BRIDGE INSPECTION REPORT

Prepared For:

Grosse Ile Township
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Grosse Ile, MI 48138

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H&H JN: 06369

Date Inspected: May 20th to May 23rd, 2024

Grosse Ile Toll Bridge

Structure Number: 12306

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1.0 EXECUTIVE SUMMARY

Hardesty & Hanover, LLC was retained by Grosse Ile Township to perform an in-depth mechanical, electrical, and structural inspection of the Grosse Ile Toll Bridge. Fishbeck was retained as subconsultant to Hardesty & Hanover to perform the in-depth structural inspection of the fixed approach bridge, approach roadway and embankments, toll facilities, and on-site buildings. Great Lakes Engineering Company was retained as subconsultant to Hardesty & Hanover to perform an underwater inspection. The physical, hands-on inspection was performed from May 20, 2024, to May 23, 2024. The underwater inspection was performed on June 12, 2024.

1.1 STRUCTURAL SUMMARY

The bridge exhibits various components in fair to serious condition, with some elements in good condition. Significant wear and deterioration were observed in multiple structural elements, including the approach span filled grid deck and swing span open grid deck, guardrails, trusses, eyebars, and stringers. The concrete deck surface shows wear, cracks, delamination, and spalling, particularly in high traffic areas and near joints. Guardrails show signs of vehicle impact that caused bending and misalignment. Additionally, the guardrails have visible deterioration in the form of holes, paint failure, and disconnected sections. Trusses exhibit issues including paint failure, pack rust, pitting, dents in the flanges, and pack rust plate separation. Eyebars exhibit pack rust, pitting, and section loss, indicating significant deterioration. The floorbeams, stringers, and joists display corrosion and section loss, particularly at connections and flanges. The rocker bearings on the pivot pier show signs of corrosion and have cracked bearing houses. The girders at the pivot pier exhibit pack rust, holes in the shelf angles, and pitting. The substructures were only inspected above the current water level by H&H. Minor to moderate cracks are present in the abutments and piers. The north protection cell is in good condition. The south cell is in fair condition, showing minor deterioration. In addition, the south cell HSS bracing tubes are cracked. The operator's house is in good condition, with minor concerns such as paint flaking and bent handrails. Signage is in good condition.

1.2 ELECTRICAL SUMMARY

The electrical system for the bridge is currently assessed to be in fair condition. The power distribution system is in poor condition. The span motor and drive system are in fair condition but have reached their useful life. The span control system is in poor condition, and the SLC PLC system is obsolete and no longer supported. The existing traffic signals and gates are in fair condition, but the associated controls need to be adjusted. [redacted] The control house and roadway lighting systems are in fair condition. The navigation lighting and marine signaling are in fair condition.

1.3 MECHANICAL SUMMARY

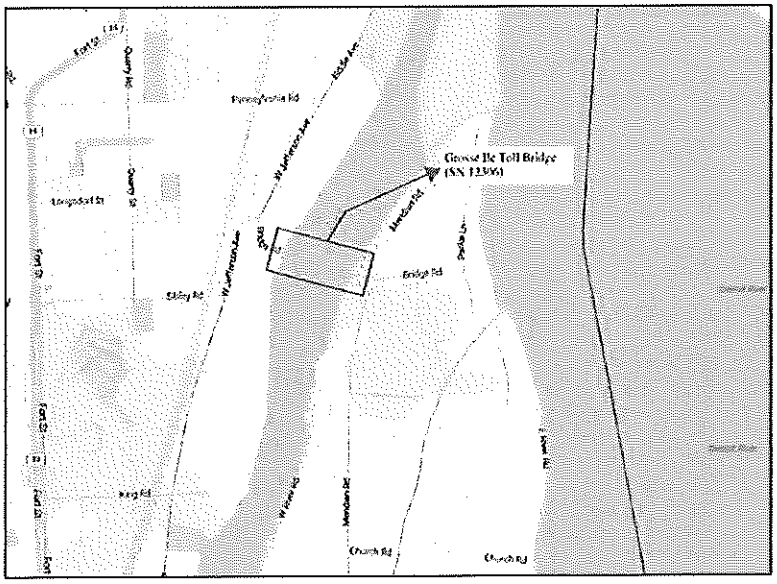
The machinery components on this bridge are in poor condition and have exceeded their useful life and should be replaced with modern equipment. H&H recommends that all machinery be replaced.

[redacted] rocker bearings should be replaced.

2.0 DESCRIPTION OF BRIDGE

2.1 STRUCTURAL DESCRIPTION

The Grosse Ile Toll Bridge was built over the Trenton Channel in 1913, and has been owned by the Grosse Ile Bridge Company (GIBC) since its construction. It is one of two historic movable bridges that provide access to the island of Grosse Ile, the other being the Grosse Ile Parkway Bridge. The bridge includes four fixed truss spans, two on the east approach and two on the west approach, with a swing span in the center. The fixed spans are each 180' long with concrete filled grid deck. The swing span is 304'-8" long and is comprised of a through truss with an open grid deck. The overall width of the bridge is 24'-8". The clear roadway of the bridge from curb to curb is 21'-8". The bridge carries one lane of eastbound traffic and one lane of westbound traffic.



Location Map – Grosse Ile Toll Bridge, Wayne County, MI

2.2 REHABILITATION ABSTRACT

Below is a list of bridge rehabilitation projects since the Grosse Ile Toll Bridge's construction in 1913:

1965- Span 3 was replaced after a large section was hit by a lake freighter.

1986- The grid deck was replaced by the GIBC.

1992- After being hit by a lake freighter, Span 3 was replaced with a nearly identical span based on the original plans. The main difference is the 1992 span has bolted connections instead of riveted connections.

1994- A new central swing bearing was built by the GIBC.

2005- The GIBC opened a toll plaza located in Riverview.

2.3 ORIENTATION AND BASIC ELEMENT NUMBERING

2.3.1 GENERAL NAMING CONVENTIONS

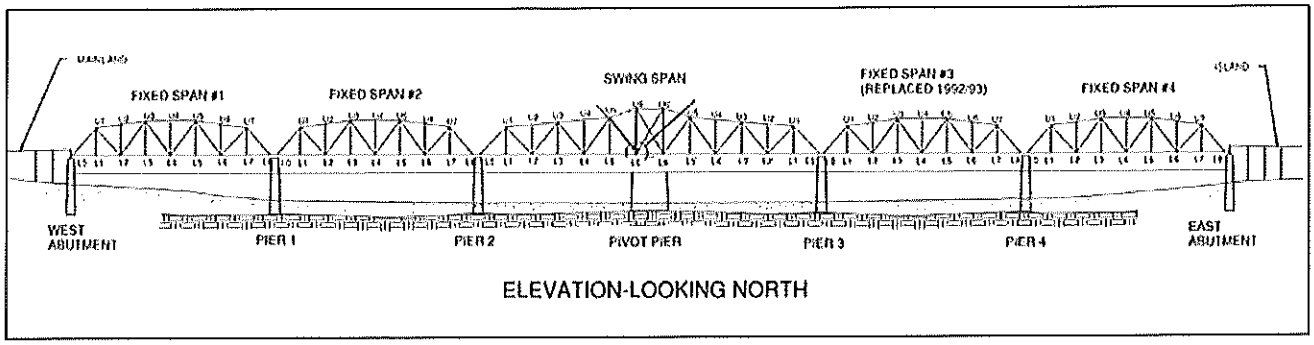
Bridge elements are labeled from south to north and west to east. The naming convention is symmetrical about the center of the structure in the west to east direction. The piers are labeled from west to east, starting from the west end river pier as Pier 1 moving to the east end river pier as Pier 4. The Pivot Pier, which is between Pier 2 and 3, is not numbered. Abutment A is the west abutment in located in Riverview, MI, while Abutment B is the east abutment located in Grosse Ile, MI. Span 1 runs from Abutment A to Pier 1, and Span 4 runs from Pier 4 to Abutment B. The Swing Span, which is between Span 2 and 3, is not numbered. The abbreviation PP refers to the panel points on the trusses on all spans.

2.3.2 APPROACH SPANS

The floorbeams are labeled FB0 to FB8 in each span from west to east. Stringers are labeled from S1 to S4 from south to north and the stringer lines are separated by floorbeam connections. The trusses are distinguished as the north and south truss. Approach span truss joints are labeled from L0 to L8 at the lower panel points and U1 to U7 at the upper panel points moving from west to east. Vertical and diagonal members are called out using their panel points at either end. Vertical members start from L1-U1, while diagonal members start from L0-U1.

2.3.3 SWING SPAN

The floorbeams on the west side of the swing span are labeled FB0 to FB6 from west to east. On the east side of the swing span, the floorbeams are labeled FB0' to FB6' from east to west. Separated by floorbeam connections, the stringers are labeled from S1 to S4 from south to north. Similar to the approach spans, the trusses are referred to with north and south designations. The truss joints on the west portion of the swing span are labeled west to east from L0 to L6 at the lower panel points and U1 to U6 at the upper panel points. The truss joints on the east portion of the swing span are labeled from L0' to L6' for the lower panel points and from U1' to U6' for the upper panel points moving east to west. The swing span's vertical and diagonal members are named in the same convention as the approach spans, using the panel points at each end of the member. Sway frames exist between the north and south trusses on all spans at all panel points.



Elevation of Grosse Ile Toll Bridge including naming conventions

3.0 INSPECTION PROCEDURE

Hardesty & Hanover engineers [redacted], EIT performed the structural inspection of the fixed spans and swing span; [redacted] performed the electrical inspection; [redacted] performed the mechanical inspection. The inspection was completed in accordance with the National Bridge Inspection Standards (NBIS), AASHTO Manuel for Bridge Evaluation, Second Edition, Federal Highway Administration (FHWA), and Bridge Inspection Reference Manuel (BIRM), as applicable.

The equipment utilized by the inspection team:

- iPad
- Pit Gauge
- Collapsible Ruler
- Sounding Wheel
- Chain
- Chalk
- Hammer
- Level
- 25' Tape Measure
- Digital and Analog Calipers

Bridge inspections are conducted to maintain compliance with the Michigan Department of Transportation Bridge Management and Inspection System (MiBRIDGE), National Bridge Inspection Standards (NBIS), Michigan Bridge Element Inspection Manuel (MiBEIM), Michigan Structure Inspection Manuel (MiSIM), MDOT NBI Rating Guidelines, and MDOT Bridge Advisories. The recorded member condition information is used to determine the physical and functional condition of the bridge, form the basis for evaluation and load rating of the bridge, initiate maintenance actions, provide a continuous record of the bridge's condition and rate of deterioration, and establish priorities for repair and rehabilitation programs in accordance with MDOT bridge inspection guidelines.

To gain access to all parts of the bridge, a manlift was used to access all elements above the bridge deck, and a bucket boat was used to access all elements below the deck. While inspecting the structure, numerous photographs were taken to note the location and condition of different aspects. The findings of the inspection, as illustrated in these photos, are included in this report.

4.0 STRUCTURAL INSPECTION OBSERVATIONS

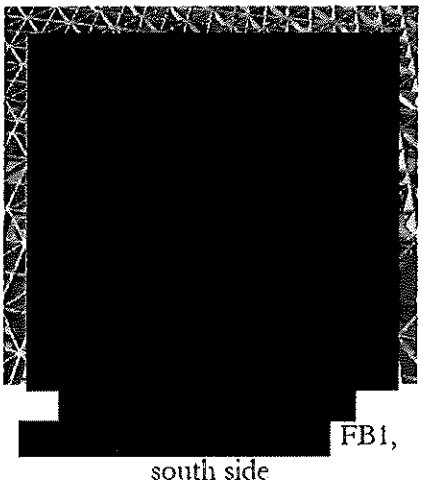
4.1 DECK

4.1.1 DECK SURFACE

The fixed spans are filled grid decks with an overpour. The deck surface on the fixed spans is in fair condition. The concrete is noticeably worn down in the path of traffic and the aggregates are beginning to show. There are many minor popouts in the concrete scattered around the centerline between lanes of traffic and near the outside edges of the lanes on Span 4, as shown in Photo S-01. The most severe longitudinal crack is located [redacted]

Photo S-01 [Span 4] Minor popouts at center line of bridge, looking west

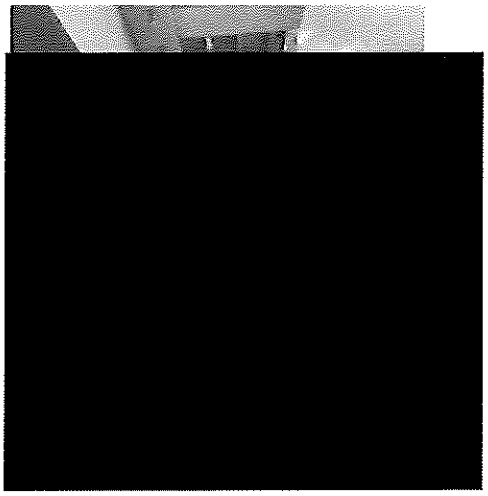
The Swing Span is comprised of an open grid deck, with filled grid deck at each joint and above the Pivot Pier to protect the machinery. The deck surface on the Swing Span is in poor condition. The portions of the span that are filled with concrete show spalling at the joints and are worn down so the grid deck is visible. The open grid deck has [redacted] The grid deck is wearing down in the tire path.



[redacted] FB1, south side

4.1.2 DECK UNDERSIDE

The underside of the deck on Span 3 is in poor condition. Span 3 has many areas of exposed concrete and reinforcement at deteriorated SIP forms at the deck underside fascia. [redacted] The deck undersides of the remaining fixed spans are in good condition.



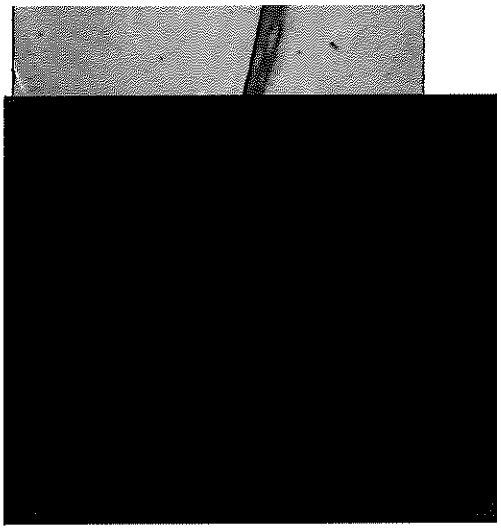
The deck underside of the Swing Span is in fair condition. There are only two locations on this span that exhibits exposed concrete and reinforcement, [redacted]

[redacted]

Photo S-04 [Span 4] Concrete spalling at joint between Span 3 and 4, looking west

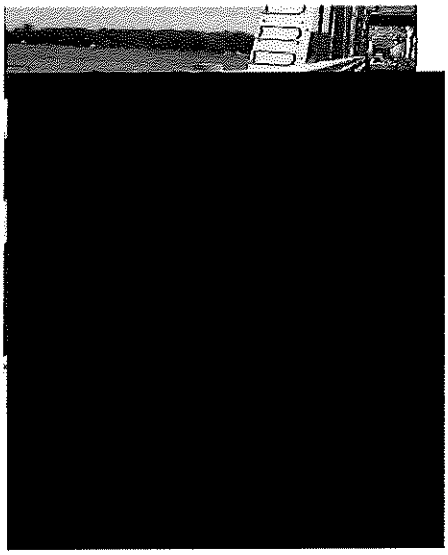
4.1.3 JOINTS

The joints on this structure are overall in fair condition. Large areas of spalling exist at both open joints of the Swing Span. [redacted]. The expansion joint devices between the fixed spans appear to be operating as intended. [redacted]



4.1.4 GUARDRAILS

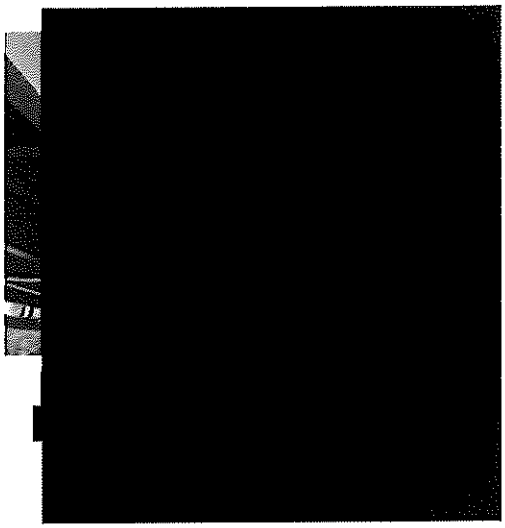
The guardrails on either side of the structure are in serious condition. The guardrails are galvanized W-profile type rails bolted to tee members that have been directly welded to the truss members. The guardrails contain holes, dents, and bends in multiple locations. Unfilled bolt holes exist throughout the guardrails on all spans. Paint failure is typical for many of the guardrails across the structure. The guardrail is rubbing against the truss member at the south Swing Span truss at U1-L0 and on the north truss of Span 2 at U7-L8. The bending of the guardrails can be attributed to the large lengths of unsupported guardrail and lack of stiffening elements. On the north side of Span 3 at vertical member L6-U6 the guardrail is bolted to an I shape (unique to this location) that is missing a bolt, shown in Photo S-05.



4.1.4.1 CURBS

The curbs are in fair condition. Six holes exist in the curb rail from rust deterioration on Span 2 between panel point 3 and 4. [redacted] The curbs do not align longitudinally between Span 3 and 4 (north side), Span

2 and Swing Span (south side), and at the location shown in Photo S-06.

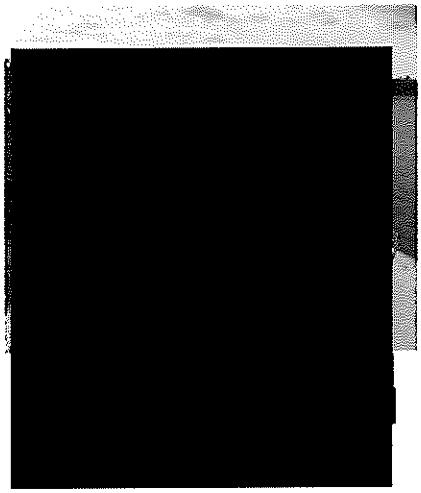


4.2 SUPERSTRUCTURE

4.2.1 TRUSSES

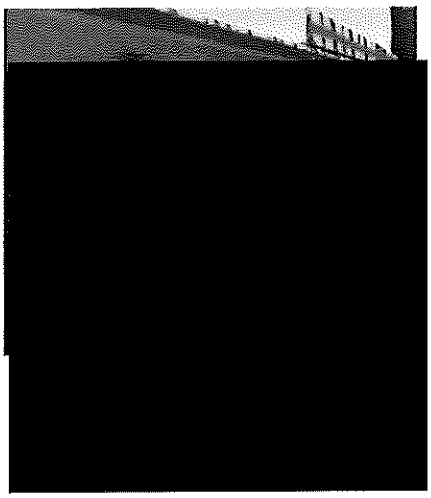
4.2.1.1 CHORDS, WEBS, AND PANEL POINTS

[redacted].



Minor pitting exists throughout all spans. [redacted]

Paint failure exists at many of the truss chords. The worst cases of paint failure on the upper panel points were located on the north face of U3'-U2' on the south truss of the Swing Span, the east face of U1-L2 on the north truss of Span 3, and the south face of PP U4 on the south truss of Span 4. The south face of L3'-L2' on the north truss of the Swing Span has paint flaking off throughout the entire length (Photo S-09).



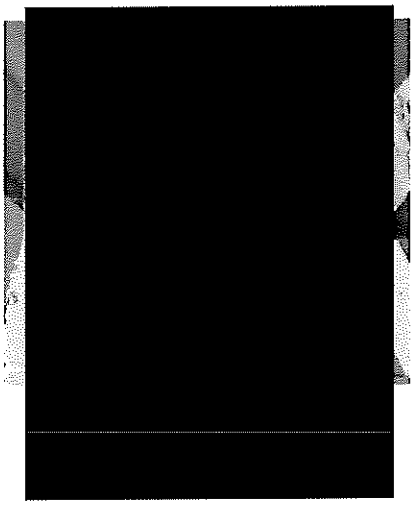
Surface rust exists throughout all truss members of the swing span. [redacted]

[redacted]

Photo S-10 [Span 1] Bent sway bracing between north and south truss at PP U6, looking east

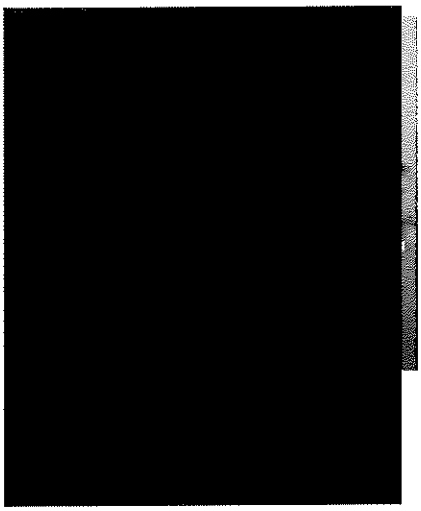
4.2.1.2 LATERAL AND SWAY BRACING

Portal framing exists between U1 of the north and south truss, and U7 of the north and south truss on all fixed spans. Portal framing exists on the swing span between U1 of the north and south truss, and U1' of the north and south truss. Sway bracing exists between all other panel points on the north truss and their opposite panel point on the south truss. Lateral bracing exists between the north and south truss at the upper panel points. The lateral bracing, portal bracing, and sway bracing are in fair condition. The corners of riveted angle connections are separating from the vertical truss members in a few locations. [redacted]. The sway bracing angle between the north and south truss at PP U6 of Span 1 is bent [redacted] The lateral bracing between PP U1 of the south truss and PP U2 of the north truss on Span 3 is bent.

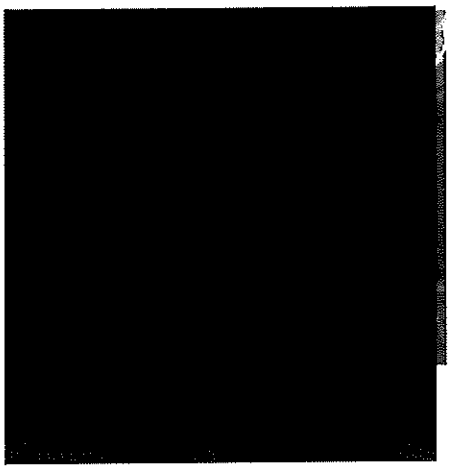


4.2.2 EYEBARS

[redacted] The pack rust between members ranges from 0.125" to 0.375". The eyebar on the south truss of the Swing Span at PP U6' also contains pack rust up to 0.375" along with minor pitting on the south face, with between 0.0625" to 0.125" of section loss on the interior members and 0.25" of section loss on the south face (Photo S-11).

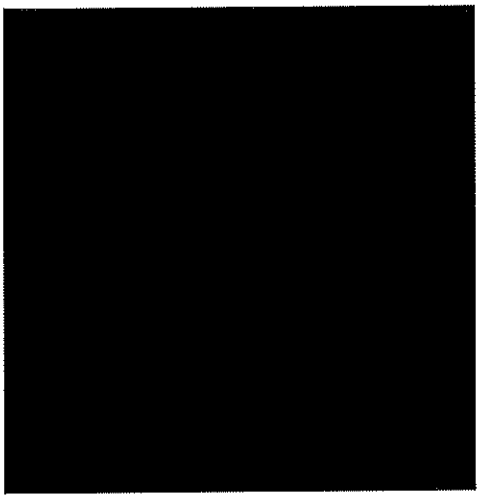


[redacted] The south face of the northwest eyebar on the Pivot Pier has pack rust [redacted]



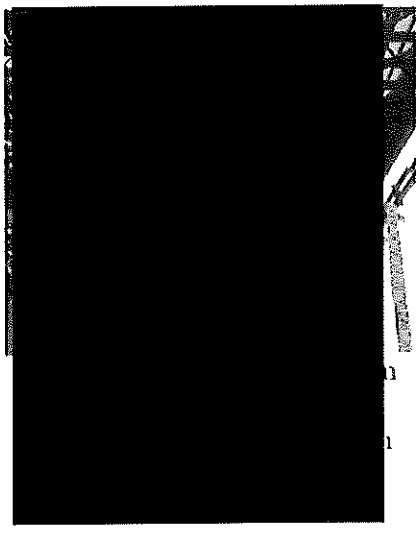
4.2.3 FLOORBEAMS

The floorbeams on the fixed spans are in fair condition. The floorbeams on the Swing Span are in poor condition. Abandoned bolt holes in the top flange exist at most connections to the trusses. [redacted] The bottom flange of this member is covered in pack rust and has minor section loss less of than 10%.



4.2.4 STRINGERS

The stringers on the fixed spans are in fair condition. The stringers on the Swing Span are in poor condition. [redacted]



[redacted], and has paint failure and pack rust. The flanges of the stringers on the [redacted] are in poor condition. Many welded top flange repairs exist throughout the span. The typical top flange weld repair consists of stitch welding an angle to the web and top flange. [redacted] was repaired and exhibits pack rust on the web and connection (Photo S-16). Welded web repairs were used at a few locations on [redacted]

[redacted]

p
of
d

4.2.5 JOISTS

The joists are in poor condition. [redacted]

The joists are butt welded together between [redacted]

The joists on the Swing Span at the north face of stringer 1S at FB4 and the south face of stringer 2S at FB4 have been replaced and are in good condition.

[redacted]

4.2.6 BEARINGS

The rocker bearings on the swing span are in fair condition. The rocker bearing below the [redacted] is corroded. There is debris on the interior, and the rocker is shifted off the centerline of the bearing pad. The bearing housing [redacted]

[redacted]

4.2.7 GIRDERS AT PIVOT PIER

The girders at the pivot pier are in fair condition. There are rivets that have been affected by pack rust. The angle and rivets at the north girder have pack rust,

holes in the shelf angle, and pitting up to 0.3125" at the top flange.

4.3 SUBSTRUCTURE

4.3.1 ABUTMENTS

The east abutment is in good condition. The west abutment is also in good condition. Hairline cracks exist throughout both abutment walls (Photo S-19).

Photo S-19 [East Abutment] West face of East Abutment, hairline cracks

4.3.2 PIERS

The piers are in good condition. The concrete has hairline cracks and some moderate cracking.

4.3.3 FENDER SYSTEM/DOLPHINS

The north pier protection cell is in good condition. The south pier protection cell is in fair condition. The filling is sinking inside the south cell, and longitudinal cracks exist along the HSS bracing throughout the cell, shown in Photo S-20.

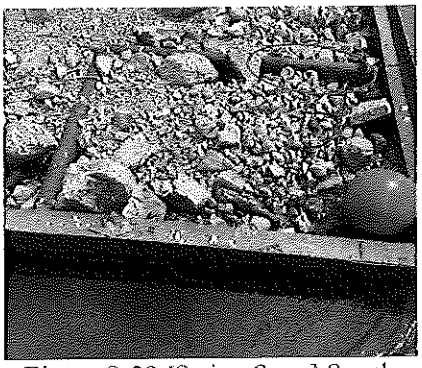


Photo S-20 [Swing Span] South pier protection cell, filling sinking, cracked weld on HSS bracing, looking south

4.4 MISCELLANEOUS

4.4.1 OPERATOR'S HOUSE

The operator's house is in good condition. There appear to be no leaks, and the outside of the house has no major concerns. The flooring supporting the house has minor paint flaking.

