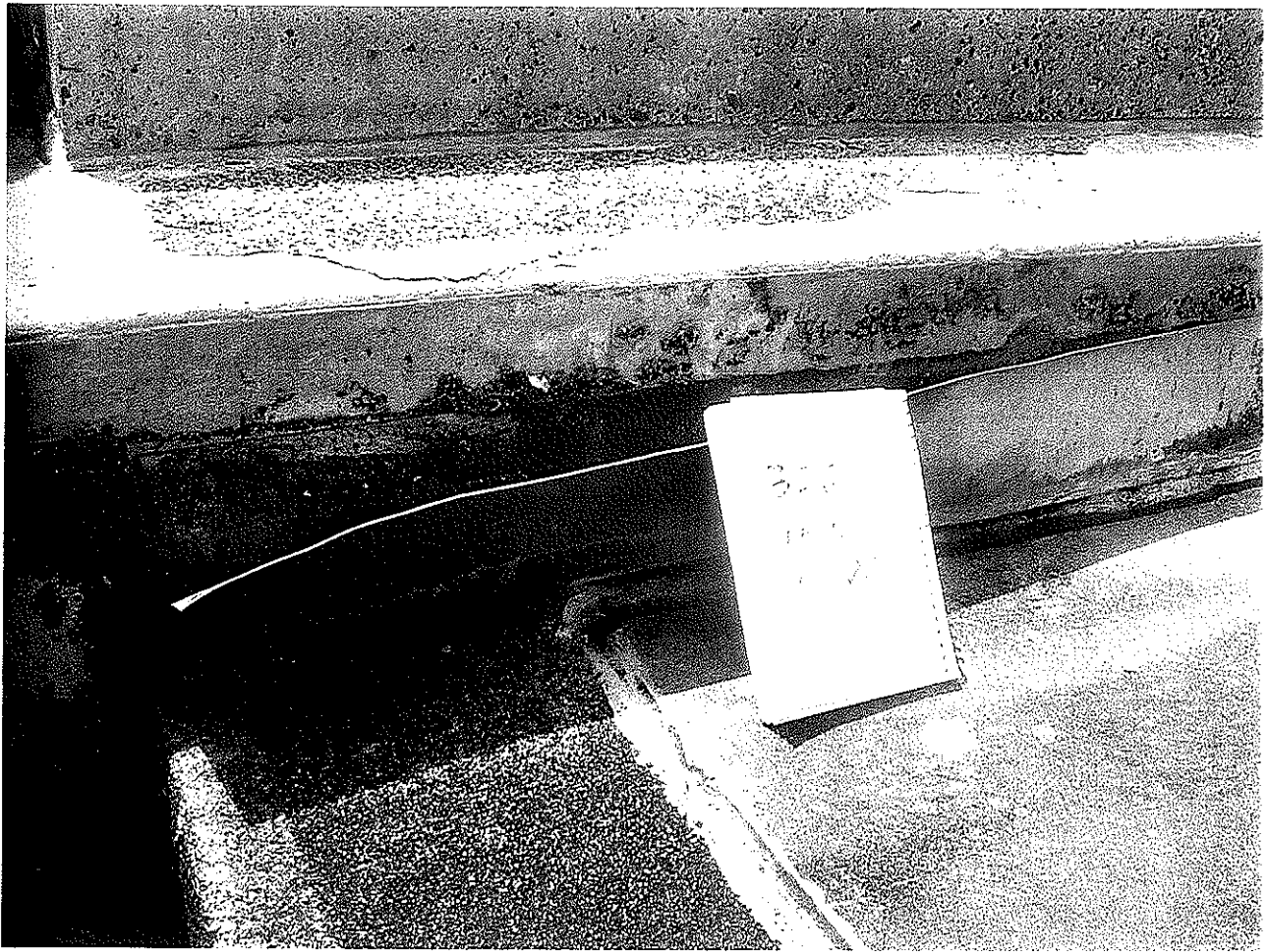
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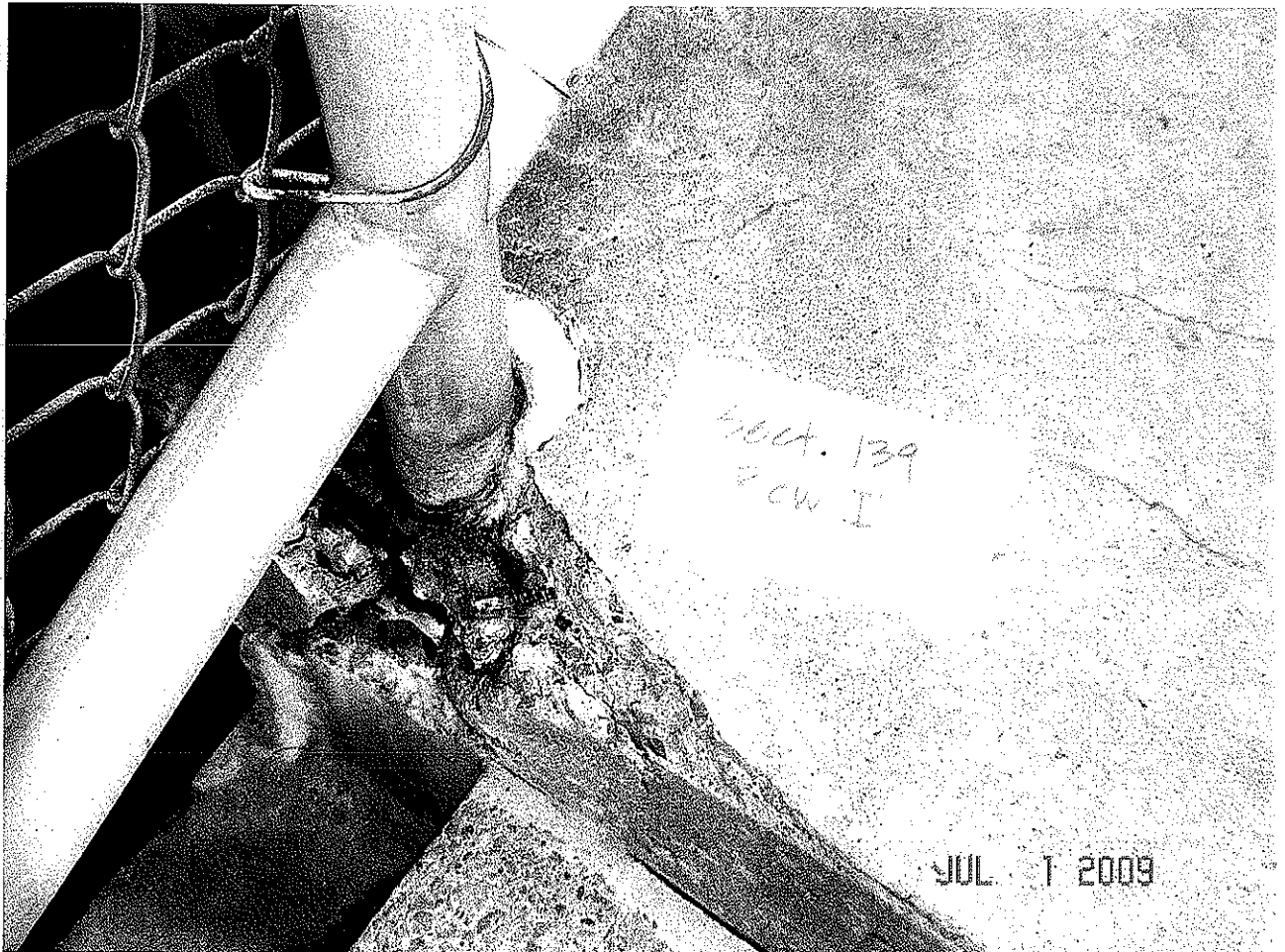
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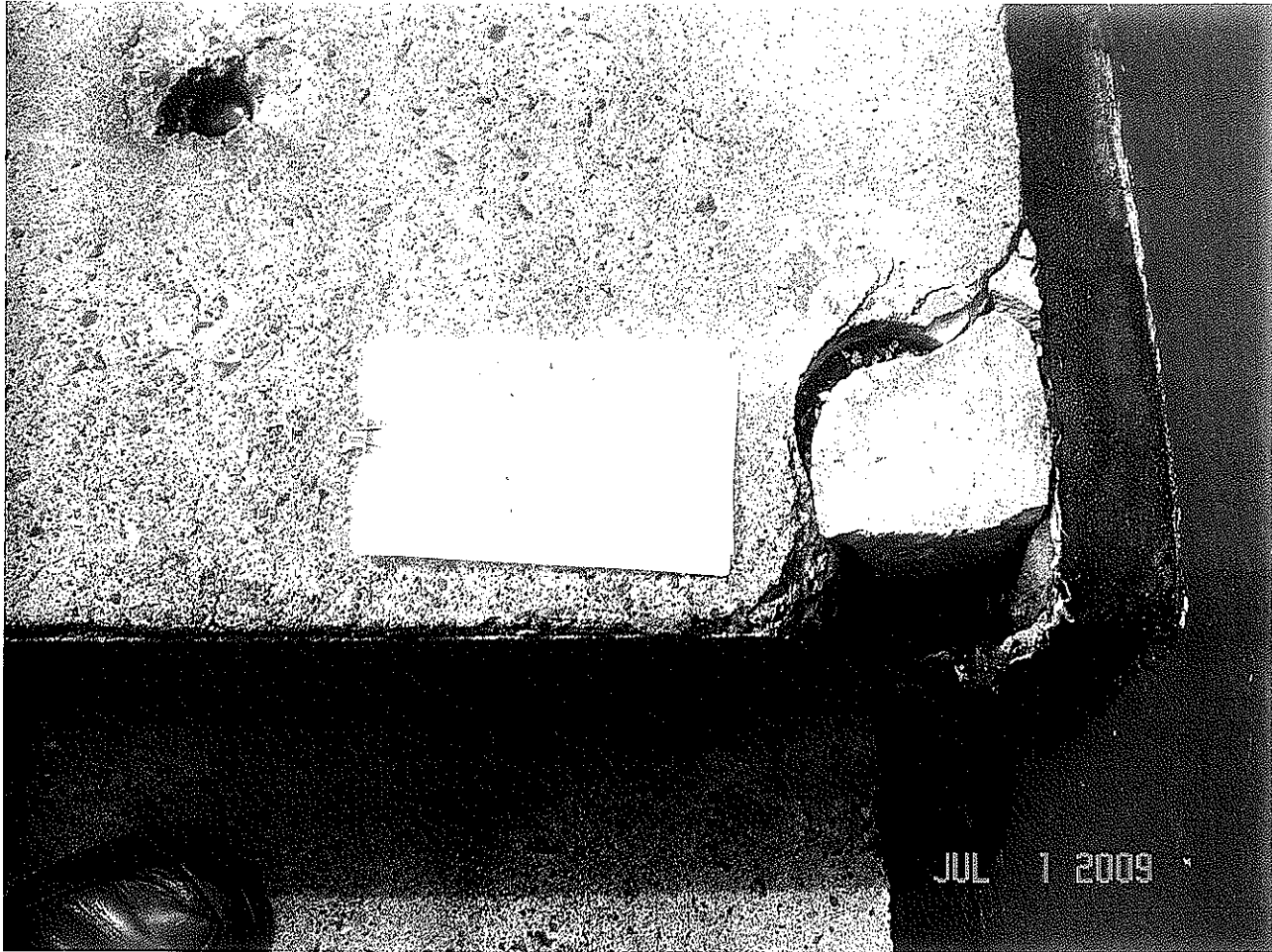
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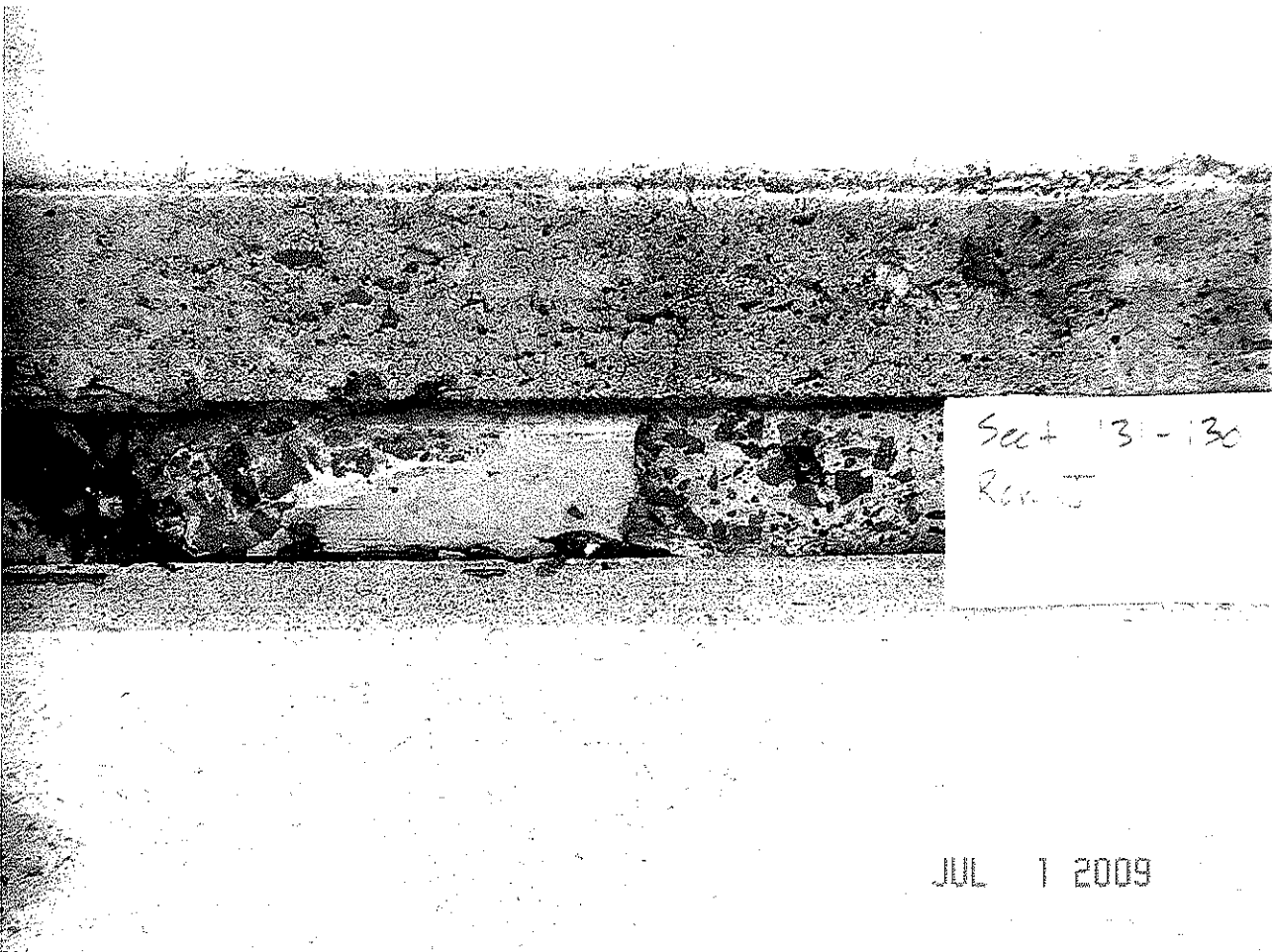
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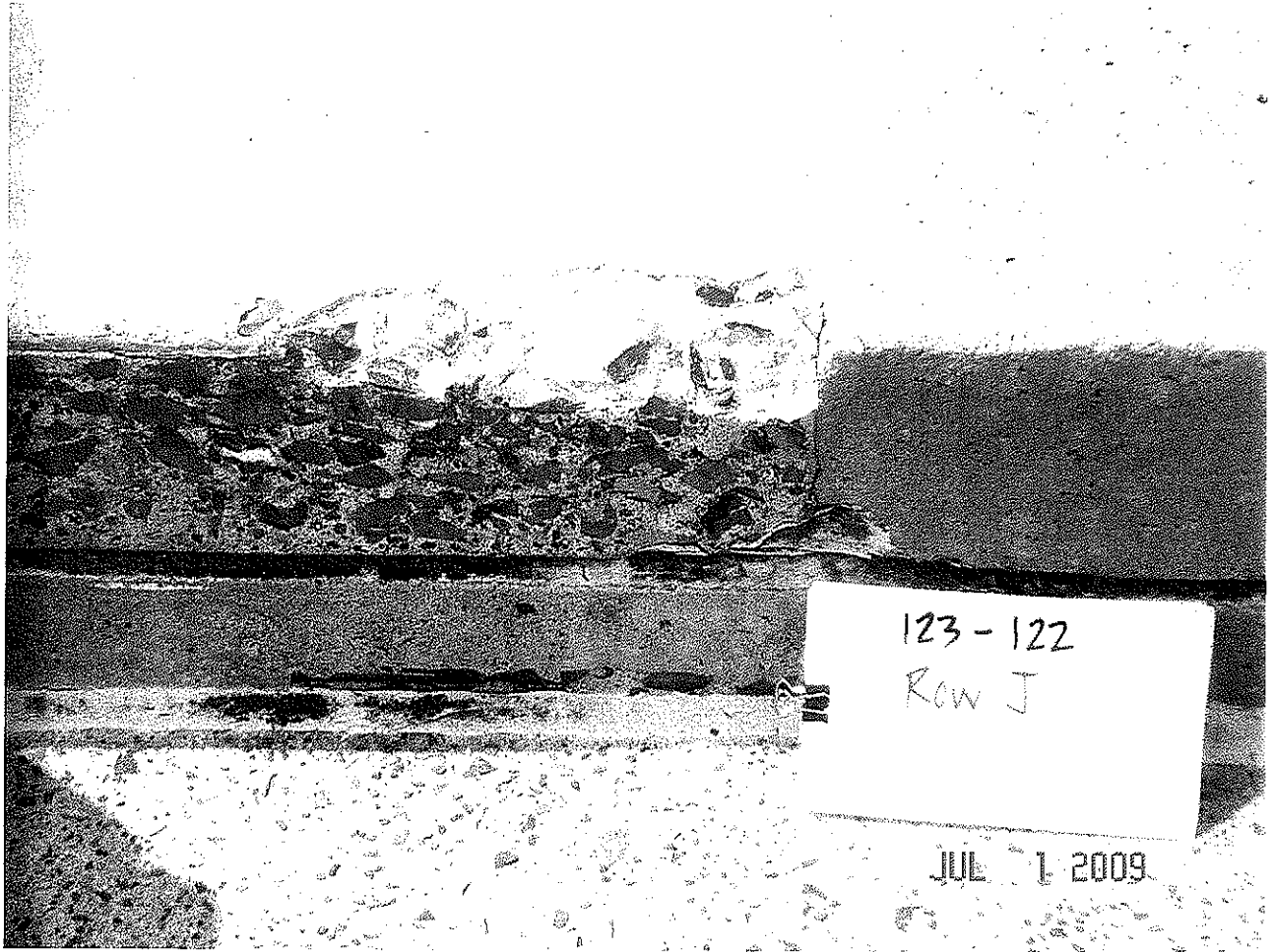


