ONE COURT STREET

STRUCTURAL CONDITION SURVEY OF EXISTING MIDDLETOWN MUNICIPAL PARKING GARAGE

MIDDLETOWN COURTHOUSE PROJECT
MIDDLETOWN, CONNECTICUT

APRIL 1992

PURCELL ASSOCIATES

SS to Soil/Pool
75 to Main Building

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PURCELL

TABLE OF EXHIBITS

1. EXECUTIVE SUMMARY

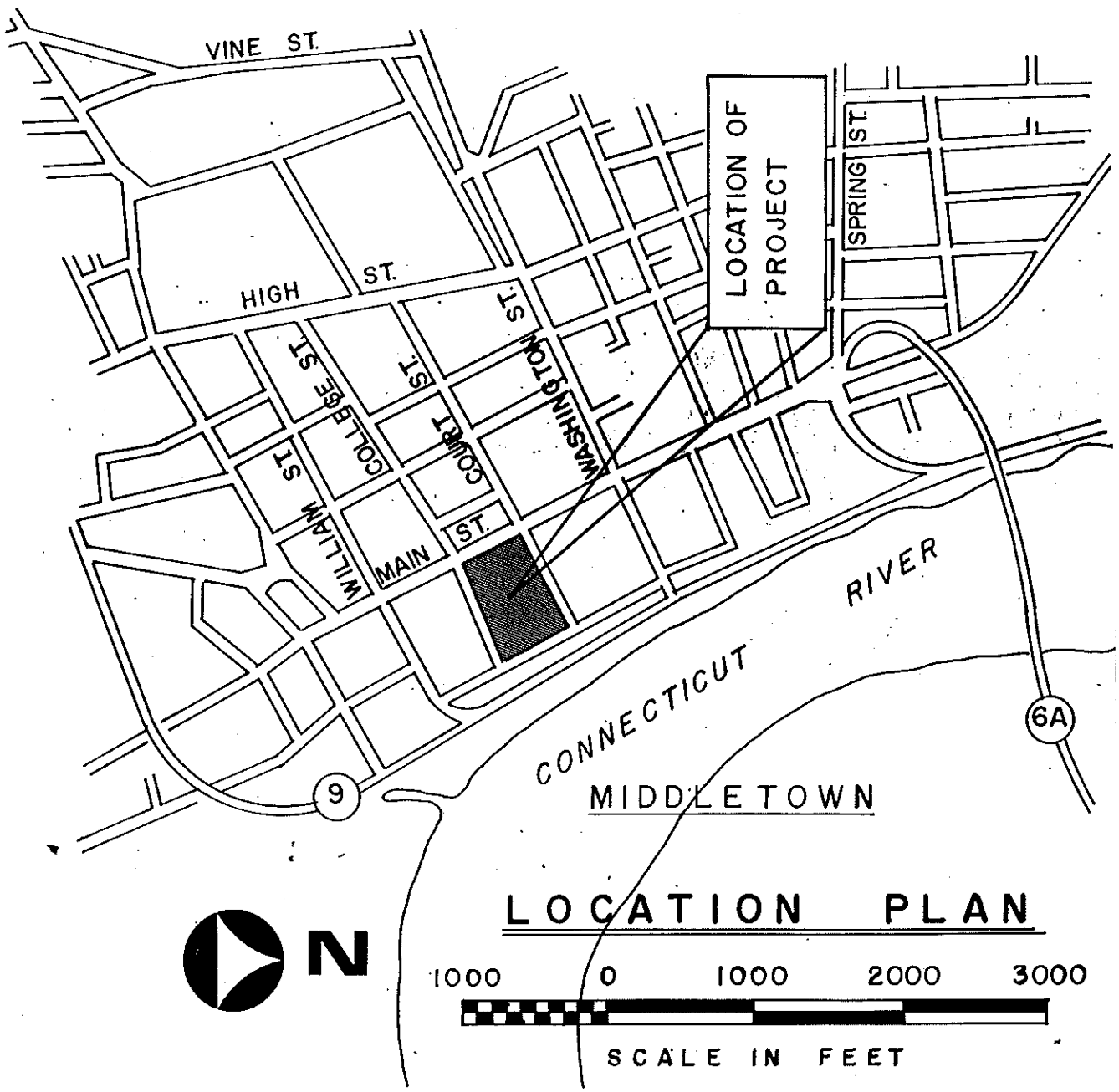
This report presents the results of a structural condition survey performed by Purcell Associates of the existing Municipal Parking Garage in Middletown, Connecticut in April, 1991. The structural condition survey and this report are a part of the proposed construction of a courthouse and garage facility adjacent to Court Street. The construction of this new facility will require demolition of approximately one-third of the existing garage adjacent to Court Street.

The existing garage is located between Court and College Streets to the south of DeKoven Drive as shown on the enclosed location plan. It is a two level, one at grade and one elevated, structure constructed of precast single-tees and columns.

As described in the later pages of this report and as shown in the enclosed photographs, the overall condition of the existing garage is fair to poor. The pedestrian bridge that connects the garage to the Sears Plaza and Main Street is in poor condition.

Based on the visual field observations and evaluation of the data collected, we recommend that a consideration be given to a major structural repair and rehabilitation to restore the integrity of the existing garage and the pedestrian bridge. The proposed development of the courthouse and garage facility adjacent to Court Street will not increase the scope of repairs and rehabilitation required for the portion of the garage to remain. On the contrary, it will reduce the area of the garage to be rehabilitated because of the partial demolition of the garage.

The conclusions and recommendations presented in this report are based on visual observations only. No material testing was performed. Further investigations, including material testing, are necessary in order to finalize the extent of repairs and rehabilitation required for the existing garage and pedestrian bridge.



STRUCTURAL CONDITION SURVEY OF EXISTING MIDDLETOWN MUNICIPAL PARKING GARAGE

LOCATION PLAN

PURCELL ASSOCIATES

SCALE: 1" = 1000'	EXHIBIT 1

158277

2. INTRODUCTION

2.1 General

The structural condition survey and this report are part of a proposed courthouse facility, the construction of which requires partial demolition of the existing garage.

The proposed Middletown Courthouse project consists of a seven-story courthouse building and an attached five-story 365 car parking garage. The courthouse building will be located in the vacant parcel adjacent to Court Street and to the north of the existing Municipal Parking Garage. The new garage will be to the south of the courthouse building and will require demolition of approximately 1/3 of the existing garage.

Except for the 63' on the west end, the existing garage will be demolished along the south property line of the site which will provide a 15'± wide buffer zone between garages. The 63' section of the existing garage on the west end will remain as a connector to span the 15' gap and provide access from Court Street, through the new garage and onto the existing upper deck.

2.2 Purpose and Scope of Structural Condition Survey

Since the proposed new construction directly affects the existing garage structure, concerns have been raised by the Middletown City officials about the potential adverse affects of the partial demolition and the new construction on the portion of the existing garage to remain. The structural condition survey and this report are a result of those concerns. Purcell Associates was retained to perform a structural survey in the field and to evaluate the present condition and integrity of the existing garage.

Specifically, the scope of the structural condition survey and this report are as follows:

- Review available data on the existing parking garage including the original as-built drawings dated January, 1966 and the rehabilitation record drawings dated December, 1979.
- Visually inspect and document areas of existing garage showing signs of structural distress which are visible and easily accessible. The field inspection not to include the area of the existing garage scheduled for demolition.
- Identify the requirements for any additional investigations and field testing. Material or destructive testing not included in this scope.
- Prepare a report with photographic documentation. The report to summarize and interpret the data collected.
- Structural analysis of the existing garage not required.

The field survey of the existing garage was performed by Purcell Associates field crew on April 24 and 27, 1992. The survey consisted of taking field notes and photographs. The survey report preparation included analysis of field notes in comparison to design drawings available and review of photographs.

2.3 Inspection Procedures

The field inspection was primarily a walk through visual check for structural deficiencies. Inspection of electrical and mechanical items was not performed.

Foundations could not be observed visually. Above grade portions of columns and walls were examined for signs of foundation movement and distress. Exterior of the garage was inspected from ground. The pedestrian bridge was inspected with an extension ladder.

Underside of the deck was observed from grade for the most part. Distress areas were observed using a step ladder. Inspection at the upper level was essentially a walk through inspection.

Because of the open nature of the garage, most structural members were easily accessible for inspection. Specific attention was given to the pedestrian bridge due to its poor condition and proximity to new construction. At the upper level, the concrete topping could not be inspected due to the bituminous concrete wearing surface on top.

2.4 Other Related Work

In addition to the structural condition survey by Purcell Associates, additional investigations of the existing structure are being performed by GZA GeoEnvironmental, Inc. of Vernon, CT. These investigations include monitoring of the existing garage for movement and settlement during the partial demolition of the garage, excavation and grading, and construction of the new multi-story garage and courthouse facility. Purcell assisted GZA in locating spots for settlement monitoring and installation of crack gauges.

3. DESCRIPTION OF EXISTING FACILITY

3.1 General Data

Year Built - 1965

Plans Available - Original as-built drawings dated January 3, 1966 and prepared by Macchi Engineers. Rehabilitation record drawings dated December 10, 1979 and prepared by Purcell Associates. Plans for pedestrian bridge not available.

Number of levels - At grade Lower Level and Framed Upper Level

Floor to Floor Height - 11'-0"

Dimensions - Trapezoidal in shape 260' (east-west) x 376'/423' (north-south)

Parking Capacity - 301 cars at lower level, 302 cars at upper level.

3.2 Garage Structure

3.2.1 Framing

The existing garage provides an at-grade parking level (El. 47') and one framed level of parking (El. 58'). The framed level consists of 9' wide precast-pretensioned concrete single-tees, each supported on precast columns. The finished deck is comprised of a 3' thick composite concrete topping with an additional 2" thick bituminous wearing surface later placed during rehabilitation in 1979. The single-tees span in an east-west direction, parallel to Court Street. The garage is divided into four equal bays, each 63'-2", in east-west direction.

Lateral stability is provided by frame action developed in the rigid connection between columns and single-tees. The rigidity of the joints, in turn, is provided by 14" wide x 18" deep cast-in-place concrete diaphragms monolithic with topping.

The precast columns are tapered in elevation. The exterior columns are 12" wide x 14" deep at the base and widen to 12" x 23" deep at the single-tee bearing level to provide for a 9" seat for the tees. The interior columns are 12" wide x 14" deep at the base and widen to 12" wide x 32" deep at the single-tee bearing level to provide for 9" seats on either side for the tees.

The single-tees are 9'-0" wide x 3'-0" deep with an 8" stem and a flange that is 1 1/2" thick at the outer edges and approximately 5" thick at the stem. The single-tees are bearing on neoprene pads over the column seats. At entrances and driving aisles the tees are either supported by precast L-shaped beams or inverted tee beams.

The garage was rehabilitated in 1979. A 2" thick bituminous wearing surface with membrane waterproofing was placed over the existing 3" topping. A strip seal type of expansion joint was installed between lines '21' and '22' in the east-west direction. The bituminous pavement was sawcut at every other tee joint and sealed.

3.2.2 Foundations

The precast columns that support single-tees are supported by continuous concrete grade walls over continuous footings. The precast columns that support inverted tee beams bear on spread footings. The ramp walls and grade walls are supported by continuous wall footings.

3.3 Pedestrian Bridge

There are no plans available for the pedestrian bridge, however, the as-built drawings for the garage show the pedestrian bridge support details on the garage side.

The pedestrian bridge is constructed of two concrete-encased W27 steel girders running longitudinally with transverse concrete-encased steel floor beams and a concrete deck slab with concrete topping. The thicknesses of the deck slab and topping are not known. The concrete encased W27 girders are supported by 8" steel pipe columns on the garage side. The W27 girders are supported by a concrete-encased transverse steel girder which spans the existing alleyway. The transverse girder is supported on a concrete wall of the north end and at the south end by a east-west beam which in turn sits on a steel column.

The pipe columns were installed as part of the garage project. The remainder of the pedestrian bridge including the girders, floor beams and deck slab was constructed under a separate contract probably at the time of garage construction.

4. INSPECTION FINDINGS

4.1 Precast Framing

4.1.1 Single-Tees

Near the ends of a few single-tees, hairline cracks and sometimes small spalls were observed on the side faces of the stems. The cracking and spalling appears to be due to splitting of concrete in a plane parallel or slightly inclined to the side faces. The worst locations appear to be near columns 'B/3' and 'D/7' where the spalls are rather large and fairly deep. A vertical medium size crack, running full height of the stem and parallel to the end face, was observed at the end of the bearing on column 'E/17'. Otherwise, the tee stems appear to be in sound condition.

The single-tee flanges show signs of distress at many locations. Most distress areas are located at the edges and corners of flanges. Distress includes rusting of wire mesh and rebars inside flanges and spalling of concrete, exposed rebar and wire mesh, rusting of flange to flange connection and spalling of concrete below, and stains due to leakage of water through the longitudinal flange joints. Fewer rust stains and spalls were observed in the tee flange near the stems.

Most of the rusting of reinforcement and spalling appear to be due to inadequate concrete cover in the original construction. At many spots dark brown rust stains were observed in the underside of the tee flanges, but no spalling was seen.

In several tees, cracks were observed running diagonally across the flange from the stem/flange junction point at the end of the tee to the edge of the flange. The width of the cracks vary from tee to tee and from fine to medium size. Leakage of water, stains, and efflorescence were seen at some of these cracks.

Leakage stains and efflorescence were observed on the underside of the flange joints at many locations throughout the garage. The stains appeared to be heavier in alternate bays apparently due to failure of sealants at top.

The concrete fill between the ends of the flanges and cast-in-place beams is broken and loose in many locations.

4.1.2 Columns

Most precast columns are in good condition. In a few columns rust stains and light spalls were observed. These appeared to be due to inadequate concrete cover provided in the original construction.