4.4.2 STAIRCASE

The staircase to the operator's house and pivot pier from the south side of the road are in good condition. The handrail on the north side of the staircase to the operator's house is bent and cracked near the top.

4.4.3 SIGNAGE

The bridge signage is in good condition. The signage on the east and west side of the bridge are clearly visible (Photo S-21).

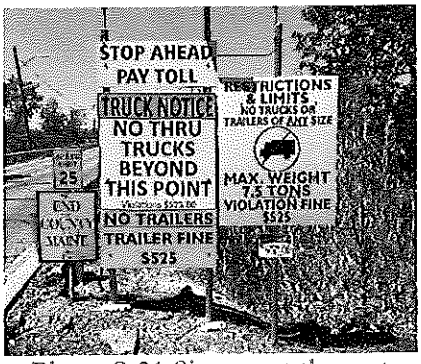


Photo S-21 Signage at the east approach of the bridge

5.0 MECHANICAL INSPECTION OBSERVATIONS

5.1 MECHANICAL DESCRIPTION

The entire weight of the [redacted] which replaced the original rim bearing system in 1994. [redacted]

A 30-Horsepower electric motor is used to drive the span operating machinery and the end lift machinery, using a manually operated sliding clutch mechanism to select the drive needed. [redacted] For braking the span drive, a hand lever mechanism is utilized to tighten a band on a drum wheel mounted on a high speed shaft.

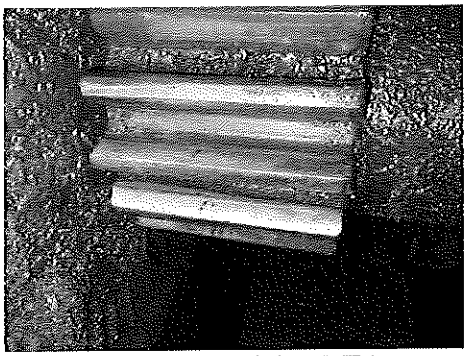
A manual centering device is operated by a cable mechanism to lower a pin at each span end into a receiving socket mounted on the rest pier, however only the east span centering device is in service. This properly maintains the span alignment, so the end lifters align with their strike plates.

When selected, the end lift machinery drives horizontal shafting that runs to both ends of the span. Two sets of bevel gears at each end split the shafting to each corner. Another spur gearset is driven through and rotates the cam housed within the rocker bearing housing. The cam either raises the ends creating a load to support vehicular traffic or lowers them to deflect free and allow for the bridge to swing.

5.2 GEARS

Where accessible, each gear had one tooth cleaned, visually inspected, and measured to determine the percent remaining on the gear tooth. The overall condition of the gear teeth is poor. The grease for the gears is contaminated, making the grease a brown color. The grease is contaminated with grit from sandblasting all over for the west tur

ning machinery located outside of the machinery room. Gear teeth nomenclature can be found in **Appendix A**. All gear teeth measurements can be found in **Appendix B**.

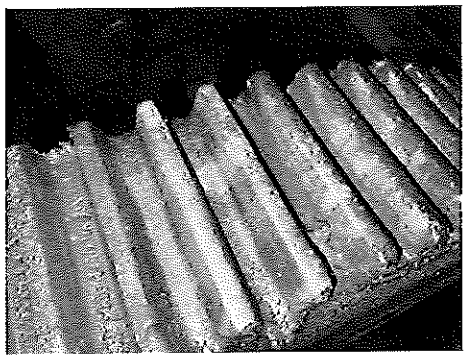


M01: Motor Pinion MP1

5.2.1 MP1/MG1 (MOTOR GEARSET)

The motor gearset consists of MP1 and GP1. MP1 is connected to the motor shaft and exhibits plastic deformation at the pitch and tip of the tooth line. There is light scoring, and the wear is more excessive on the inboard side (motor side). This is shown in Photo M01.

The teeth are also polished. GP1 has moderate rust at the ends of the gear teeth. There is scoring throughout the teeth and the end of the teeth are rounded from wear. The gear teeth exhibit plastic flow at the pitch line and the ends of the teeth are battered, likely from the root and tip of the teeth interfering. This is shown in Photo M02.



M02: Motor Gear MG1

5.2.2 P1/G1

Pinion P1 and Gear G1 mesh as part of the turning machinery.

P1 exhibits severe plastic flow at the pitch line that has caused the tooth to appear dented. It also shows heavy finning, moderate scoring, and light rust at the root. G1 has surface rust, plastic deformation and finning at the tip on the outboard (non-motor side). The teeth also have light to moderate scoring and the edges are rounded from plastic flow. P1 and G1 are shown in Photo M03 and Photo M04.

M03: Pinion P1

5.2.3 B1A/B1B/B1C

The differential gearset distributes the torque in the east and west direction. It consists of 2 equally sized bevel gears that mesh with a smaller bevel gear on top. Since these are used only to evenly distribute the torque and there was limited access, they were not cleaned and measured for inspection. They have surface rust throughout but are in overall good condition.

M04: Gear G1

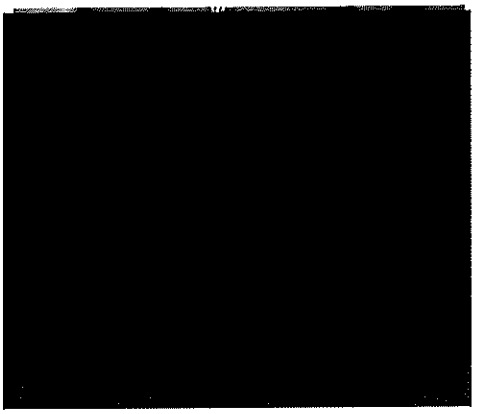
5.2.4 BM1/BM2

BM1 and BM2 comprise a miter bevel gearset for the end lift machinery. The condition of the two gears is the same. Teeth are rusted, rounded from plastic flow, and exhibit wear at their roots. There is significant wear, reducing the original tip thickness. The backlash should be approximately

0.020", but it was much higher due to the amount of wear. The significant wear allows the bevel gear set to be moved by hand. This bevel gearset can be shown in Photo M05.

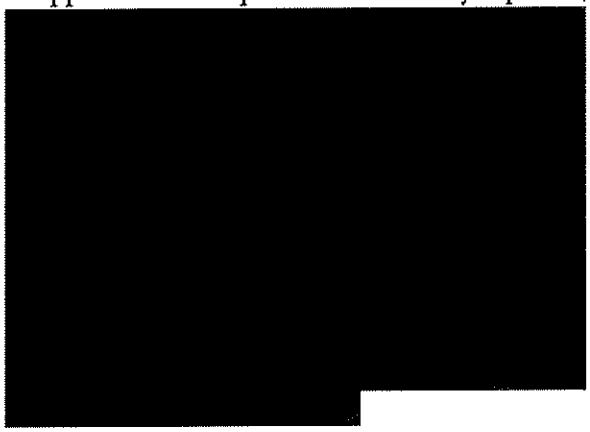
In the photo, the wear from the original tooth tip thickness can be observed. At the top of the bevel gear, the tip is much thicker than the bottom of the bevel gear.

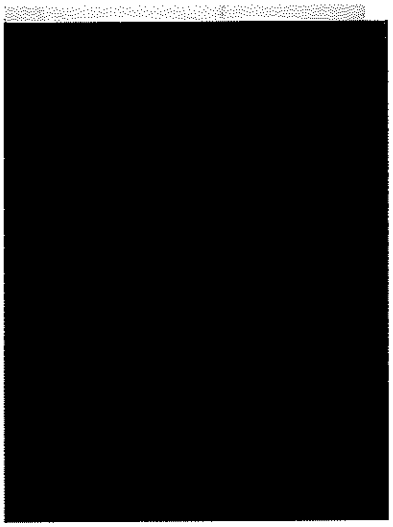
The shafting above BM1 is also severely rusted. This is shown in Photo M06.



5.2.5 P2/G2 – WEST

The west P2 and G2 gearset is in poor condition. It appears that the pinion was recently replaced;





5.2.6 P2/G2 – EAST

M07: P2 – East

5.2.7 WEST RACK AND MAIN PINION

The main pinion on the west side is in fair condition. Unlike the main pinion on the east side, the west side pinion is not shrouded. The pinion has moderate scoring and some finning. The rack on the west side is also in fair condition. There is some surface rust and, similar to the east side, there are areas of weld repairs. The west

main rack and pinion conditions are shown in Photo M09 and Photo M10.

[redacted]

M08: G2 – East

5.2.8 EAST RACK AND MAIN PINION

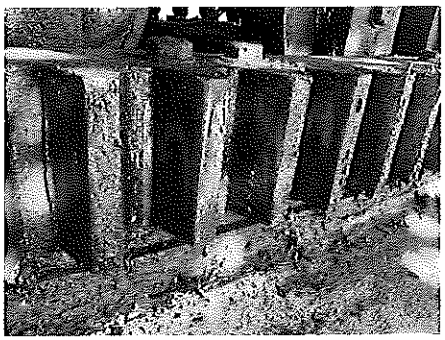
The east rack and pinion were replaced in 1994. The main pinion is a shrouded gear. It exhibits finning and moderate to severe scoring at the pitch line. It appears that the pinion is top bearing. The rack has light scoring, finning, light surface rust. It exhibits plastic flow only at the top half of the tooth and it appears to be bearing only on the bottom half of the tooth. Sample teeth were cleaned for the east side main rack and pinion are shown in Photo M12 and Photo M13.

[redacted]

M09: Main Pinion – West

5.2.9 P3/G3

P3 and G3 are used for the end lift machinery. Both P3 and G3 exhibited rust throughout the entire tooth when cleaned. P3 has moderate scoring at the tip of the teeth. G3's scoring is light with some moderate scoring. P3 and G3 are shown in Photo M15 and Photo M16.

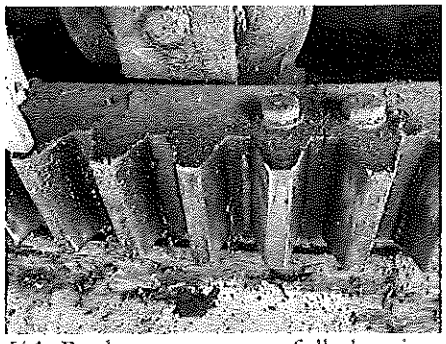


M10: Main Rack – West Side

5.2.10 P4/G4

P4 and G4 are part of the end lift machinery. They are rusted and the tips of the teeth are rounded and chipped off. They have heavy scoring, finning, and plastic flow at the tips. Plastic flow is across the entire face of G4. There is plastic deformation from contamination. P4 and G4 are seen in Photo M17 and Photo M18.

[redacted]

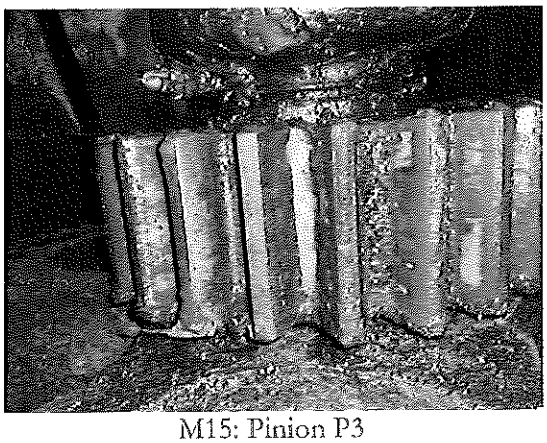


M11: Rack segments not fully bearing

M12: East Main Pinion

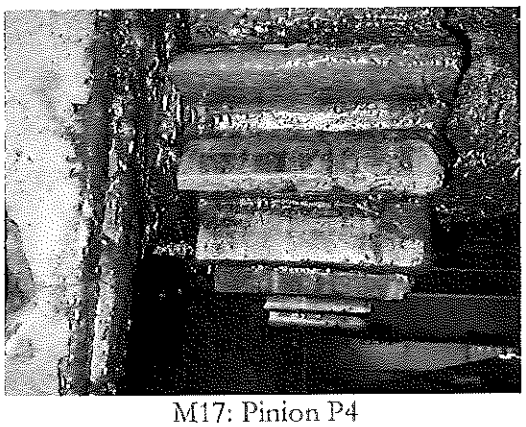
M13: Main Rack – East

M14: Glass between rack and pinion

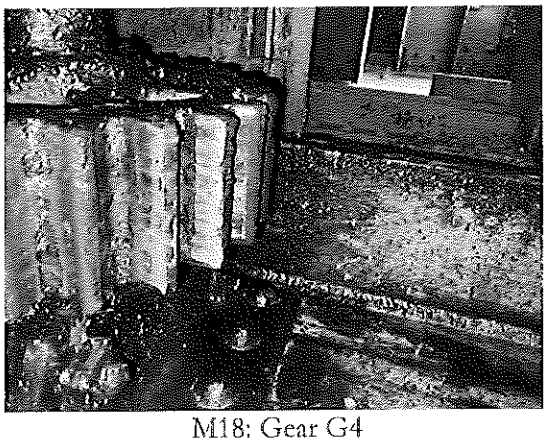


M15: Pinion P3

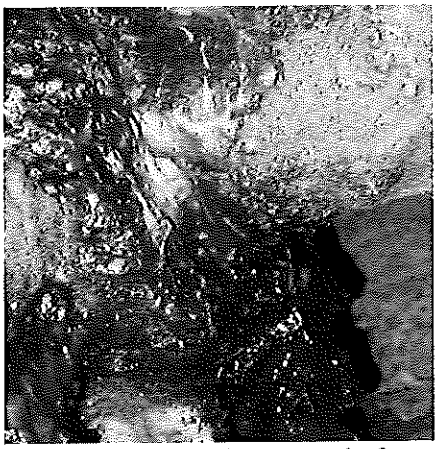
M16: Gear G3



M17: Pinion P4



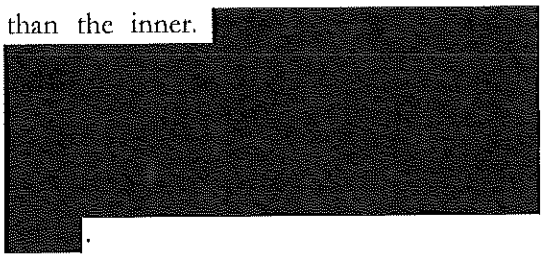
M18: Gear G4

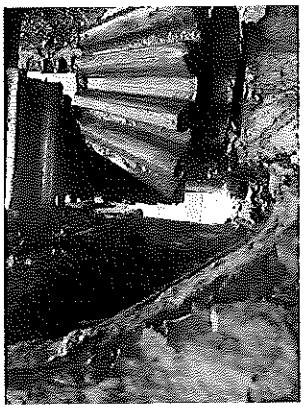


M19: Gear G4 loose on shaft

5.2.11 BP1/BG1 – EAST

BP1 on the east has finning and plastic flow/deformation. The cleaned tooth of BG1 also appears to be indented where it is in contact with the bevel gear BP1. There is also surface rust throughout. BG1's teeth are rounded due to plastic flow. The gear teeth are rusted and there is heavy scoring. The gear is heel bearing, meaning that the ends of the teeth at the outer diameter are more worn than the inner.

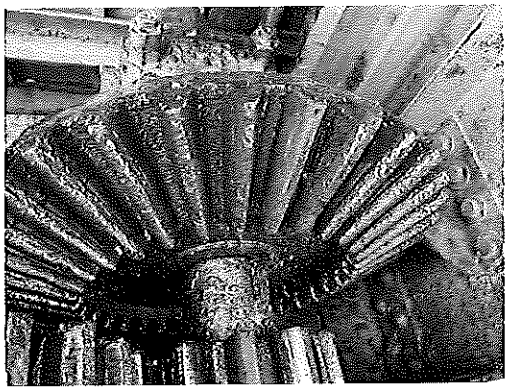




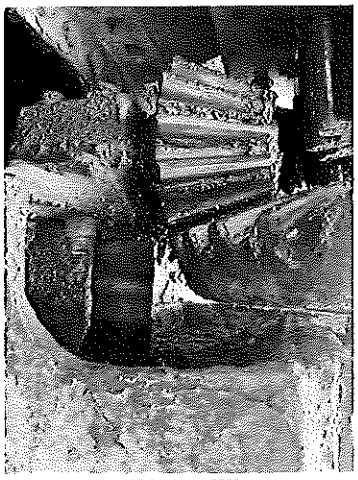
M20: BP1 – East

5.2.12 BP1/BG1 – WEST

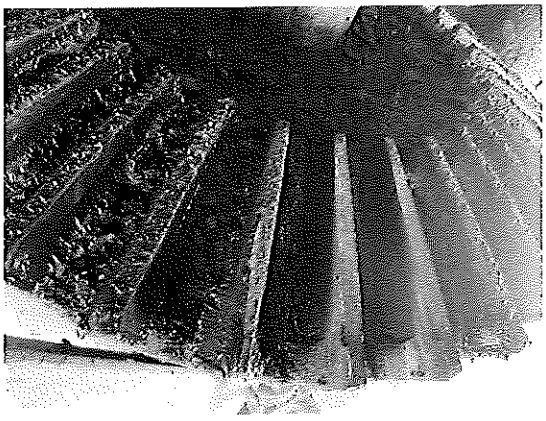
BP1 and BG1 west are in similar condition to the gears on the east side. They exhibit finning and plastic flow. There is also a similar denting on BG1 where it is in contact with BP1.



M21: BG1 – East



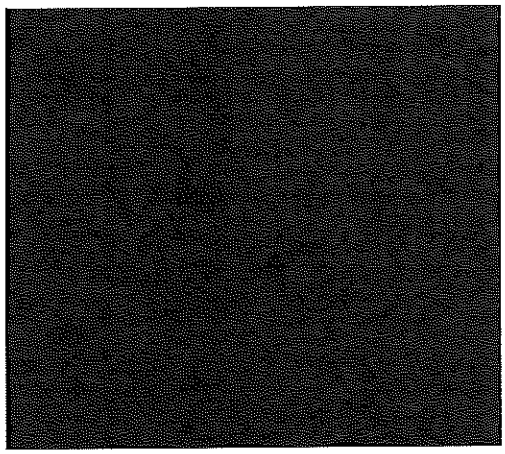
M22: BP1 – West



M23: BG1 – West

5.2.13 BP2/BG2 – EAST & WEST

BP2 and BG2 comprise the first set of bevel gears at the end lift machinery on the rest piers. The bevel gearset was not accessible for measurements. The grease looks old and hard, likely because of the lack of access to grease the gear teeth. It was also difficult to take photos close up. A general photo is shown below.



5.2.14 BP3/BG3 – EAST & WEST

BP3 and BG3 comprise the second set of bevel gears at the end lift machinery rest piers. The gear teeth are difficult to access and therefore were not cleaned and measured. The gearset on the west side appears to be misaligned as shown in Photo M25. The gearset on the east side is also severely misaligned. Photo M27 shows the shafting for BG3 –

M25: BP3/BG3 – West

5.2.15 P5/G5 – NW, SW, NE, SE

The spur gearsets P5/G5 are located at the corners of the piers on the west and east side of the bridge. A sample tooth from each gear was cleaned and measured. The grease is old and hard. The gears appeared to have paint on them when a gear tooth was cleaned for

measurement. The gear teeth have a rough finish. P5 is a shrouded gear. [redacted]

The NW gearset has the most severe battering. This type of damage to a gear is commonly seen on gears that are exposed to small gravel. The NW gearset had non-removable covers, so the gear teeth could not be inspected at the top of the gears. The NE gear cover has holes in it. The ladder interferes with the key at the NE gear (Photo M36). [redacted]. The SE pinion's contact was variable because of the movement in the shaft.

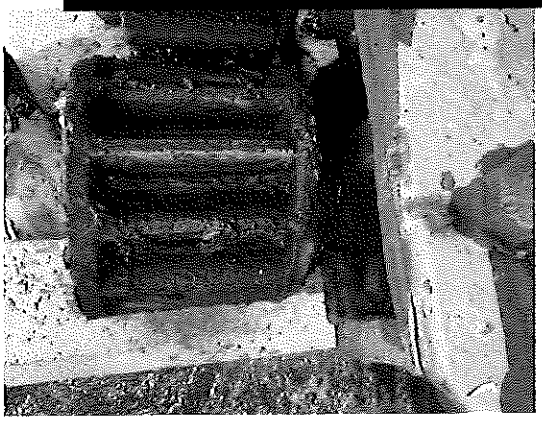
The ladder on the NE side was broken as shown in Photo M37.

The backlash for these gears was inaccessible for measurement but the NE gearset is estimated to have about a half an inch of backlash.

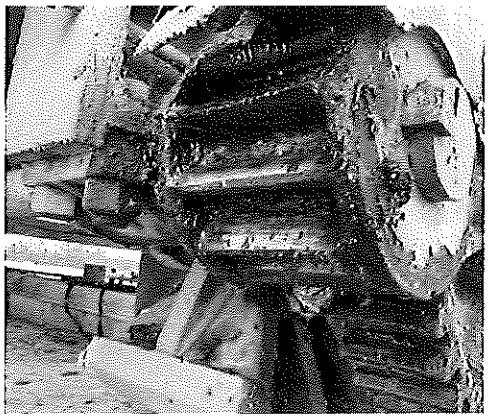
Photos of the gears are shown below:

M26: BP3/BG3 – East

M28: G5 – SW



M29: P5 – SW

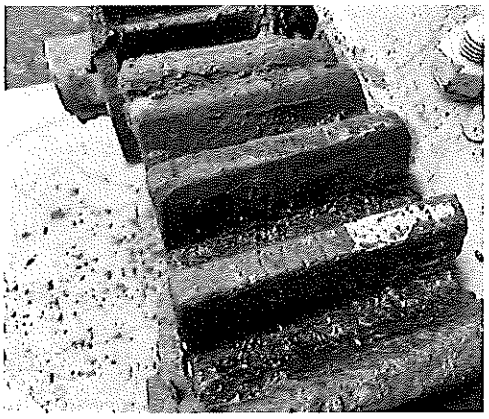


M30: G5 – NW

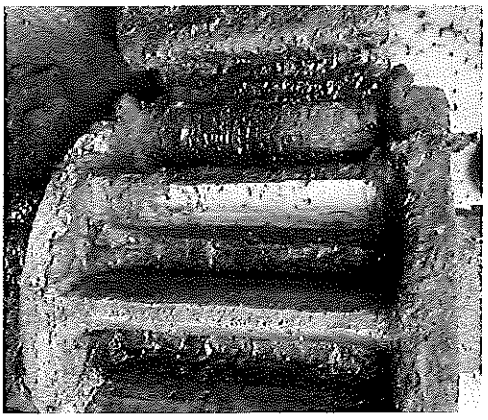
M31: G5 – NW

M32: G5 – NE

M33: P5 – NE

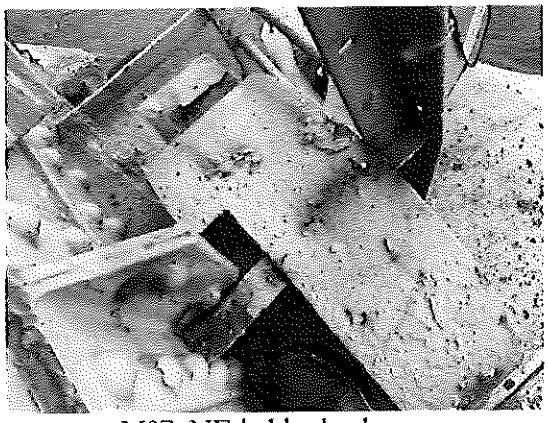


M34: G5 – SE



M35: P5 – SE

M36: NE key interfering with ladder



M37: NE ladder broken

5.3 ROLLERS

[redacted]

[redacted]

[redacted] very corroded. This is shown in Photo M38.

5.4 TRACK

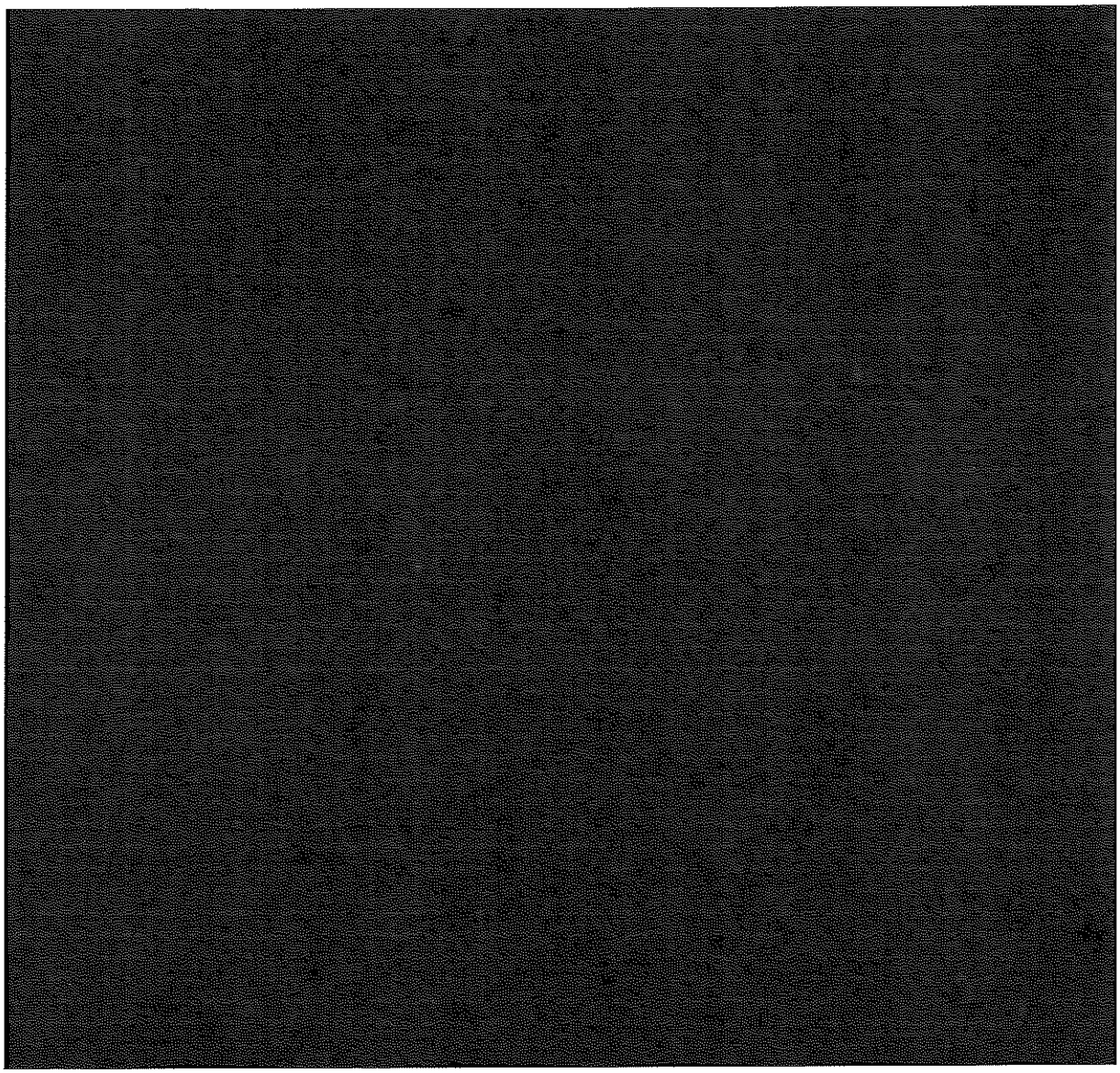
The track is in fair to poor condition. It was also replaced in 1994 with the rollers and the center pivot. There is surface rust throughout with pack rust in several areas. This is shown in Photo M42 and Photo M43.