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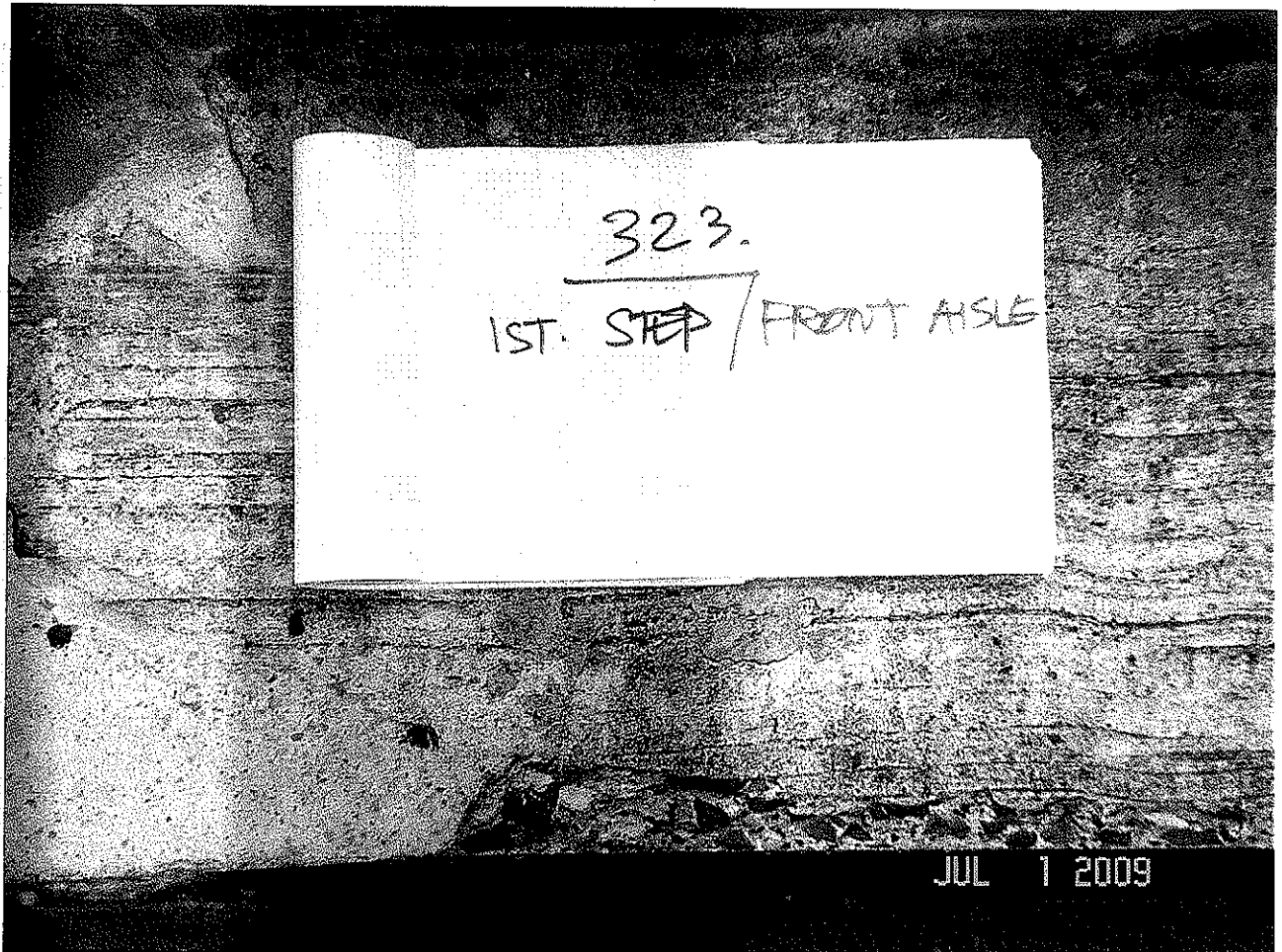
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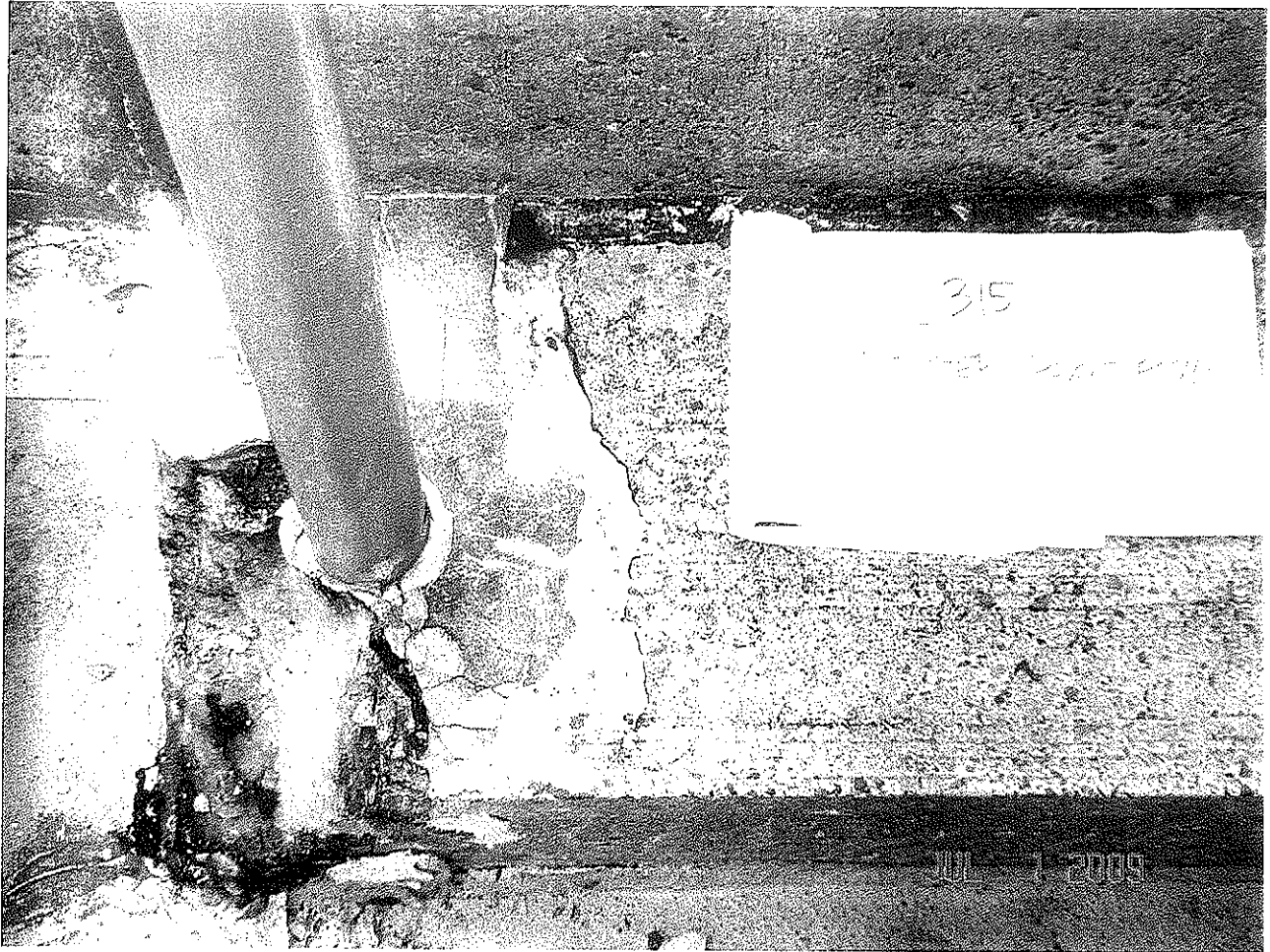
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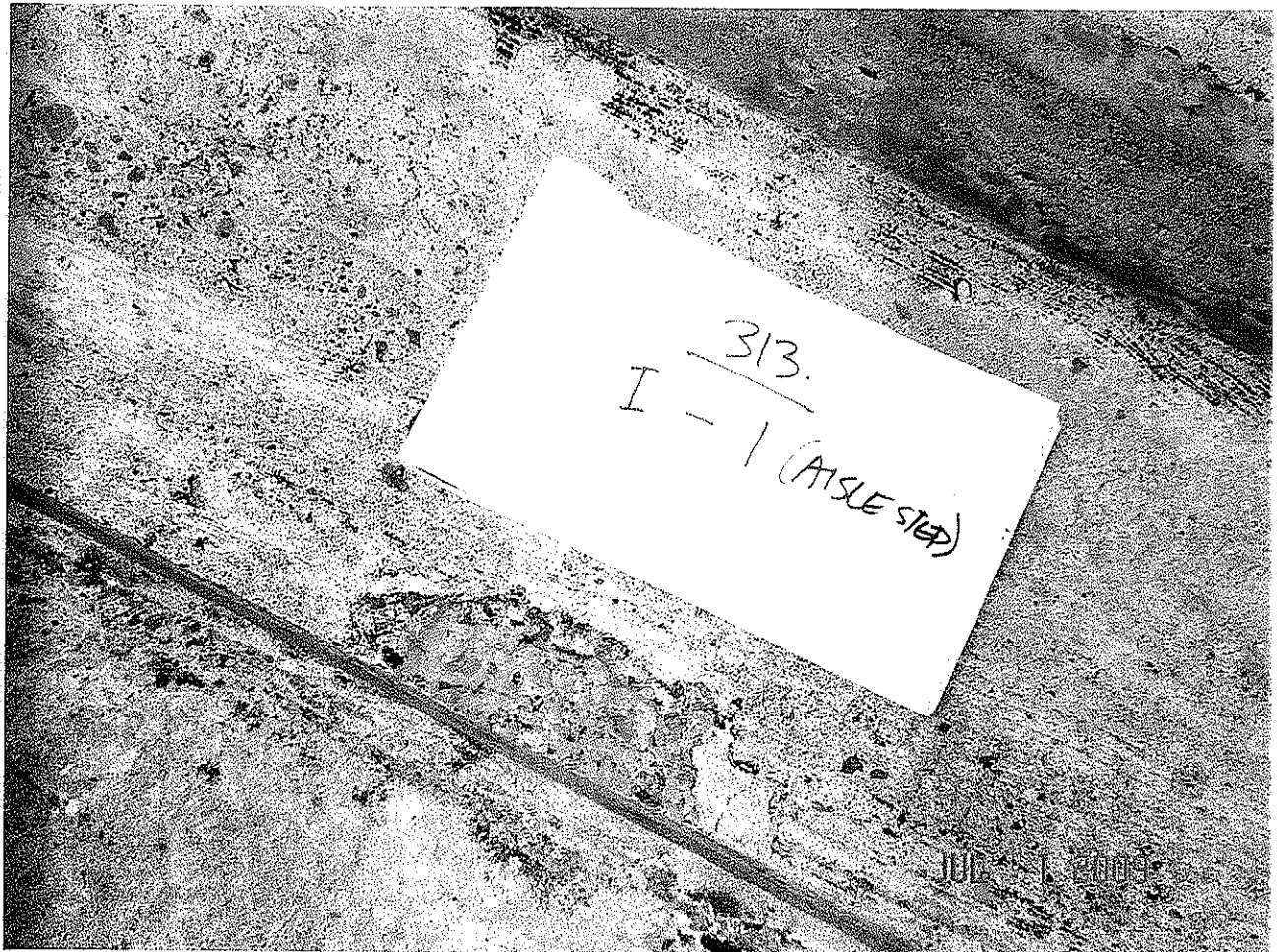
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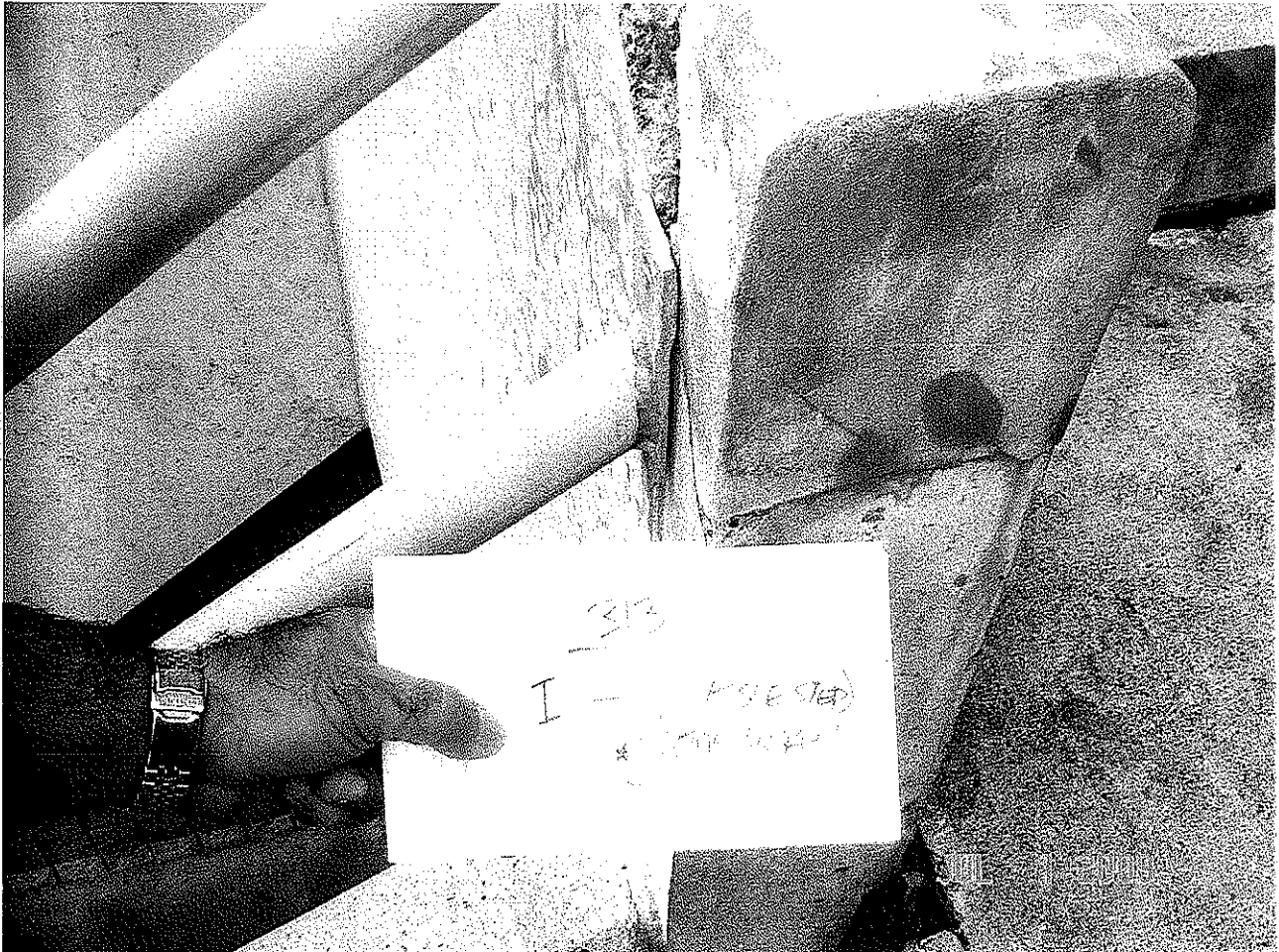
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SikaQuick® 1000