In many precast columns along lines 'B', 'C', and 'D' horizontal hairline cracks were seen at the base of the column segment that extends above the single-tee bearing. In some columns, additional horizontal and inclined

cracks were observed in these segments. Columns 'E/1A' and 'E/2A', located along the inside edge of the southeast ramp, appeared to be in the worst shape of all the columns in the parking area. Inclined medium size cracks were noticed in both these columns just below the tee flanges. Column 'E/1A' also has a small spall and a vertical fine crack that runs almost full height from top of wall to the base of column head.

Column base plates and anchor bolts were not inspected as they are buried below grade.

4.1.3 Miscellaneous Precast Members

Inverted tee beams and L-shaped beams, located at the driving aisles and entrance areas, are overall in a good condition. However, the anchor bolts and the embedded plates at the ends of these beams are heavily rusted possibly due to inadequate or missing grout.

A few small spalls, exposed rusted rebars, and leakage stains were noticed on the underside of the inverted tee beam that runs east from column 'C/3'.

4.1.4 Connections

Majority of the flange connections appear to be in good condition. However, at many locations, the flange to flange connections are deteriorated or showing signs of deterioration. The connection materials are severely rusted and the flange concrete around the connections has spalled or is in the process of spalling. Leakage of water through the joints appear to be contributing to the deterioration of the connections.

Other connections, at the top of tee flanges, between various structural elements were not visible and therefore could not be inspected.

4.1.5 Bearings

The condition of existing neoprene bearing pads ranges from good to poor. Approximately a third of the pads that support single-tees have considerably deformed, stiffened up and lost elasticity due to aging, and appear not to function as original intended. A few of these pads have cracked into laminations in the plane of the bearing.

The steel plates, embedded in tee stems and bearing on the neoprene pads show signs of light to medium rust. At many locations the steel plates are only partially bearing on the pads. At some bearings, steel shim plates were observed between column seats and neoprene pads apparently used during original construction to overcome tolerance problems. The shim plates have light to medium rust on them.

The column concrete just below the bearing pad shows no signs of distress and appears to be in sound condition.

4.1.6 Joints

The existing expansion joint runs between lines '21' and '22' from line 'E' to 'A' in the parking area and up into the elevated walkway. A short segment of expansion joint is also located at the top of northeast ramp. The overall condition of these joints is poor. The rubber strip seal between the aluminum extrusion is filled with dirt on top. The weight of the dirt has pushed the strip seal down and in some locations the dirt is up to 2" deep. The aluminum extrusions themselves appear to be in fair condition. At some locations along the joint, the bituminous wearing surface immediately adjacent to the extrusions is broken up.

The expansion joint in the walkway, west of line A, is left unprotected against leakage of water as the plate that spans the joint does not run down on the side face of the curb. The strip seal ends abruptly at the curb line and has slipped from the extrusion pockets. Concrete adjacent to the plate and extrusions has broken loose.

On the underside of the deck joint there is leakage throughout, severe at some locations. There are leakage stains and efflorescence on the tee flanges on either side of the joint. At some spots the flange edges have spalled due to exposure to moisture and rusting of reinforcement. The leakage of water at the joint appears to be due to the slippage of strip seal from the extrusion pockets or seepage of water along the sides and underneath of extrusions.

Between lines 'A' and 'C' the extrusion are anchored into the existing concrete using through bolts which are heavily rusted.

4.2 Cast-in-Place Concrete

4.2.1 Beams

The cast-in-place beams along lines 'B', 'C', 'D', & 'E', that frame into precast columns to make continuous multi-bay portal frames, are mostly in good condition. There are no beams between lines '21' and '22' where the expansion joint is located. In many locations one or more flexural cracks were observed at or near midspan of these beams, however, no sign of distress was evident. At a few locations, mostly where the construction joints in the beam are located, spalling on the underside and side faces of the beam were observed. In some beams leakage stains on one or both sides of the beam were noticed. In a few beams, spalling and exposed rebar were observed.

At line 'A,' the cast-in-place beam has contraction joints with filler material at the midpoint of every other bay. The joint also runs transversely across the sidewalk at every other bay. Leakage stains were observed at almost every beam joint. Fine cracks and small spalls were observed on the side faces and underside of the beam at several of these joints. In a few

beams, fine longitudinal splitting cracks were noticed. These cracks typically begin at the joint and run on the underside of the beam towards the columns. Almost all the cracks appear to be associated with the failure of joints and leakage of water.

4.2.2 Elevated Walkways and Pedestrian Ramp

Overall condition of the elevated walkway, located along line'A', is poor. Heavy scaling and exposed aggregates were observed throughout in the top surface of the walkway. The joint sealants, at the top of joints located midway of every other bay, are loose and in poor condition. Leakage stains were observed on the underside of several of these joints. Transverse full width medium size cracks were observed from underneath at mid-bay in bays not having contraction joint.

Small spalls, rust stains, and exposed rebars were observed at several locations on the underside of the walkway. The walkway is essentially a cantilever type design and is bolted down onto to the single-tees for support against overturning. There are two anchors at every tee on either side of the stem. The anchors are rusted.

Midway between lines '21' and '22' where expansion joint is located, a large spalled area, measuring approximately 4' long along the joint and 2' wide, was observed on the underside of the walkway. The spalling is several inches deep and the joint is heavily leaking at this location. A similar but smaller spalled joint was observed between column lines '27' and '28'. At both locations heavily rusted utility conduits and exposed rebars were noticed.

The sloped concrete pedestrian ramp that connects the walkway and pedestrian bridge has several transverse cracks and light scaling. Concrete curbs on either side of the ramp have spalled at many locations along the ramp.

4.2.3 Walls

The grade wall parallel to line A is in fairly good condition except for a few vertical cracks which appear to be shrinkage cracks. The walls located on either side of the southeast ramp also have several vertical cracks ranging from hairline to medium in size. These cracks too appear to be due to shrinkage of concrete.

At the end of outside CIP wall where the ramp transitions from cast-in-place into single-tees, the wall is cracked. A 40' high light pole is located at the top of the wall over the cracks. The concrete patch at the base of the pole is also cracked. Because of these cracks the anchor bolts are exposed to moisture and the fixity at the base of the pole is impaired.

4.2.4 Miscellaneous Cast-In-Place Work

The 3" concrete topping over single-tees is covered with bituminous

concrete wearing surface in all areas except at ramps. Therefore the overall condition of the concrete topping cannot be assessed. However, based on the extensive leakage stains seen on the underside of the deck it is apparent that the topping is cracked or the sealants along the tee joints are not performing as required. Edge of the topping over the east entrance is deteriorated. The topping at the southeast ramp is cracked along the flange-to-flange tee joint.

Concrete curbs are cracked and spalled in several location. Corners of several light pole bases have broken loose and the existing cover to light pole anchor bolts are probably inadequate to prevent rusting. Inside parapet along the southeast ramp is severely cracked. The patch over these cracks is loose. The concrete curbing along the ramp is also cracked in a few locations.

4.3 Bituminous Concrete Wearing Surface

The overall condition of the bituminous concrete wearing surface is poor. Typical problems observed were random cracking, map cracking, pot holes with or without exposed membrane, patches at previous pot holes breaking up, dirt accumulated along curb lines, and oil stains. Some of the cracked areas appear to be pot holes in the making.

Cold joints made during the placement of the wearing surface have separated along the full length of garage. At some locations they are very wide. Typically they are spaced at 10' to 11' on center. The wearing surface immediately adjacent to the longitudinal joint along line 'C' is breaking up. Sealants in the wearing surface at every other tee joint and along line 'C' are deteriorated in some areas.

The at-grade bituminous pavement at the lower level is in better condition. There are very few cracks or settled areas.

4.4 Drainage

Ponding of water was observed in many locations near and away from the roof drains. The field inspection was performed after a rainstorm and numerous ponded areas on the deck were noticed. In a few spots the drains appeared to be slightly higher than the surrounding wearing surface. The ponding appears mainly due to the uneveness of the wearing surface. The trench drain at lower level adjacent to stair #1 is filled with dirt and clogged. All other drains in the upper level appear to be working.

Embedded plates that support the drain pipes on the underside of the flange and the top elbow of the drain pipe are lightly rusted. Based on exterior leakage stains and ponding of water observed during inspection it appears that the drainage conditions are poor at the upper level.

4.5 Railing

The pedestrian railing at the upper level, mounted on the cast-in-place curb around the perimeter of the garage, is damaged and bent at several locations apparently due to vehicle impact. Two 18' segments along the walkway parallel to line 'A' are bent outward. Another 20' segment along the south face above the ramp is also bent outward.

The worst damage appears to be between lines '20' and '22' at the east face of the garage. At this location, a 15' segment of railing is bent outward, the top rail is 6" out of plumb. The guard rail attached to the curb is also damaged with one of the guard rail anchorage plates pulled off the curb. At the base of the damaged pedestrian railing a large chunk of curb concrete is loose at the outside face.

The rail posts are rusted at the base and the curb concrete around the base is severely stained in almost all locations. At many locations small cracks or spalling was observed at the base of rail posts. The railing itself appears to be rusting underneath the paint. Several spots of loose paint were noticed.

4.6 Stairs

4.6.1 Stair No. 1

Stair No. 1 is located at the southeast corner of the garage and is constructed of cast-in-place concrete. Stair No. 1 is in fair condition except for the connection area of stair to the upper deck which is severely deteriorated with large spalls on either side of the joint. Steel reinforcing bars could be seen through this joint from underneath.

Concrete topping in Stair No. 1 adjacent to upper level has numerous cracks. The corners of the stair landing are breaking loose due to rusting of rail post bases. The wall adjacent to the lower set of stairs has a medium size vertical crack at its intersection with the column that supports stair framing. Several small spalls were noted on the side faces of Stair No. 1.

4.6.2 Stair No. 2

Stair No. 2 is located on the west side of the garage and is in poor condition compared to Stair No. 1. The columns at 'A/26' and 'A/27' have wide longitudinal cracks about 4' long near the top of the column. Rust stains were noticed on concrete adjacent to the crack indicating that the rebars inside have rusted. At column 'A/27' the cracks have been patched once, however, the patch is also cracking.

Scaling was noticed in the underside of the cast-in-place stairs from upper level to the pedestrian bridge. Concrete at the edge of these stairs has deteriorated severely and can be poked loose with a sharp object. Several small spalls and exposed heating coils were observed at the edge of these stairs.

Masonry walls and infills at stairs are cracked or have deteriorated masonry blocks. Both vertical and horizontal cracks were noticed in these walls. In some areas the block wall is loose and can be pushed sideways with force. Adjacent to the stairs connecting upper level with pedestrian bridge, holes can be seen in the masonry.

The landing midway between upper level and lower level is cracked transversely. The landing at the pedestrian bridge level also has a transverse east-west crack from the expansion joint to the top of the stairs.

4.7 Pedestrian Bridge

The pedestrian bridge, connecting Stair No. 2 and the garage to Sears Plaza, and its supports are in poor condition.

Several fine to medium size random cracks were observed in the concrete topping over the deck slab. The concrete curbs on both sides are cracked with small spalls in a few locations. The curb appears to have been patched and the patches have separated from original concrete. The concrete immediately adjacent to the expansion joint that separates the pedestrian bridge and Stair No. 2 has broken up with cavities filled with dirt.

At Stair No. 2, the block wall beneath the deck slab has badly deteriorated and has several cracks and small to large spalls. Some leakage stains were also observed on the blocks.

The steel pipe columns which support the concrete encased W27 steel girders are heavily rusted near top and lightly rusted below. At top of these columns there is some section loss the extent of which could not be determined during field inspection. The column base plates and anchor bolts are encased in concrete and therefore could not be inspected.

The concrete encasement around W27 steel girders appears to have been patched a few years ago. The encasement is severely cracked and has efflorescence at the cracks and stalactites on the underside. On the exterior faces of the encasement numerous cracks and small spalls were noticed. The transverse floor beams appear to be in better condition. At the bearing area of the W27 girders on the garage side, there are numerous hairline to wide cracks in the concrete encasement and the concrete and masonry of Stair #2.

The area with the worst damage appears to be at the southwest corner of the pedestrian bridge. The concrete encasement of the steel beam that runs along the east face of the alleyway is severely cracked with small and large spalls at the northeast corner of the Sears building. Most of the cracking and spalling are at the bottom of the encasement.

The W27 girders are supported by a concrete encased steel girder spanning transversely across the alleyway approximately 6' from the face of the Sears building. The transverse steel girder is bearing on a concrete wall at its north end and at the south end on an east-west steel beam which in turn sits on a steel column. The south end of the steel beam is not concrete encased over the support and is heavily rusted with delamination.

5. Conclusions and Recommendations

The existing Middletown Municipal Parking Garage bridge that connects it to Sears Shopping Plaza are o show signs of aging. Like many garages built during t not much attention was paid to corrosion protection in of better materials in construction. Most of the corrosi forcement and steel connection materials are probably d water leaking through joints and seeping into the concr tee flanges. The source of chlorides in water are salts months.

The overall condition of the garage is fair to poor. Distres observed throughout the garage, however, the garage still few years of service life left. Specific items of major concern

- Elevated walkways and its anchorage into single-tees.
- Connections of tee flanges.
- Spalling and exposed reinforcement in the flanges.
- Poor condition of waterproofing, sealants, and joints.
- Cracked bituminous pavement.
- Damaged railing.
- Ponding on the deck.

The precast columns are in good condition. Deterioration c masonry was observed at Stairs No. 1 and 2.

The overall condition of the pedestrian bridge is poor. Exte and deterioration was observed near the supports at both e rian bridge. The concrete encasements are cracked and supports are rusted. Plans for the pedestrian bridge are therefore, field observations cannot be verified against plans

Based on visual inspection and evaluation of data collected, r rehabilitation is recommended for the pedestrian bridge repairs for the garage. Quantification of repairs required scope of this report. More testing and investigation are determine the extent of repairs required.