[redacted]

The angle of the track was measured between each accessible wheel using a level. The results

[redacted]

are tabulated in a chart that can be found in **Appendix D**.



5.5 CENTER PIVOT

The center pivot was replaced in 1994. It is in fair to poor condition. The steel has surface rust and peeled paint throughout. There are some areas where the concrete under the steel had been chipped away and a cracked weld repair is visible (Photo M44).

[redacted]

[redacted]

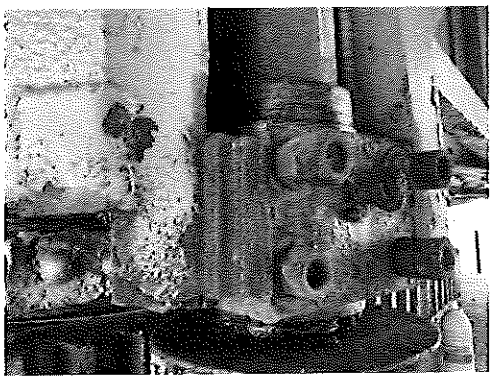
5.6 BEARINGS

The bearings for the turning machinery are located [redacted] he bearings for the end lift machinery are all located [redacted] Many of the bearings are inaccessible or clearance measurements. The bearing measurements can be found in **Appendix C.**

The bearings were well lubricated at the time of the inspection.

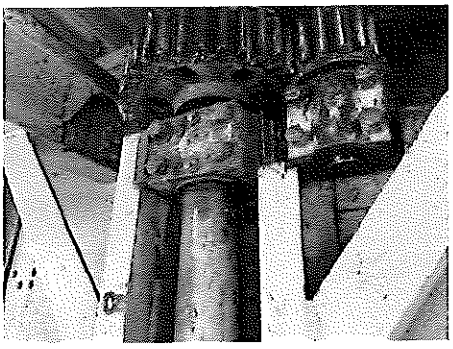
Many of the bearings located [redacted]

These are shown in Photo M47.



M46: East Bearing B10

[redacted]



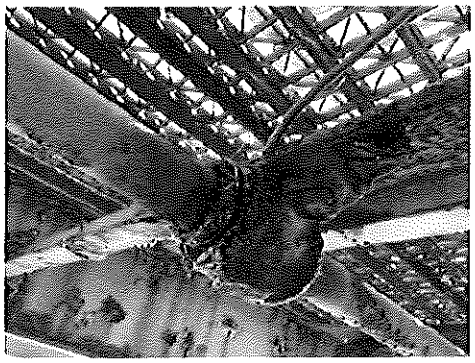
M48: East Bearing B9

The bearing located [redacted] has several weld repairs (Photo M46). [redacted]

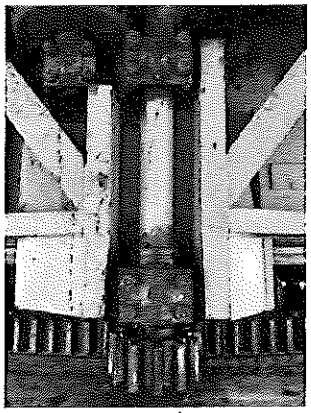
Bearing B9 is located directly above B10 (Photo M48). It has welded plates to keep the bearing in place [redacted].

Bearing B8 (located above the main pinion on the west side) is in better condition than the corresponding bearing on the east side (B10). [redacted] owever, the fasteners are very corroded. There is a significant amount of pack rust causing the threading to be about a quarter of the way through the nut on bearing B8. Bearings B7 and B8 are shown in Photo M50 below.

All end lift machinery bearing clearances were measured where accessible. Overall, the bearings are in poor to fair condition. There is pack rust between the bearings and the bearing support beams, and the fasteners are corroded. [redacted]



M49: B11 – W

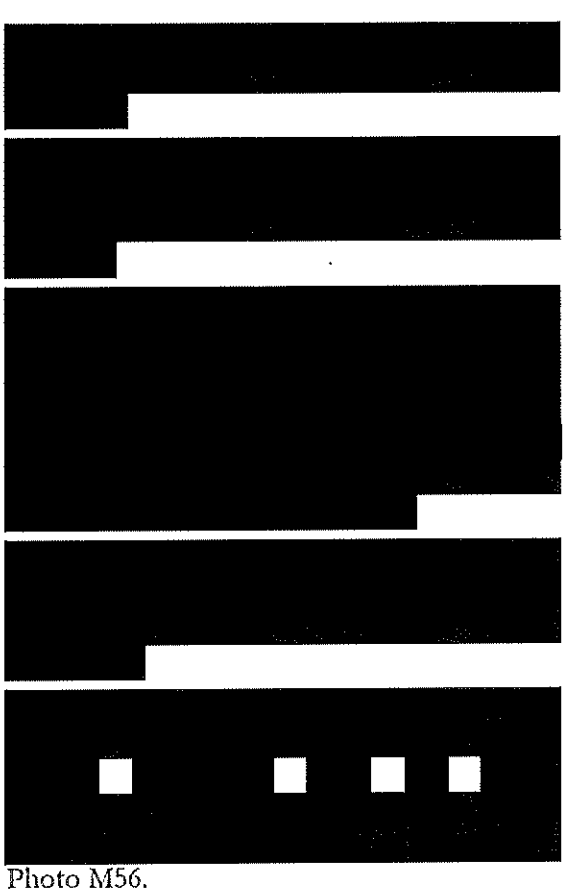


M50: West Bearing B7 & B8

5.7 SUPPORTS

[redacted]

[redacted]



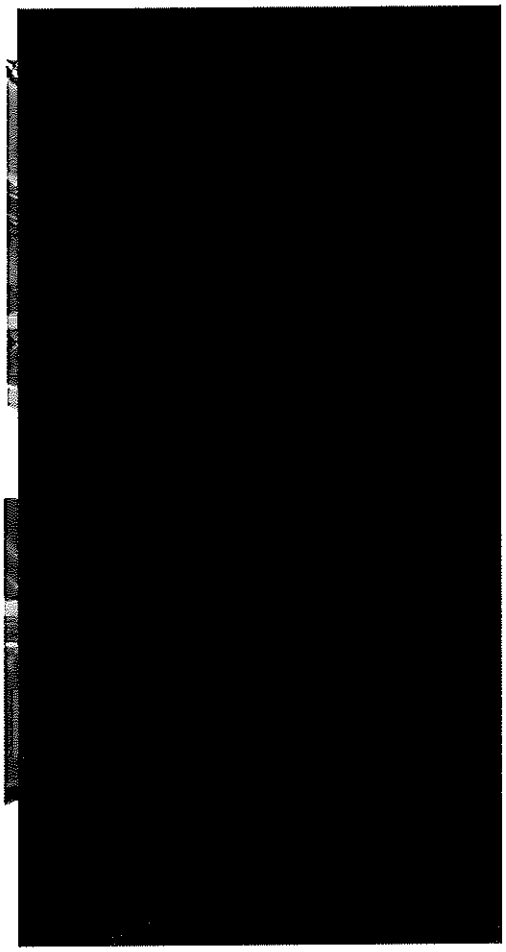
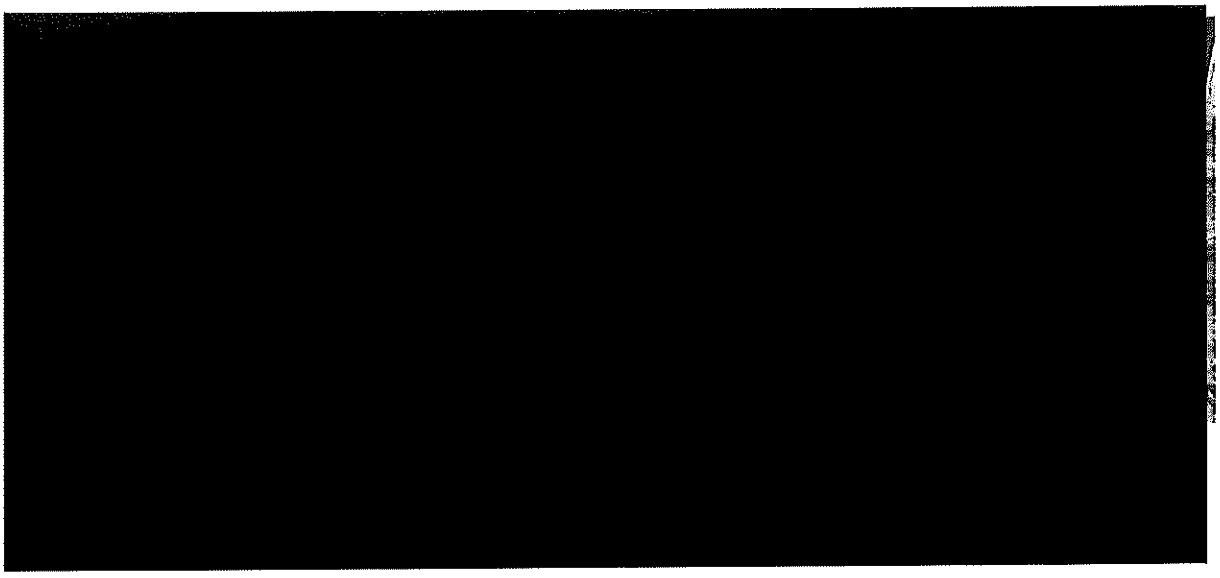


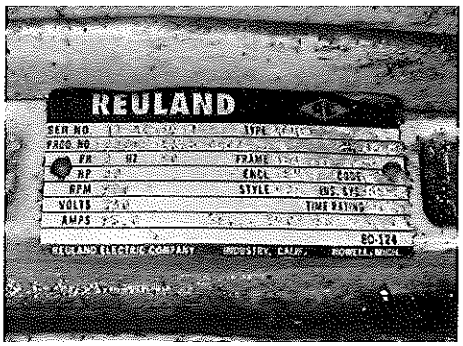
Photo M56.



[redacted]

5.8 MOTOR

The motor is a 364T, 30hp, 900 rpm electric motor. The condition of the motor is fair, [redacted] nameplate of the motor is shown in Photo M57. For more information regarding the motor's condition, refer to the electrical section of this report.



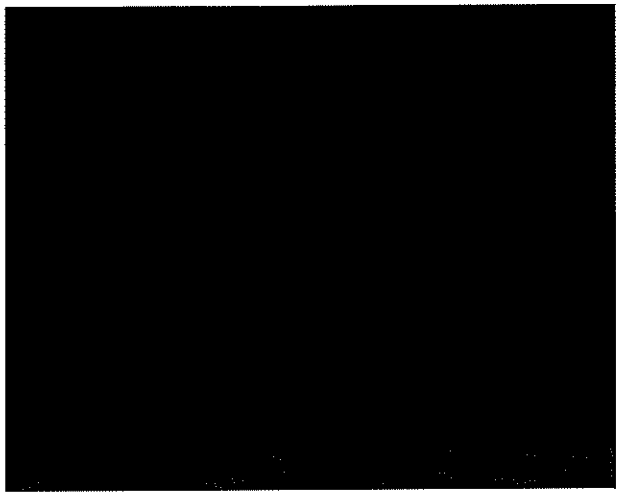
M57: Thrust Load Support

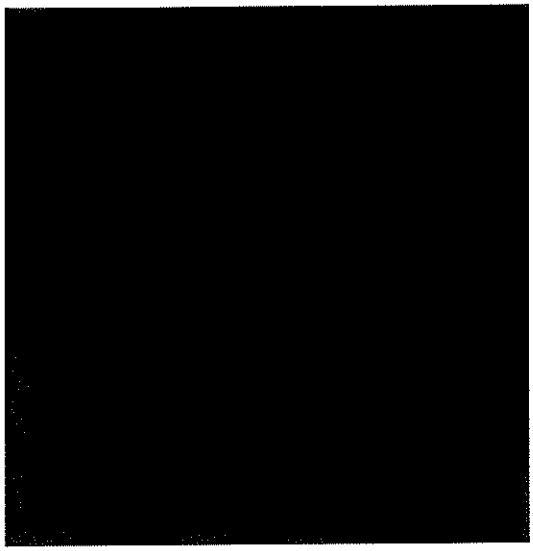
5.9 CLUTCH MECHANISM

The manual clutch mechanism consists of two fixed jaw coupling halves and two sliding jaw coupling halves [redacted] This switch from operating ti end lift machinery is made from the operator house.

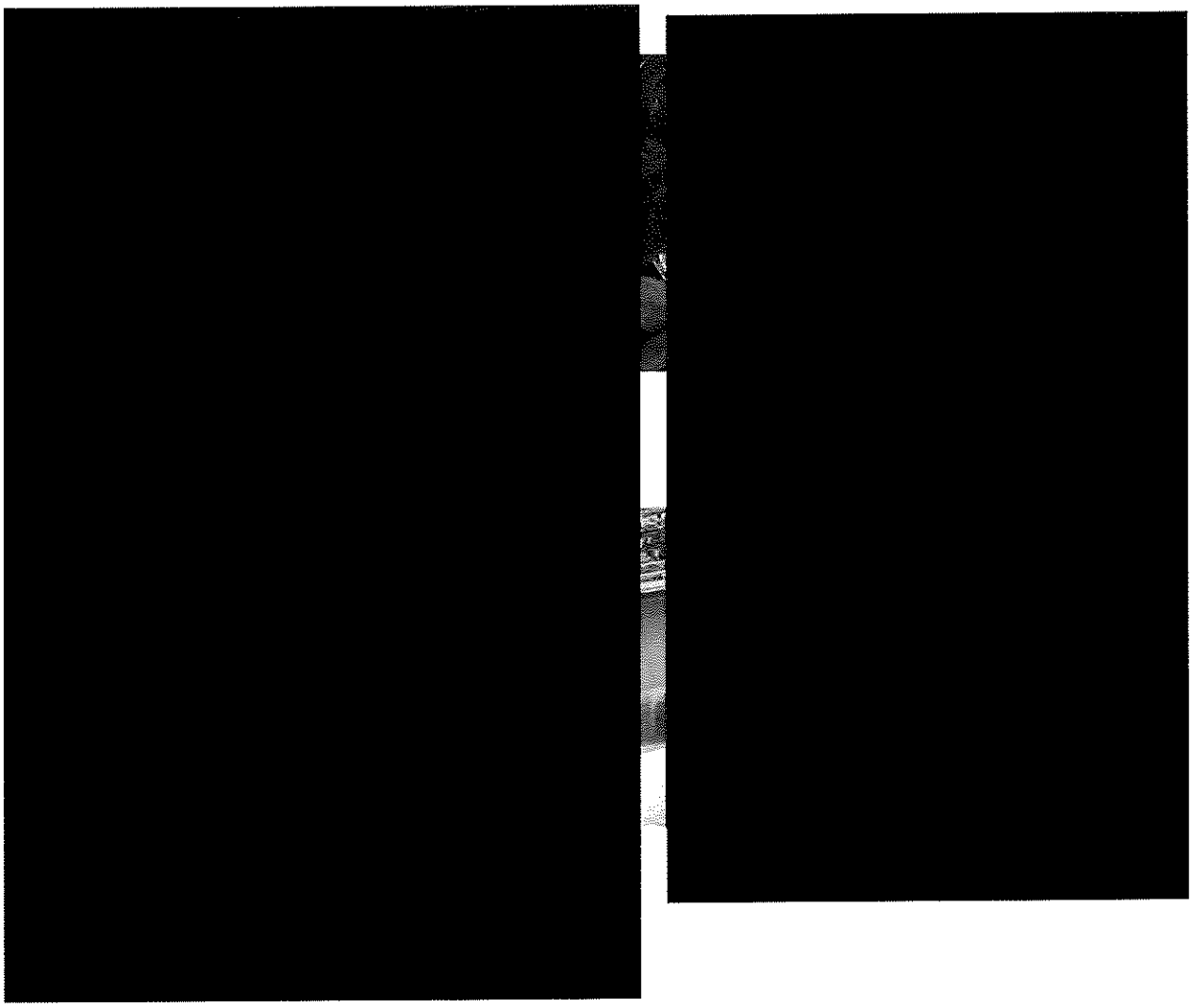
[redacted]

M59.





5.10 COUPLINGS



[redacted]

[redacted]

5.11 CENTERING DEVICE

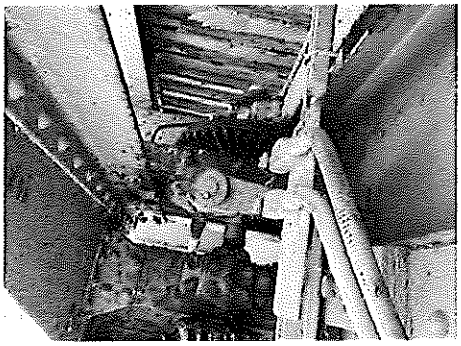
[redacted] It is shown in Photo M66. The actuator's nameplate is listed below:

Actuator Nameplate:

Model No. 6.00CC2ANLUS33AC6.500

Serial No. C1404900001B

Envelope Pressure: 250 psi Air

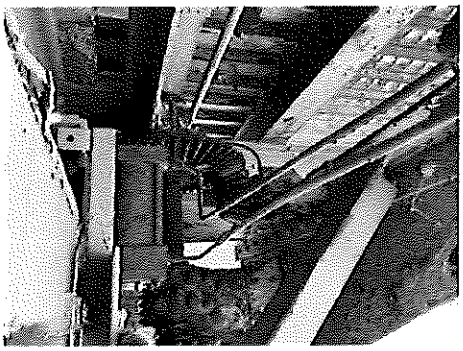


M65: Clearance at pin – West

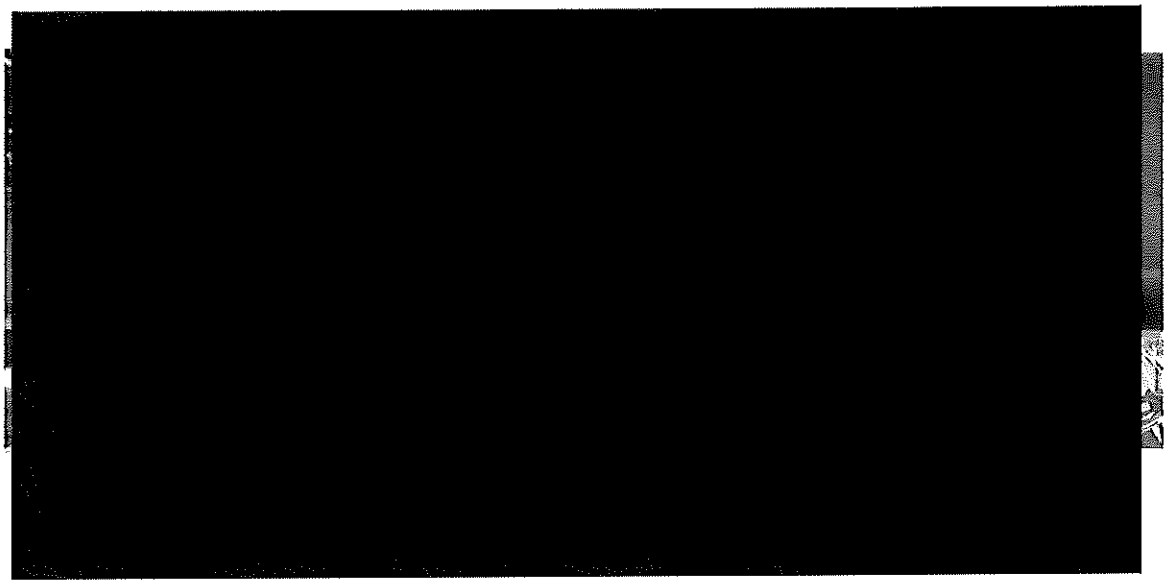
5.12 SHAFTING

The shafting was observed throughout the entire bridge. The shafting inside the machinery room is in fair condition with some areas of rust.

[redacted]

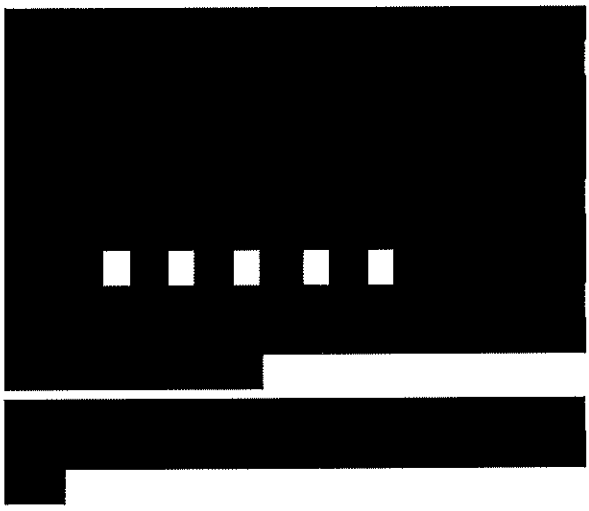


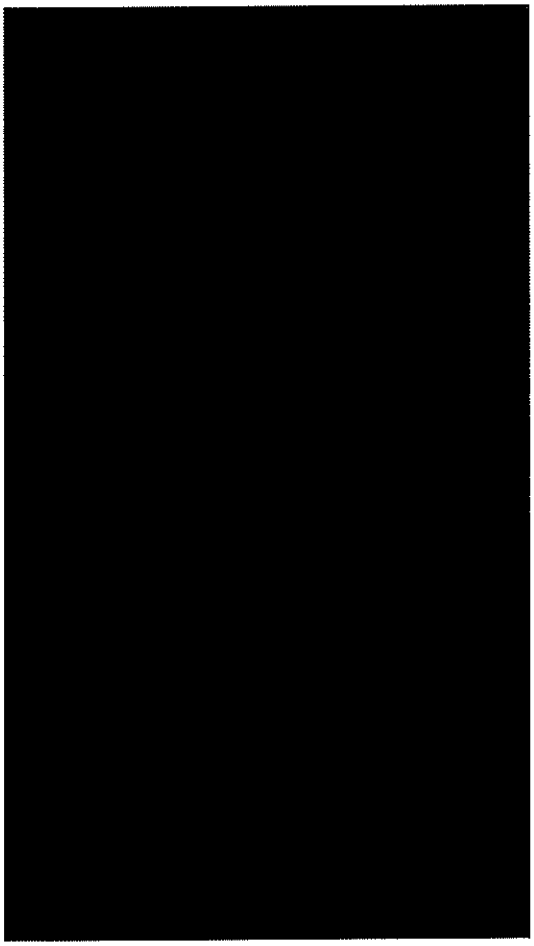
M66: Actuator – East



5.13 LINKAGES

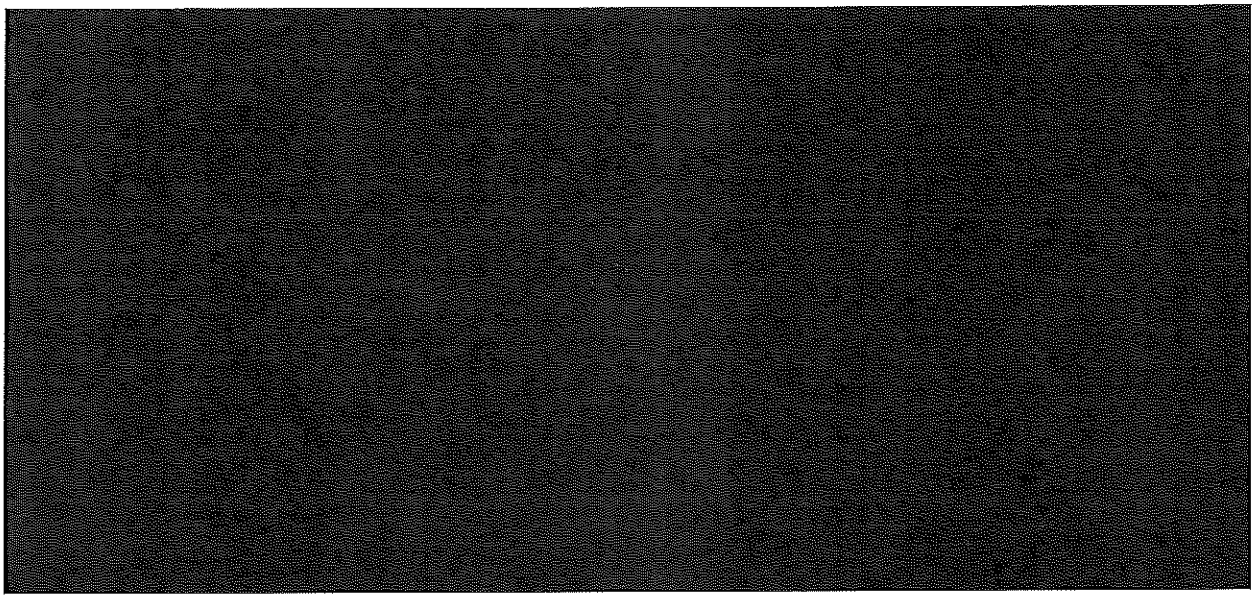
The linkages for switching from the end lift machinery to the turning machinery were inspected. The linkage assembly is located on the south side of the bridge.





5.14 GENERATOR

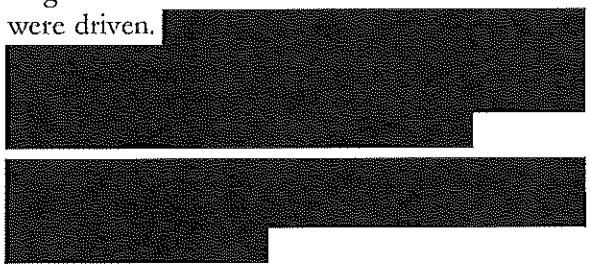
The generator was visually inspected. It is in fair condition. The brackets that connect the generator to its support are rusted.