Rapid hardening repair mortar with extended working time

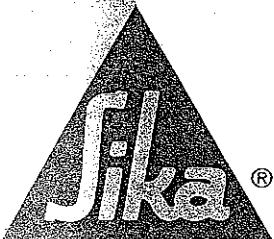
Description	SikaQuick 1000 is a 1-component, rapid hardening, early strength gaining, cementitious, patching material for concrete.
Where to Use	<ul style="list-style-type: none"> ■ Use on grade, above, and below grade on concrete. ■ Highway overlays and repairs. ■ Structural repair material for concrete roadways, parking structures, bridges, dams and ramps. ■ Full depth patching repairs. ■ Economical patching material for horizontal repairs of concrete and mortar.
Advantages	<ul style="list-style-type: none"> ■ Specially suited for hot weather applications when extended working time is required. ■ Rapid hardening as defined by ASTM C-928. ■ Allows application of an epoxy coating within 6 hours (73°F/50%R.H.). ■ Freeze/thaw resistant. ■ Easy to use, labor-saving material. ■ Contains no added chlorides. ■ Not gypsum-based. ■ High early strength. ■ Open to foot traffic in 4 hours; to vehicle traffic in 6 hours (at 73°F). ■ Easily applied to clean, sound substrate. ■ Not a vapor barrier.
Coverage	Approximately 0.43 cu. ft. When extended with 25 lbs. of 3/8 in. gravel yield is approximately 0.60 cu. ft.
Packaging	50-lb. multi-wall bag.

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.) (Water/powder = 0.10)

Shelf Life	1 year in original, unopened bag.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). For best results, condition material to 65°-75°F before using.	
Color	Concrete gray.	
Mixing Ratio	Approximately 4.5 - 5 pints of liquid per 50 lb. bag.	
Application Life	Approximately 30 minutes after adding powder to the water.	
Compressive Strength, psi	Mortar - ASTM C-109	*Concrete - ASTM C-39
3 hours	1,000 psi (6.9 MPa)	1,000 psi (6.9 MPa)
1 day	4,500 psi (31.0 MPa)	3,500 psi (24.1 MPa)
7 days	7,800 psi (53.8 MPa)	4,500 psi (31.0 MPa)
28 days	9,000 psi (62.1 MPa)	5,500 psi (37.9 MPa)
Flexural Strength, psi (ASTM C-78)		
1 day	850 psi (5.9 MPa)	600 psi (4.1 MPa)
7 days	1,000 psi (6.9 MPa)	900 psi (6.2 MPa)
28 days	1,100 psi (7.6 MPa)	1,000 psi (6.9 MPa)
Splitting Tensile Strength, psi (ASTM C-496)		
1 day	850 psi (5.9 MPa)	
7 days	1,000 psi (6.9 MPa)	
28 days	1,100 psi (7.6 MPa)	
Bond Strength, psi (ASTM C-882) modified		
1 day	2,000 psi (13.8 MPa)	1,500 psi (10.3 MPa)
7 days	2,900 psi (20.0 MPa)	2,500 psi (17.2 MPa)
28 days	3,100 psi (21.4 MPa)	2,700 psi (18.6 MPa)
Direct Tensile Bond, psi (ACI 503)	28 days	300 psi (substrate failure)
Drying Shrinkage, % (ASTM C-596)	28 days	0.06
Modulus of Elasticity, psi (ASTM C-469)	28 days	4.6 x 10 ⁶
Chloride Permeability, Coulombs (ASTM C-1202)	28 days	< 450
Freeze/Thaw Resistance, % (ASTM C-666)	28 days	98%
Scaling Resistance, lb./ft² (ASTM C-672)	50 cycles	0.080
Initial Set, Minutes (ASTM C-266)	50-60	
Final Set, Minutes (ASTM C-266)	70-100	
Abrasion Resistance, Inches of Wear at 1 hr. (ASTM C-779)	28 days	0.026

* Material was tested with an addition rate of 25 lbs. of clean, well-graded, saturated surface dry, low-absorption and high-density coarse aggregate. Water was added to achieve a 7 in. slump.

**Independent certificates available upon request.



How to Use

Surface Preparation

Surface must be clean and sound. Remove all deteriorated concrete, dirt, oil, grease, and other bond-inhibiting materials from the area to be repaired. Be sure repair area is not less than 1/4 in. deep. Preparation work should be done by appropriate means. Obtain an exposed aggregate surface with a minimum surface profile of $\pm 1/8$ in. (CSP-6) on clean, sound concrete. To ensure optimum repair results, the effectiveness of decontamination and preparation should be assessed by a pull-off test. Saw cutting of edges is preferred and a dovetail is recommended. Saturate surface to be repaired with clean water. Substrate should be saturated surface dry (SSD) prior to application.

Priming

For priming of reinforcing steel use Sika Armatec 110 EpoCem (consult Technical Data Sheet).

Concrete Substrate: Prime the prepared substrate with a scrub coat of SikaQuick 1000 prior to placement of the mortar. The repair mortar has to be applied into the wet scrub coat before it dries.