We recommend that testing of single-tee flanges be done to ride content. Since the W27 girders supporting the pedestr encased in concrete, the extent of rusting of these girder determined. However, numerous cracks observed in the enc cate that the girders are heavily rusted. More investigatior to determine the condition of these girders and to assess the tion of the pedestrian bridge. Core tests also may be neede deck slab concrete strength.

APPENDIX A - DEFINITIONS

Terms used to describe the condition of a building's structural or architectural system or element are listed and defined below. When the term is applied to an overall system, it does not mean that some element of the system may not be in a different condition.

Condition Rating	Definition
Excellent	Element is in "as new" condition.
Good	Element is sound and performing its functions, although it shows signs of use, and may require some minor repairs, mostly "routine."
Fair	Element is still performing adequately at this time but needs "priority" and/or "routine" repairs to prevent further deterioration and to restore it to good condition.
Poor	Element cannot be relied upon to continue to perform its original function without "immediate" and/or "priority" repairs.

Additional terms used to describe deficiencies in this report can be defined as follows:

Steel Materials

Corrosion of steel is commonly referred to as rust. Rusted surfaces can be described as:

"Light Rust"	Rust which has small grains and is generally smooth in appearance. Unrusted areas may be present.
"Medium Rust"	Rust having larger grains forming a rough surface which may include surface pitting.
"Heavy Rust"	Rust having larger grains forming a thick rough surface which may include a pitted or delaminated surface.
"Delamination"	The separation of a thin sliver of rusted steel due to penetration of the microscopic steel layers by rust.
"Pitting"	Similar to delamination but without separation of a full layer of rust. The steel surface may be bubbled due to very small point delaminations causing a bumpy or orange peel surface. In some cases, these bumps may break open causing a minor surface flaking or a rough crater appearance.

Concrete and Masonry Materials

Deterioration of these elements was confined to two basic types: cracks and spalls.

"Cracking"	For the purposes of this report, cracks have been classified by their measurable surface width.
"Fine Cracks"	Measurable crack width less than 1/32 inch.
"Medium Cracks"	Measurable crack width between 1/32 inch and 1/16 inch.
"Wide Cracks"	Measurable crack width is greater than 1/16 inch.

Additional crack descriptions are:

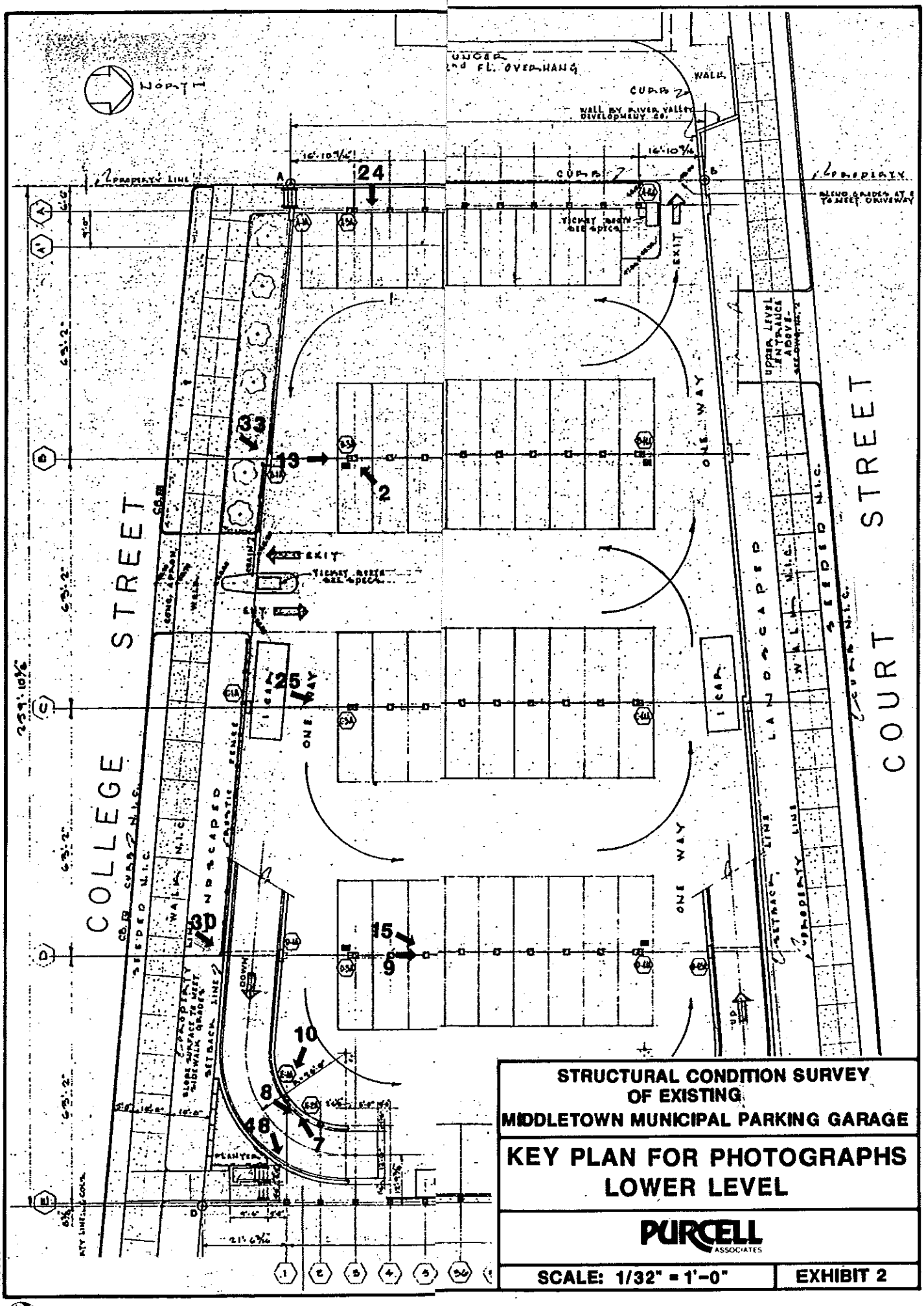
"Map Cracking"	Series of interconnected cracks forming networks of varying sizes similar to sun cracking seen on dried mud flats.

Often terms such as "very fine" or "hairline" are used to describe a crack of much less than 1/32 inch in width. Similarly, "very wide" or "open" may be used to describe a crack much greater than 1/16 inch in width. Often a wide crack will spall along its edges, making it wider at the top surface; it is referred to as being "spalled open."

"Spalling"	Is the separation and removal of a portion of the surface concrete resulting in a cavity or depression. Spalling can be classified as:
"Small Spall"	Less than 6 inches in diameter and 1 inch deep.
"Medium Spall"	Between 6 inches and 12 inches in diameter and up to 2 inches deep.
"Large Spall"	Over 12 inches in diameter of any depth. Various additional adjectives may be used to define large spalls.

Additional terms that are used in this report are:

"Sealing"	Loss of surface mortar and exposed coarse aggregates.
"Efflorescence"	Deposit of white substance on the surface of concrete.
"Stalactites"	A cylindrical or conical deposit on the underside of concrete surfaces.



STRUCTURAL CONDITION SURVEY OF EXISTING MIDDLETOWN MUNICIPAL PARKING GARAGE

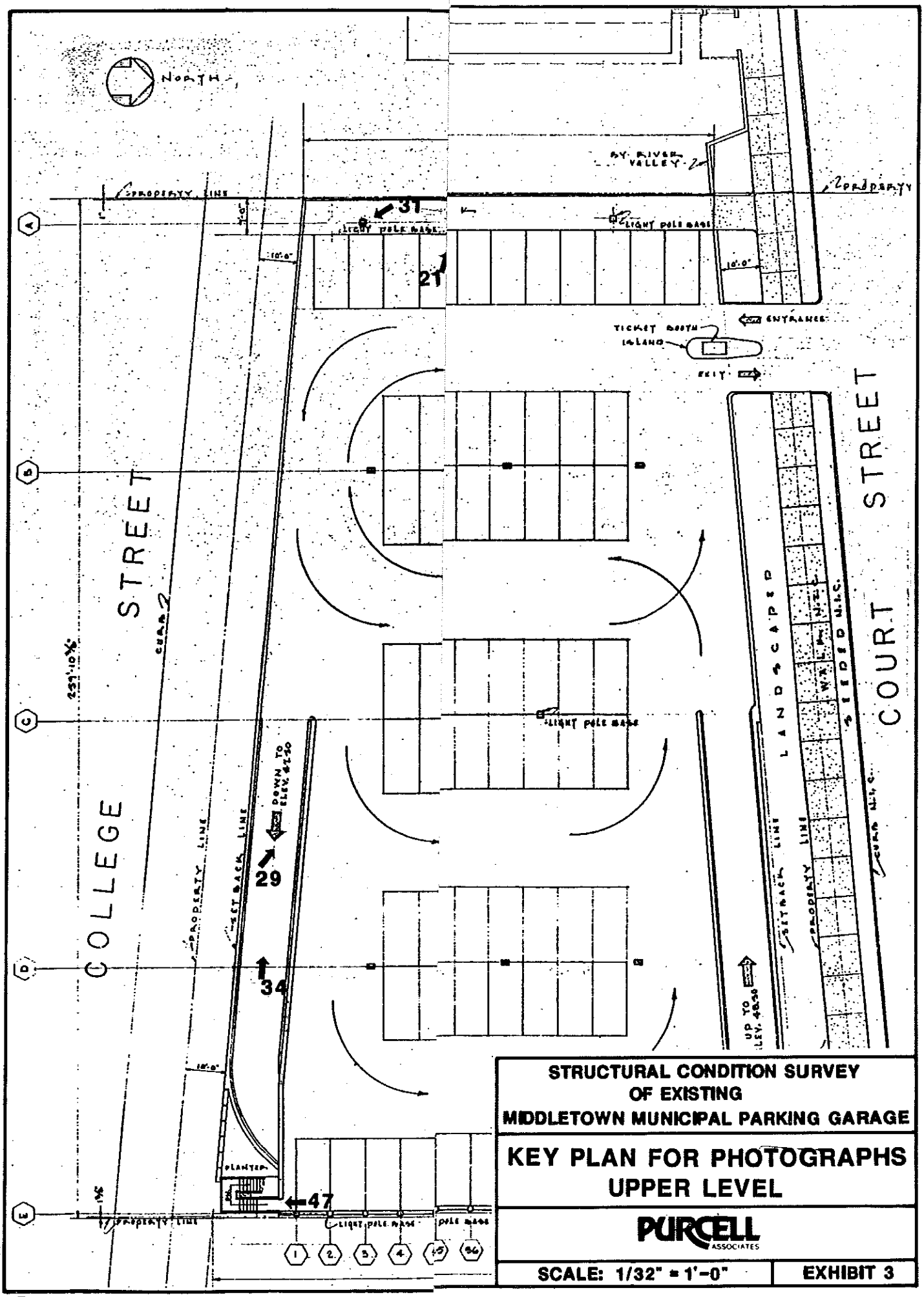
KEY PLAN FOR PHOTOGRAPHS LOWER LEVEL

PURCELL ASSOCIATES

SCALE: 1/32" = 1'-0"

EXHIBIT 2

138089



STRUCTURAL CONDITION SURVEY OF EXISTING MIDDLETOWN MUNICIPAL PARKING GARAGE

KEY PLAN FOR PHOTOGRAPHS UPPER LEVEL

PURCELL ASSOCIATES

SCALE: 1/32" = 1'-0" | EXHIBIT 3

138089

DESCRIPTION OF PHOTOGRAPHS

1. Vertical medium size crack in tee stem at column 'E/17'.

2. Hairline cracks and spalling on the side face of tee stem near column 'B/3'.

3. Spalling of concrete and exposed rusted rebar and wire mesh at the corner of tee flange.

4. Diagonal crack running across flange at the end of tee and leakage of water through diagonal crack.

5. Edge of tee flange cracked and spalled with exposed rusted reinforcement.

6. Cracked and spalled corner of tee flange with exposed rusted reinforcement.

7. Inclined medium size crack in column 'E/1A' just below tee flange.

8. Inclined medium size crack in column 'E/2A' just below tee flange.

9. Hairline cracks in precast column above the single-tee bearing level.

10. A small spalled area and a vertical fine crack, running from top of wall to base of column head, in column 'E/1A'.

11. Exposed rusted cross-tie at column 'D/6'.

12. Exposed rusted cross-ties at column 'E/8'.

13. Heavily rusted anchor bolts and embedded steel plates at the end of precast inverted tee beam at 'B/5'. Deteriorated concrete grout can also be seen.

14. Severely rusted flange to flange connection in single-tees and spalled area around the connection. Leakage stains can also be seen around the connection.

15. Neoprene bearing pad cracked into laminations in the plane of bearing and rusted steel plate in the tee stem above neoprene bearing.

16. Top of the 14" wide x 18" deep CIP beam chipped on the east face along line 'C' apparently to accommodate the joint above.

17. Leakage stains and efflorescence on the underside of tee flange along expansion joint between lines '21' and '22'.

18. Leakage stains and spalling at the end of tees between columns 'D/21' and 'D/22'.

19. Expansion joint between lines '21' and '22' filled with dirt.

20. Expansion joint between lines '21' and '22' at walkway, west of line 'A'. Strip seal has slipped from the extrusion pockets and the cover plate does not run down the face of the curb. Concrete adjacent to the plate has broken loose.

21. Loose joint sealant in elevated walkway.

22. Bituminous wearing surface breaking up adjacent to longitudinal joint along line 'C'.

23. Spalling and leakage stains in cast-in-place concrete beam between columns 'B/15' and 'B/16'.

24. Transverse joint in beam at line 'A'. Fine cracks, small spalls, and leakage stains can be seen on either side of the joint. Fine longitudinal splitting crack can also be seen on the underside of the beam.