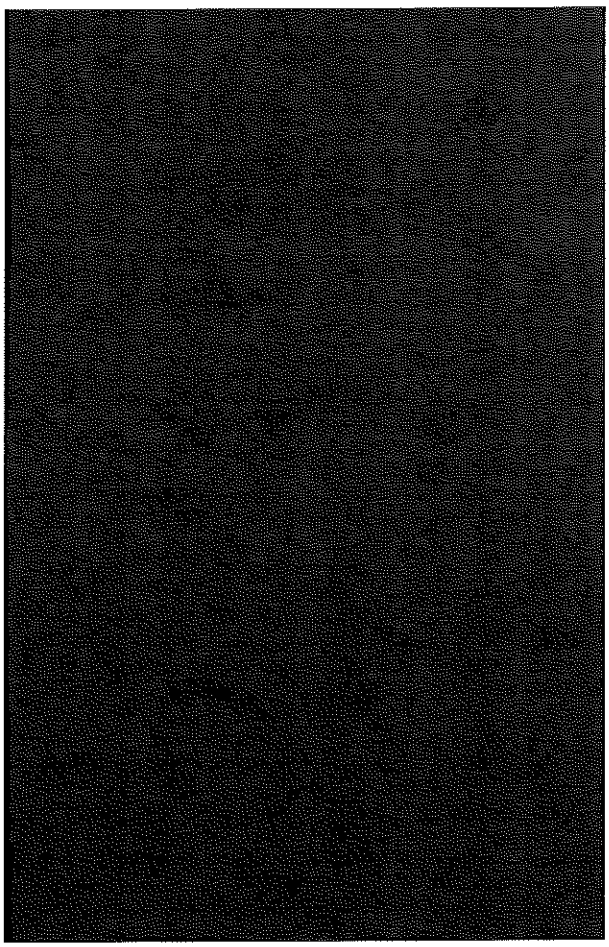


5.15 ROCKER BEARINGS

The rocker bearings were visually inspected while the b

ridge was seated, and measurements were taken during a bridge operation. The rocker bearing height was measured before and after the end lifts were driven.



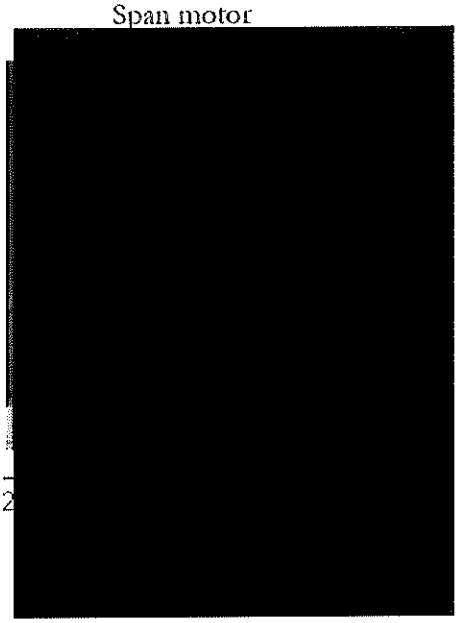


6.0 ELECTRICAL INSPECTION OBSERVATIONS

6.1 MOTORS

The main span drive motor is a Reuland Electric 30 HP, 230 VAC, 3 phase, 900 RPM synchronous, wound rotor motor in a NEMA type 364T frame (Photo E-1). Megger readings were taken from the local disconnect switch and were all greater than 550 Megaohms. A tachometer for drive feedback and a Stearns type disc brake are coupled to the rear of the motor. Disc brakes are not normally used on movable bridges due to the shock they can place on the mechanical system if braked at full speed, but it is acceptable as a holding brake if operated with the span stopped or at creep speed. The bridge is provided with an Allen Bradley 700 variable frequency drive. This style of drive allows for full speed and torque control. The drive does not fully stop the span prior to setting the motor disc brake.

Photo E-1 [Machinery Room]
Span motor

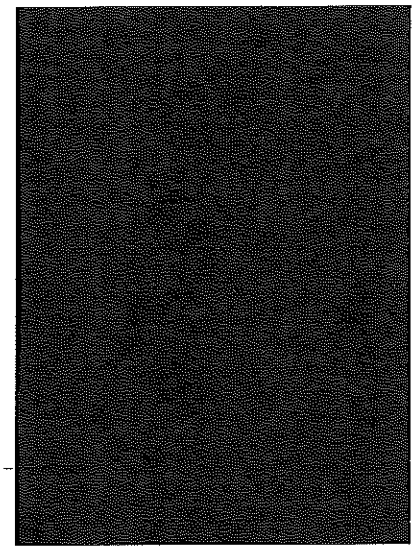


Emergency span operation is [redacted] The emergency system was not tested due to the impact of this system on traffic flow. [redacted]

6.2 POWER DISTRIBUTION

The primary power source is a three phase 240 VAC high leg delta overhead service [redacted] The meter is located close to the approach, and the feeders are carried in conduit on the fixed approach, [redacted]

disconnect switches for the machinery room heaters and a disconnect for the original tender's house heating supply. On the line side of the disconnect, a 240 volt tap is taken to feed one side of a manual transfer switch for a house power 100 Amp disconnect switch (Photo E-3). The other side of the transfer switch is from a 7.5 KVA step down transformer. The line side of this transformer runs through the submarine duct to the east approach and provides emergency single phase power for lighting and utilities, but not for bridge operation.



The exclusive use of fused disconnect switches provides no phase loss protection and while code legal, these multiple taps are not common practice considering the availability of modern switchgear with all disconnects bolted to a common bus. Modern switchgear would be safer, more reliable and more easily maintained.

All the incoming service conductors were in good condition. The disconnect switches themselves range in condition from fair to good and are mounted on electrical framing channel racks beam clamped to the bridge framing.

There is no emergency or backup power for span operation in the event of mainland power outage. The island backup generator power is solely to operate house lighting and utilities.

All the power distribution equipment was visually inspected and was in good condition. The incoming service voltage and current was measured and recorded during operations; a graph is provided in the Appendix.

6.3 CONTROL SYSTEM

The span control system consists of an Allen Bradley SLC500 PLC connected to an Allen Bradley PowerFlex 700 adjustable frequency drive. The control console houses the PLC, and the drive is mounted in a separate enclosure. The control console appears well laid out and is of substantial construction (Photo E-4). The PLC is provided with position information from two absolute binary position optical encoders, one coupled to the original end lift mechanical indicator to provide end lift information, and one in the machinery space attached to the span and coupled to the span center pin to provide span position information. A Gemco rotary cam limit switch is provided for overtravel indication (Photo E-5). It was noted that the traffic signals and warning gates are not interlocked with the span control system in violation of AASHTO.

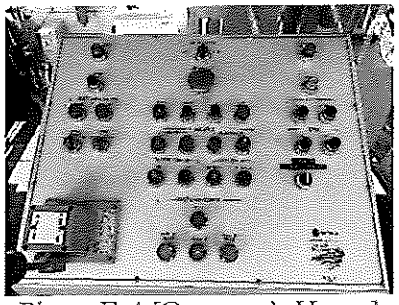


Photo E-4 [Operator's House] Main control console

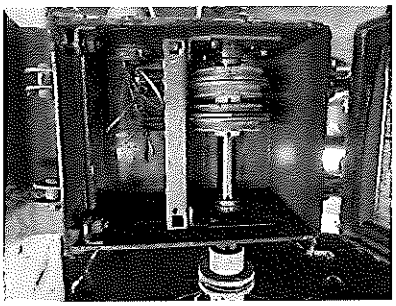


Photo E-5 [Machinery Room] Typical Gemco rotary cam limit switch

The warning gates are operated by switch stations either in the Operator's house or on the wall of the tender's house. These switches were originally connected to NEMA size 0 starters in the operator's house (Photo E-6) but are now connected directly to starters located in the warning gates. The gates have latching circuits such that once the switch is momentarily placed in the lower position, the gates will lower unless the stop button is depressed. On movable bridges, operators often must hold the gate switches in the "lower" position to keep their attention on the lowering gate and stop in the event a car was continue when closing traffic. There is a latched group raise feature, which is normal procedure with raising gates. The starters are fed through a 60-amp three pole fused disconnect on the line side of the main motor disconnect. It is wired with No. 10 AWG conductors between the disconnect and the starters; wiring by code should be No. 6 AWG. The emergency drive starters are fed from the same circuit that feeds the gate starters. Pendant control stations are mounted on the wall of the tender's house.

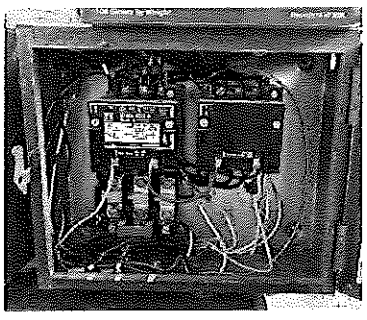


Photo E-6 [Operator's House] Typical disconnected NEMA Size 0 starter

6.4 TRAFFIC CONTROL DEVICES

The bridge is provided with stop lights and gongs. The stop lights and gongs have no individual control, instead they are actuated by limit switches in the oncoming traffic gates. This does not allow for any advance stop warning. The gongs were inoperable at the time of inspection. Typically, on movable bridges, a limit switch on the end lifts would discontinue the gong during span operations. There are also warning lights to alert motorists that there is a drawbridge. These are actuated by photocells at night and by the "slippery when wet" signal that is manually turned on at the tender's house.

Photo E-7 [Span 3] Typical stop light

The bridge is also provided with four warning gates, two on each approach. The gates are electro-mechanically operated gates, and each gate closes one lane of traffic when lowered. Each warning gate contains a 1/2-HP electric motor and limit switches for gate arm position information. None of the gates have disconnect switches, heaters or energized convenience receptacles. Obstruction lighting was provided by 12 VDC flashers powered by internal 12 VDC power supplies. All four gates have sufficient spare limit switch contacts to allow for additional interlocks to be wired in future renovation projects. The gates were operated during the inspection and are in good working condition.

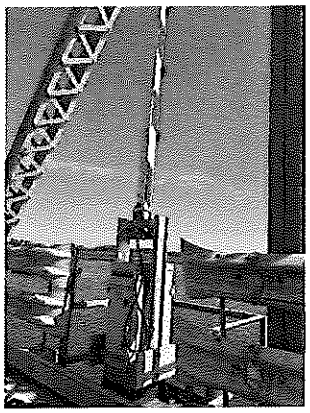


Photo E-8 [Span 3] Typical traffic gate

The gate housings are in good condition. The interiors of the housings are relatively clean.

The gate arms were manually moved to check the linkages and ball joints. The linkages were in good condition.

Resistance gates are not currently provided on the bridge approaches. AASHTO Sections 1.4.4.1 and 1.4.4.4 and MUTCD Chapter 4J required the use of resistance gates as a physical deterrent to roadway users when placed in the appropriate position.

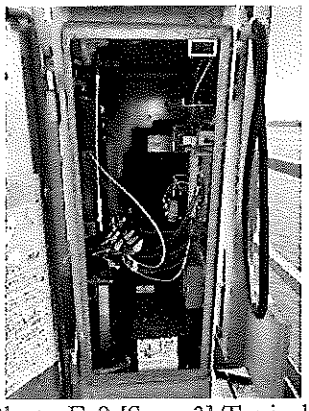


Photo E-9 [Span 3] Typical traffic gate housing

Movable bridge resistance gates are considered a design feature and not a traffic control device. When a swing span is in the open position, there is no means to prevent the entry of a vehicle to an unsafe area.

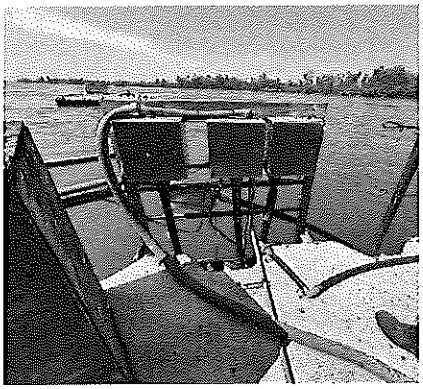


Photo E-10 [Pivot Pier] Submarine cable enclosures

6.5 SUBMARINE CABLES

The submarine cables were replaced in 1995 with submarine ducts and new wiring, which allows for ample future expansion. [redacted]

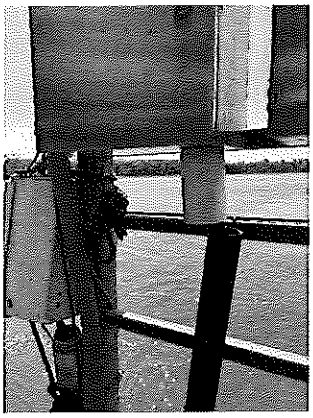


Photo E-11 [Pivot Pier] Duct cable coming loose

[redacted]

6.6 CONDUIT & CABLING

The primary conduit type used on the bridge is rigid galvanized steel (RGS) for indoor locations and PVC-coated RGS (PVC-RGS) for outdoor locations. At certain locations, liquid-tight flexible conduit is used for the final connection. The conductors consist of CHCTC, XLP, and RHW 2 cables. They appeared in fair condition.

Multiple conduit covers are missing on the movable span conduit system (Photo E-12).

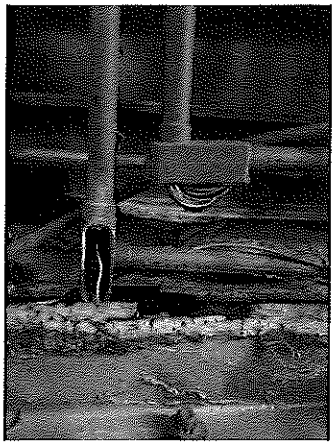


Photo E-12 [Pivot Pier] Typical conduit missing cover

6.7 HOUSE & ROADWAY LIGHTING AND CCTV

The operator's house and machinery room lighting is minimal. There are four protected industrial type fixtures in the machinery room, switched from the maintenance platform. Normally there would be an additional switch near the roadway access hatch. Lighting in the operator's house was by two overhead incandescent fixtures, switched at the doorway. The operator's house and the toll house have sufficient lighting and receptacles as necessary.

Roadway lighting is provided by overhead LED lighting, three fixtures per span (Photo E-13). Power conductors are carried in PVC conduit supported by messenger. Control for the mainland approach is by photocells tapped off the line side of the main disconnect switch. The two bridge spans have a lighting contactor in the operator's house controlled by photocell. The island side approach spans have a 12.5 KVA transformer tapping off the 240 VAC auxiliary power line. This feeds a lighting panel controlled by photocells. The island land approach has standard overhead luminaires on poles, each of which has a 120/240 VAC transformer providing power and individual photocells.

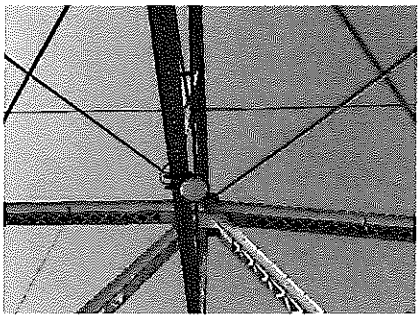


Photo E-13 [Span 3] Typical overhead LED roadway lighting

The bridge is provided with a closed-circuit camera system. Individua[redacted]

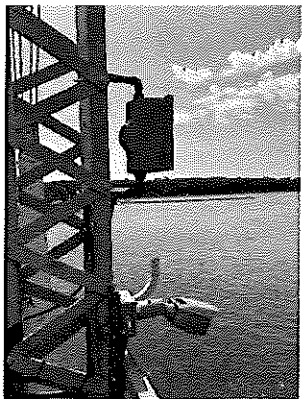


Photo E-14 [Span 2] Typical closed-circuit camera

6.8 NAVIGATION LIGHTING AND MARITIME SIGNALING

The bridge is provided with Coast Guard mandated pier and navigation lighting, as well as an air horn for maritime signaling. The pier lights are externally powered Tideland Signal polycarbonate housed pier and fender lights, while the navigation lights are dual color bronze housed fixtures. Operation of all lights was confirmed by the bridge operators. They are controlled by the photocells that operate the bridge roadway lighting. The air horn is operated by a free-standing air compressor in the operator's house. This air compressor also operates the span centering mechanism.

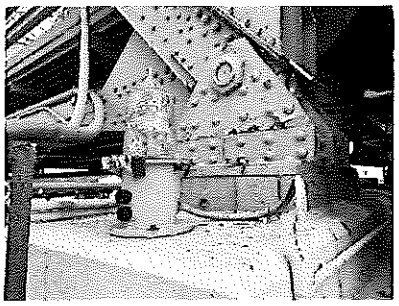


Photo E-15 [Pier 3] Typical navigation lighting

6.9 OPERATION TESTING

Several bridge openings were conducted during the inspection to record necessary measurements and conduct necessary tests. During the openings, operating current of the main motors during the entire span operation was measured and recorded. Separate measurements and recordings were made for the incoming voltage at the main Power Control Panel circuit breaker for utility service power. All graphs are provided in the Appendix.

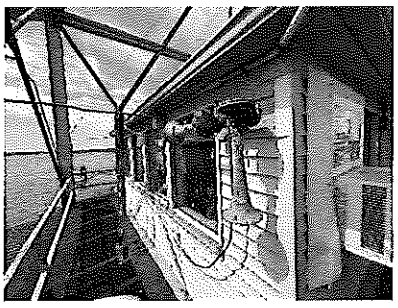


Photo E-16 [Operator's House] Air horn

7.0 RECOMMENDATIONS AND COST ESTIMATES

Structural Swing Span and Fixed Approach Spans:

Short-Term Recommendations – Repairs/rehabilitation recommendations within the next 1-4 years. The short-term recommendations will not provide a heavier live load carrying capacity of the bridge over the current restrictions.

SHORT-TERM RECOMMENDATIONS	
Work Activity	**Description**
Deck	Repair all delaminated concrete deck regions on the fixed approach spans, then apply epoxy overlay.
Joints	Replace all of the expansion joints.
Guardrails	Replace the bridge barrier guardrail along both faces of the swing span and fixed approach trusses.
Paint	Blast clean and zone paint isolated regions of structural steel.
Eyebars	[redacted]

The estimated short-term structural repair/rehabilitation cost is $3,278,000 in fiscal year 2028. See Appendix 9.4 for detailed short-term cost data.

Long-Term Recommendations – Repairs/rehabilitation recommendations within the next 10 years. The long-term recommendations will allow for an increase of the live load carrying capacity of the bridge.

LONG-TERM RECOMMENDATIONS	
Work Activity	**Description**
Deck	Replace the open grid deck on the swing span and the concrete filled grid deck on the fixed approach spans.
Paint	Paint all superstructure steel.
Eyebars	Replace remaining tension member eyebars with less severe deterioration.
Floorbeams	Repair floorbeams that exhibit section loss of greater than 10%.
Stringers	Replace all stringers.
Joists	Replace joists with holes in the flanges and cracked welds in the middle with one continuous joist in each location.
Bearings	Replace expansion bearings on the approach fixed spans.

The estimated long-term structural repair/rehabilitation cost is $19,601,000 in fiscal year 2034. See Appendix 9.4 for detailed long-term cost data. The estimated long-term structural repair/rehabilitation cost would be $16,241,000 if advanced to fiscal year 2028.

Mechanical Swing Span:

Short-Term Recommendations – Replace all mechanical machinery equipment within the next 1-4 years.

SHORT-TERM RECOMMENDATIONS	
Work Activity	**Description**

Bridge Mechanical Machinery	Replace all mechanical bridge machinery including but not limited to: Motor brake release, all gearing, bearings, bearing support beams, machinery supports, clutch, couplings, shafting, centering device, and rocker bearings.

The estimated short-term mechanical machinery equipment replacement cost is $15,000,000 in fiscal year 2028.

Electrical Swing Span:

SHORT-TERM RECOMMENDATIONS	
Work Activity	**Description**
Motors	Modify motor span control to have motor drive ramp motor to a full stop before setting motor brakes.
Control System	Remove latching lowering circuit from gate controls.
Submarine Cables	Repair detached submarine cable ducts.

The estimated short-term electrical repair/rehabilitation cost is $75,000. See Appendix 9.4 for detailed short-term cost data.

LONG-TERM RECOMMENDATIONS	
Work Activity	**Description**
Power Distribution	Provide a new 480 VAC utility source. Install a new backup generator for the control house and span operation power. Provide new power distribution switchgear.
Motors	Replace the span motors and drives. Install new span drive brakes. The end machinery, centering pin and end lifts, should be provided with independent motor assemblies to minimize machinery and maintenance. Each assembly should be provided with position instrumentation to determine if equipment is operating properly.
Control System	The SLC PLC system is obsolete and no longer supported. A new network-based PLC control system should be implemented. The new control system would be programmed to have all AASHTO compliant interlocks and bypasses. An HMI with system diagnostics should be provided to assist with troubleshooting and maintenance. The end machinery should be provided with local control cabinets with remote I/O structures and motor starters. A full control system rehabilitation would allow for a new inventory of readily available spare parts and properly documented as-builts to allow for proper troubleshooting during a failure event.
Traffic Control Devices	Install new green, amber, and red signal heads. Reconfigure the traffic gates. Install new resistance-style barrier gates.
Submarine Cables	Provide new submarine cable ducts and boxes. Install new wiring for submarine cable ducts.
Conduit & Cabling	Install a new conduit system. Provide new cabling. Install new traveling cables.
House & Roadway Lighting	Provide new house lighting. Install new roadway access lighting. Provide a new control house HVAC system.
Navigation Lighting & Marine Signals	Install new fender lights. Install new span navigation lights. Provide a new air horn.

The estimated long-term electrical repair/rehabilitation cost is $3,725,000. See Appendix 9.4 for detailed long-term cost data.

Approach Roadway Girder Bridge (GB):

Short-term repair/rehabilitation recommendations.

SHORT-TERM RECOMMENDATIONS	
Work Activity	**Description**
Deck	Full depth deck patching.
Joints	Expansion joint replacement.
Beams	Repair steel beam ends.

The estimated short-term repair/rehabilitation cost is $164,000 in fiscal year 2025. See Appendix 8.2 for detailed short-term cost data.

Long-term repair/rehabilitation recommendations.

LONG-TERM RECOMMENDATIONS	
Work Activity	**Description**
Deck & Barriers	Replace the concrete bridge deck and barriers.

The estimated long-term repair/rehabilitation cost is $396,000 in fiscal year 2034. See Appendix 8.2 for detailed long-term cost data.

Bridge Approach Roadway and Embankment (RE):

Short-term repair/rehabilitation recommendations.

SHORT-TERM RECOMMENDATIONS	
Work Activity	**Description**
Pavement	Apply pavement crack sealant.
Riprap	Add riprap in isolated locations along the approach roadway embankment.

The estimated short-term repair/rehabilitation cost is $84,000 in fiscal year 2025. See Appendix 8.4 for detailed short-term cost data.

Long-term repair/rehabilitation recommendations.

LONG-TERM RECOMMENDATIONS	
Work Activity	Description
Pavement	Mill and overlay the approach pavement.

The estimated long-term repair/rehabilitation cost is $473,000 in fiscal year 2044. See Appendix 8.4 for detailed long-term cost data.

Short-Term Repair/Rehabilitation Cost Summary (All Components):

SHORT-TERM REPAIR/REHABILITATION COSTS (1-4 Years)				
	Swing Span & Fixed Approach Spans	Approach Roadway Girder Bridge (GB)	Approach Roadway & Embankments (RE)	Toll Facilities (TF)
Structural	$ 3,278,000.00			
Mechanical	$ 15,000,000.00			
Electrical	$ 75,000.00			
		$ 164,000.00	$ 84,000.00	$ -
SUB-TOTAL	**$ 18,353,000.00**	**$ 164,000.00**	**$ 84,000.00**	**$ -**

TOTAL	**$ 18,601,000.00**

Long-Term Repair/Rehabilitation Cost Summary (All Components):

LONG-TERM REPAIR/REHABILITATION COSTS (8-10 Years)				
	Swing Span & Fixed Approach Spans	Approach Roadway Girder Bridge (GB)	Approach Roadway & Embankments (RE)	Toll Facilities (TF)
Structural	$ 19,601,000.00			
Mechanical	$ -			
Electrical	$ 3,725,000.00			
		$ 396,000.00	$ 154,000.00	$ -
SUB-TOTAL	**$ 23,326,000.00**	**$ 396,000.00**	**$ 154,000.00**	**$ -**