Mixing

Mechanically mix in an appropriately sized mortar mixer. Wet down all tools and mixer to be used.

With water: Start with 4.5 pints of water added to the mixing vessel. Add 1 bag of SikaQuick 1000 while continuing to mix. Add up to another 1/2 pint of water to achieve desired consistency. Do not over-water.

With Latex R: Pour 4.5 pints of Sika Latex R into the mixing container. Slowly add powder, mix and adjust as above.

With diluted Latex R: Sika Latex R may be diluted up to 5:1 (water: Sika Latex R) for projects requiring minimal polymer-modification. Pour 4.5 pints of the mixture into the mixing container. Slowly add powder, mix and adjust as above.

For applications greater than 1 in. in depth, add 3/8 in. coarse aggregate. The aggregate must be non-reactive (reference ASTM C-1260, C-227 and C-289), clean, well graded, saturated surface dry, have low absorption and high density, and comply with ASTM C-33 size number 8 per Table 2.

Note: Variances in aggregate may result in different strengths. The addition rate is 25 lbs. of aggregate per bag of SikaQuick 1000. (25 lbs. of 3/8 in. aggregate is approximately 2.0 gallons by loose volume of aggregate).

Do not exceed a slump of 7 in. This may cause excessive bleeding and retardation and will reduce the strength and performance of the material.

Application

The prepared mortar must be scrubbed into substrate. Be sure to fill all pores and voids. Force material against edge of repair, working toward center. After filling repair, screed off excess. Allow concrete to set to desired stiffness, then finish. If a smoother finish is desired, a magnesium float should be used. Mixing, placing, and finishing should not exceed 30 minutes maximum.

To control setting times, cold water should be used in hot weather and hot water used in cold weather.

Curing

As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a curing compound meeting ASTM C-309. Moist cure should commence immediately after finishing. If necessary, protect newly applied material from rain. To prevent from freezing, cover with insulating material.

Limitations

- Minimum ambient and surface temperatures 45°F and rising.
- Minimum application thickness 1/4 in. as a mortar and 1 in. extended with aggregate.
- Maximum application thickness 1 in. as a mortar and 6 in. extended with aggregate.
- Do not feather edge.
- Do not exceed 7 in. slump when extended.
- Use only potable water.
- Variations in aggregates may produce differences in strengths from the typical values stated in Sika's Technical Data.
- As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur Hi-Mod 32.
- Do not use Sika Armatec 110 EpoCem as a bonding agent with SikaQuick 1000.

Caution Irritant

Skin/Eye/Respiratory Irritant: Avoid breathing dust. Dust may cause respiratory tract irritation. May cause delayed lung injury (silicosis).

Warning: This product contains crystalline silica, which in the state of California, is known to cause cancer.

First Aid

Eyes: Rinse thoroughly with water a minimum of 15 minutes. Consult a physician. **Skin:** Wash thoroughly with soap and water. Remove contaminated clothing. **Inhalation:** Remove person to fresh air. Consult a physician. **Ingestion:** Dilute with water. Consult a physician. In all cases, if symptoms persist contact a physician.

Handling and Storage

Avoid contact. Wear suitable personal protective equipment (chemical resistant goggles/gloves/clothing). Remove contaminated clothing and launder before reuse. Use in the presence of adequate ventilation. In the absence of adequate ventilation, wear a properly fitted NIOSH respirator. Uncured material can be removed with water. Cured material can only be removed mechanically. Store in a cool, dry area. Keep bag tightly closed.

Clean Up

In case of spill, wear protective equipment (chemical resistant gloves/goggles/clothing). Ventilate area. In the absence of adequate ventilation, use a properly fitted NIOSH respirator. Confine spill. Vacuum or scoop into an appropriate container. Dispose of in accordance with current applicable local, state and federal regulations. In case of emergency, call CHEM-TREC at 1-800-424-9300. 703-527-3887 (outside USA & Canada).

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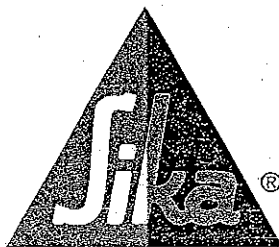
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Sikacrete® 211

One-component, cementitious,
 pumpable and pourable concrete mix

Description	Sikacrete 211 is a 1-component, portland-cement concrete containing factory blended coarse aggregate.
Where to Use	<ul style="list-style-type: none"> ■ Full depth repairs. ■ On grade, above, and below grade on concrete. ■ On horizontal, vertical and overhead surfaces. ■ As a structural repair material for parking facilities, industrial plants, walkways, bridges, tunnels, dams and balconies. ■ Filler for voids and cavities.
Advantages	<ul style="list-style-type: none"> ■ Pre-packaged coarse aggregate: Eliminates need to extend material in the field; Eliminates the risk of reactive aggregate. ■ High bond strength. ■ Compatible with coefficient of thermal expansion of concrete. ■ Increased resistance to deicing salts. ■ Simple-to-use labor-saving system. ■ Easily mixed. ■ Good freeze/thaw resistance. ■ Easily applied to clean, sound substrate. ■ Not a vapor barrier. ■ Not flammable, non-toxic.
Yield	Approximately 0.65 ft. ³ /unit
Packaging	80 lb. multi-wall bag.

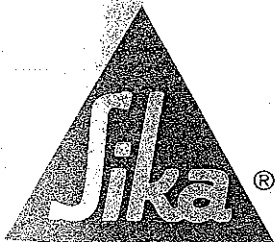
Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

Shelf Life	1 year - in original, unopened packaging.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F before using.	
Color	Concrete gray when mixed.	
Mixing Ratio	Mix with clean potable water at rate of up to 1 gallon per bag. Start with 4/5 gallon and mix to consistency required with remainder of gallon.	
Application Time	Initial Slump 5"-7"; Slump at 30 minutes >4"	
Flexural Strength (ASTM C-78)	28 days	700 psi (5.0 MPa)
Splitting Tensile Strength (ASTM C-496)	28 days	750 psi (3.4 MPa)
Bond Strength* (ASTM C-882 modified)	28 days	1,500 psi (15.2 MPa)
Compressive Strength (ASTM C-39)		
	1 day	2,000 psi (13.8 MPa)
	7 days	4,500 psi (31.0 MPa)
	28 days	5,000 psi (37.9 MPa)
Shrinkage (ASTM C-157)	28 days	<0.05%
Chloride ion permeability (Astm C-1202)	28 days	<1,500 Coloumbs

* Mortar scrubbed into substrate.

How to Use

Substrate	Concrete, mortar, and masonry products.
Surface Preparation	Concrete: Remove all deteriorated concrete, dirt, oil, grease, and all bond-inhibiting materials from surface. Be sure repair area is not less than 1 in. in depth. Preparation work should be done by high pressure water blast, scabber, or other appropriate mechanical means to obtain an exposed aggregate surface with a minimum surface profile of ±1/8 in. (CSP-7). Saturate surface with clean water. Substrate should be saturated surface dry (SSD) with no standing water during application.



Reinforcing Steel: Steel reinforcement should be thoroughly prepared by mechanical cleaning to remove all traces of rust. Where corrosion has occurred due to the presence of chlorides, the steel should be high-pressure washed with clean water after mechanical cleaning. For priming of reinforcing steel use Sika Armatec 110 EpoCem (consult Technical Data Sheet).

Priming	For priming of reinforcing steel use Sika Armatec 110 EpoCem (consult Technical Data Sheet).
Mixing	Place 4/5 of 1 gallon water in mixing container. Add Sikacrete 211 while continuing to mix. Add additional water up to 1 gallon total. Mix to a uniform consistency, maximum 3 minutes. Mechanically mix with a low-speed drill (400-600 rpm) and paddle or in appropriate-size mortar mixer or concrete mixer.
Application & Finish	Form and pour or pump applications: Pre-wet surface to SSD. Ensure good intimate contact with the substrate is achieved. To accomplish this, material should be scrubbed into the substrate or other suitable means should be employed such as vibration of the material or pumping under pressure. Vibrate form while pouring or pumping. Pump with a variable pressure pump. Continue pumping until a 3 to 5 psi increase in normal line pressure is evident then STOP pumping. Form should not deflect. Vent to be capped when steady flow is evident, and forms stripped when appropriate.
Curing	As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based* compatible curing compound. Curing compounds adversely affect the adhesion of following layers of mortar, leveling mortar or protective coatings. Moist curing should commence immediately after finishing. Protect newly applied material from direct sunlight, wind, rain and frost. *Pretesting of curing compound is recommended.
Limitations	<ul style="list-style-type: none"> Application thickness: Minimum 1 in. (25 mm); Maximum 8 in. (200 mm) Minimum ambient and surface temperatures 45°F (7°C) and rising at time of application.
Caution Irritant	Suspect carcinogen - Contains portland cement and sand (crystalline silica). Skin and eye irritant. Avoid contact. Dust may cause respiratory tract irritation. Avoid breathing dust. Use only with adequate ventilation. May cause delayed lung injury (silicosis). IARC lists crystalline silica as having sufficient evidence of carcinogenicity in laboratory animals and limited evidence of carcinogenicity in humans. NTP also lists crystalline silica as a suspect carcinogen. Use of safety goggles and chemical resistant gloves is recommended. If PELs are exceeded, an appropriate, NIOSH approved respirator is required. Remove contaminated clothing.
First Aid	In case of skin contact, wash thoroughly with soap and water. For eye contact, flush immediately with plenty of water for at least 15 minutes, and contact a physician. For respiratory problems, remove person to fresh air.
Clean Up	In case of spillage, scoop or vacuum into appropriate container, and dispose of in accordance with current, applicable local, state and federal regulations. Keep container tightly closed and in an upright position to prevent spillage and leakage. Mixed components: Uncured material can be removed with water. Cured material can only be removed mechanically.

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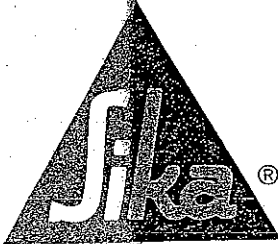
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Product Data Sheet
Edition 6.2003
Identification no. 552
SikaRepair 222

SikaRepair® 222

One-component, early strength gaining, cementitious patching material

Description	SikaRepair 222 is a one-component, early strength gaining, cementitious, patching material for horizontal repair of concrete.
Where to Use	<ul style="list-style-type: none"> ■ On grade, above and below grade on concrete and mortar. ■ As a repair material for spalled horizontal concrete surfaces, walkways, ramps, steps, etc.
Advantages	<ul style="list-style-type: none"> ■ Easy-to-use; just add water. ■ Not a vapor barrier. ■ Suitable for exterior and interior applications. ■ Not flammable, non-toxic. ■ Easily applied to clean, sound substrate. ■ High early strengths.
Yield	Approximately 0.42 cu. ft. Approximately 0.62 cu. ft. (222+32 lbs. of 3/8" pea gravel).
Packaging	50 lb. multi-wall bag. SikaLatex R - 1 gal. plastic jug; 4/carton, 5 gal. pails

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

Shelf life	One year in original, unopened bags.
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F before using.
Color	Concrete gray
Mixing Ratio	¾ gallon to 7/8 gallon of liquid per 50 lb. bag
Application Time	Approximately 30 minutes
Finishing Time	50-120 minutes

Note: All times start after adding Component 'B' to Component 'A' and are highly affected by temperature, relative humidity, substrate temperature, wind, sun, and other jobsite conditions.

Compressive Strength (ASTM C109)		With undiluted Latex R
1 day	1,800 psi (12.4 MPa)	2,300 psi (15.9 MPa)
7 days	4,000 psi (27.6 MPa)	4,500 psi (31.0 MPa)
28 days	5,000 psi (34.5 MPa)	5,500 psi
Flexural Strength (ASTM C293)		
28 days	750 psi (5.2 MPa)	1,200 psi (8.2 MPa)
Splitting Tensile Strength (ASTM C496)		
28 days	450 psi (3.1 MPa)	700 psi (4.8 MPa)
Bond Strength *(ASTM C882 modified)		
28 days	2,000 psi (13.8 MPa)	2,000 psi (13.8 MPa)

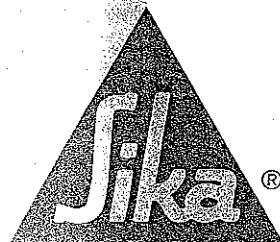
* Mortar scrubbed into substrate.

How to Use

Surface Preparation Remove all deteriorated concrete, dirt, oil grease and all bond inhibiting materials from surface. Preparation work should be done by high pressure water blast, scabbler, or other appropriate mechanical means to obtain an exposed aggregate surface with a minimum surface profile of ±1/8 inch. (CSP-6). Saturate surface with clean water. Substrate should be saturated surface dry (SSD) with no standing water during application.

Priming For priming of reinforcing steel use Sika Armatec 110 EpoCem (consult Technical Data Sheet).
Concrete Substrate: Prime the prepared substrate with a brush or sprayed applied coat of Sika Armatec 110 EpoCem (consult Technical Data Sheet). Alternately, a scrub coat of SikaRepair 222 can be applied prior to placement of the mortar. The repair mortar has to be applied into the wet scrub coat before it dries.