25. Small spalls, exposed rusted rebars, and leakage stains on the underside of the precast inverted tee-beam east of column 'C/3'.

26. A large spalled area, several inches deep, with rusted utility conduits and exposed rebars between lines '21' and '22' on the underside of the elevated walkway.

27. Transverse cracks in pedestrian ramp that connects elevated walkway and pedestrian bridge. Spalled concrete curbs on either side of the ramp.

28. Heavy sealing and exposed aggregates in the top surface of elevated walkway.

29. Cracked parapet and deteriorated concrete patch along the north parapet of the southeast ramp.

30. Cracks and deteriorated patch at the end of cast-in-place wall at southeast ramp.

31. Light pole base with broken corners at top.

32. Crack in concrete curb and loose concrete between 'E/20' and 'E/21'.

33. Crack and spalling at the end of inverted tee beam at column 'B/1A'.

34. Longitudinal crack in concrete topping of southeast ramp along flange-to-flange tee joint.

35. Pothole filled with water in bituminous concrete wearing surface.

36. Pothole with exposed membrane in bituminous concrete patch.

37. Map cracking in bituminous concrete wearing surface.

38. Random cracks in bituminous concrete wearing surface.

39. Ponding in bituminous concrete wearing surface.

40. Ponding in bituminous concrete wearing surface.

41. Leakage stains and efflorescence on the underside of tee flange, along expansion joint between lines '21' and '22'.

42. Lightly rusted embedded plate and top elbow of the drain pipe.

43. Cracked curb with rust stains at rail post base.

44. Large spall in concrete curb with rusted rail post base near the top of pedestrian ramp.

45. Damaged pedestrian railing and guard railing between 'E/20' and 'E/22'.

46. Guard rail anchorage plate pulled off the curb near column 'E/21'.

47. Numerous cracks in concrete topping at Stair No. 1.

48. Large spalls with exposed rusted rebars on the underside of Stair No. 1 connection to upper deck.

49. Wide longitudinal crack with rust stains near top of column 'A/26'.

50. Sealing on the underside and spalling along the edge of cast-in-place stairs at upper level at Stair No. 2.

51. Severely cracked concrete encasement with several spalls at the southwest corner of the pedestrian bridge (at the northeast corner of Sears Building).

52. Numerous cracks on the exterior face of concrete encasement around the W27 girder.

53. A large crack in masonry at Stair No. 2.

54. Numerous cracks with efflorescence and stalactites in the concrete encasement around the W27 girder.

55. Deteriorated concrete immediately adjacent to the expansion joint that separates the pedestrian bridge and Stair No. 2.

56. Cracked masonry in fill underneath the W27 girders at Stair No. 2.

57. Underside of pedestrian bridge looking west. Stalactites and efflorescence can be seen in concrete encasements around W27 girders.

58. Underside of pedestrian bridge looking east and west elevation of Stair No. 2. Severely deteriorated masonry infill underneath pedestrian bridge can be seen.

59. Steel pipe column heavily rusted near top and severely deteriorated masonry infill.

60. Cracked masonry infill and steel column that is heavily rusted near top.

61. Heavily rusted and delaminated steel beam at the northeast corner of Sears Building.

62. Heavily rusted and delaminated south end of transverse girder that supports the W27 girders and pedestrian bridge.

63. Random cracks in concrete topping over pedestrian bridge deck slab.

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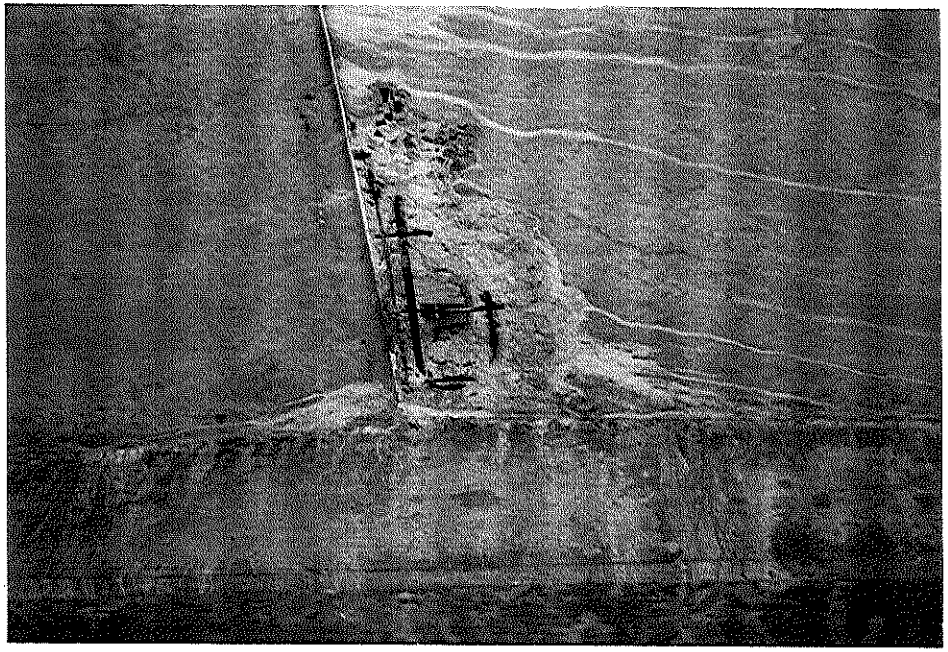

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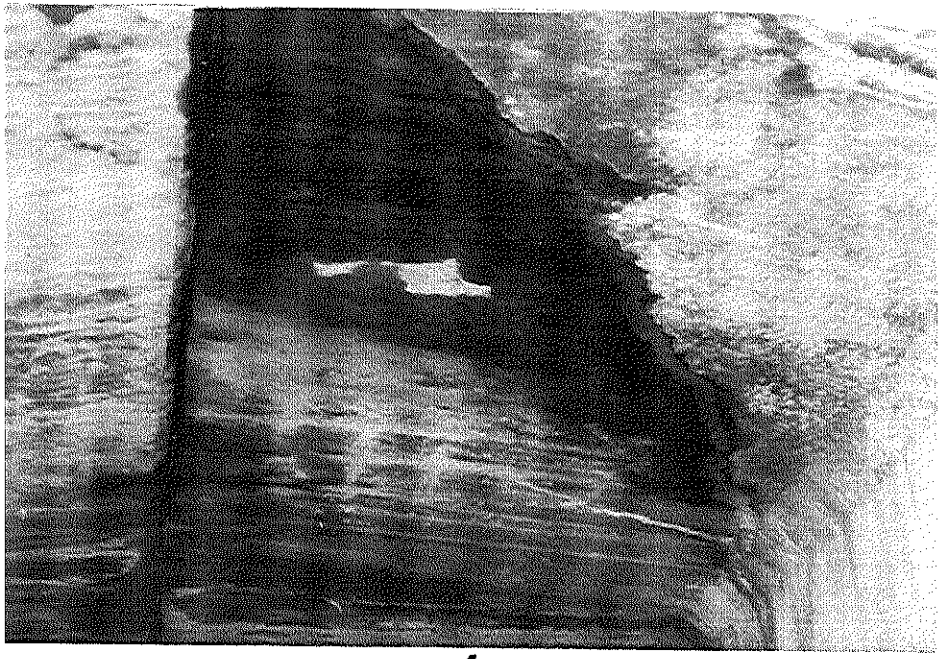

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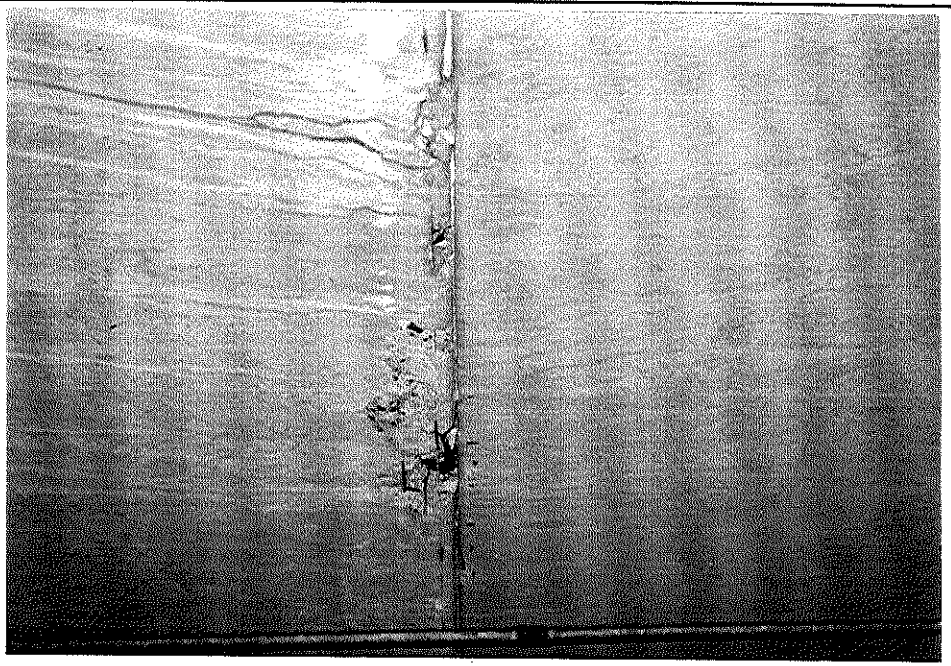

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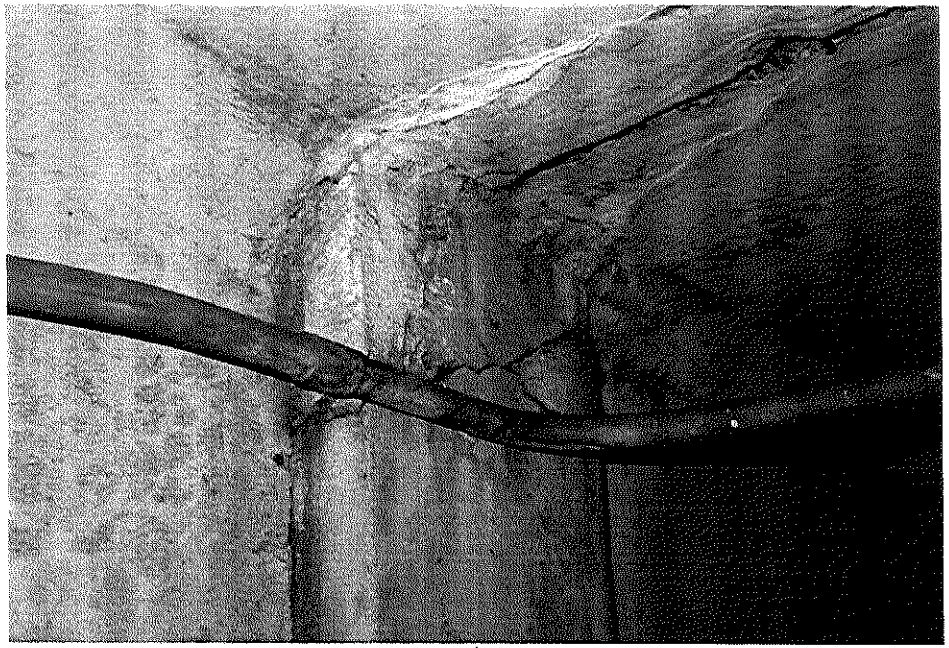

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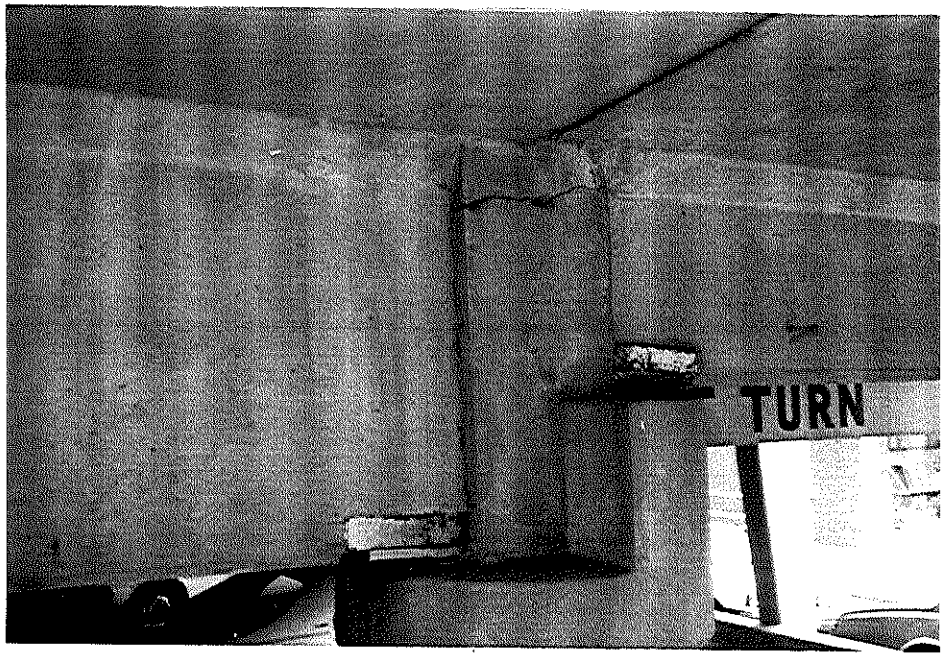