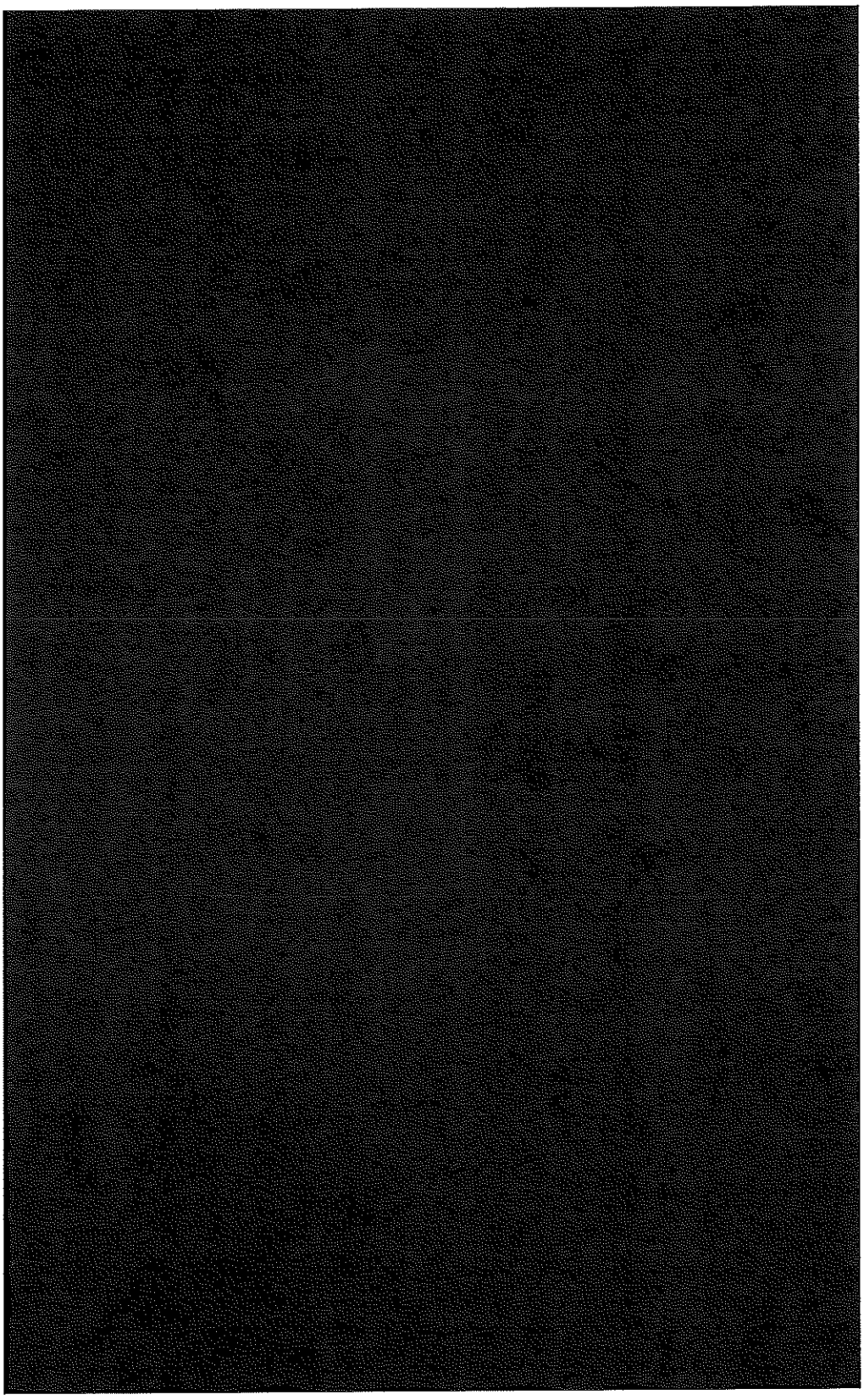
TOTAL	**$ 23,876,000.00**

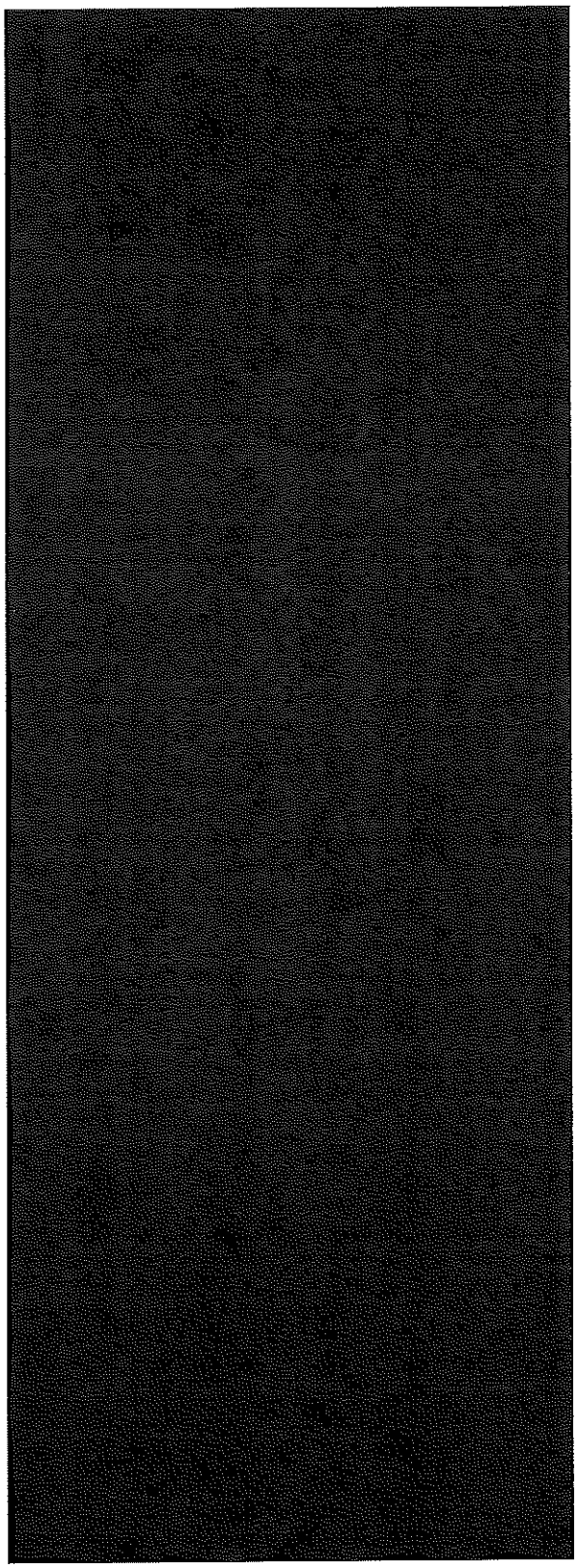
Bridge Replacement Costs:

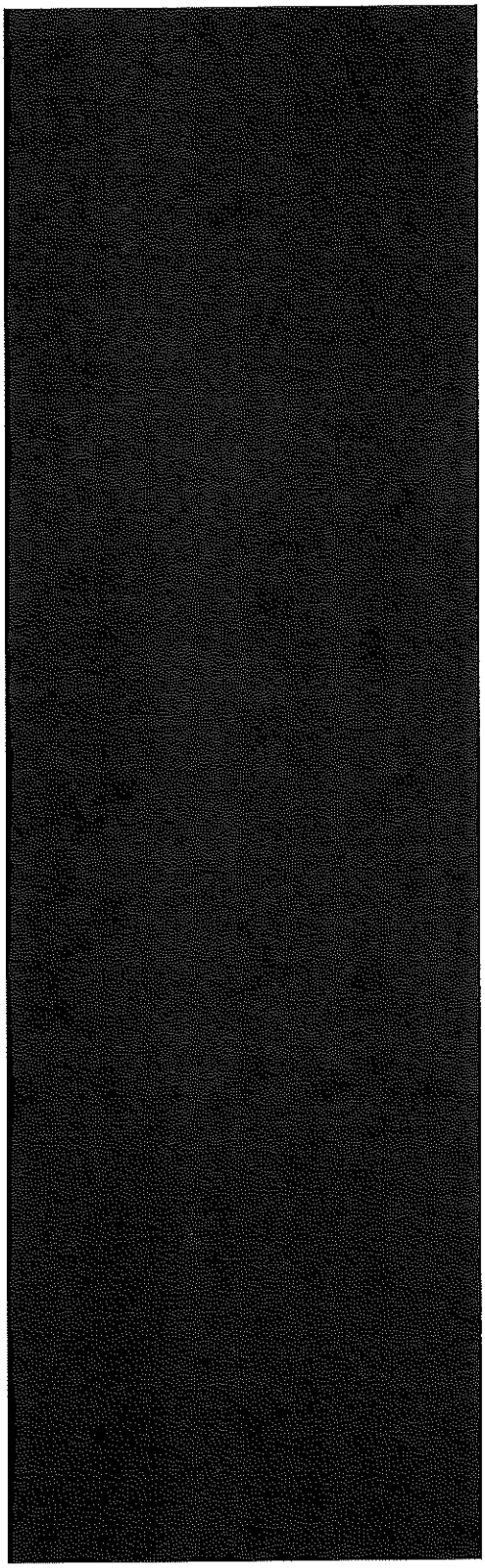
BRIDGE REPLACEMENT COSTS		
Construction Year	Swing Span & Fixed Approach Spans	Approach Roadway Girder Bridge (GB)
2028	$ 182,256,000.00	
2044		$ 1,120,000.00
2054	$ 345,657,000.00	

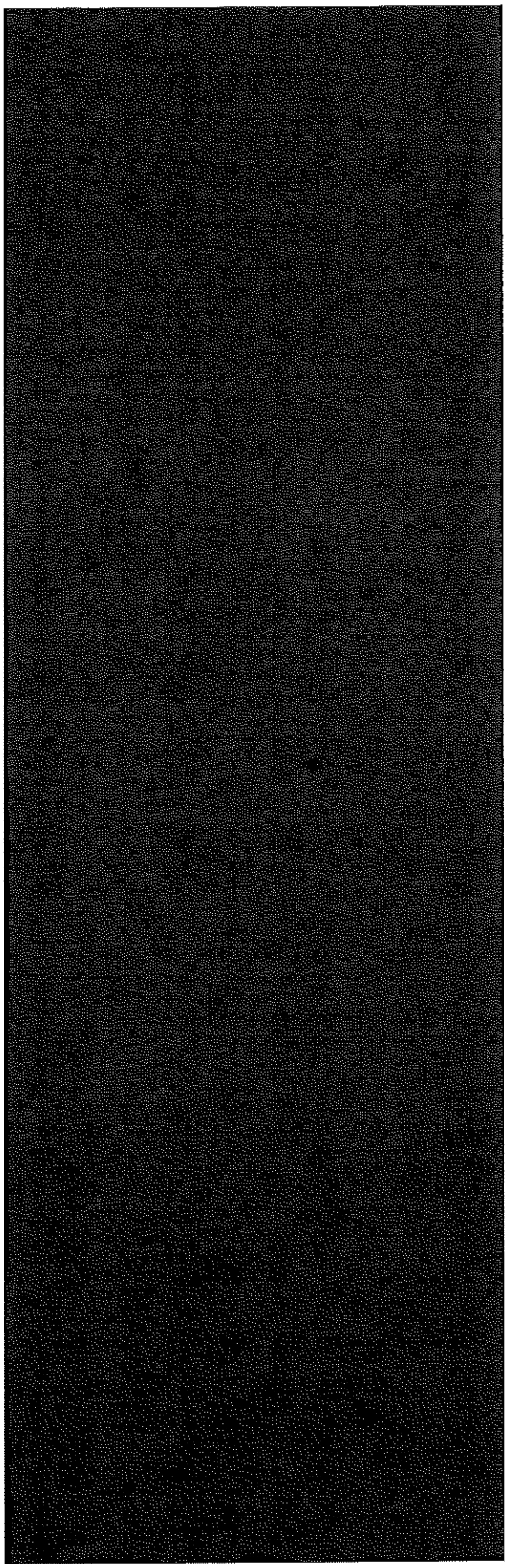
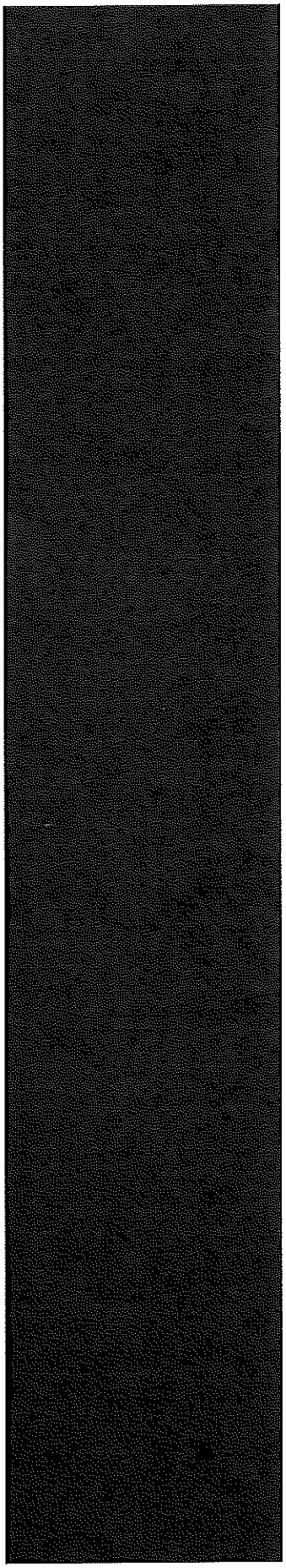
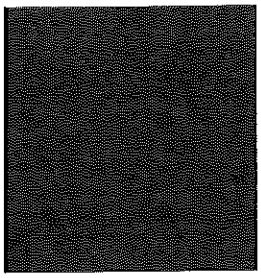
BRIDGE INSPECTION REPORT FORM

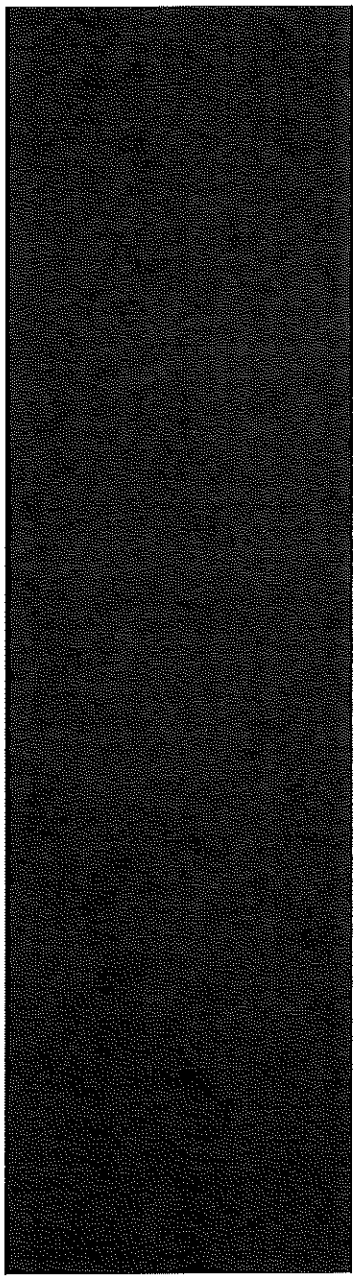
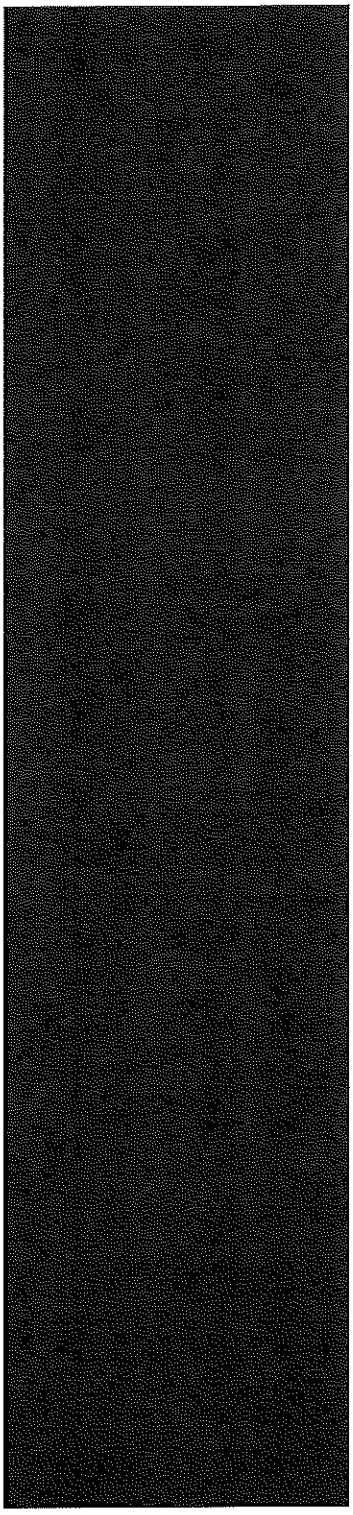
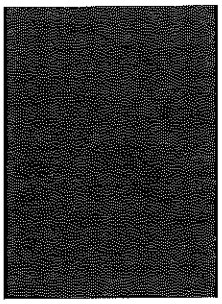
H&H