Mixing **With water:** Wet down all tools and mixer to be used. Add approximately 3/4 gallon of water to mixing vessel. Slowly add 1 bag of SikaRepair 222 while continuing to mix. Mechanically mix with a low-speed drill (400-600 rpm) and Sika paddle or in an appropriate size mortar mixer. Add an additional 1/8 gallon of water if needed.
With Latex R: Pour 3/4 gallon of Sika Latex R into the mixing container. Slowly add powder, mix and adjust as above.



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With diluted Latex R: Sika Latex R may be diluted up to 5:1 (water: Sika Latex R) for projects requiring minimal polymer-modification. Pour 3/4 gallon of the mixture into the mixing container. Slowly add powder, mix and adjust as above.

SikaRepair 222 Concrete: For applications greater than 1 inch depth, add a 3/8 inch coarse aggregate. Aggregate must be non-reactive (reference ASTM C1260, C227 and C289), clean, well-graded, saturated surface dry (SSD), have low absorption and high density, and comply with ASTM C33 size number 8 per Table 2. Addition rate must not exceed 32 lbs. of aggregate/bag of SikaRepair 222 (32 lbs. of 3/8 in. aggregate is approximately 2.5 to 3.0 gal. by loose volume of aggregate). **Water may be varied to achieve the desired consistency. Do not overwater.**

Application and Finish The prepared mortar must be scrubbed into the substrate, filling all pores and voids. Force material against edge of repair, working toward center. After filling repair, consolidate, then screed. Allow mortar to set to desired stiffness, then finish. Mixing, placing and finishing should not exceed 45 minutes maximum.

Curing As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based, compatible curing compound. Curing compounds adversely affect the adhesion of following lifts of mortar, leveling mortar or protective coatings. Moist curing should commence immediately after finishing. Protect freshly applied mortar from direct sunlight, wind, rain and frost.

Limitations

- **Application thickness: (with water and diluted Latex R)**

<i>Min.</i>	<i>Max. inches one lift</i>
Neat	1/4 inch (6 mm) 1 inch (25 mm)
Extended	1 inch (25 mm) 4 inches (100 mm)
- **Application thickness: (with undiluted Latex R)**

<i>Min.</i>	<i>Max. inches one lift</i>
Neat	1/8 in (3 mm) 1 inch (25 mm)
Extended	1 inch (25 mm) 4 inches (100 mm)
- Minimum ambient and surface temperatures 45°F (7°C) and rising at time of application.
- Addition of coarse aggregates may result in variations of the physical properties of the mortar.
- Use only potable water.
- Not intended for use as an overlay material.
- As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur Hi-Mod 32.

Caution **Sika Latex R - Irritant:** May cause skin/eye/respiratory irritation. Avoid breathing vapors. Use with adequate ventilation. Avoid skin and eye contact. Safety goggles and rubber gloves are recommended.

Irritant **Suspect carcinogen** - Contains portland cement and sand (crystalline silica). Skin and eye irritant. Avoid contact. Dust may cause respiratory tract irritation. Avoid breathing dust. Use only with adequate ventilation. May cause delayed lung injury (silicosis). IARC lists crystalline silica as having sufficient evidence of carcinogenicity in laboratory animals and limited evidence of carcinogenicity in humans. NTP also lists crystalline silica as a suspect carcinogen. Use of safety goggles and chemical resistant gloves is recommended. If PELs are exceeded, an appropriate, properly fitted NIOSH approved respirator is required. Remove contaminated clothing.

First Aid In case of skin contact, wash thoroughly with soap and water. For eye contact, flush immediately with plenty of water for at least 15 minutes, and contact a physician. For respiratory problems, remove person to fresh air.

Clean Up In case of spillage, scoop or vacuum into appropriate container, and dispose of in accordance with current, applicable local, state, and federal regulations. Keep container tightly closed and in an upright position to prevent spillage and leakage.
Mixed components: Uncured material can be removed with water. Cured material can only be removed mechanically.

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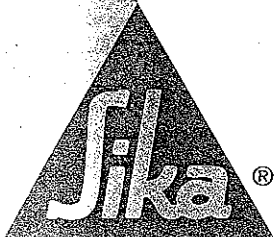
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Product Data Sheet

Edition 6.2003

Identification no. 553

SikaRepair 223

SikaRepair® 223

One component, early strength gaining, cementitious patching material

Description	SikaRepair 223 is a one-component, early strength gaining, cementitious, patching material for vertical and overhead repair of concrete.
Where to Use	<ul style="list-style-type: none"> ■ On grade, above, and below grade on concrete and mortar. ■ As a repair material for vertical and overhead concrete surfaces.
Advantages	<ul style="list-style-type: none"> ■ Easy-to-use. ■ Suitable for exterior and interior applications. ■ Easily applied to clean, sound substrate. ■ High early strengths. ■ Increased abrasion resistance. ■ Increased freeze/thaw resistance. ■ Not a vapor barrier. ■ Not flammable.
Coverage	Approximately 0.41 cu. ft.
Packaging	SikaRepair 223 - 50 lb. multi-wall bag. SikaLatex R - 1 gal. plastic jug; 4/carton, 5 gal. pails

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

Shelf Life	One year in original, unopened bags.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F before using.	
Color	Concrete gray.	
Mixing Ratio	¾ gallon to 1 gallon of liquid per 50 lb. bag	
Application Time	Approximately 15 min. after adding powder to Latex or Latex R. Application time is dependent on temperature and relative humidity.	
Finishing Time	20 to 60 min after combining powder and liquid; depends on temperature, relative humidity, and type of finish desired.	
Flexural Strength (ASTM C-293)		with undiluted Latex R
28 days	850 psi (5.9 MPa)	1,200 psi (8.2 MPa)
Splitting Tensile Strength (ASTM C-496)		
28 days	550 psi (3.8 MPa)	700 psi (4.8 MPa)
Bond Strength* (ASTM C-882 modified)		
28 days	1,800 psi (12.4 MPa)	2,000 psi (13.8 MPa)
Compressive Strength (ASTM C-109)		
1 day	3,000 psi (20.7 MPa)	3,300 psi (22.8 MPa)
7 days	6,000 psi (41.4 MPa)	6,200 psi (42.8 MPa)
28 days	7,000 psi (48.3 MPa)	7,500 psi (51.7 MPa)

*Mortar scrubbed into substrate

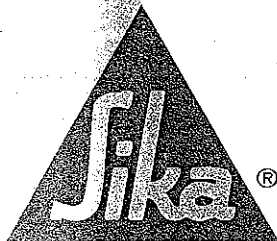
How to Use

Surface Preparation Remove all deteriorated concrete, dirt, oil, grease, and all bond-inhibiting materials from surface. Be sure repair area is not less than ¼ inch in depth. Preparation work should be done by scabber or other appropriate mechanical means to obtain an exposed aggregate surface with a minimum surface profile of ±¼ inch (CSP-6). Saturate surface with clean water. Substrate should be saturated surface dry (SSD) with no standing water during application.

Priming For priming of reinforcing steel use Sika Armatec 110 EpoCem (consult Technical Data Sheet).

Concrete Substrate: Prime the prepared substrate with a brush or sprayed applied coat of Sika Armatec 110 EpoCem (consult Technical Data Sheet). Alternately, a scrub coat of Sika Repair 223 can be applied prior to placement of the mortar. The repair mortar has to be applied into the wet scrub coat before it dries.

Mixing **With water:** Wet down all tools and mixer to be used. Add approximately ¾ gallon of water to mixing vessel. Slowly add 1 bag of SikaRepair 223 while continuing to mix. Mechanically mix with a low-speed drill (400-600 rpm) and SikaTop Gel paddle. ¼ gallon of water may be added to achieve desired consistency. Do not overwater. Maintain a mix temperature of 65°-75°F for maximum performance by using hot or cold water as needed.



With Latex R: Pour ¾ gallon of SikaLatex R into the mixing container. Slowly add powder while continuing to mix mechanically as above. Add remaining SikaLatex R (up to ¼ gallon) to adjust the desired consistency.

note: SikaLatex R must be protected from freezing. If frozen, discard.

With diluted Latex R: Sika Latex R may be diluted up to 5:1 (water:Sika Latex R) for projects requiring minimal polymer-modification. Pour ¾ gallon of the mixture into the mixing container. Slowly add powder and mix as above. Add remaining diluted SikaLatex R (up to ¼ gallon) to adjust the desired consistency.

Application & Finish	<p>At the time of application, surfaces should be saturated surface dry (SSD) with no standing water. Mortar must be scrubbed into the substrate, filling all pores and voids. Force material against edge of repair, working toward center. After filling repair, consolidate, then screed. Material may be applied in multiple lifts. The thickness of each lift not to be less than ½ inch minimum.</p> <p>Where multiple lifts are required score top surface of each lift to produce a roughened surface for next lift. Allow preceding lift to reach final set, 30 minutes minimum before applying fresh material. Saturate surface of the lift with clean water. Scrub fresh mortar into preceding lift. Allow mortar to set to desired stiffness, then finish with wood or sponge float for a smooth surface, or texture as required.</p> <p>For repairs greater than 1 inch in depth, the use of SikaRepair 222 extended with coarse aggregate, and appropriate formwork is also recommended.</p> <p>Important: Maximum bond is achieved with application of a scrub coat on properly prepared, saturated surface dry (SSD) substrate.</p>
Curing	<p>As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based compatible curing compound. Curing compounds adversely affect the adhesion of following lifts of mortar, leveling mortar or protective coatings. Moist curing should commence immediately after finishing. Protect freshly applied mortar from direct sunlight, wind, rain and frost.</p>
Limitations	<ul style="list-style-type: none">■ Application thickness: (with water and diluted Latex R) Minimum ¼ inch (6 mm). Maximum in one lift 1.5 inch (38 mm).■ Application thickness: (with undiluted Latex R) Minimum ⅛ inch (3 mm). Maximum in one lift 1.5 inch (38 mm).■ Minimum ambient and surface temperatures 45°F (7°C) and rising at time of application.■ Use only potable water.■ Do not use solvent-based curing compound.■ As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur Hi-Mod 32.
Caution Irritant	<p>Suspect carcinogen - Contains portland cement and sand (crystalline silica). Skin and eye irritant. Avoid contact. Dust may cause respiratory tract irritation. Avoid breathing dust. Use only with adequate ventilation. May cause delayed lung injury (silicosis). IARC lists crystalline silica as having sufficient evidence of carcinogenicity in laboratory animals and limited evidence of carcinogenicity in humans. NTP also lists crystalline silica as a suspect carcinogen. Use of safety goggles and chemical resistant gloves is recommended. If PELs are exceeded, an appropriate, NIOSH approved respirator is required. Remove contaminated clothing.</p>
First Aid	<p>In case of skin contact, wash thoroughly with soap and water. For eye contact, flush immediately with plenty of water for at least 15 minutes, and contact a physician. For respiratory problems, remove person to fresh air.</p>
Clean Up	<p>In case of spillage, scoop or vacuum into appropriate container, and dispose of in accordance with current, applicable local, state and federal regulations. Keep container tightly closed and in an upright position to prevent spillage and leakage. Mixed components: Uncured material can be removed with water. Cured material can only be removed mechanically.</p>

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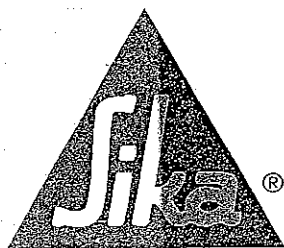
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Product Data Sheet
Edition 1.10.2008
Identification no. 770
Sikadur 32, Hi-Mod

Sikadur® 32, Hi-Mod

High-modulus, high-strength, epoxy bonding/grouting adhesive

Description	Sikadur 32, Hi-Mod, is a multi-purpose, 2-component, 100% solids, moisture-tolerant structural epoxy adhesive. It conforms to the current ASTM C-881 and AASHTO M-235 specifications.
Where to Use	<ul style="list-style-type: none"> ■ Bond fresh, plastic concrete to hardened concrete and steel. ■ Grout horizontal cracks in structural concrete and wood by gravity feed. ■ Machinery and 'robotic' base-plate grout. ■ Structural adhesive for concrete, masonry, metal, wood, etc.
Advantages	<ul style="list-style-type: none"> ■ Super-strength bonding/grouting adhesive. ■ Tolerant to moisture before, during and after cure. ■ Excellent adhesion to most structural materials. ■ Convenient easy-to-mix ratio A:B = 1:1 by volume. ■ Easy-to-use for bonding/grouting applications. ■ Fast initial set; rapid gain to ultimate strengths. ■ USDA-certified for use in food plants.
Coverage	<p>Bonding Adhesive - 1 gal. covers approximately 80 sq. ft. on smooth surface.</p> <p>Base Plate Grout - 1 gal. mixed with 1.5 parts oven-dried aggregate by loose volume yields approximately 420 cu. in. of grout.</p> <p>Anchoring grout - 1 gal. yields 231 cu. in. of grout.</p>

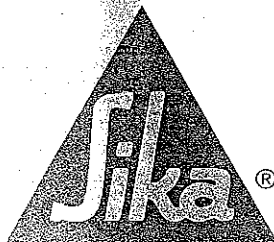
Typical Data (Material and curing conditions @ 73°F {23°C} and 50% R.H.)