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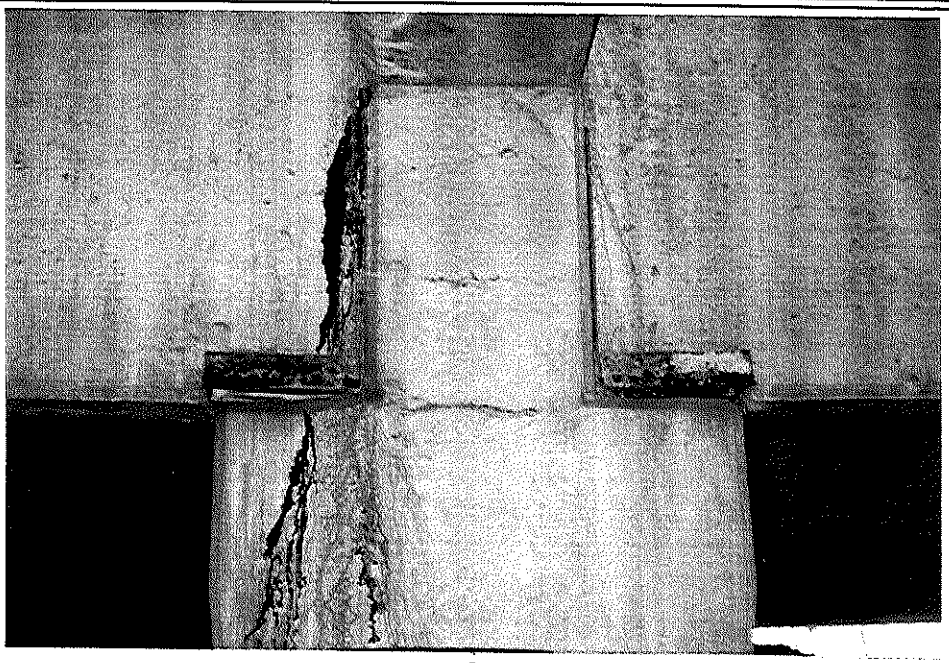

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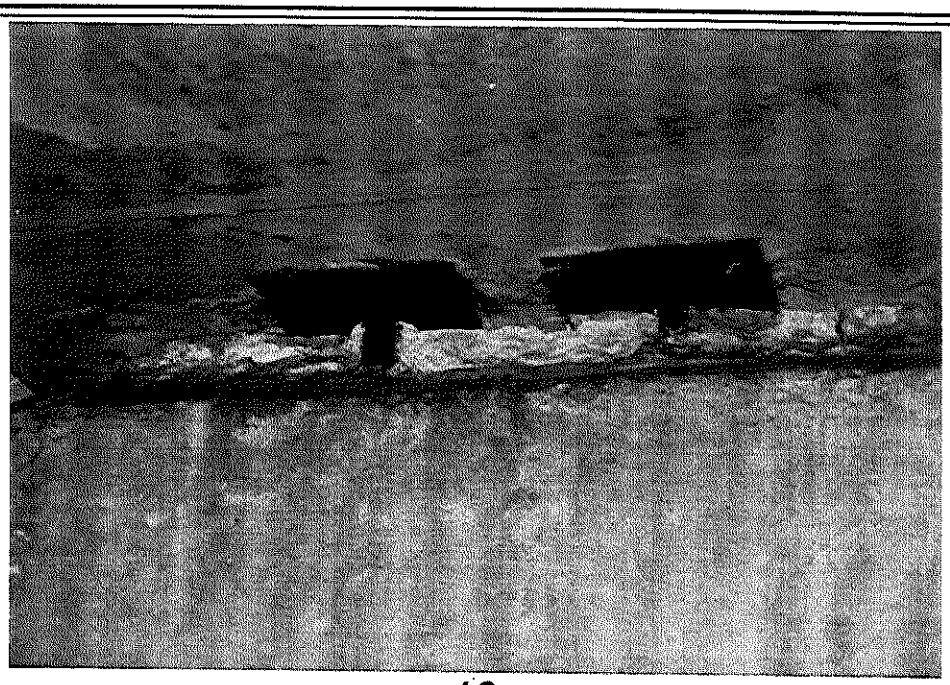

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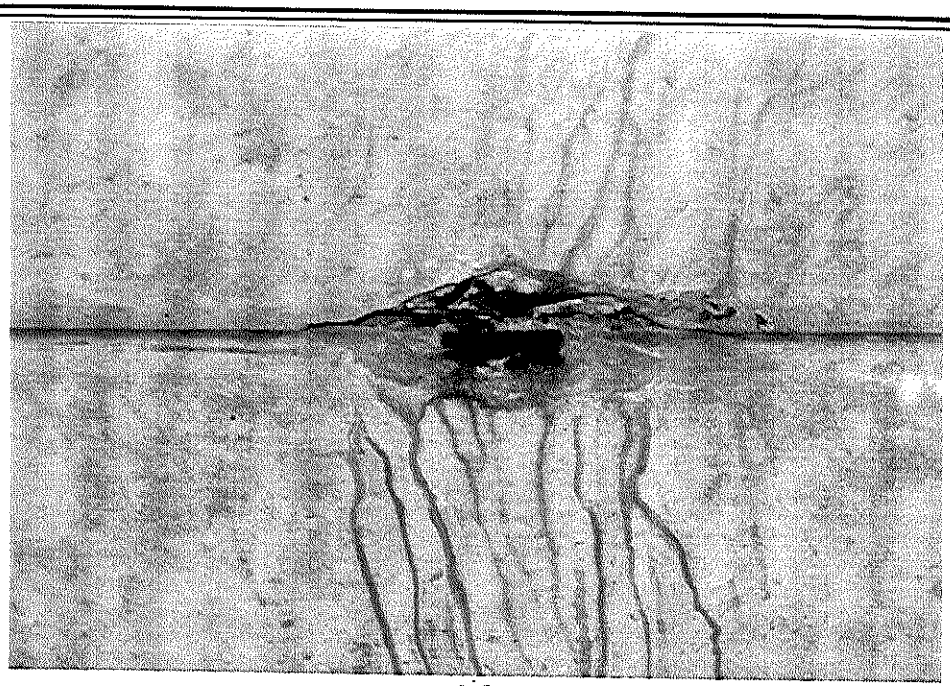

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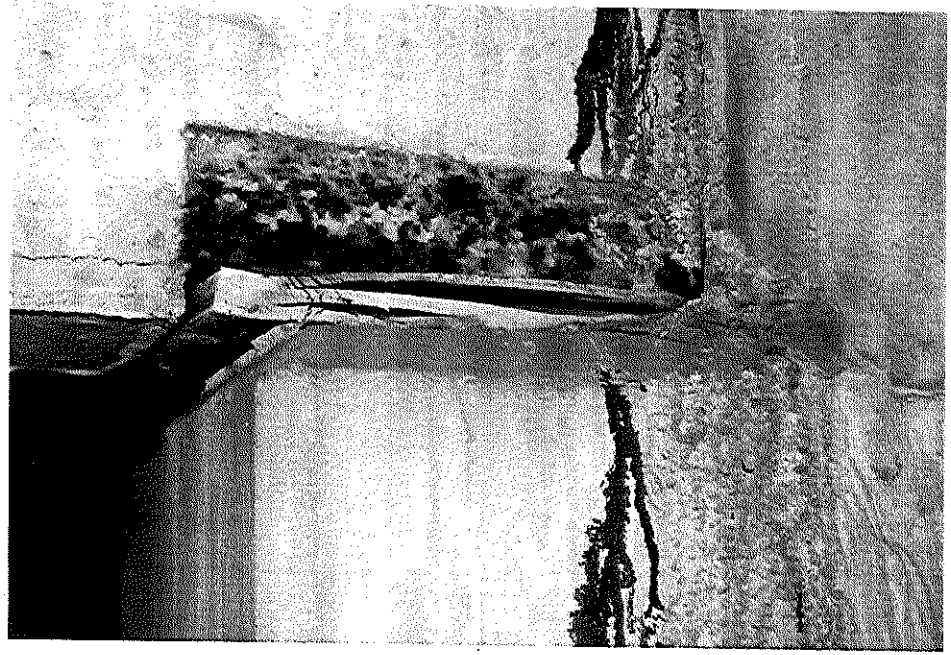

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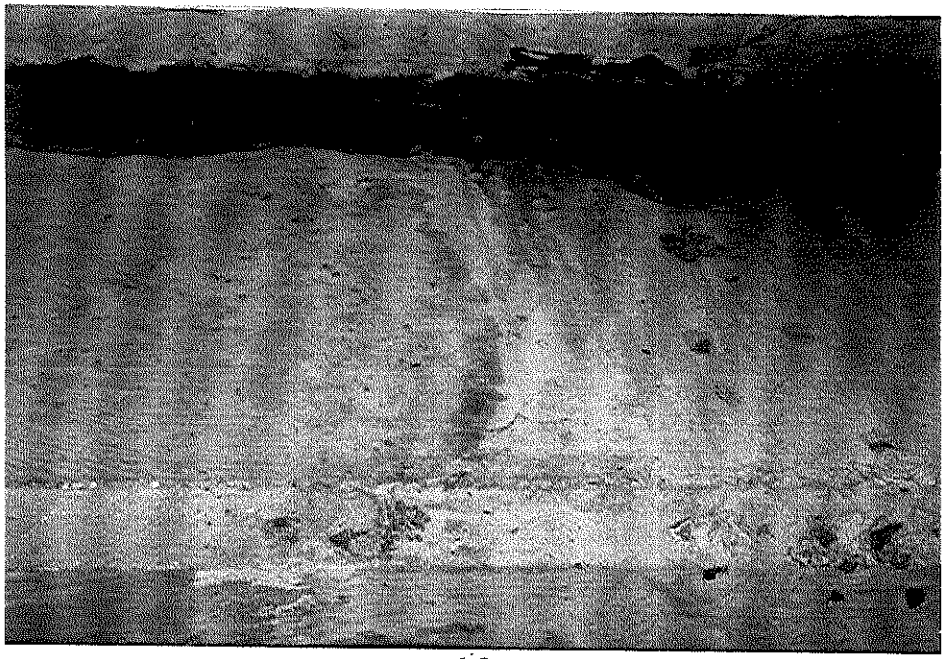

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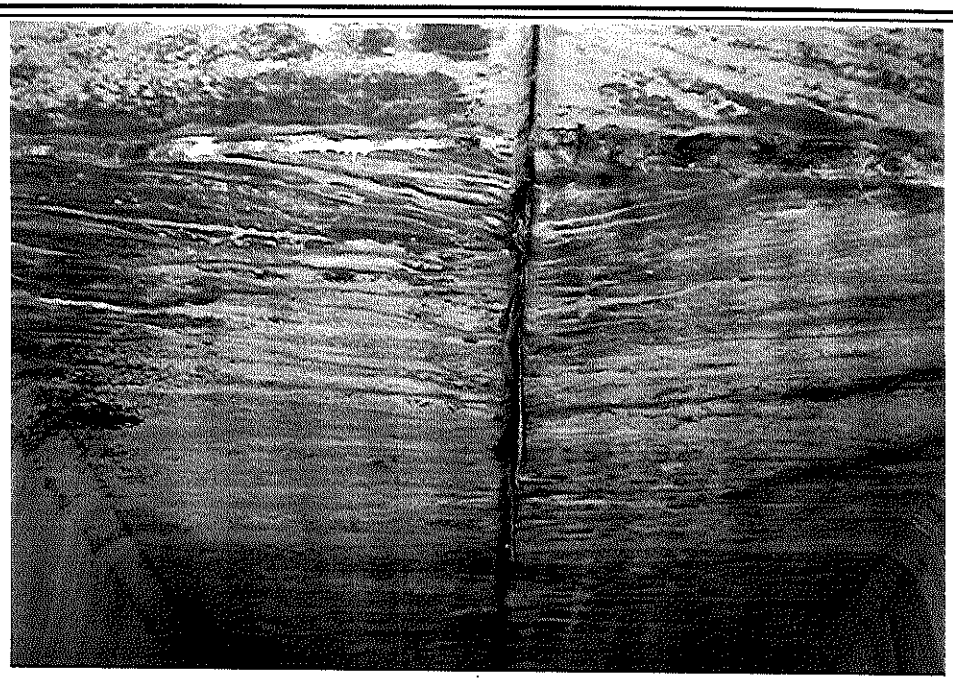

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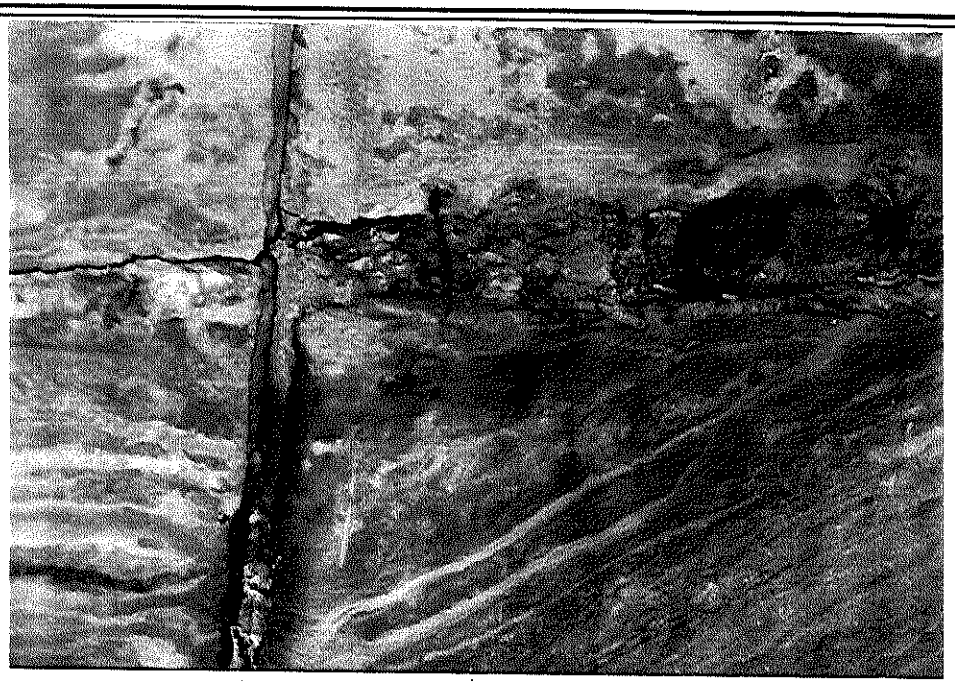