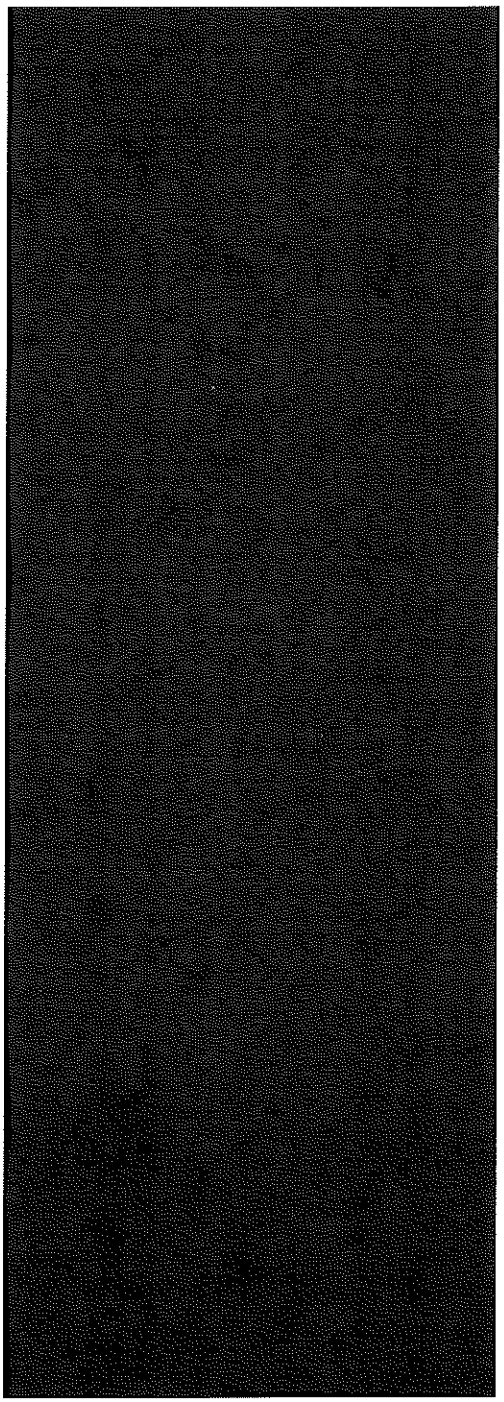


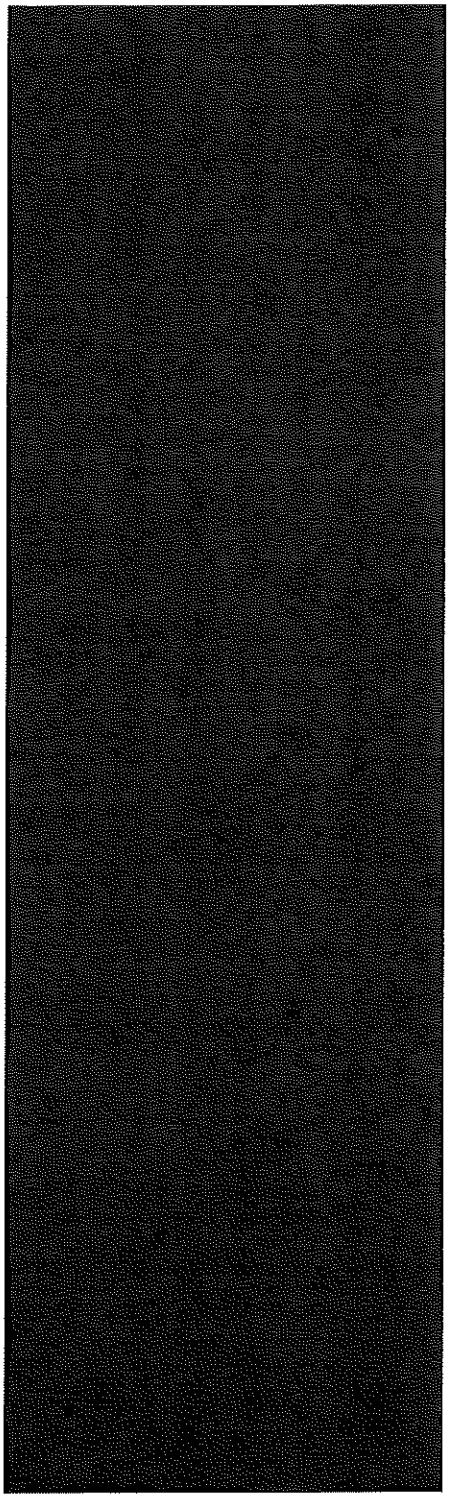


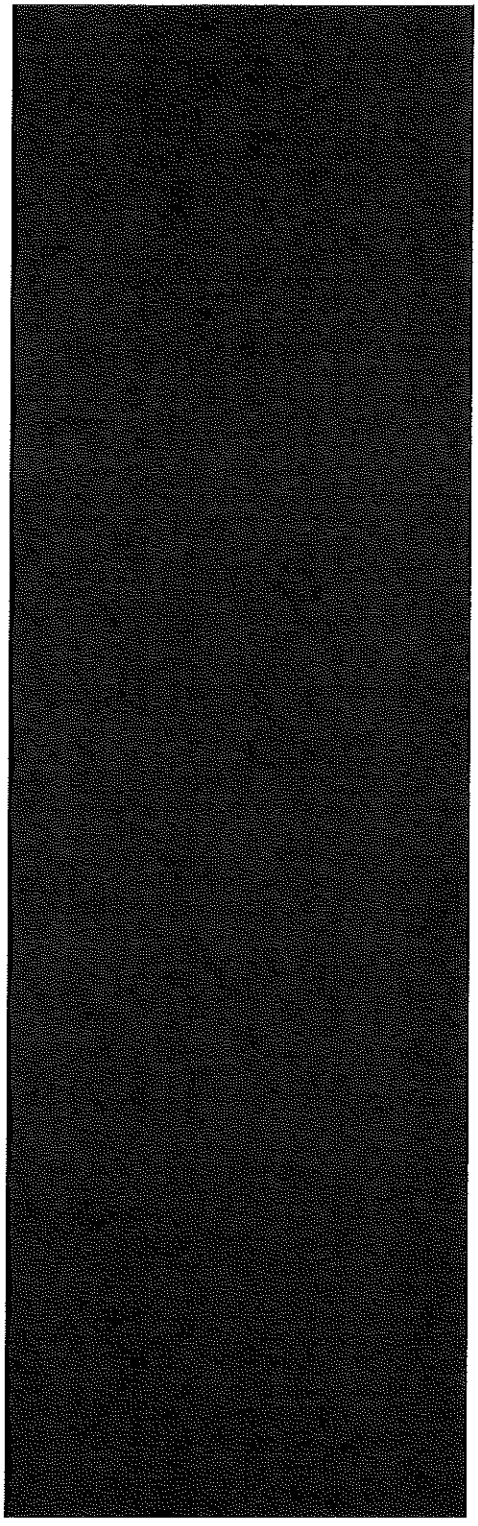


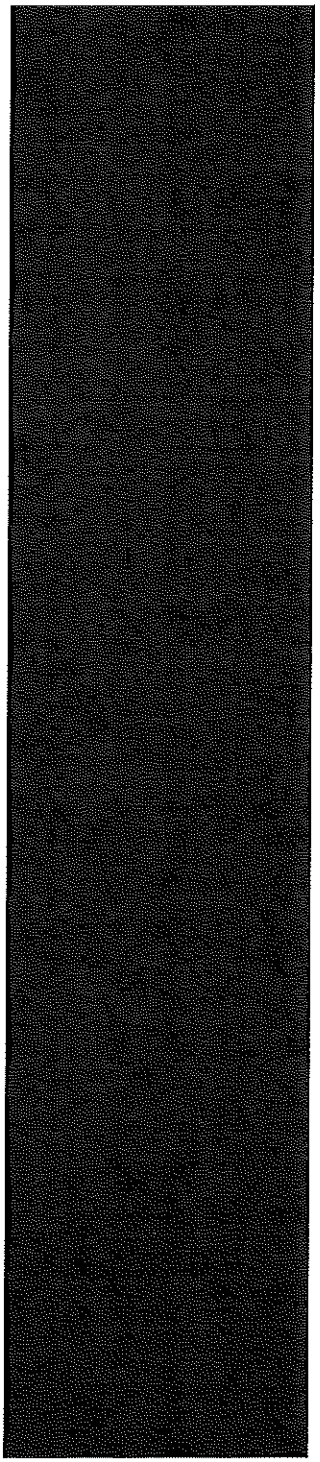




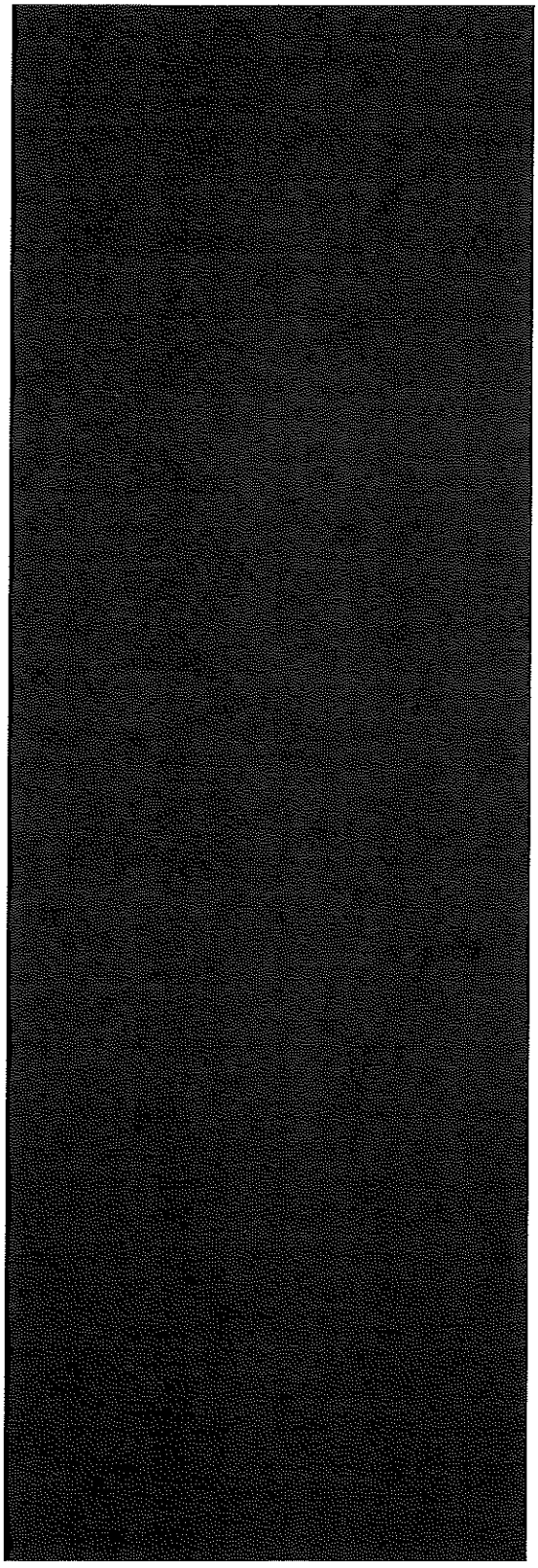




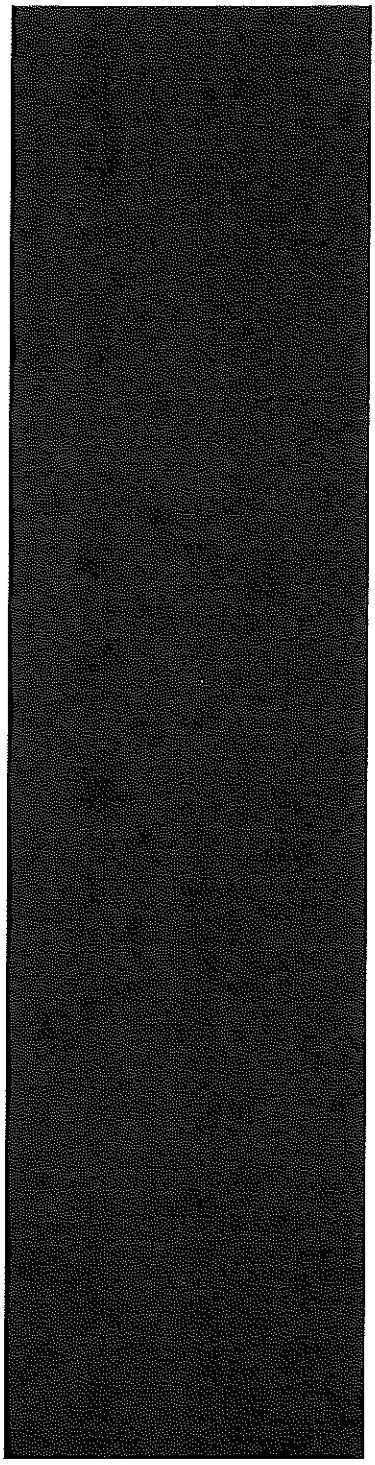


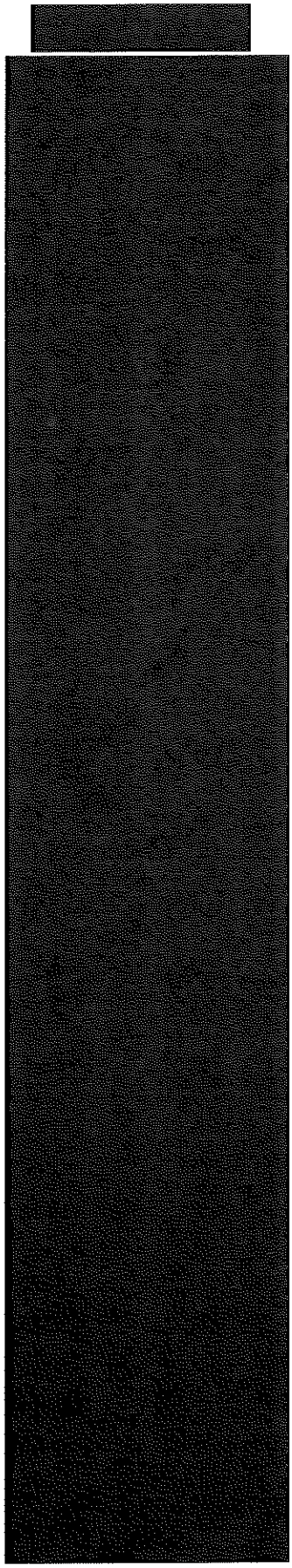


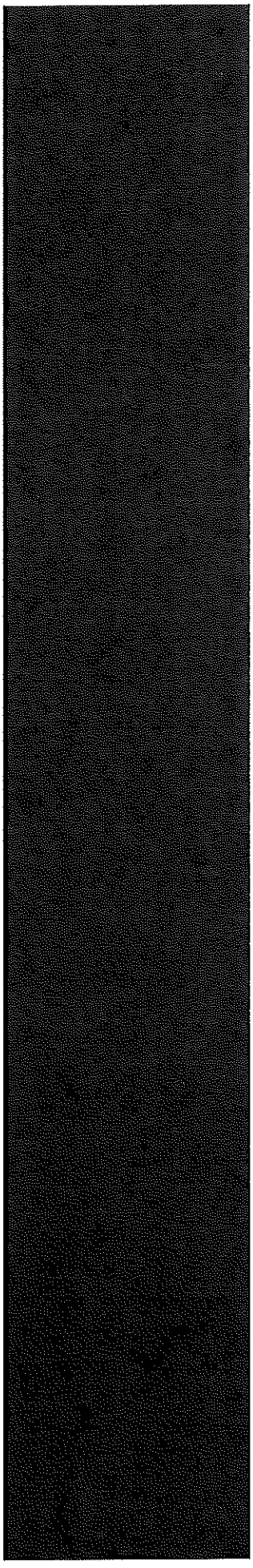


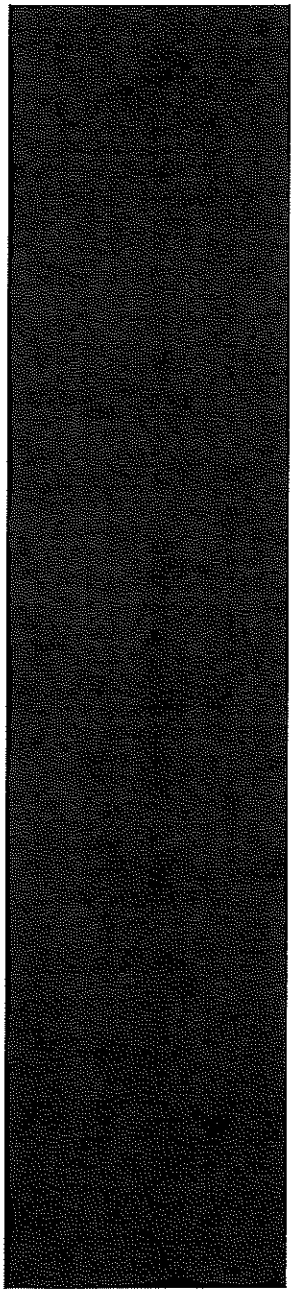


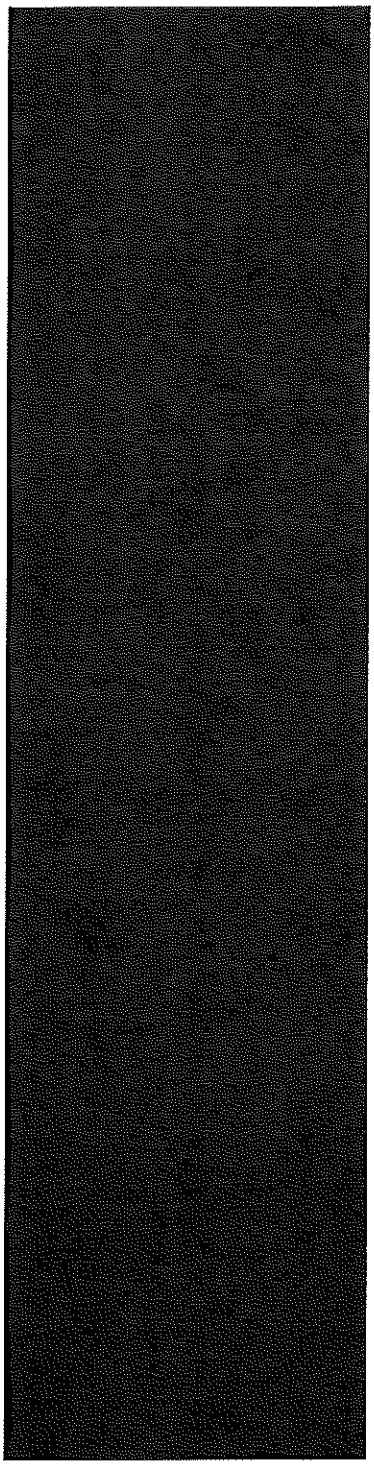


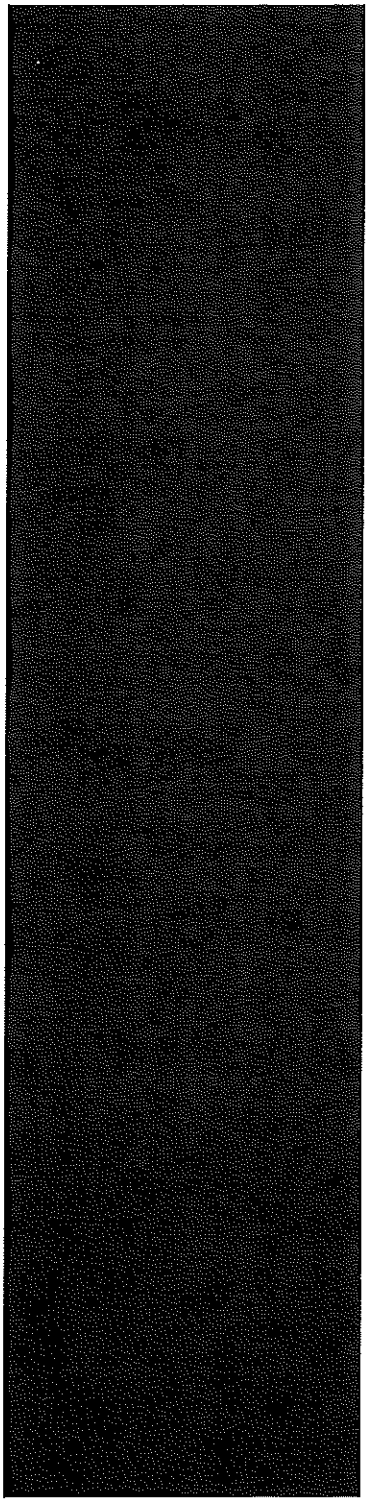


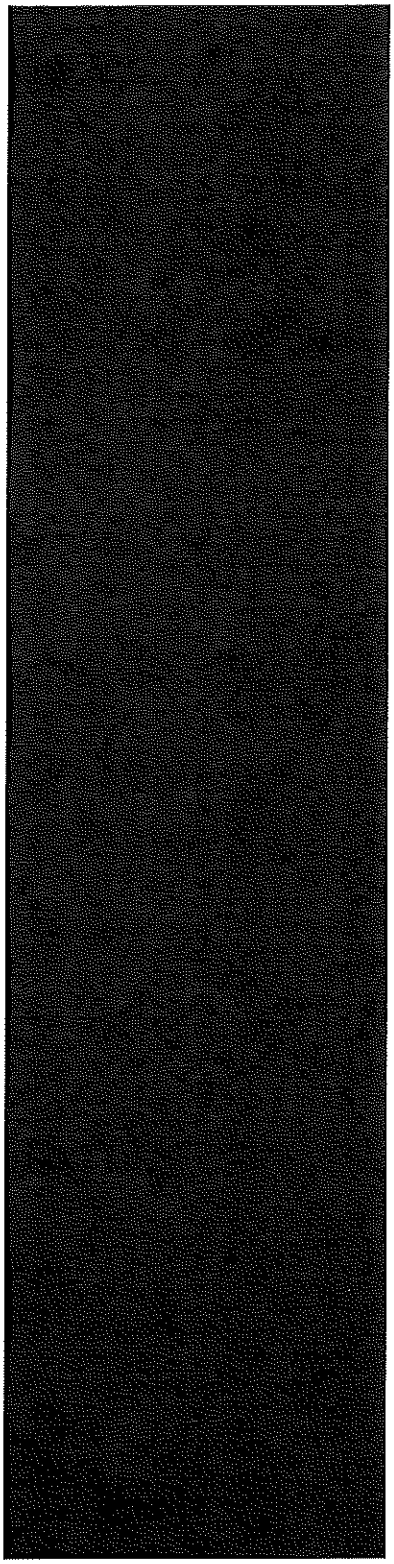


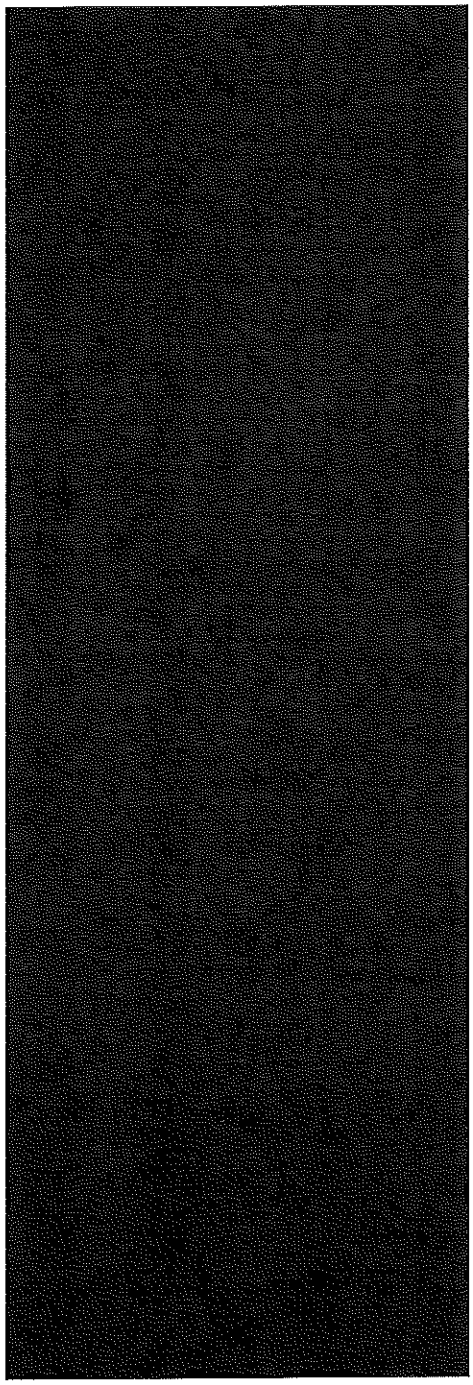
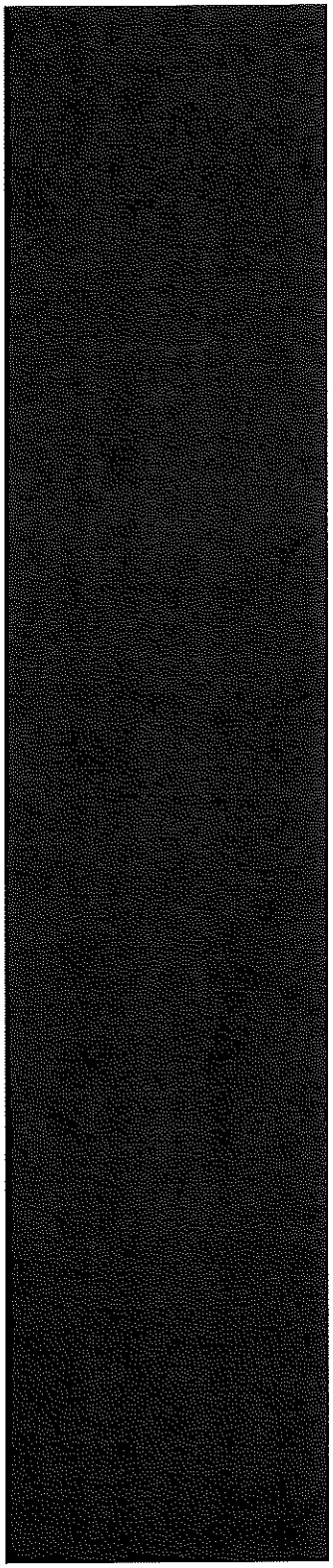
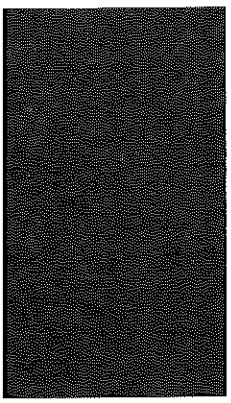


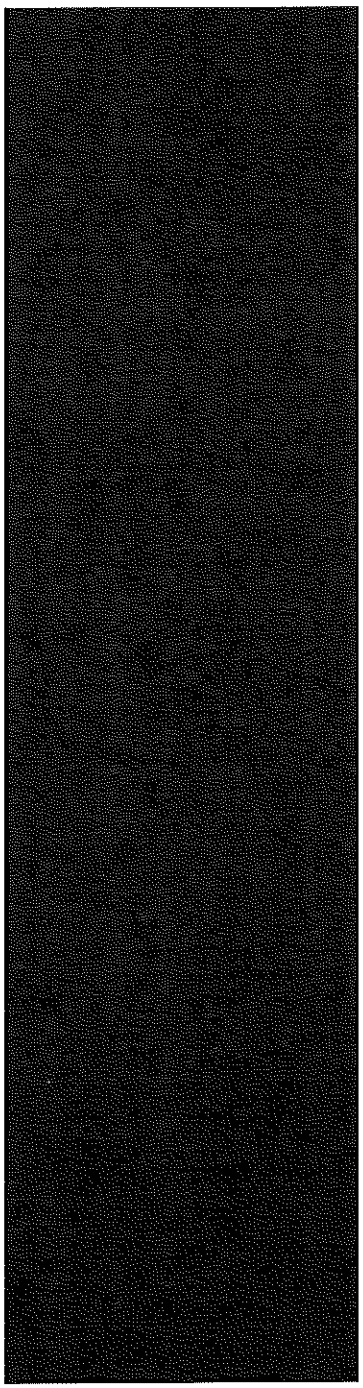
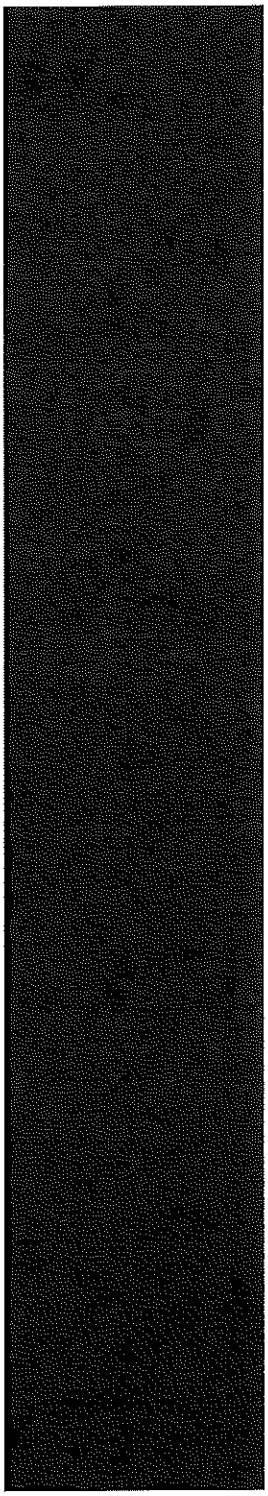
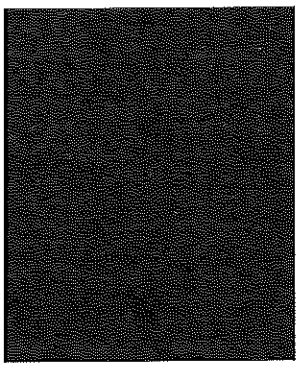


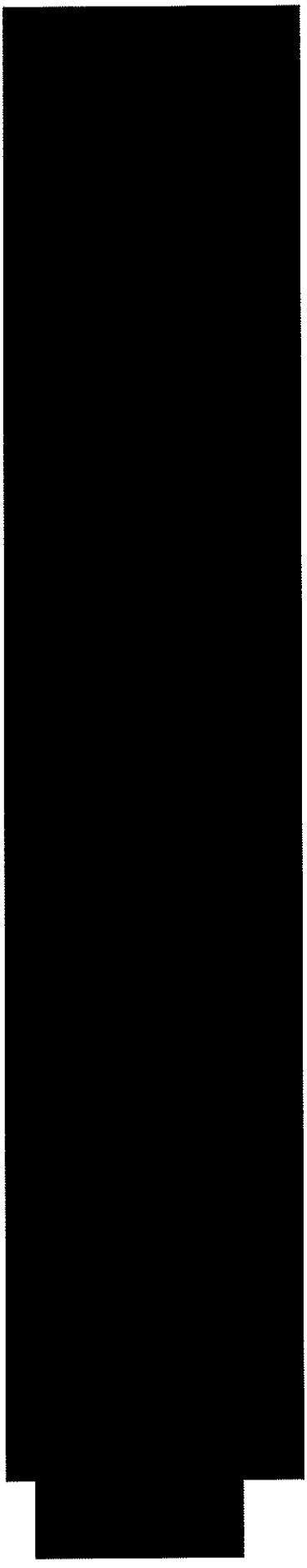


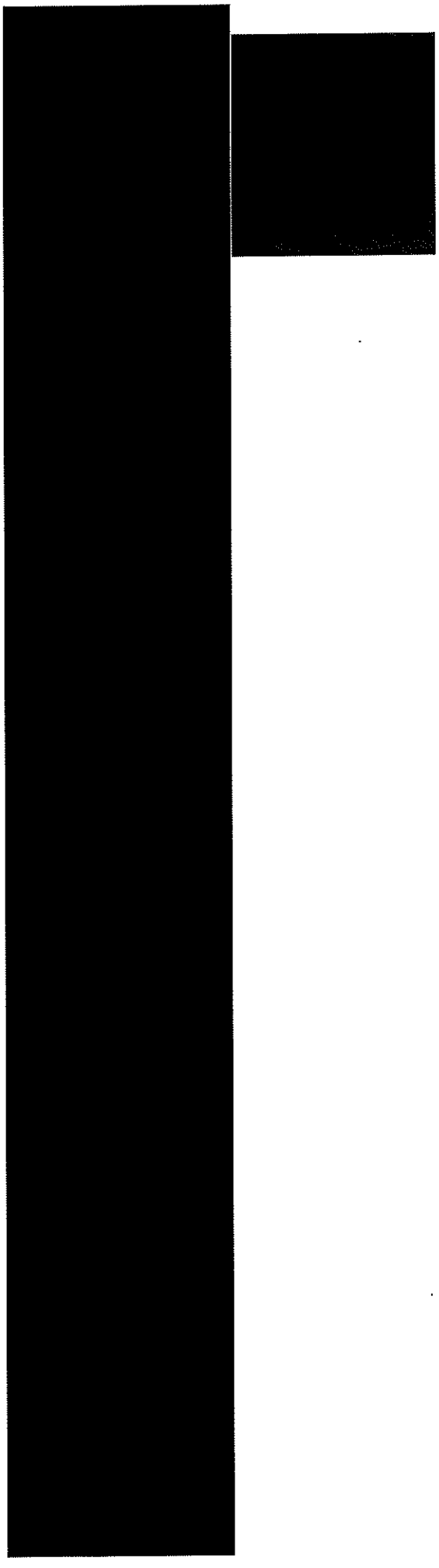


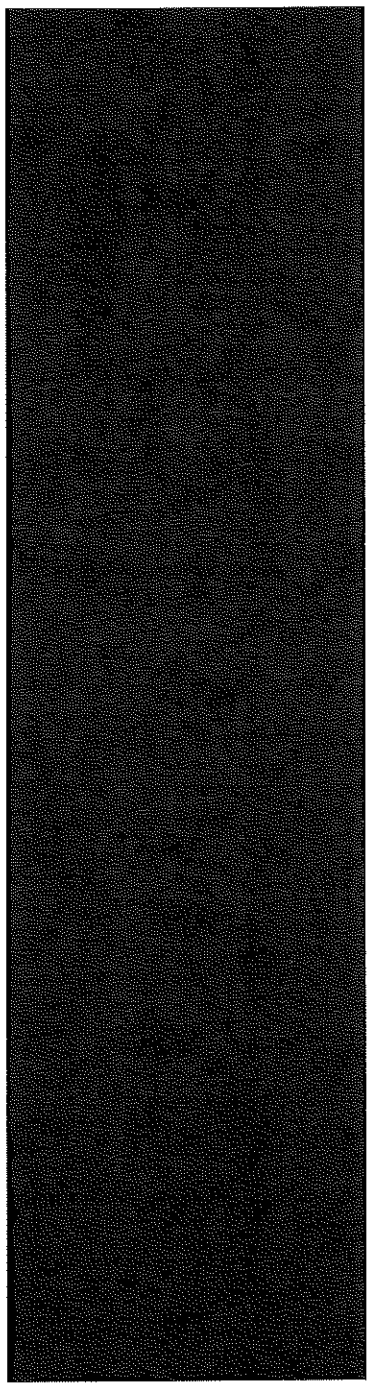
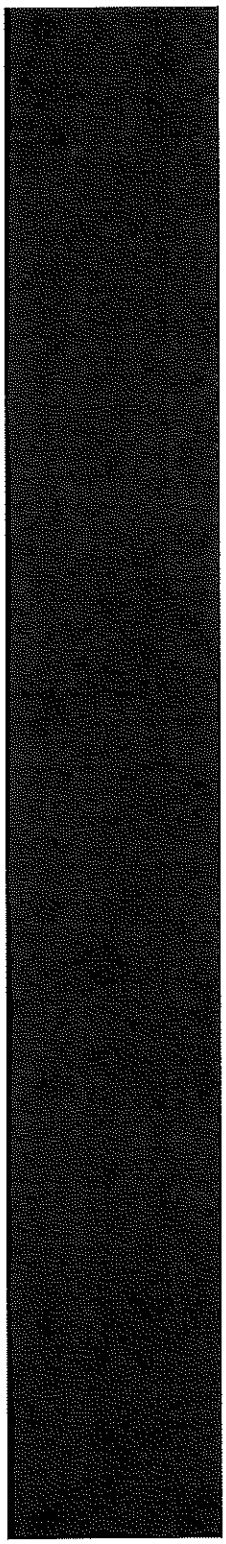
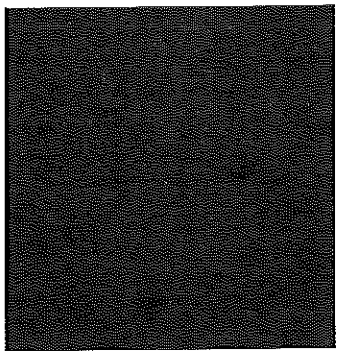