Shelf Life	2 years in original, unopened containers.		
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F (18°-24°C) before using.		
Color	Concrete gray		
Mixing Ratio	Component 'A': Component 'B' = 1:1 by volume.		
Viscosity	Approximately 3,000 cps.		
Pot Life	Approximately 30 minutes. (60 gram mass). Approximately 22 minutes. (350 gram mass, 8 oz.)		
Contact Time	40°F (4°C)*: 12 hrs.	73°F (23°C)*: 3-4.5 hrs.	90°F (32°C)*: 1.5-2 hrs
Compressive Modulus, psi	7 day	2.1 X 10 ⁵ psi (1,449 MPa)	
Tensile Properties (ASTM D-638)			
	7 day	Tensile Strength	6,900 psi (48 MPa)
		Elongation at Break	1.9%
	14 day	Modulus of Elasticity	5.4 X 10 ⁵ psi (3,726 MPa)
Flexural Properties (ASTM D-790)			
	14 day	Flexural Strength (Modulus of Rupture)	7,000 psi (48.3 MPa)
		Tangent Modulus of Elasticity in Bending	6.9 X 10 ⁵ psi (4,800 MPa)
Shear Strength (ASTM D-732)	14 day	Shear Strength	6,200 psi (43 MPa)
Water Absorption (ASTM D-570)	7 day (24 hour immersion)	0.21%	
Heat Deflection Temperature (ASTM D-648)			
	7 day	[fiber stress loading 264 psi (1.8 MPa)]	122°F (50°C)
Bond Strength (ASTM C-882):			
	2 day (moist cure)	Plastic Concrete to Hardened Concrete	1,700 psi (11.7 MPa)
		Hardened Concrete to Hardened Concrete	2,000 psi (13.8 MPa)
		Hardened Concrete to Steel	1,900 psi (13.1 MPa)
	14 day (moist cure)	Plastic Concrete to Hardened Concrete	2,200 psi (15.1 MPa)
		Plastic Concrete to Steel	2,000 psi (13.8 MPa)
		Hardened Concrete to Hardened Concrete	2,000 psi (13.8 MPa)

Compressive Properties (ASTM D-695)

	40°F* (4°C)	73°F* (23°C)	90°F* (32°C)
Compressive Strength, psi (MPa)			
8 hour	-	140 (1.0)	1,700 (11.7)
16 hour	-	4,800 (33.1)	7,300 (50.3)
1 day	30.0 (0.2)	5,700 (39.3)	7,300 (50.3)
3 day	5,300 (36.6)	11,300 (77.9)	10,400 (71.7)
7 day	9,600 (66.2)	11,800 (81.4)	10,400 (71.7)
14 day	11,900 (82.1)	12,200 (84.1)	10,400 (71.7)
28 day	12,600 (86.9)	12,200 (84.1)	10,500 (72.4)

*Material cured and tested at the temperatures indicated.



Packaging	2 and 4 gal. units; 1kg. unit (25.6 fl.oz.), 6/case, 75/pallet; 2.5 kg. unit (63.8 fl.oz.), 2/case, 90/pallet
How to Use	Surface must be clean and sound. It may be dry or damp, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes and any other contaminants.
Surface Preparation	Preparation Work: Concrete - Should be cleaned and prepared to achieve a laitance and contaminant free, open textured surface by blastcleaning or other equivalent mechanical means. Steel - Should be cleaned and prepared thoroughly by blastcleaning.
Mixing	Pre-mix each component. Proportion equal parts by volume of Component 'A' and Component 'B' into clean pail. Mix thoroughly for 3 minutes with Sika paddle on low-speed (400-600 rpm) drill until blend is a uniform color. Mix only that quantity that can be applied within its pot life.
Application	To bond fresh concrete to hardened concrete - Apply by brush, roller, broom or spray. Place fresh concrete while Sikadur 32, Hi-Mod, is still tacky. If coating becomes glossy and loses tackiness, remove any surface contaminants then recoat with additional Sikadur 32 Hi-Mod, and proceed. To grout baseplates - Add up to 1 1/2 parts of oven-dried aggregate to 1 part of mixed Sikadur 32, Hi-Mod, by volume. Place grout under baseplate. Avoid contact with the underside of the plate. A 1/4 to 3/8 in. (6 to 10 mm) space should remain between the top of the grout and the bottom of the plate. Maximum thickness of grout per lift is 1.5 in. (38 mm) If multiple lifts are needed, allow preceding layer to cool to touch before applying additional layer. The remaining 1/4 to 3/8 in. (6 to 10 mm) space should be filled with neat Sikadur 32 Hi-Mod. Pour a sufficient quantity of neat epoxy to allow the level to rise slightly higher than the underside of the bearing plate. To gravity feed cracks - Pour neat material into vee-notched crack. Continue placement until completely filled. Seal underside of slab prior to filling if cracks reflect through.
Limitations	<ul style="list-style-type: none"> ■ Minimum substrate and ambient temperature 40°F (4°C). ■ For spray applications, consult Technical Service at 800-933-7452. ■ Use only oven-dry aggregate. ■ Material is a vapor barrier after cure. ■ For applications on exterior, on-grade substrates, consult Technical Services at 800-933-7452. ■ Do not apply over wet, glistening surface.
Warning	Component 'A' - IRRITANT; SENSITIZER - Contains epoxy resin, nonyl phenol. Can cause skin sensitization after prolonged or repeated contact. Eye irritant. May cause respiratory irritation. Harmful if swallowed. Component 'B' - CORROSIVE; IRRITANT; SENSITIZER - Contains amines, silica (quartz), and benzylalcohol nonyl phenol. Contact with eyes or skin causes severe burns. Can cause skin sensitization after prolonged or repeated contact. Skin/respiratory/eye irritant. Harmful if swallowed. Deliberate concentration of vapors of Component A or B for purposes of inhalation is harmful and can be fatal. Cured material, if sanded, may result in exposure to a chemical known to the state of California to cause cancer.
First Aid	Eyes: Hold eyelids apart and flush thoroughly with water for 15 minutes. Skin: Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. Inhalation: Remove person to fresh air. Ingestion: Do not induce vomiting. In all cases, contact a physician immediately if symptoms persist.
Clean Up	Wear chemical resistant gloves/goggles/clothing. Ventilate area. In absence of adequate general and local exhaust ventilation, use a properly filled NIOSH respirator. Confine spill. Collect with absorbent material. Dispose of in accordance with current, applicable local, state and federal regulations. Uncured material can be removed with solvent. Strictly follow manufacturer's warnings and instructions for use. Cured material can only be removed mechanically.
Handling & Storage	Avoid direct contact with skin and eyes. Wear chemical resistant gloves/goggles/clothing. Use only with adequate ventilation. In absence of adequate general and local exhaust ventilation, use a properly filled NIOSH respirator. Wash thoroughly after handling product. Launder clothing before reuse. Store in a cool dry well ventilated area.

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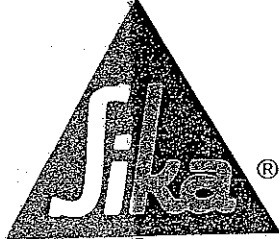
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Sika Armatec® 110 EpoCem®

Bonding Agent and Reinforcement Protection

Description	Sika Armatec 110 EpoCem is a 3-component, solvent-free, moisture-tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent and an anti-corrosion coating.
Where to Use	<ul style="list-style-type: none"> ■ As an anti-corrosion coating for reinforcing steel in concrete restoration. ■ As added protection to reinforcing steel in areas of thin concrete cover. ■ As a bonding agent for repairs to concrete and steel. ■ As a bonding agent for placing fresh, plastic concrete to existing hardened concrete.
Advantages	<ul style="list-style-type: none"> ■ Excellent adhesion to concrete and steel. ■ Acts as an effective barrier against penetration of water and chlorides. ■ Long open time - up to 16 hours. ■ Not a vapor barrier. ■ Can be used exterior on-grade. ■ Contains corrosion inhibitors. ■ Excellent bonding bridge for cement or epoxy based repair mortars. ■ High strength, unaffected by moisture when cured. ■ Spray, brush or roller application. ■ Non-flammable, solvent free.
Coverage	<p>Bonding agent: minimum (theoretical) on smooth, even substrate 80 sq. ft./gal. (=20 mils thickness). Coverage will vary depending on substrate profile and porosity.</p> <p>Reinforcement Protection: 40 sq. ft./gal. (=20 mils thickness) (2 coat application).</p>
Packaging	<p>3.5 gal. unit. (47.6 fl. oz. Comp. A + 122.1 fl. oz. Comp. B + 46.82 lb. Comp. C) Comp. A + B in carton, Comp. C in multi-wall bag.</p> <p>1.65 gal. unit. (22.7 fl. oz. A + 57.6 fl. oz. B + 4 bags @ 5.5 lb.) Factory-proportioned units in a pail.</p>

Typical Data (Material and curing conditions @ 73°F and 50% R.H.)

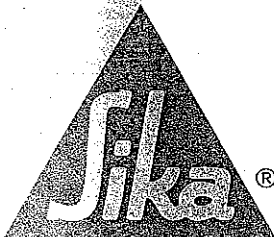
Shelf Life	1 year in original, unopened packaging.		
Storage	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F (18°-24°C) before using. If components A and B are frozen, discard. Protect Component C from humidity.		
Color	Concrete gray		
Density (Mixed)	125 lb./cu. ft. (2.0 kg.)		
Pot Life	Approximately 90 minutes		
Compressive Strength (ASTM C-109)	3 days	4500 psi	(31.0 MPa)
	7 days	6500 psi	(44.8 MPa)
	28 days	8500 psi	(58.6 MPa)
Flexural Strength (ASTM C-348)	28 days	1250 psi	(8.6 MPa)
Splitting Tensile Strength (ASTM C-496)	28 days	600 psi	(4.1 MPa)
Important Data for Sika Armatec 110 as a Corrosion Protective Coating			
Water	Water Permeability at 10 bar (145 psi)	8.92 x 10 ⁻¹⁵ ft./sec.	
	Control	7.32 x 10 ⁻¹⁰ ft./sec.	
	Water vapor diffusion coefficient μ H ₂ O	110	
Carbon Dioxide	Carbon dioxide diffusion coefficient μ CO ₂	14000	

TEST DATA: Time-to-Corrosion Study

- Sika Armatec 110 more than tripled the time to corrosion
- Reduced corrosion rate by over 40%

Important Data for Sika Armatec 110 as a Bonding Agent

Bond Strength (ASTM C882)	14 days moist cure, plastic concrete to hardened concrete:	
	Wet on Wet	2800 psi (19.3 MPa)
	24 hr. Open Time	2600 psi (17.9 MPa)
Bond of Steel Reinforcement to Concrete (Pullout Test):		
	Sika Armatec 110 Coated	625 psi (4.3 MPa)
	Epoxy Coated	508 psi (3.5 MPa)
	Plain Reinforcement	573 psi (3.95 MPa)



How to Use

Surface Preparation	Cementitious substrates: Should be cleaned and prepared to achieve a laitance and contaminant-free surface prepared in accordance with the requirements specified by the overlay or repair material by blast cleaning or equivalent mechanical means. Substrate must be saturated surface dry (SSD) with no standing water. Steel: Should be cleaned and prepared thoroughly by blast cleaning.
Mixing	Shake contents of both Component 'A' and Component 'B'. Empty entire contents of both Component 'A' and Component 'B' into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a Sika paddle on a low speed (400-600 rpm) drill. Slowly add the entire contents of Component 'C' while continuing to mix for 3 minutes until blend is uniform and free of lumps. Mix only that quantity that can be applied within its pot life.
Application	As a bonding agent - Apply by stiff-bristle brush or broom. Spray apply with Goldblatt Pattern Pistol or equal equipment. For best results, work the bonding slurry well into the substrate to ensure complete coverage of all surface irregularities. Apply the freshly mixed patching mortar or concrete wet on wet, or up to the maximum recommended open time, onto the bonding slurry. Maximum recommended open time between application of Armatec 110 and patching mortar or concrete: 80°-95°F (26°-35°C) 6 hours 65°-79°F (18°-26°C) 12 hours 50°-64°F (10°-17°C) 16 hours 40°-49°F (4°-9°C) wet-on-wet For corrosion protection only - Apply by stiff-bristle brush or spray at 80 sq. ft./gal. (20 mils). Take special care to properly coat the underside of the totally exposed steel. Allow coating to dry 2-3 hours @ 73°F, then apply a second coat at the same coverage. Allow to dry again before the repair mortar or concrete is applied. Pour or place repair within 7 days.
Limitations	<ul style="list-style-type: none">■ Substrate and ambient temperature: Minimum 40°F (5°C).■ Maximum 95°F (35°C).■ Minimum thickness: As a bonding agent 20 mils.■ For reinforcement protection 40 mils.■ (2 coats, 20 mils each).■ Not recommended for use with expansive grouts.■ Use of semi-dry mortars onto Sika Armatec 110 EpoCem must be applied "wet on wet".■ When used in overhead applications with hand placed patching mortars, use "wet on wet" for maximum mortar build thickness.■ Substrate profile as specified by the overlay or repair material is still required.■ As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur Hi-Mod 32.
Caution	Part A & B: IRRITANT; SENSITIZER - Can cause skin sensitization after prolonged or repeated contact. Skin and eye irritant. High concentrations of vapor may cause respiratory irritation. Avoid skin contact. Use only with adequate ventilation. Use of safety goggles and chemical resistant gloves is recommended. Part C: IRRITANT; SUSPECT CARCINOGEN - Contains crystalline silica, quartz (sand); cement. Skin and eye irritant. Dust may cause respiratory tract irritation. Avoid breathing dust. Use only with adequate ventilation. May cause delayed lung injury (silicosis). IARC list crystalline silica as having sufficient evidence of carcinogenicity to laboratory animals and limited evidence of carcinogenicity in humans. NTP also lists crystalline silica as a suspect carcinogen. Use of safety gloves is recommended. In case of high dust concentrations or exceedance of PELs, use an appropriate NIOSH approved respirator.
First Aid	In case of eye contact, wash immediately with soap and water for 15 minutes; immediately consult a physician. In case of skin contact, wash with soap and water; consult a physician for irritation. For respiratory problems, remove person to fresh air and institute artificial respiration if necessary; consult a physician. In case of ingestion, immediately consult a physician. Wash clothing before reuse.
Clean-Up	In case of spills or leaks, wear suitable protective equipment, contain spill, collect with absorbent material, and transfer to a suitable container. Ventilate area. Avoid contact. Dispose of in accordance with current, applicable local, state, and federal regulations.