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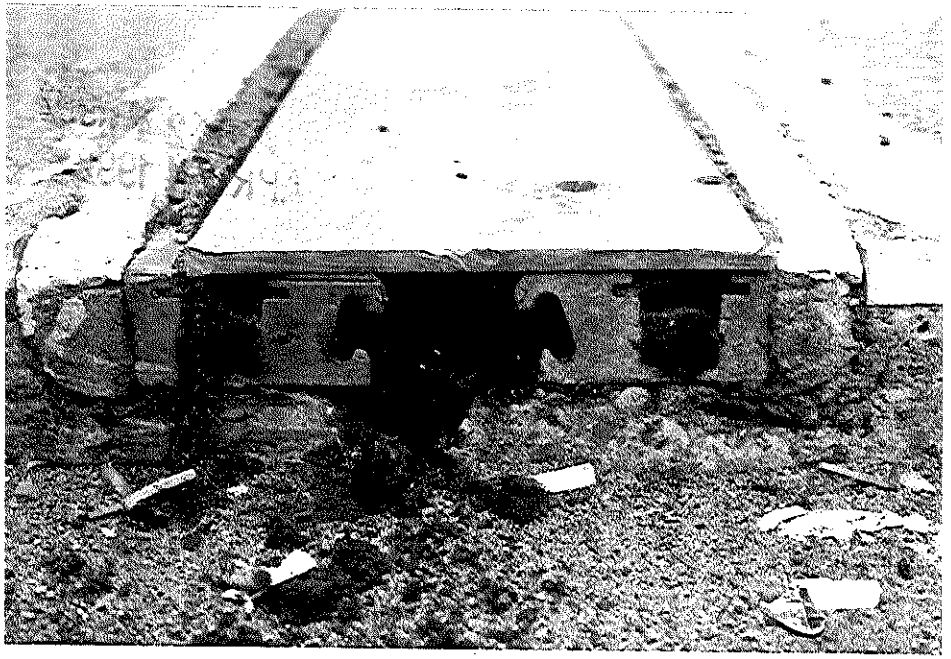

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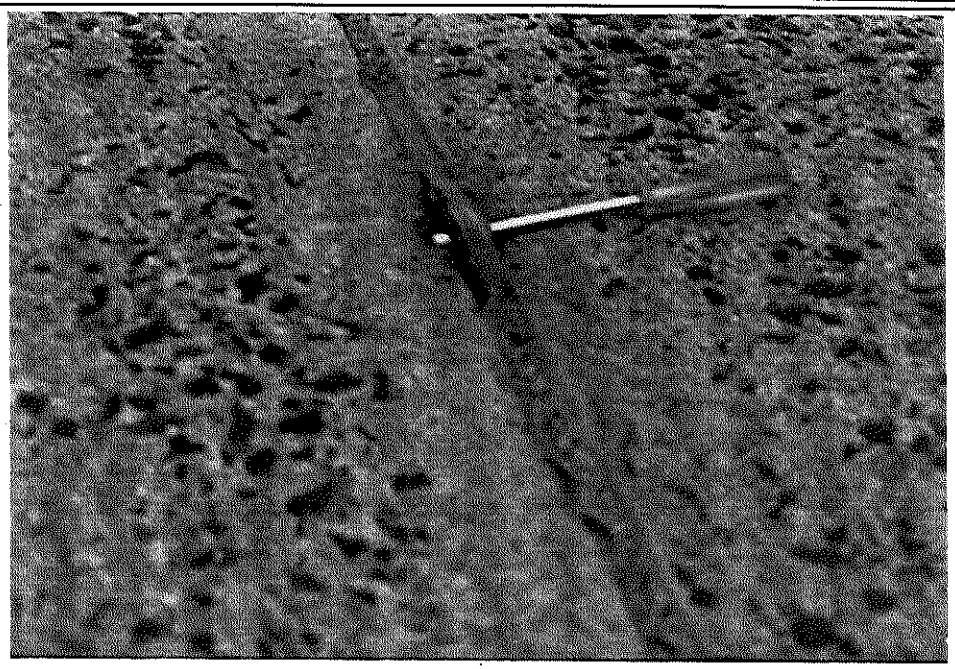

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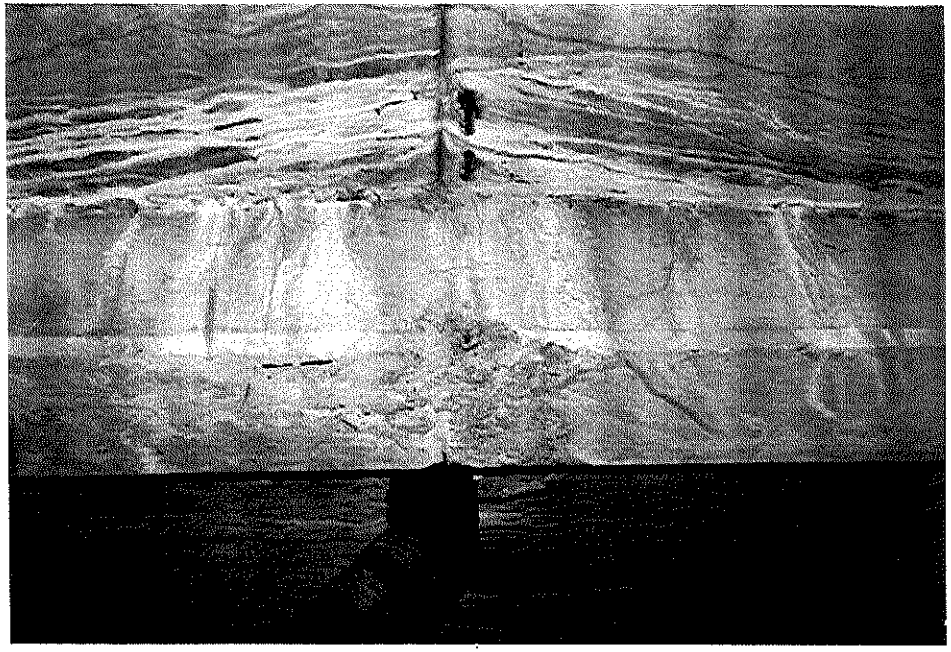

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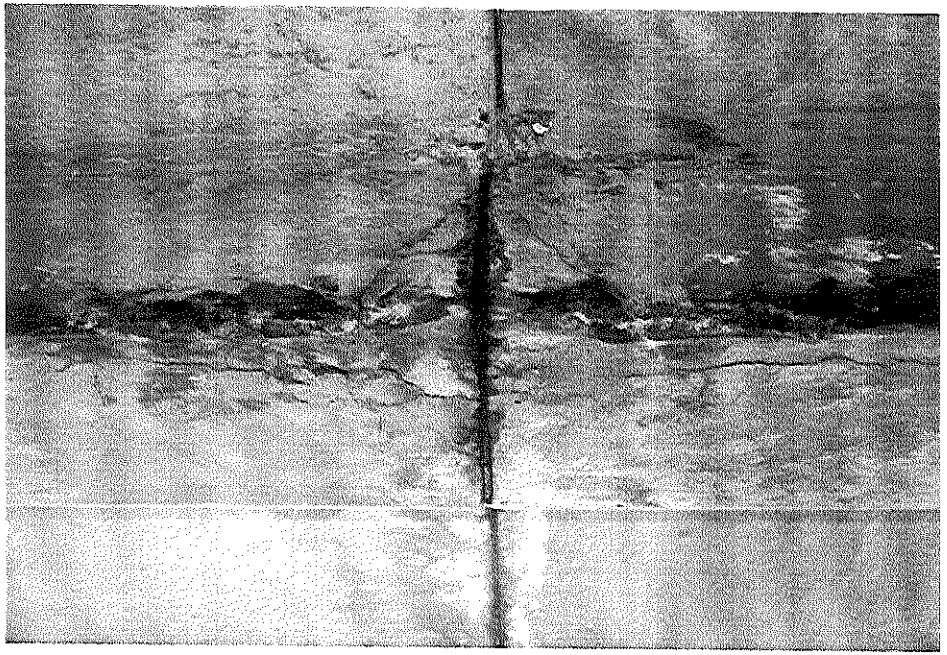

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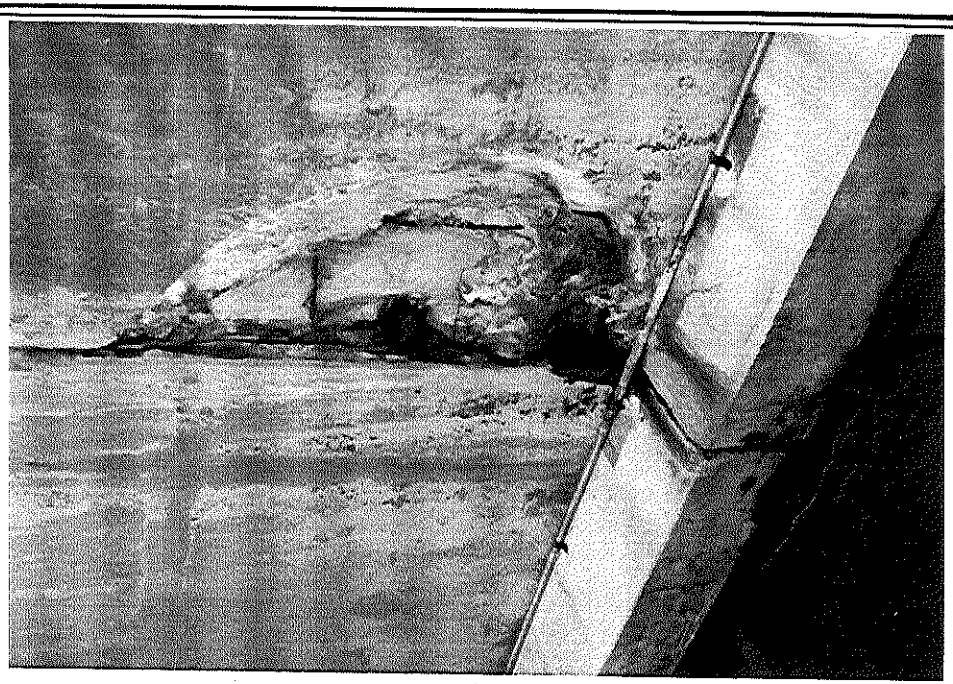

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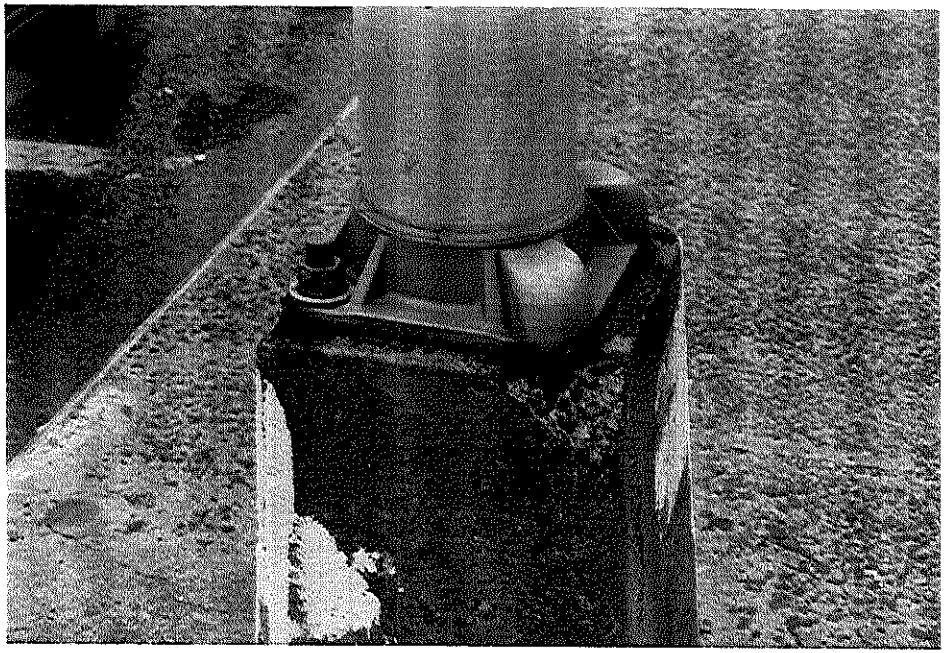

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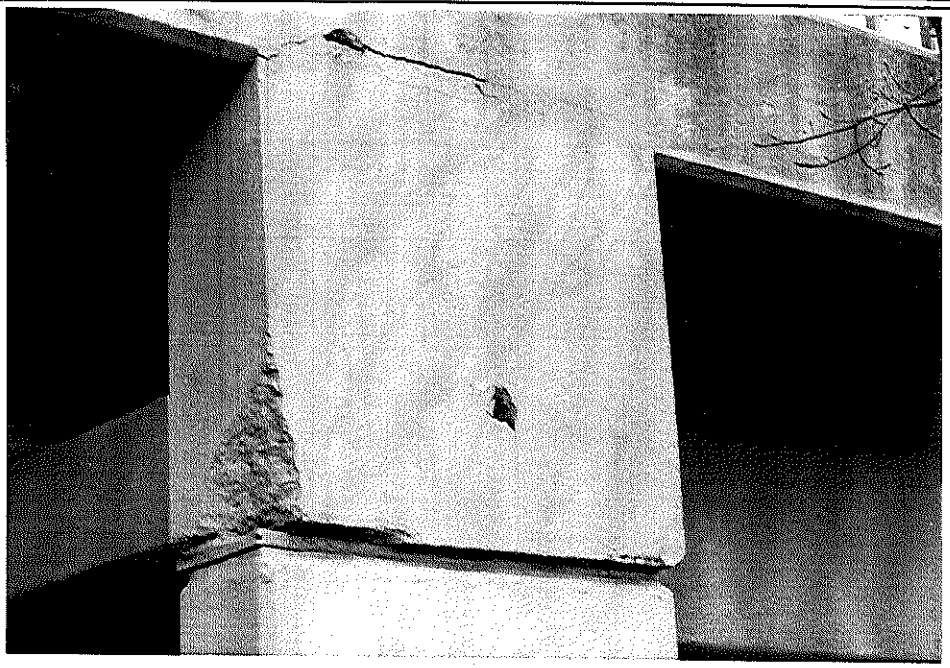