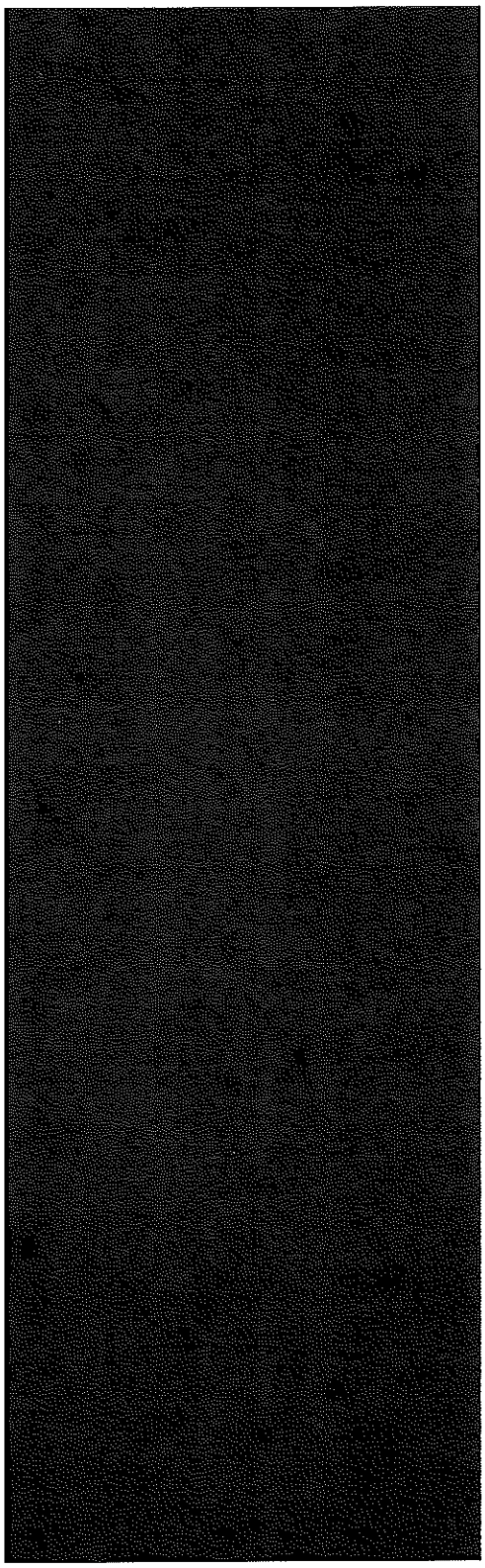




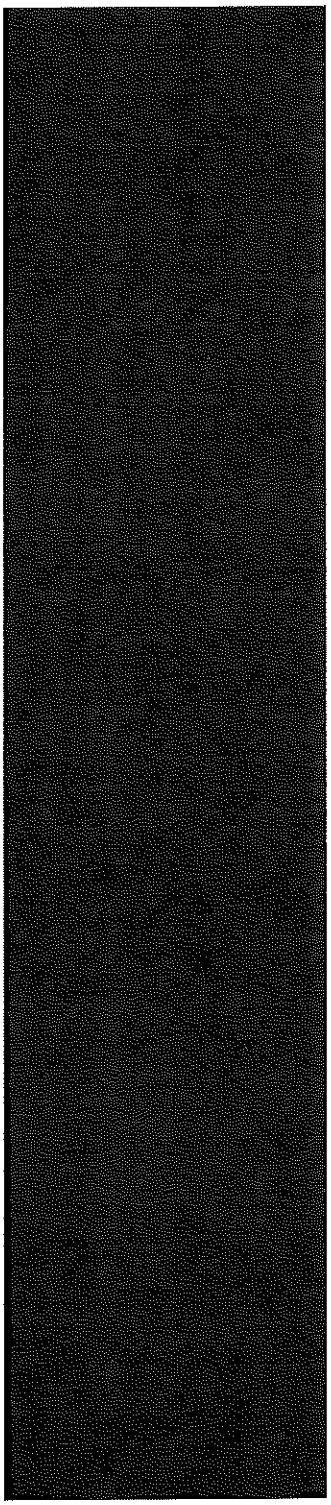




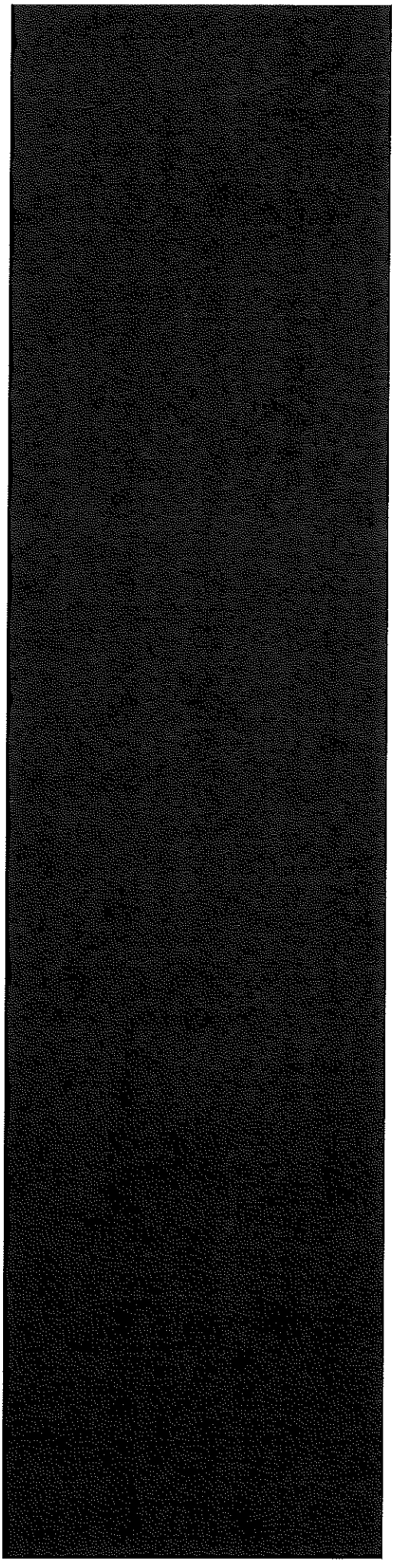


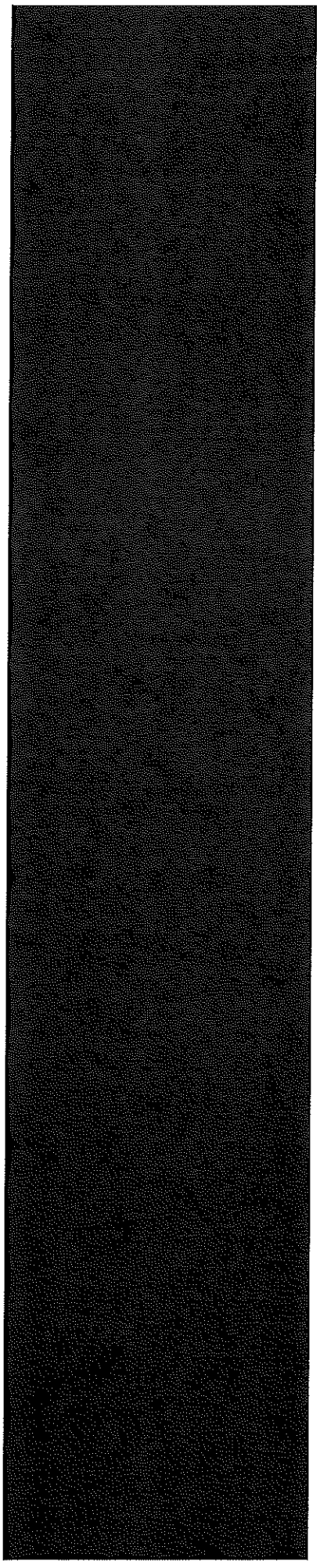


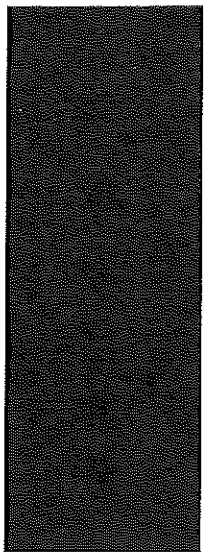




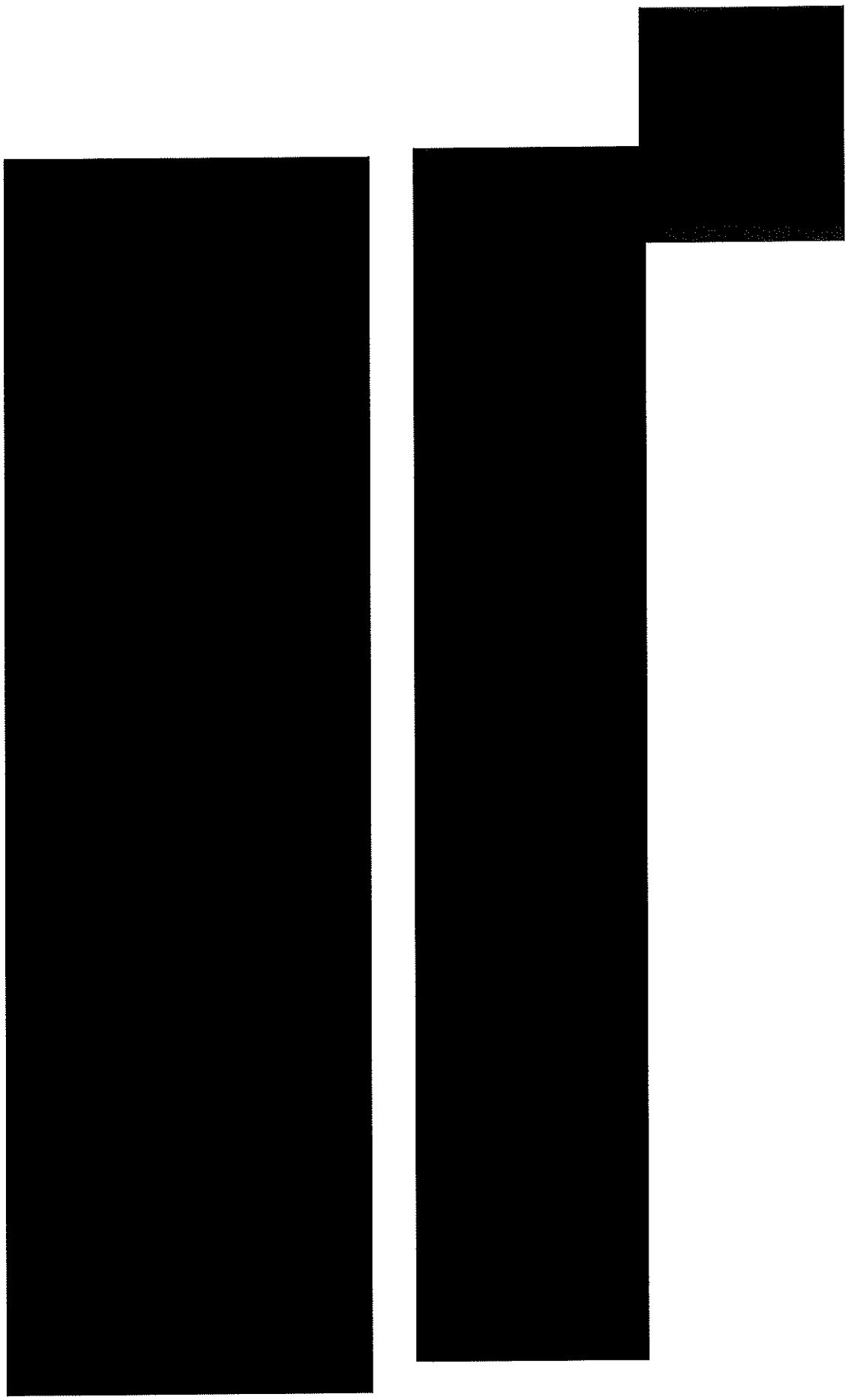


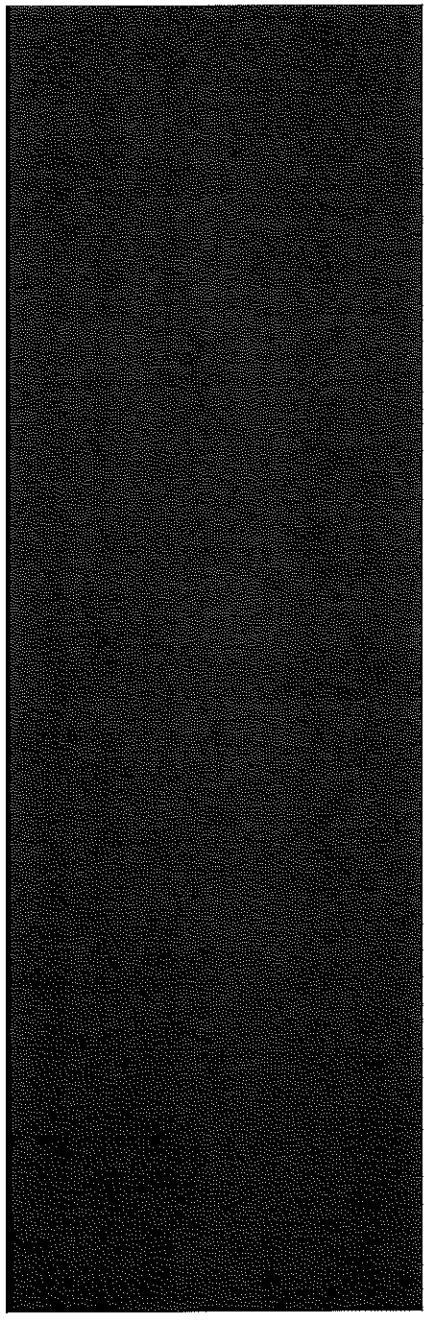


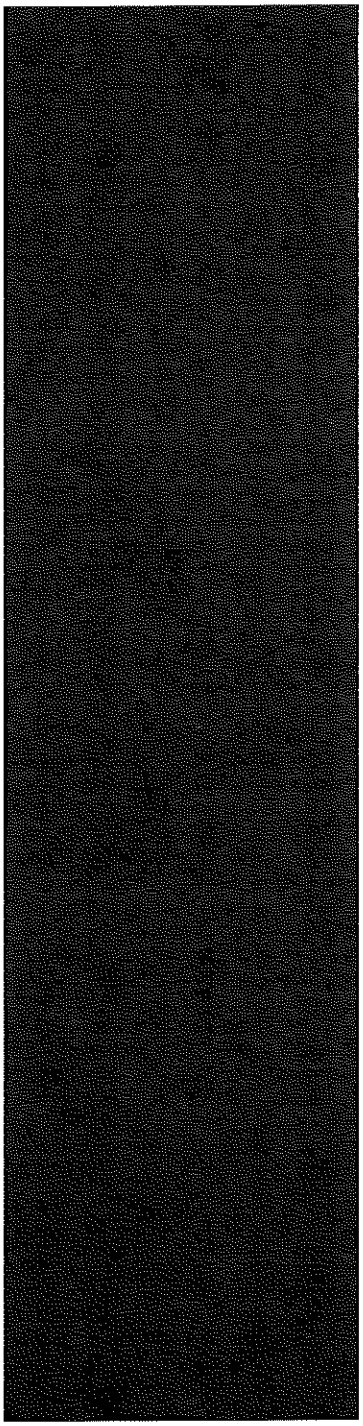


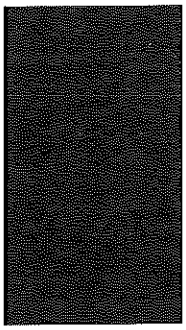


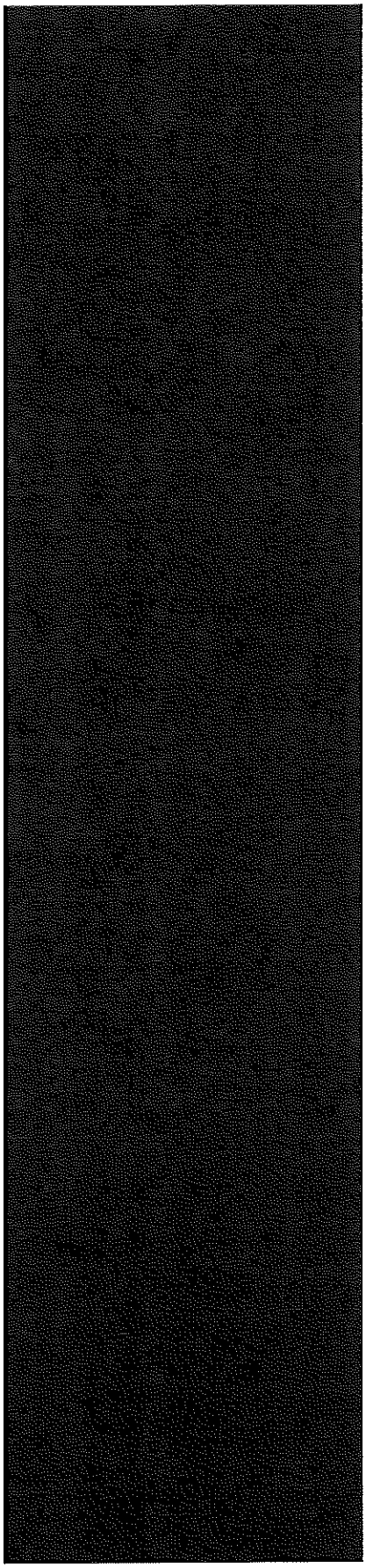
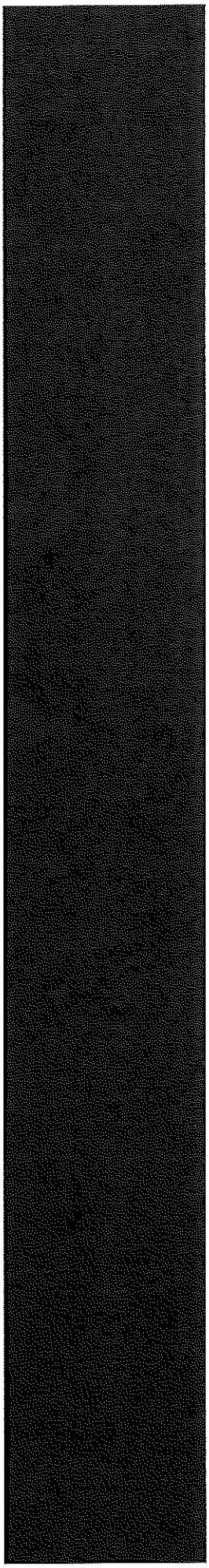
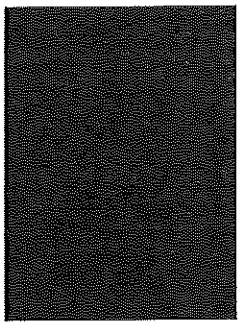