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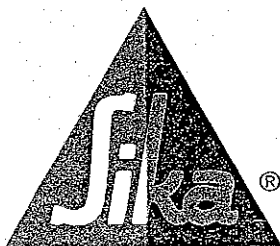
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ISO 9001:2000

Sika and Armatec are registered



Product Data Sheet

Edition 1.11.2008

Identification no. 464

Sikaflex-2c NS

Sikaflex[®]-2c NS

Two-component, non-sag, polyurethane elastomeric sealant

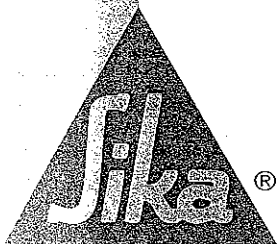
Description	Sikaflex-2c NS is a 2-component, premium-grade, polyurethane-based, elastomeric sealant. It is principally a chemical cure in a <u>non-sag</u> consistency. Meets ASTM C-920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O, I and Federal Specification TT-S-00227E, Type II, Class A. Tested in accordance with ASTM C-1382 for use in EIFS systems.
Where to use	<ul style="list-style-type: none"> ■ Intended for use in all properly designed working joints with a minimum depth of 1/4 inch. ■ Ideal for vertical and horizontal applications. ■ Placeable at temperatures as low as 40°F. ■ Adheres to most substrates commonly found in construction. ■ An effective sealant for use in Exterior Insulation Finish Systems (EIFS). ■ Submerged environments, such as canal and reservoir joints.
Advantages	<ul style="list-style-type: none"> ■ Capable of ±50% joint movement. ■ Chemical cure allows the sealant to be placed in joints exceeding 1/2 in. in depth. ■ High elasticity with a tough, durable, flexible consistency. ■ Exceptional cut and tear resistance. ■ Exceptional adhesion to most substrates without priming. ■ Available in 40 architectural colors. ■ Color uniformity assured via Color-pak system. ■ Available in pre-pigmented Limestone Gray (no Color-pak needed). ■ Non-sag even in wide joints. ■ Easy to mix. ■ Paintable with water-, oil-, and rubber-base paints. ■ ANS/NSF 61 approval for contact with potable water. ■ Jet fuel resistant.
Coverage	1 gal. yields 231 cu. in. or 154 lin. ft. of a 1/2 in. x 1/4 in. joint.
Packaging	1.5 gal. unit. 3 gal units. Color-pak is purchased separately. Limestone Gray color available pre-pigmented.

Typical Data (Material and curing conditions 73°F (23°C) and 50% R.H.)

Shelf life	One year in original, unopened containers.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F before using.	
Colors	A wide range of architectural colors are available. Special colors available on request.	
Application Temperature	40° to 100°F, ambient and substrate temperatures. Sealant should be installed when joint is at mid-range of its anticipated movement.	
Service Range	-40° to 170°F (-40°-75°C).	
Curing Rate (ASTM C-679)		
Tack-Free Time	6-8 hrs.	
Final Cure	3 days	
Application Life	3-4 hrs.	
Tear Strength	ASTM D-624	45 lb./in.
Shore A Hardness	ASTM D-2240	25 ± 5
Tensile Properties (ASTM D-412)		
Tensile Strength at Break	120 psi	
Tensile Elongation	500%	
100% Modulus	70 psi	
Adhesion in Peel (Fed Spec. TT-S-00227E)		
Substrate	Peel Strength	% Adhesion Loss
Concrete	25 lb.	Zero
Weathering Resistance	Excellent	
Chemical Resistance	Good resistance to water, diluted acids, diluted alkalines, and residential sewage. Consult Technical Service for specific data.	

How to Use

Surface Preparation All joint-wall surfaces must be clean, sound, and frost-free. Joint walls must be free of oils, grease, curing compound residues, and any other foreign matter that might prevent bond. Ideally this should be accomplished by mechanical means. Bond breaker tape or backer rod must be used in bottom of joint to prevent bond.



Priming	<p>Priming is typically not necessary. Most substrates only require priming if sealant will be subjected to water immersion after cure. Testing should be done, however, on questionable substrates, to determine if priming is needed.</p> <p>Consult Technical Service or Sikaflex Primer Technical Data Sheet for additional information on priming.</p> <p>Note: Most Exterior Insulation Finish Systems (EIFS) manufacturers recommend the use of a primer. When EIFS manufacturer specifies a primer or if on-site bond testing indicates a primer is necessary, Sikaflex 429 primer is recommended. On-site adhesion testing is recommended with final system prior to the start of a job.</p>
Mixing	<p>Pour entire contents of Component 'B' into pail of Component 'A'. Add entire contents of Color-pak into pail and mix with a low-speed drill (400-600 rpm) and Sikaflex paddle.* Mix for 3-5 minutes to achieve a uniform color and consistency. Scrape down sides of pail periodically. Avoid entrapment of air during mixing.</p> <p>When mixing in cold weather (<50°F), do not force the mixing paddle to the bottom of the pail. After adding Component 'B' and Color-pak into Component 'A', mix the top 1/2 to 3/4 of the pail during the first minute of mixing. After scraping down the sides of the pail, mix again for another minute. The paddle should reach the bottom of the pail between the first and second minute of mixing. Scrape down the sides of the pail a second time and then mix for an additional 2-3 minutes until the sealant is well blended.</p> <p>Color-pak must be used with tint base. For pre-pigmented Limestone base, just mix with low speed drill and Sikaflex paddle (no Color-pak needed).</p>
Application	<p>Recommended application temperatures 40°-100°F. Pre-conditioning units to approximately 70°F is necessary when working at extremes. Move pre-conditioned units to work areas just prior to application.</p> <p>Apply sealant only to clean, sound, dry, and frost-free substrates. Sikaflex-2c should be applied into joints when joint slot is at mid-point of its designed expansion and contraction.</p> <p>To place, load directly into bulk gun or use a follower plate loading system. Place nozzle of gun into bottom of joint and fill entire joint. Keeping the nozzle deep in the sealant, continue with a steady flow of sealant preceding nozzle to avoid air entrapment. Also, avoid overlapping of sealant since this also entraps air. Joint dimension should allow for 1/4 inch minimum and 1/2 inch maximum thickness for sealant. Proper design is 2:1 width to depth ratio. Tool sealant to ensure full contact with joint walls and remove air entrapment.</p>
Limitations	<ul style="list-style-type: none"> ■ The ultimate performance of Sikaflex-2c NS depends on good joint design and proper application. ■ Minimum depth in working joint is 1/4 in. ■ Maximum expansion and contraction should not exceed 50% of average joint width. ■ Do not cure in the presence of curing silicones. ■ Avoid contact with alcohol and other solvent cleaners during cure. ■ Allow 3-day cure before subjecting sealant to total water immersion. ■ Avoid exposure to high levels of chlorine. (Maximum level is 5 ppm). ■ Do not apply when moisture vapor transmission exists since this can cause bubbling within the sealant. ■ Avoid over-mixing sealant. ■ Light color shades tend to yellow over time when exposed to ultraviolet rays. ■ Light colors can yellow if exposed to direct gas fired heating elements. ■ When overcoating: an on-site test is recommended to determine actual compatibility. ■ The depth of sealant in horizontal joints subject to traffic is 1/2 inch. ■ In horizontal joints exposed to vehicular or foot traffic, "TG" additive is recommended. See Sikaflex-2c NS TG data sheet for specific details.
Caution	<p>Component 'A'; Irritant - Avoid contact. Product is a skin, respiratory and eye irritant. Use of safety goggles and chemical resistant gloves recommended. Use of a NIOSH approved respirator required if PELs are exceeded. Use with adequate ventilation.</p> <p>Component 'B'; Combustible; Sensitizer; Irritant - Contains Xylene. Keep away from heat, sparks and open flame. Use with adequate ventilation. Product is a respiratory and skin sensitizer. Avoid contact. Product is an eye, skin, and respiratory irritant. Use of safety goggles and chemical resistant gloves recommended. Use of a NIOSH approved respirator required if PELs are exceeded.</p>
First Aid	<p>Eyes - Rinse eyes thoroughly for fifteen minutes. Contact physician. Skin - Wash affected area thoroughly with soap and water. Remove contaminated clothing. If irritation persists contact physician. Inhalation - Remove to fresh air. If breathing stops, institute artificial respiration. Contact physician. Ingestion - Dilute with water. Contact physician.</p>
Clean Up	<p>Uncured material can be removed with approved solvent. Cured material can only be removed mechanically. For spillage, collect, absorb, and dispose of in accordance with current, applicable local, state, and federal regulations.</p>

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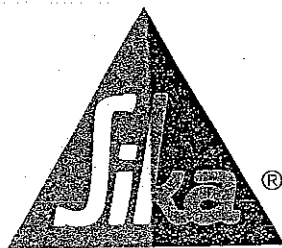
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Phone: 52 442 2385800



4.3.5 Kwik Bolt 3 Expansion Anchor

4.3.5.1 Product Description

4.3.5.2 Material Specifications

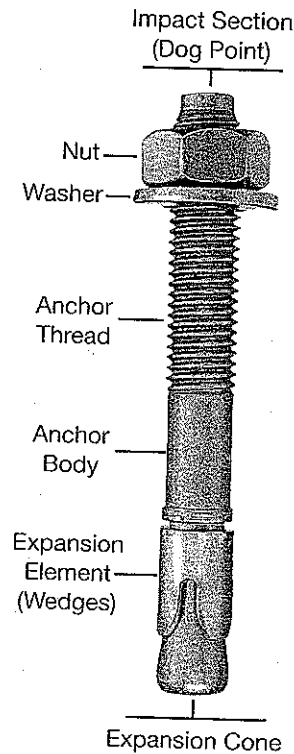
4.3.5.3 Strength Design (LRFD)

4.3.5.4 Allowable Stress Design (ASD)

4.3.5.5 Installation Instructions

4.3.5.6 Ordering Information

4.3.5.7 Sample Calculations



Listings/Approvals

ICC-ES (International Code Council)

AC 193 ESR pending

ICC-ES ESR-1385

Grout filled concrete masonry

City of Los Angeles

Research Report No. 25577

FM (Factory Mutual)

Pipe Hanger Components for
Automatic Sprinkler (3/8" - 3/4")

UL (Underwriters Laboratories)

UL 203 Pipe Hanger Equipment for Fire
Protection Services (3/8" - 3/4")

Miami-Dade County

NOA No. 06-0810.13

Qualified under an NQA-1 Nuclear Quality
Program



*Please refer to the reports to verify that the type
and diameter specified is included

Building Code Compliance

IBC® 2006 (for masonry only)

IRC® 2006 (for masonry only)

UBC® 1997

4.3.5.1 Product Description

The Kwik Bolt 3 (KB3) is a torque controlled expansion anchor, which provides consistent performance for a wide range of mechanical anchor applications. This anchor series is available in carbon steel with zinc electroplated coating, carbon steel with hot-dip galvanized coating, 304 stainless steel and 316 stainless steel versions. The threaded stud version of the anchor is available in a variety of diameters ranging from 1/4 in. to 1 in. depending on the steel and coating type. Applicable base materials include normal-weight concrete, structural lightweight concrete, lightweight concrete over metal deck, and grout filled concrete masonry.

Guide Specifications

Torque controlled expansion anchors shall be Kwik Bolt 3 supplied by Hilti meeting the description in Federal Specification A-A 1923A, Type 4. The anchor bears a length identification mark embossed into the impact section (dog point) of the anchor identifying the anchor as a Hilti Kwik Bolt 3 in the installed condition. Anchors are manufactured to meet one of the following conditions:

1. The carbon steel anchor body, nut and washer have an electroplated zinc coating conforming to ASTM B633 to a minimum thickness of 5 μ m.
2. The carbon steel hot-dip galvanized anchor body, nut, and washer conform to ASTM A153. The stainless steel expansion elements conform to either AISI 304 or AISI 316.
3. The stainless steel anchor body, nut, and washer conform to AISI 304. The stainless steel expansion elements conform to either AISI 304 or AISI 316.
4. The stainless steel anchor body, nut, and washer conform to AISI 316. The stainless steel expansion elements conform to AISI 316.