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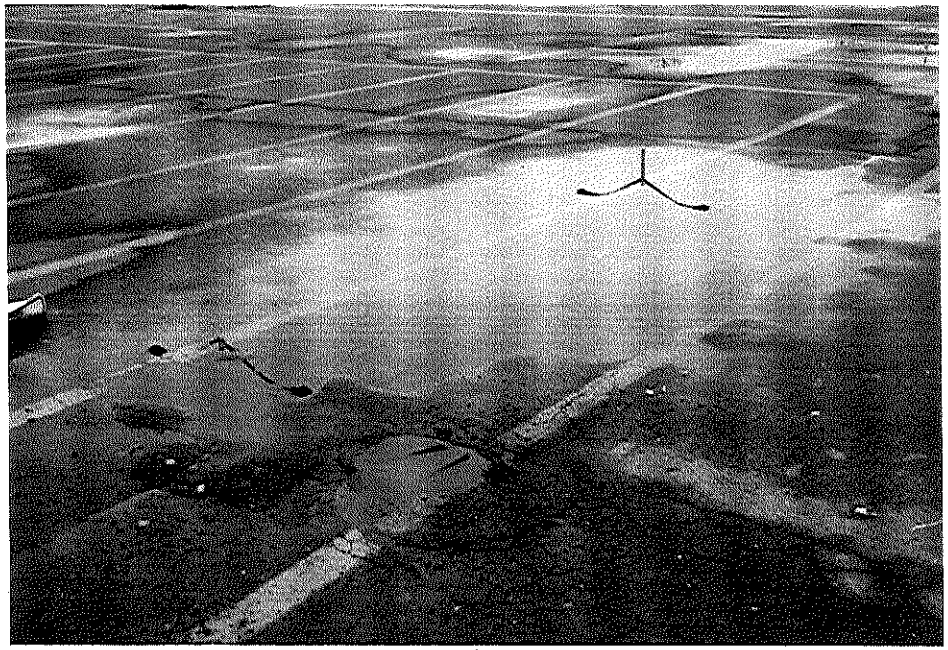

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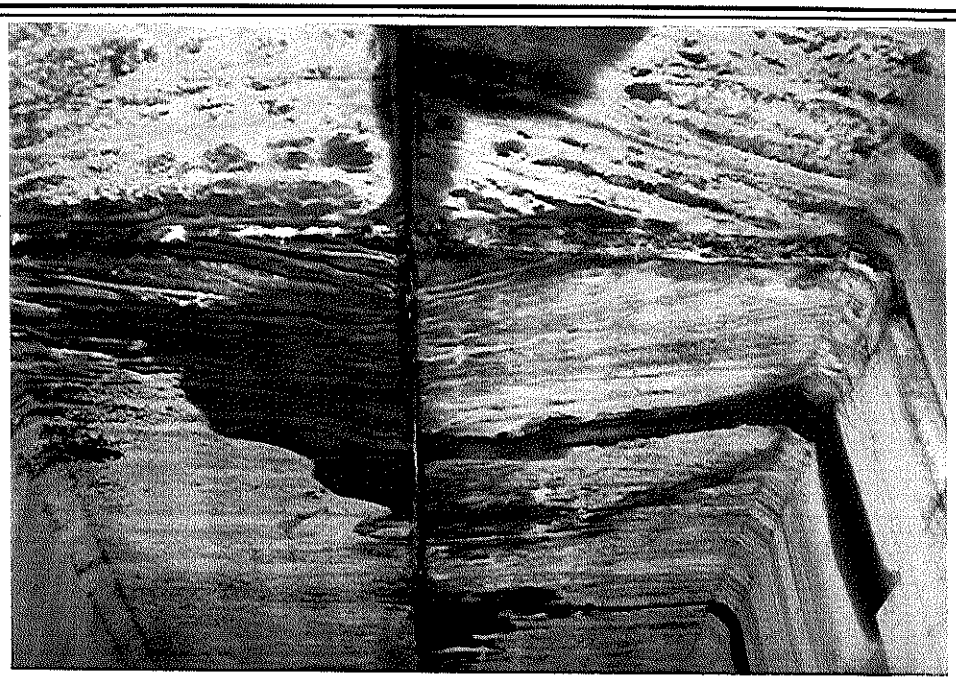

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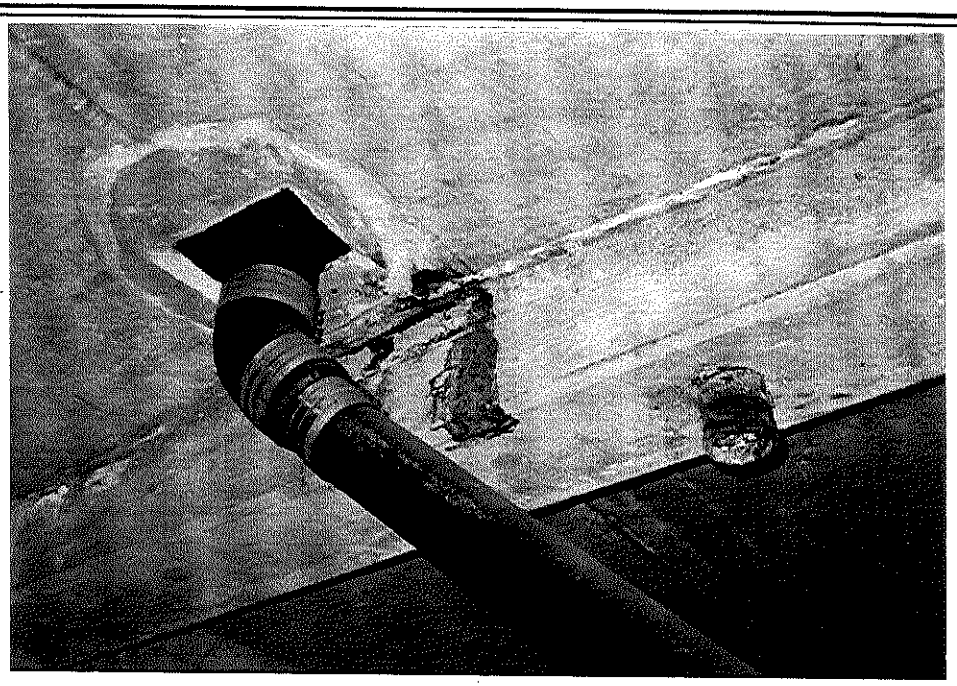

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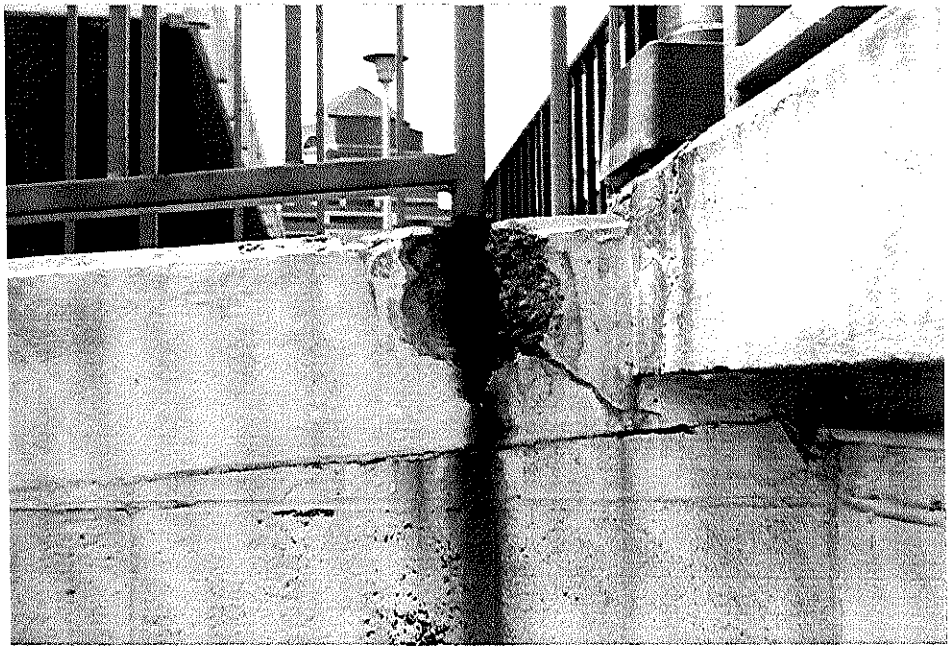

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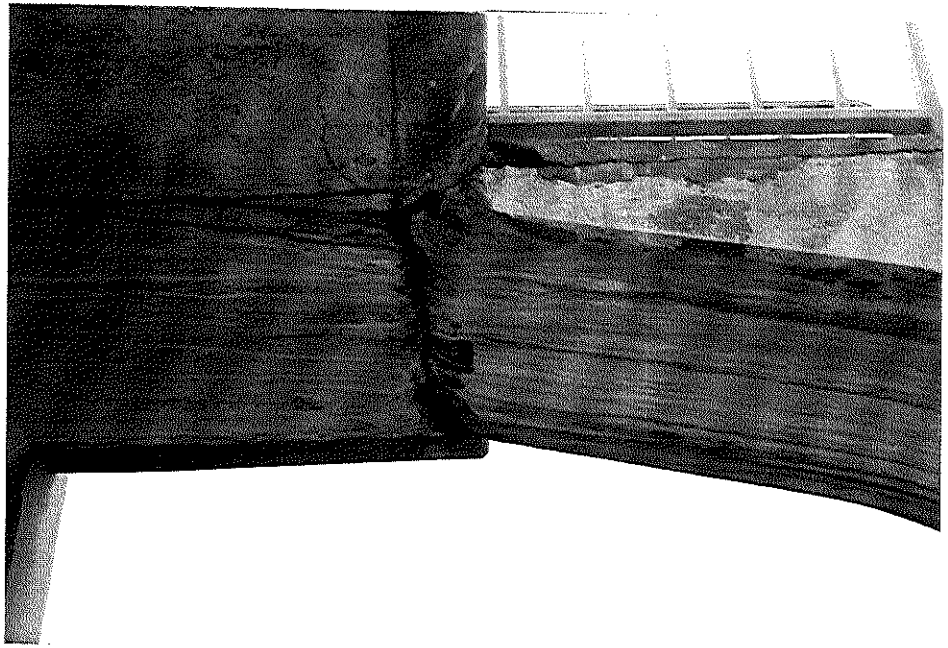

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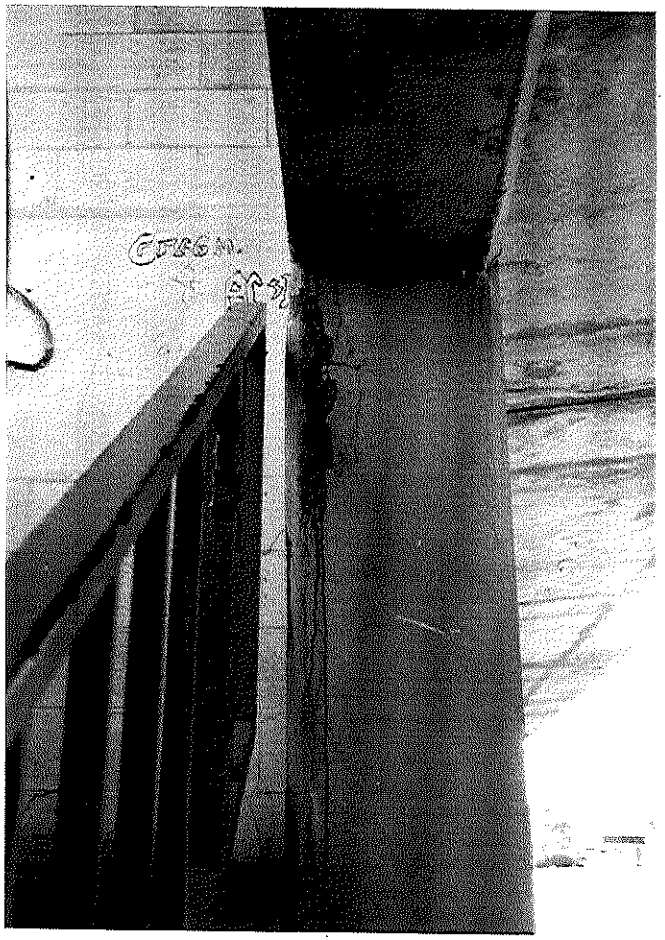