Product Features

- Length identification code facilitates quality control and inspection after installation.
- Through fixture installation and variable thread lengths improve productivity and accommodate various base plate thicknesses.
- Raised impact section (Dog Point) prevents thread damage during installation.
- Anchor size is same as drill bit size for easy installation. For temporary applications anchors may be driven into drilled holes after usage.
- Mechanical expansion allows immediate load application.

Installation

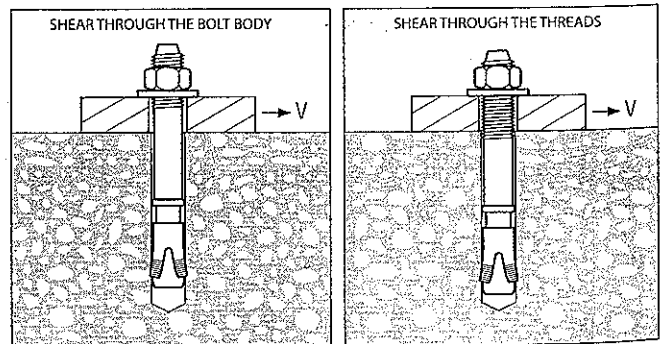
Drill hole in concrete, structural lightweight concrete, or grout filled concrete masonry using a Hilti carbide tipped drill bit and a Hilti rotary hammer drill. Remove dust from the hole with oil free compressed air or vacuum. Alternately for 1/2, 5/8, 3/4, and 1 inch diameter Kwik Bolt 3 anchors, the hole may be drilled using a matched tolerance Hilti DD-C wet diamond core bit for anchoring applications. The slurry must be flushed from the diamond cored hole prior to anchor installation. The minimum hole depth must exceed the anchor embedment prior to torquing by one hole diameter. Drive the anchor into the hole using a hammer. A minimum of six threads must be below the surface of the fixture. Tighten the nut to the recommended installation torque.

4.3.5 Kwik Bolt 3 Expansion Anchor

Table 8 - Stainless Steel Kwik Bolt 3 Allowable Loads in Normal-Weight Concrete¹

Anchor Diameter in. (mm)	Embedment Depth in. (mm)	$f'_c = 2000$ psi (13.8 MPa)		$f'_c = 3000$ psi (20.7 MPa)		$f'_c = 4000$ psi (27.6 MPa)		$f'_c = 6000$ psi (41.4 MPa)	
		Tension lb (kN)	Shear ² lb (kN)	Tension lb (kN)	Shear ² lb (kN)	Tension lb (kN)	Shear ² lb (kN)	Tension lb (kN)	Shear ² lb (kN)
1/4 (6.4)	1-1/8 (29)	260 (1.2)	595 (2.6)	320 (1.4)	675 (3.0)	380 (1.7)	725 (3.2)	470 (2.1)	805 (3.6)
	2 (51)	540 (2.4)	675 (3.0)	625 (2.8)		705 (3.1)	805 (3.6)	910 (4.0)	
	3 (76)	685 (3)	750 (3.3)	810 (3.6)		810 (3.6)	910 (4.0)		
3/8 (9.5)	1-5/8 (41)	605 (2.7)	880 (3.9)	670 (3.0)	1110 (4.9)	730 (3.2)	1345 (6.0)	950 (4.2)	1690 (7.5)
	2-1/2 (64)	1285 (5.7)	1655 ³ (7.4)	1430 (6.4)	1655 ³ (7.4)	1575 (7.0)	1870 ⁴ (8.3)	1940 (8.6)	1870 ⁴ (8.3)
	3-1/2 (89)	1620 (7.2)	1755 (7.8)	1755 (7.8)	1885 (8.4)	1885 (8.4)	2035 (9.1)	2035 (9.1)	
1/2 (12.7)	2-1/4 (57)	1015 (4.5)	1875 (8.3)	1230 (5.5)	2130 (9.5)	1450 (6.4)	2380 (10.6)	1620 (7.2)	2740 (12.2)
	3-1/2 (89)	1445 (6.4)	3170 ³ (14.1)	1975 (8.8)	3170 ³ (14.1)	2510 (11.2)	3580 ⁴ (15.9)	2655 (11.8)	3580 ⁴ (15.9)
	4-3/4 (121)	1990 (8.9)	2250 (10.0)	2250 (10.0)	2510 (11.2)	2510 (11.2)	2985 (13.3)	2985 (13.3)	
5/8 (15.9)	2-3/4 (70)	1650 (7.3)	2875 (12.8)	1755 (7.8)	3485 (15.5)	1860 (8.3)	4095 (18.2)	2335 (10.4)	4870 ³ (21.7)
	4 (102)	2455 (10.9)	4870 ³ (21.7)	2900 (12.9)	4870 ³ (21.7)	3340 (14.9)	4870 ³ (21.7)	4395 (19.5)	
	5-1/2 (140)	3480 (15.5)	3885 (17.3)	3885 (17.3)	4290 (19.1)	4290 (19.1)	6260 (27.8)	6260 (27.8)	
3/4 (19.1)	3-1/4 (83)	1550 (6.9)	3945 (17.5)	1950 (8.7)	4260 (18.9)	2350 (10.5)	5645 (25.1)	2610 (11.6)	5645 (25.1)
	4-3/4 (121)	2510 (11.2)	5535 (24.6)	3250 (14.5)	5535 (24.6)	3870 (17.2)		4670 (20.8)	
	8 (203)	2930 (13.0)	3735 (16.6)	3735 (16.6)	4530 (20.2)	4530 (20.2)		5120 (22.8)	
1 (25.4)	4-1/2 (114)	3120 (13.9)	6080 (27.0)	3870 (17.2)	6770 (30.1)	4610 (20.5)	7420 (33.0)	4800 (21.4)	7470 (33.2)
	6 (152)	4400 (19.6)	7470 (33.2)	6400 (28.5)	7470 (33.2)	7200 (32.0)		7330 (32.6)	
	9 (229)	5600 (24.9)	8000 (35.6)	8000 (35.6)	9390 (41.8)	9390 (41.8)		9390 (41.8)	

- Intermediate load values for other concrete strengths and embedments can be calculated by linear interpolation.
- Unless otherwise noted, values shown are valid for the shear plane acting through either the anchor body or the anchor threads.
- Values shown are for a shear plane through the anchor body. When the shear plane is acting through the anchor threads, reduce the shear value by 5%.
- Values shown are for a shear plane through the anchor body. When the shear plane is acting through the anchor threads, reduce the shear value by 15%.

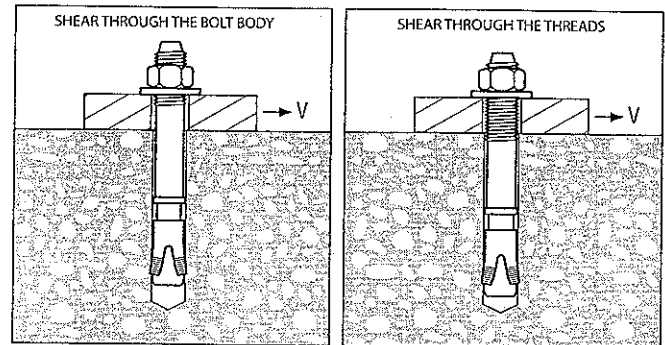


Kwik Bolt 3 Expansion Anchor 4.3.5

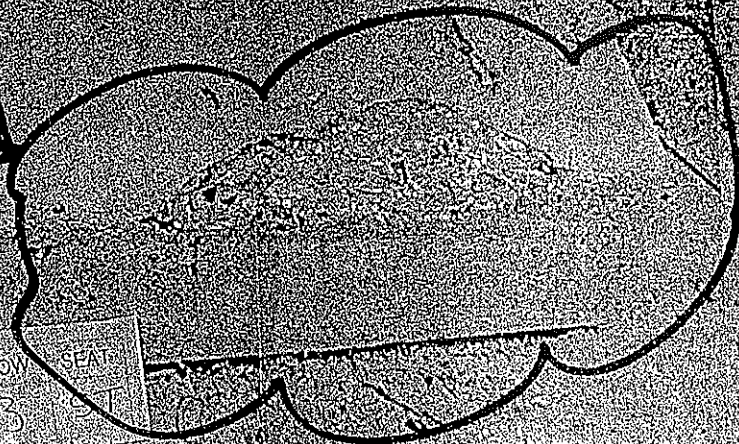
Table 9 - Stainless Steel Kwik Bolt 3 Ultimate Loads in Normal-Weight Concrete¹

Anchor Diameter in. (mm)	Embedment Depth in. (mm)	$f'_c = 2000 \text{ psi (13.8 MPa)}$		$f'_c = 3000 \text{ psi (20.7 MPa)}$		$f'_c = 4000 \text{ psi (27.6 MPa)}$		$f'_c = 6000 \text{ psi (41.4 MPa)}$	
		Tension lb (kN)	Shear ² lb (kN)	Tension lb (kN)	Shear ² lb (kN)	Tension lb (kN)	Shear ² lb (kN)	Tension lb (kN)	Shear ² lb (kN)
1/4 (6.4)	1-1/8 (29)	980 (4.4)	2240 (10.0)	1205 (5.4)	2530 (11.3)	1430 (6.4)	2725 (12.1)	1755 (7.8)	3020 (13.4)
	2 (51)	2035 (9.1)	2530 (11.3)	2340 (10.4)		2640 (11.7)	3020 (13.4)	3415 (15.2)	
	3 (76)	2580 (11.5)		2810 (12.5)		3040 (13.5)		3415 (15.2)	
3/8 (9.5)	1-5/8 (41)	2275 (10.1)	3300 (14.7)	2505 (11.1)	4175 (18.6)	2735 (12.2)	5045 (22.4)	3560 (15.8)	6330 ³ (28.2)
	2-1/2 (64)	4825 (21.5)	6210 ³ (27.6)	5365 (23.9)	6210 ³ (27.6)	5905 (26.3)	7005 ⁴ (31.2)	7270 (32.3)	7005 ⁴ (31.2)
	3-1/2 (89)	6075 (27.0)		6575 (29.2)		7075 (31.5)		7625 (33.9)	
1/2 (12.7)	2-1/4 (57)	3805 (16.9)	7030 (31.3)	4620 (20.6)	7980 (35.5)	5435 (24.2)	8930 (39.7)	6080 (27.0)	10285 (45.7)
	3-1/2 (89)	5415 (24.1)	11885 ³ (52.9)	7410 (33.0)	11885 ³ (52.9)	9405 (41.8)	13425 ⁴ (59.7)	9950 (44.3)	13425 ⁴ (59.7)
	4-3/4 (121)	7460 (33.2)		8435 (37.5)		9405 (41.8)		11200 (49.8)	
5/8 (15.9)	2-3/4 (70)	6185 (27.5)	10790 (48.0)	6580 (29.3)	13075 (58.2)	6975 (31.0)	15360 (68.3)	8760 (39.0)	18270 ³ (81.3)
	4 (102)	9205 (40.9)	18270 ³ (81.3)	10870 (48.4)	18270 ³ (81.3)	12530 (55.7)	18270 ³ (81.3)	16490 (73.4)	
	5-1/2 (140)	13040 (58.0)		14560 (64.8)		16080 (71.5)		23475 (104.4)	
3/4 (19.1)	3-1/4 (83)	5800 (25.8)	14790 (65.8)	7300 (32.5)	15980 (71.1)	8800 (39.1)	21160 (94.1)	9800 (43.6)	21160 (94.1)
	4-3/4 (121)	9400 (41.8)	20750 (92.3)	11950 (53.2)	20750 (92.3)	14500 (64.5)		17500 (77.8)	
	8 (203)	11000 (48.9)		14000 (62.3)		17000 (75.6)			
1 (25.4)	4-1/2 (114)	11700 (52.0)	22800 (101.4)	14500 (64.5)	25400 (113.0)	17300 (77.0)	28000 (124.6)	18000 (80.1)	28000 (124.6)
	6 (152)	16500 (73.4)	28000 (124.6)	21750 (96.7)	28000 (124.6)	27000 (120.1)		27500 (122.3)	
	9 (229)	21000 (93.4)		28100 (125.0)		35200 (156.6)			

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- Values shown are for a shear plane through the anchor body. When the shear plane is acting through the anchor threads, reduce the shear value by 5%.
- Values shown are for a shear plane through the anchor body. When the shear plane is acting through the anchor threads, reduce the shear value by 15%.



STALL



SECTION	ROW	SEAT
513	3	

Before



STALL REPAIR
FRUP.

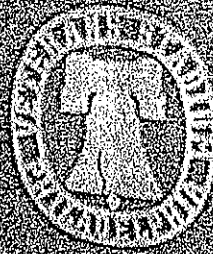
ROW

Repairs
Type "B" (Star)

REPAIR



REPAIR



REPAIR PAPER

(FOR FORMER
REPAIR)