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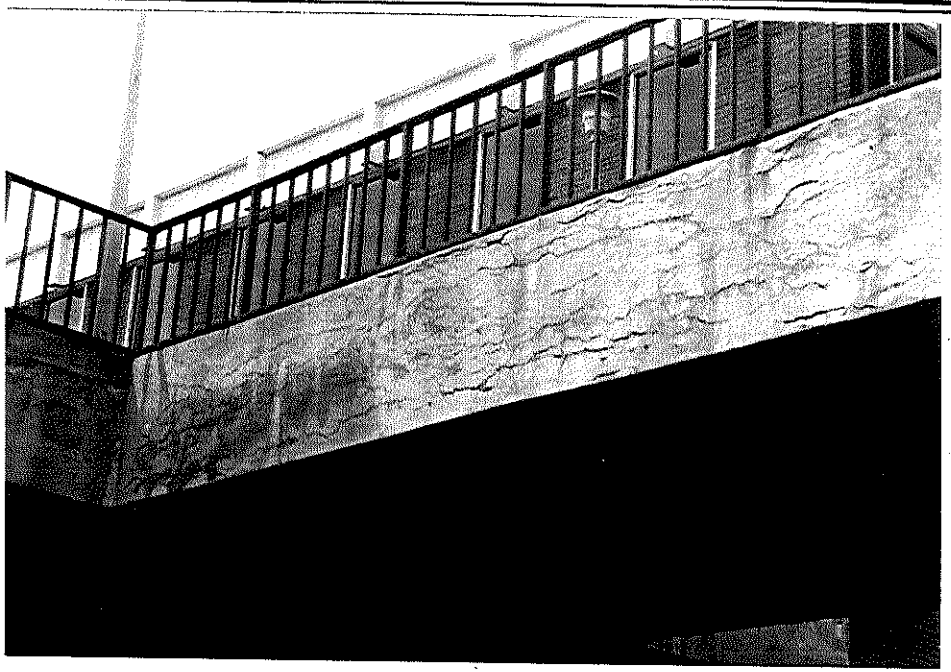

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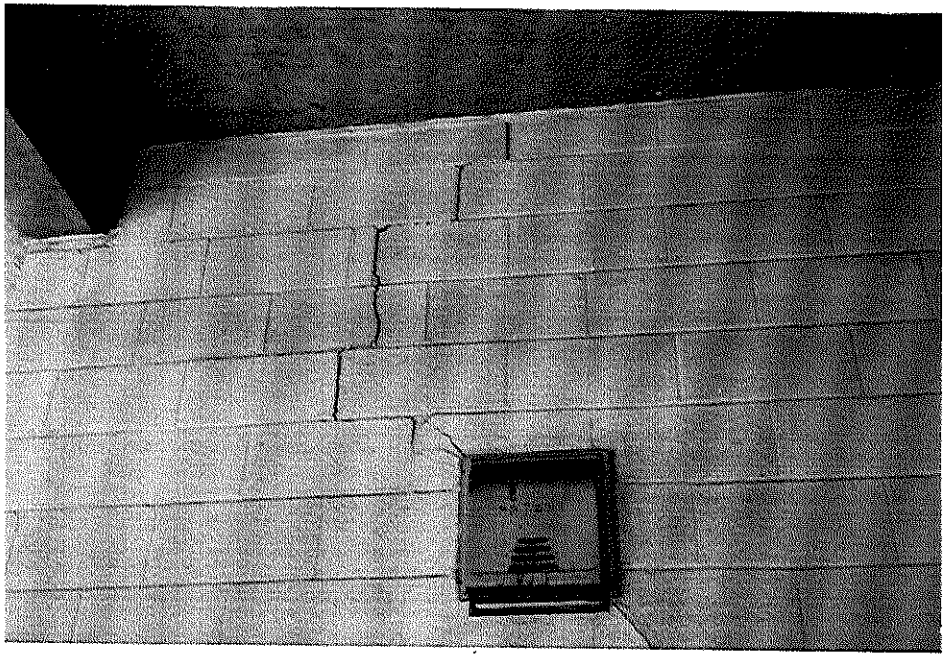

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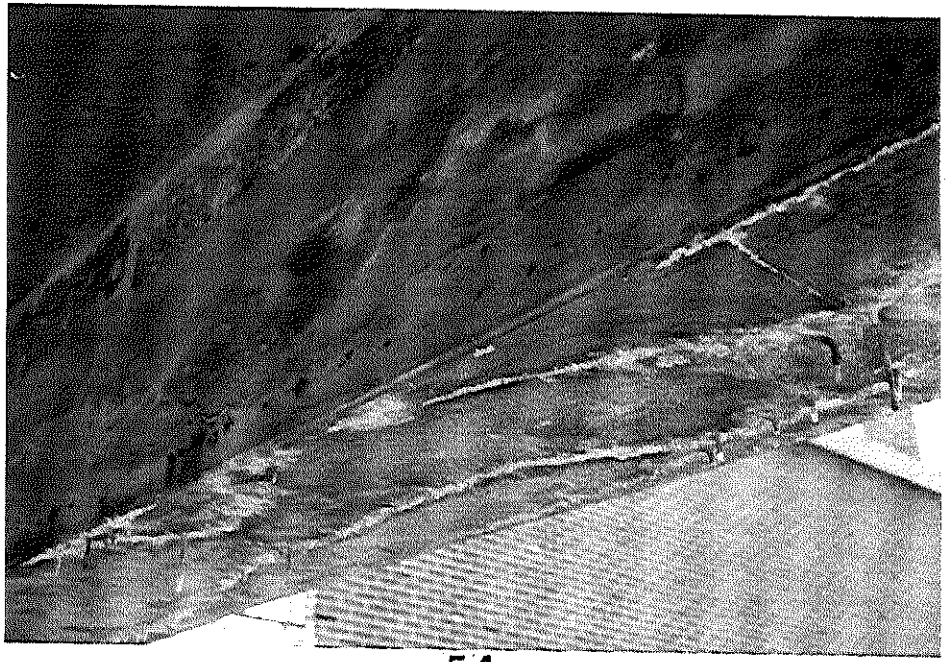

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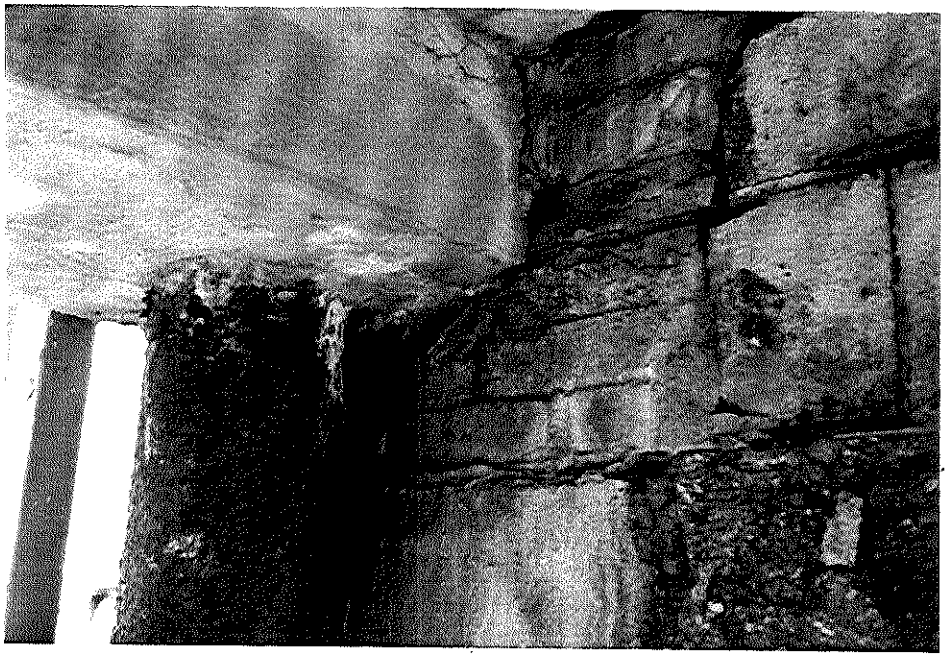

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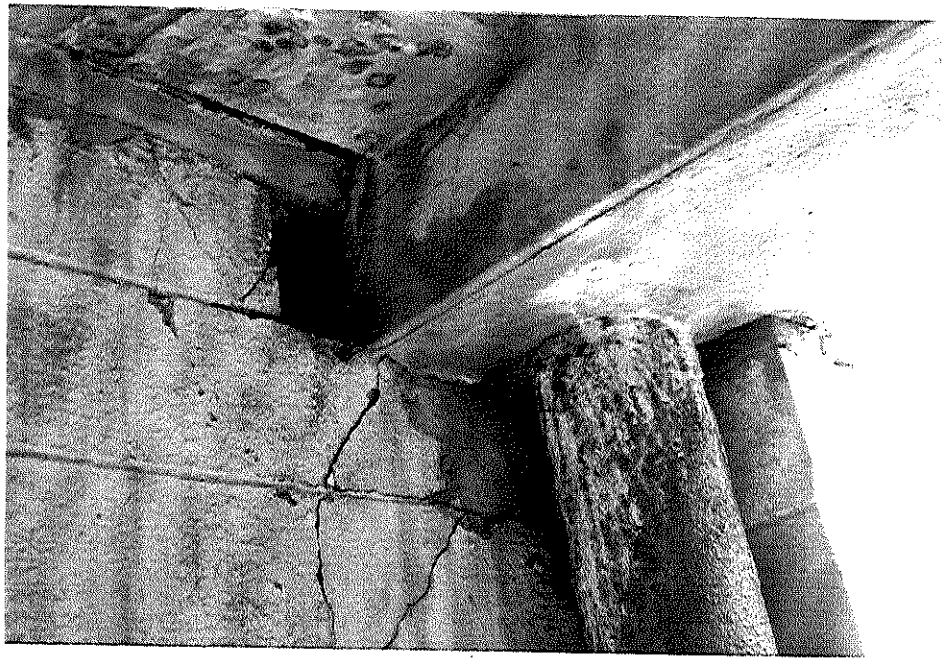

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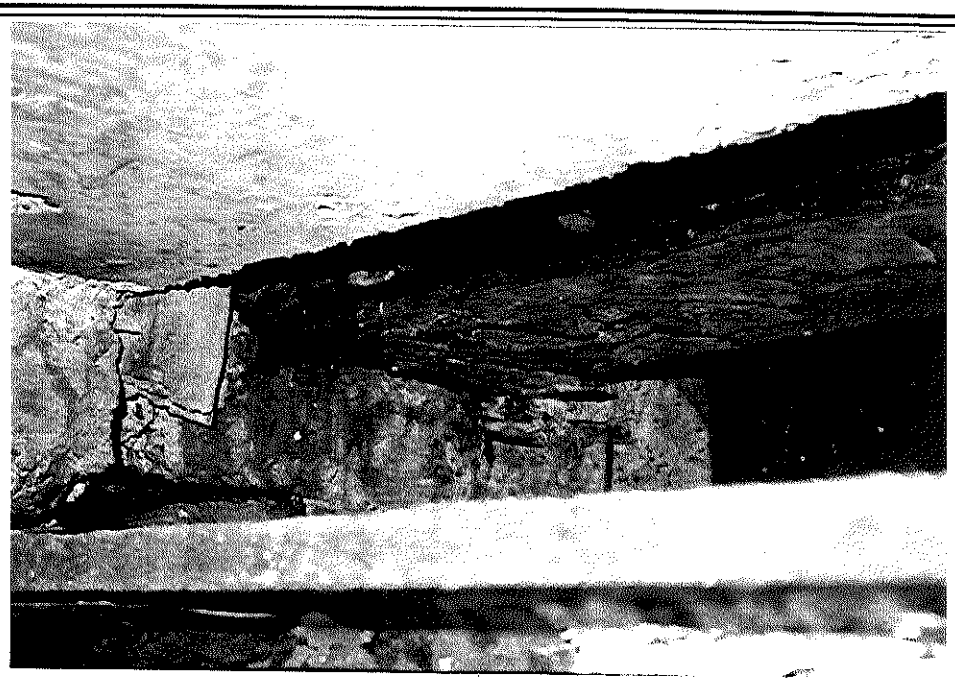

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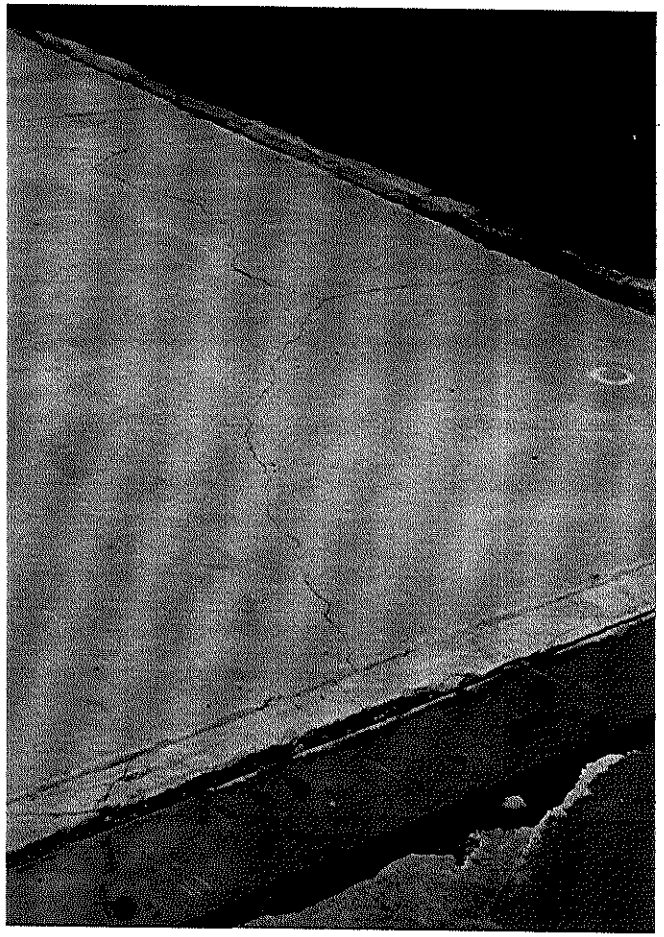

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