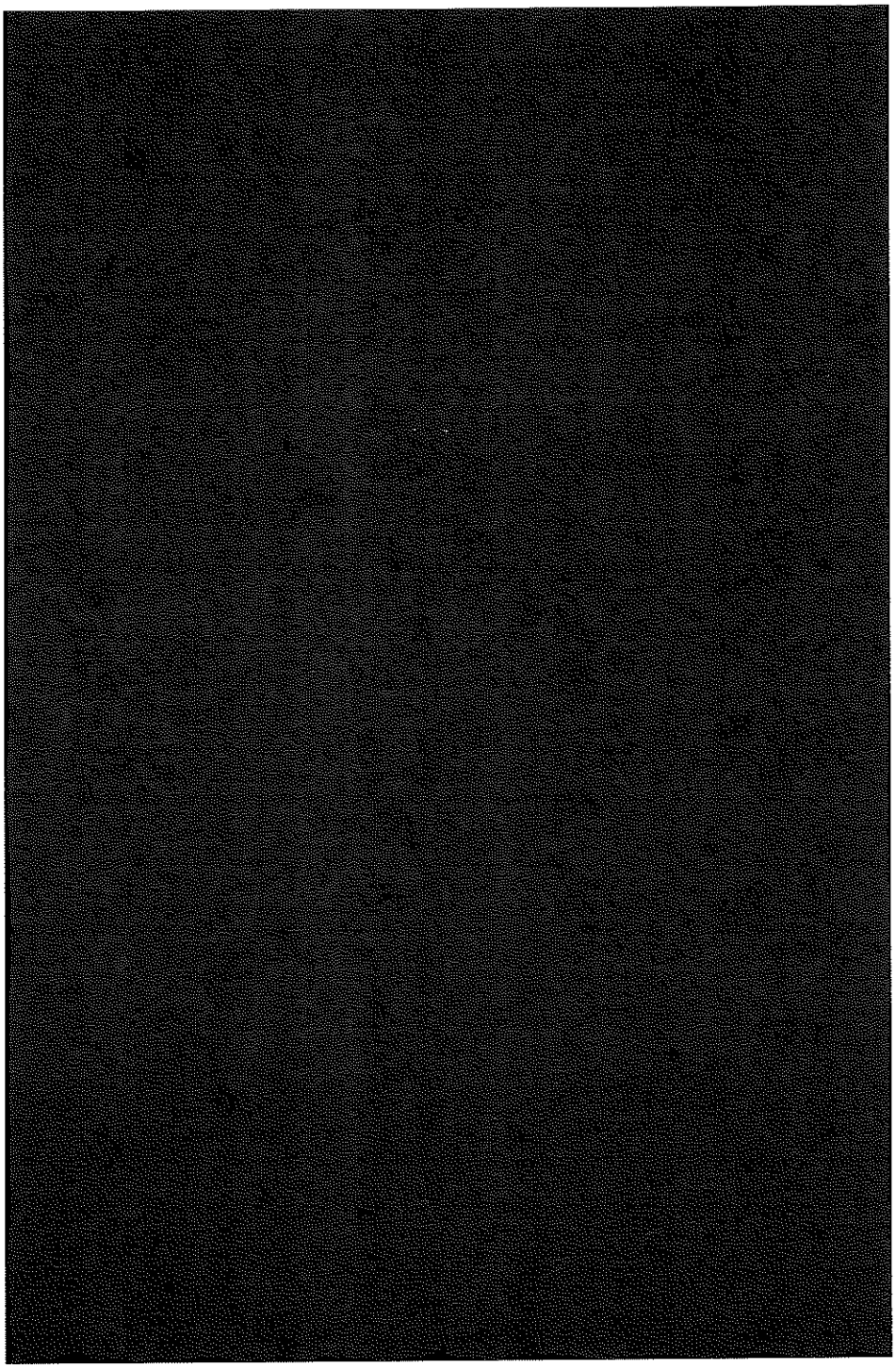


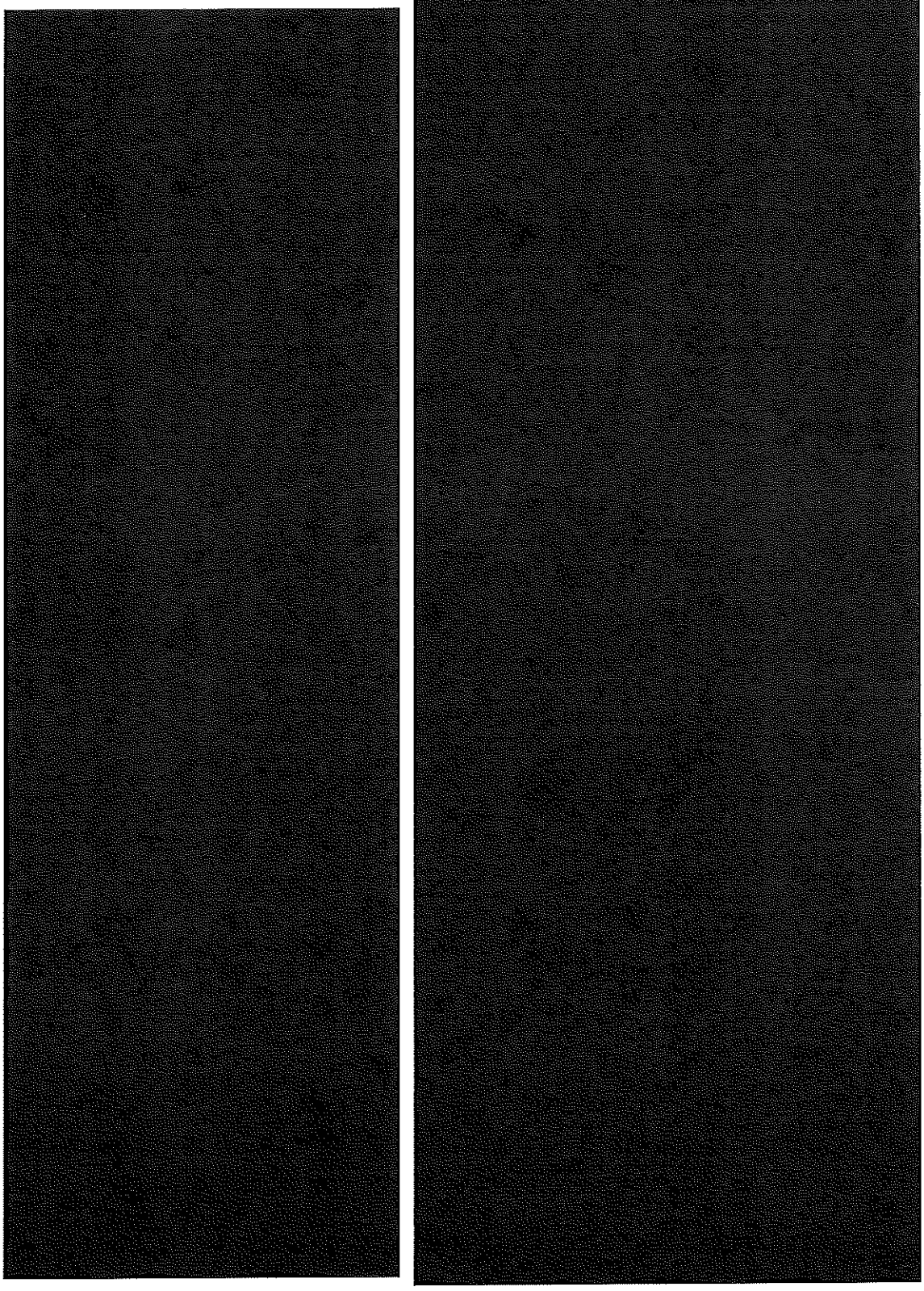


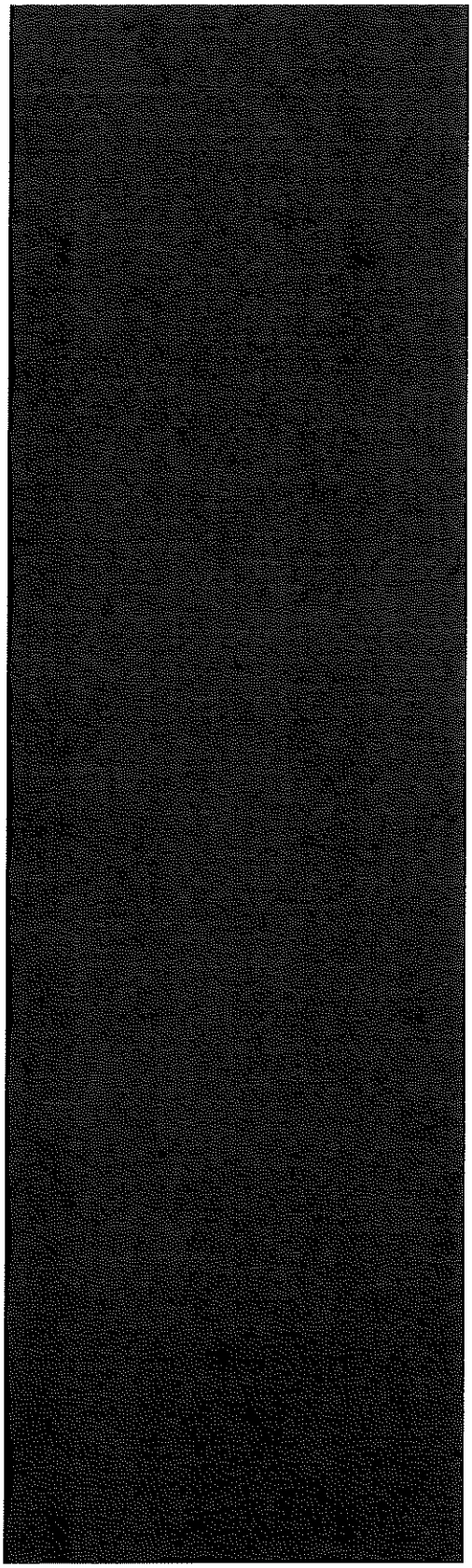


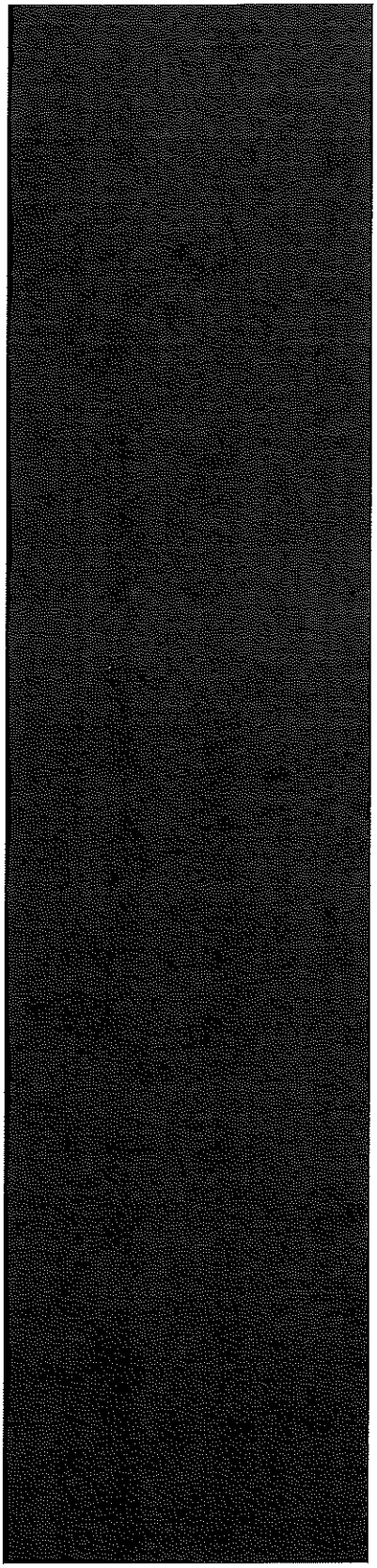


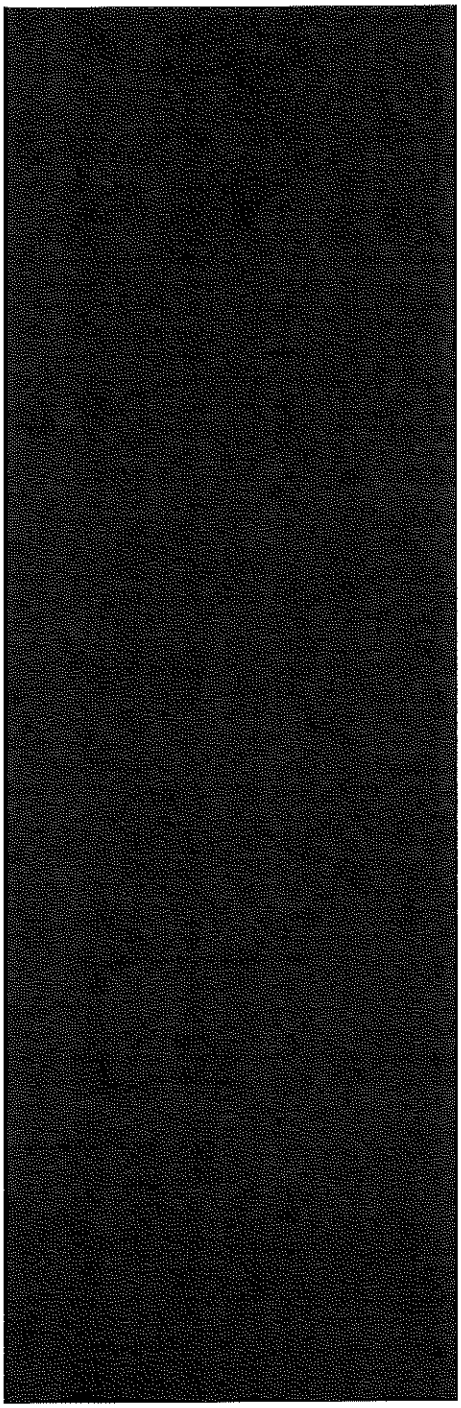




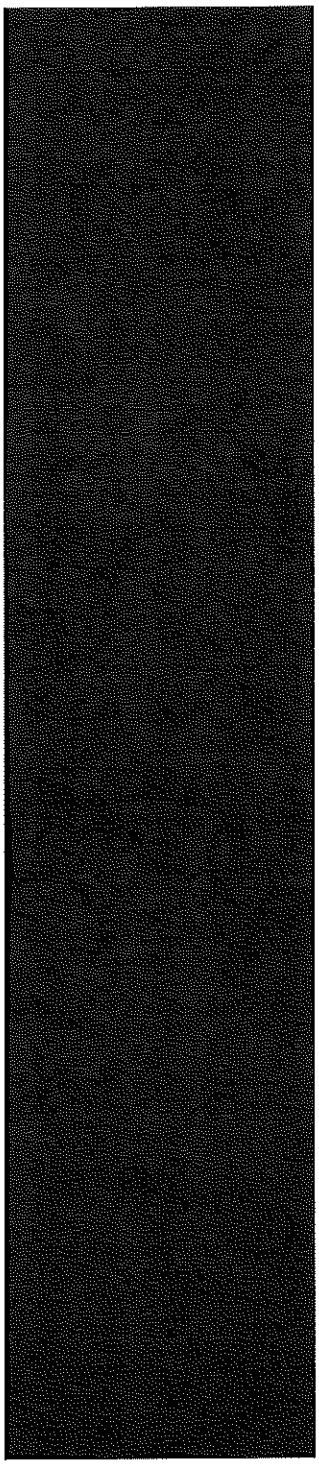


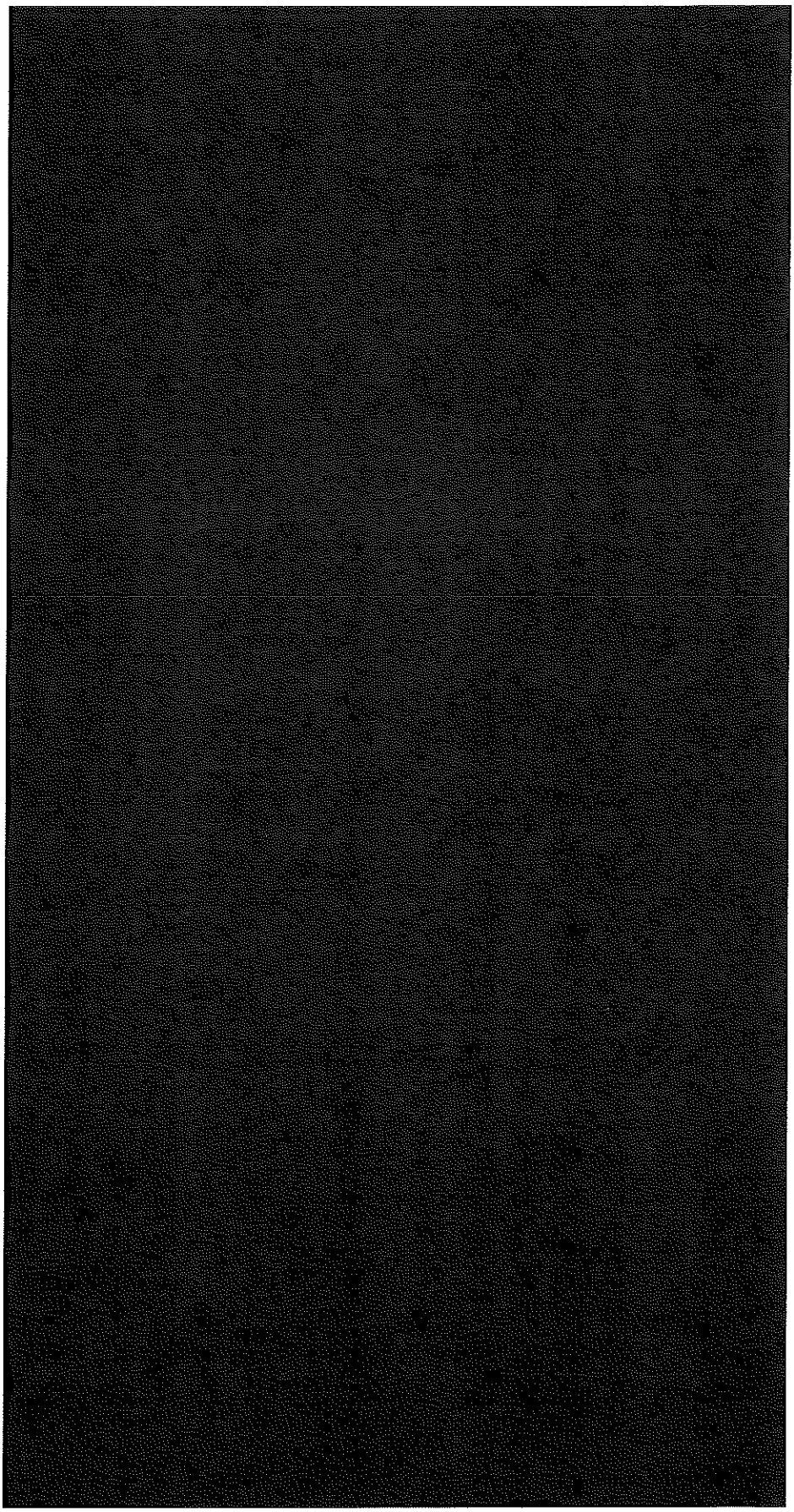


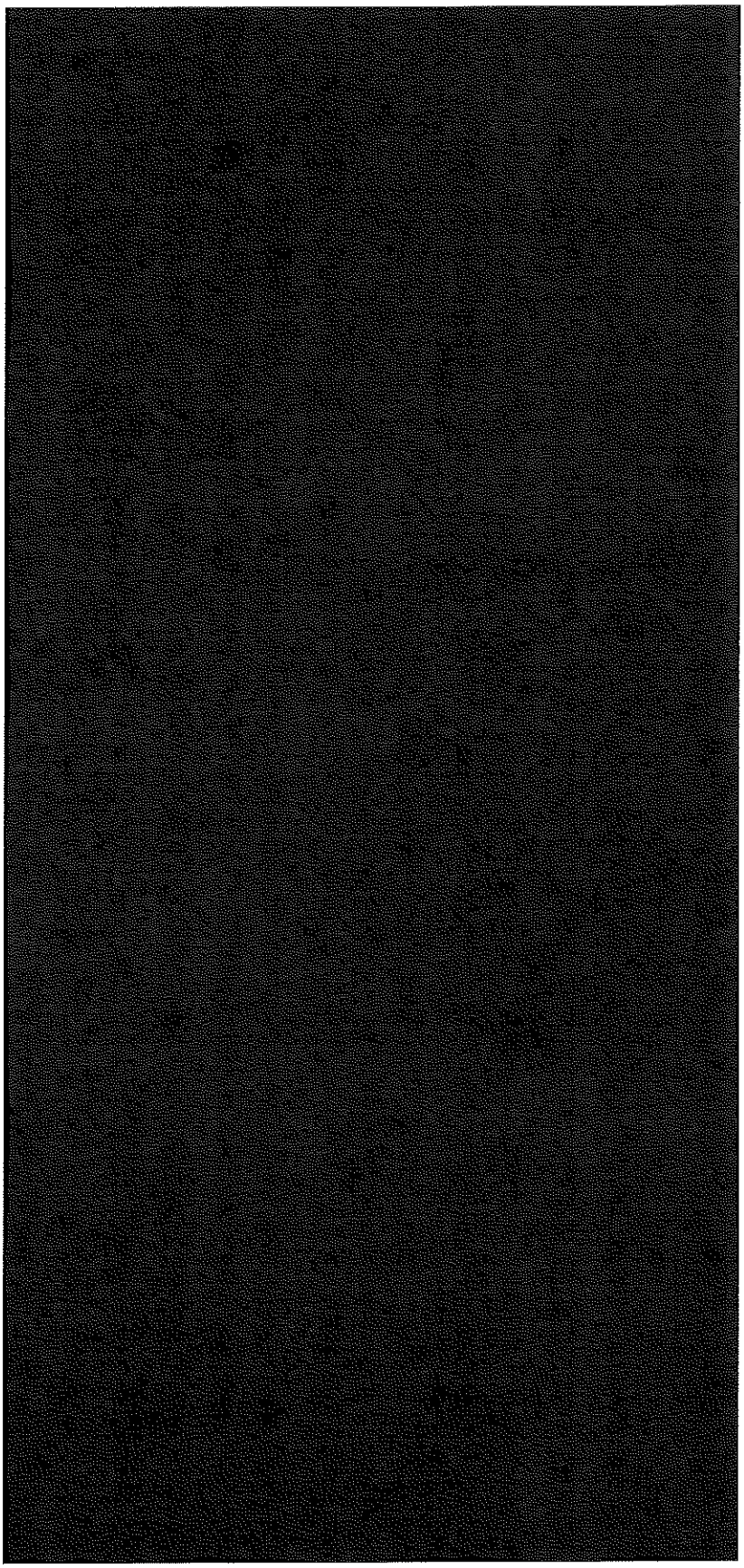


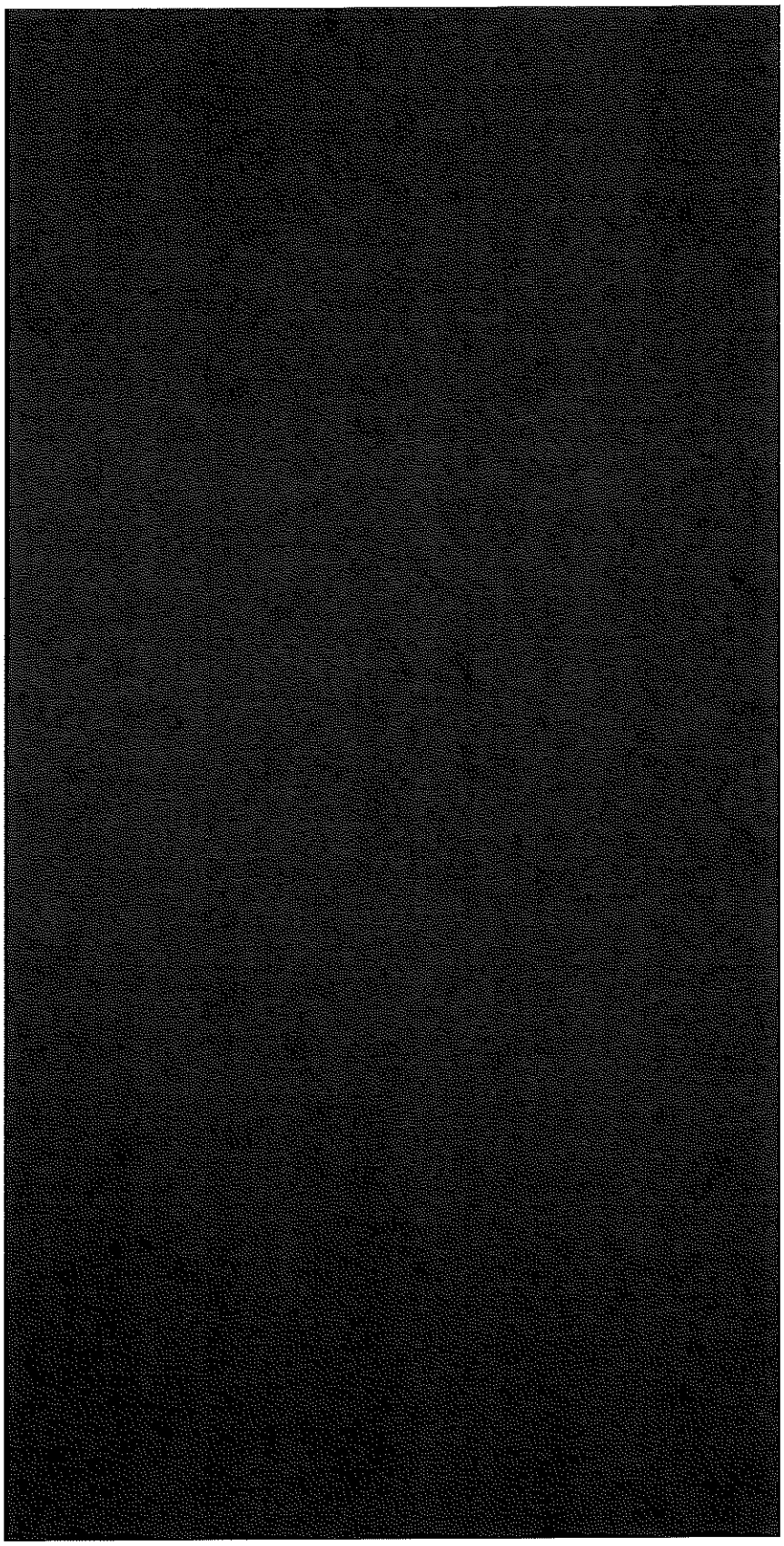


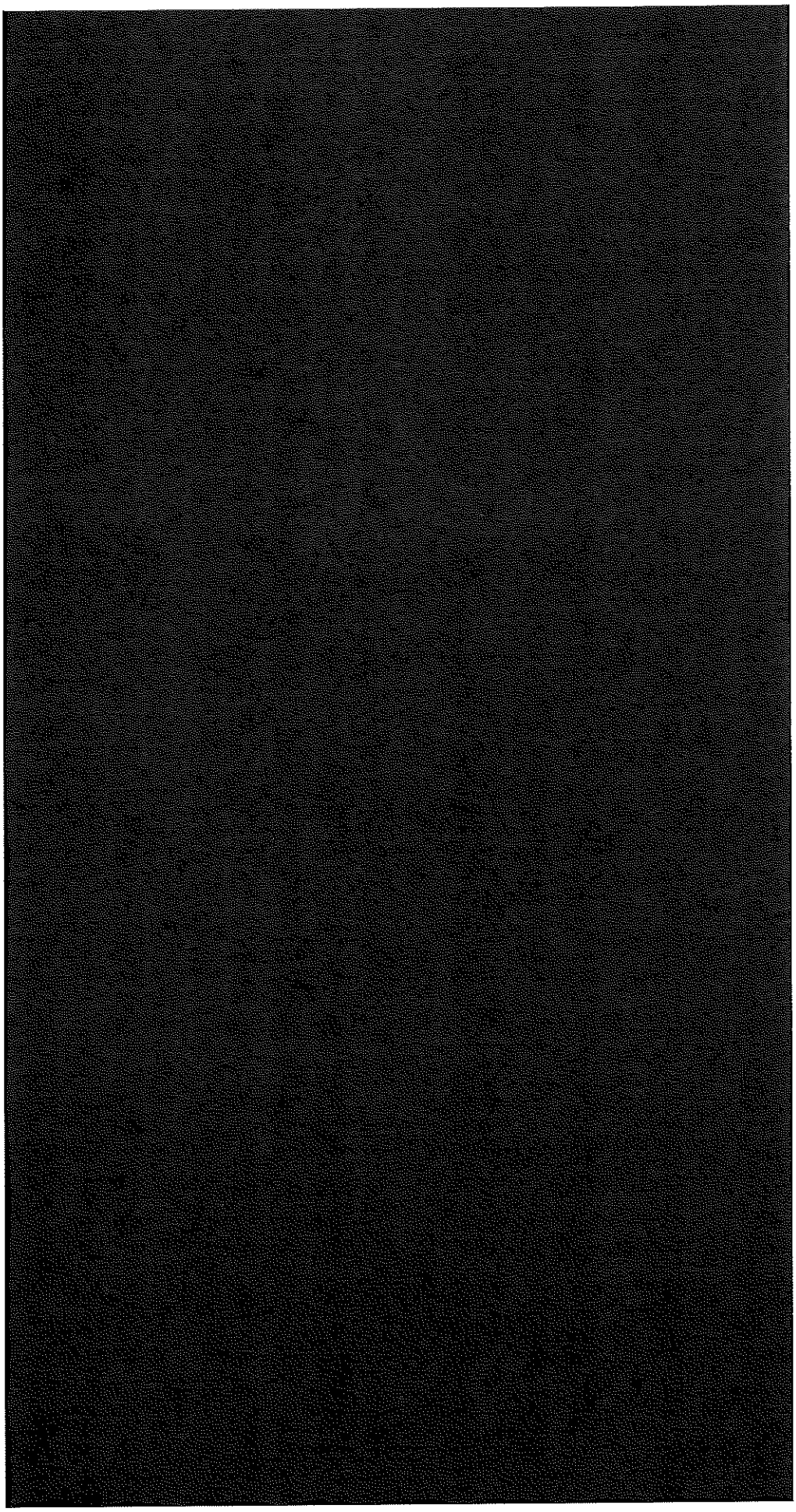


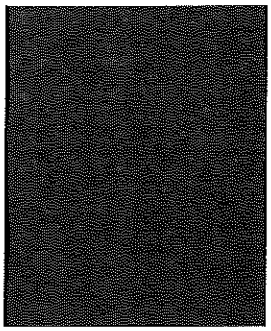


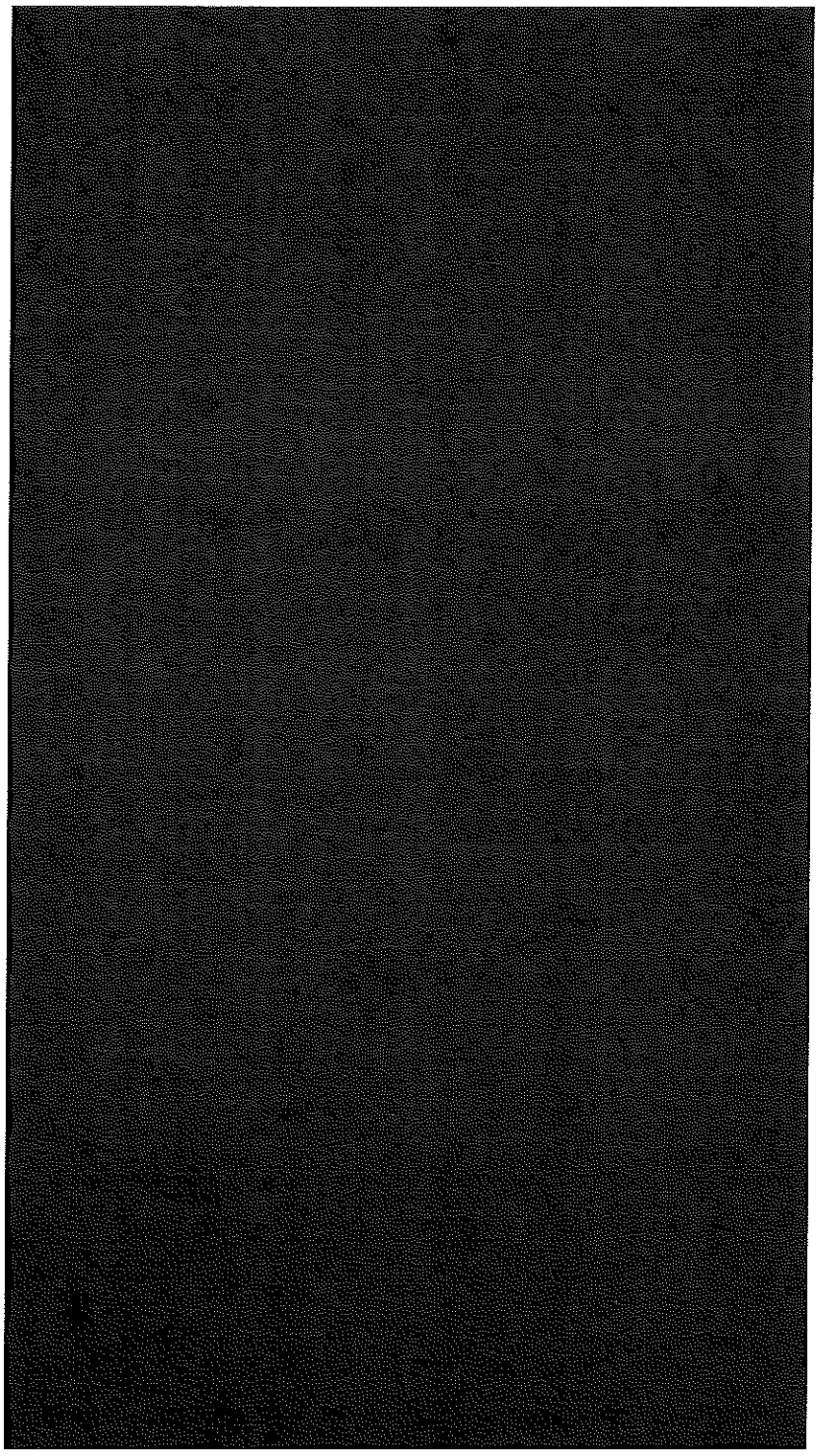


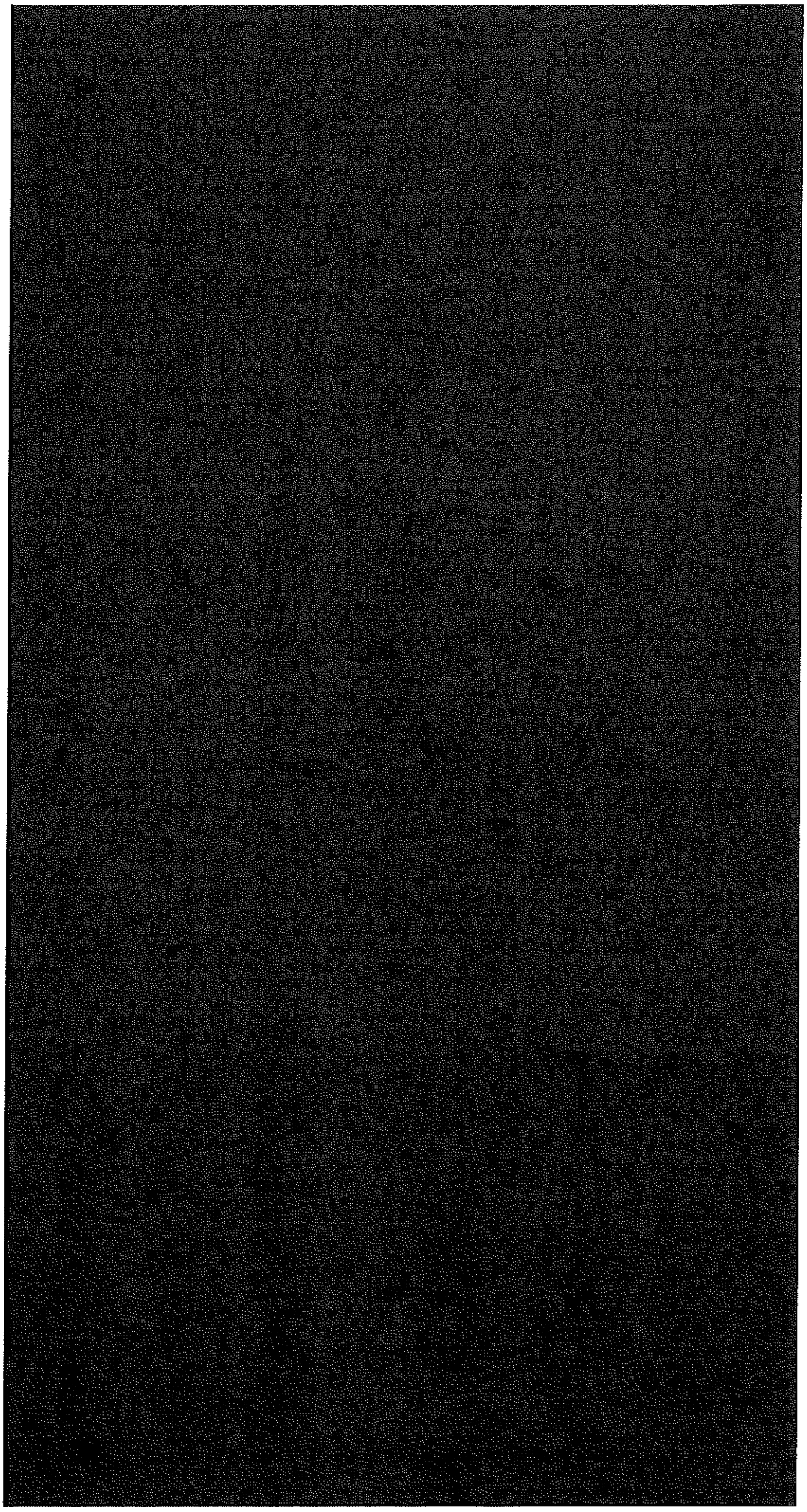


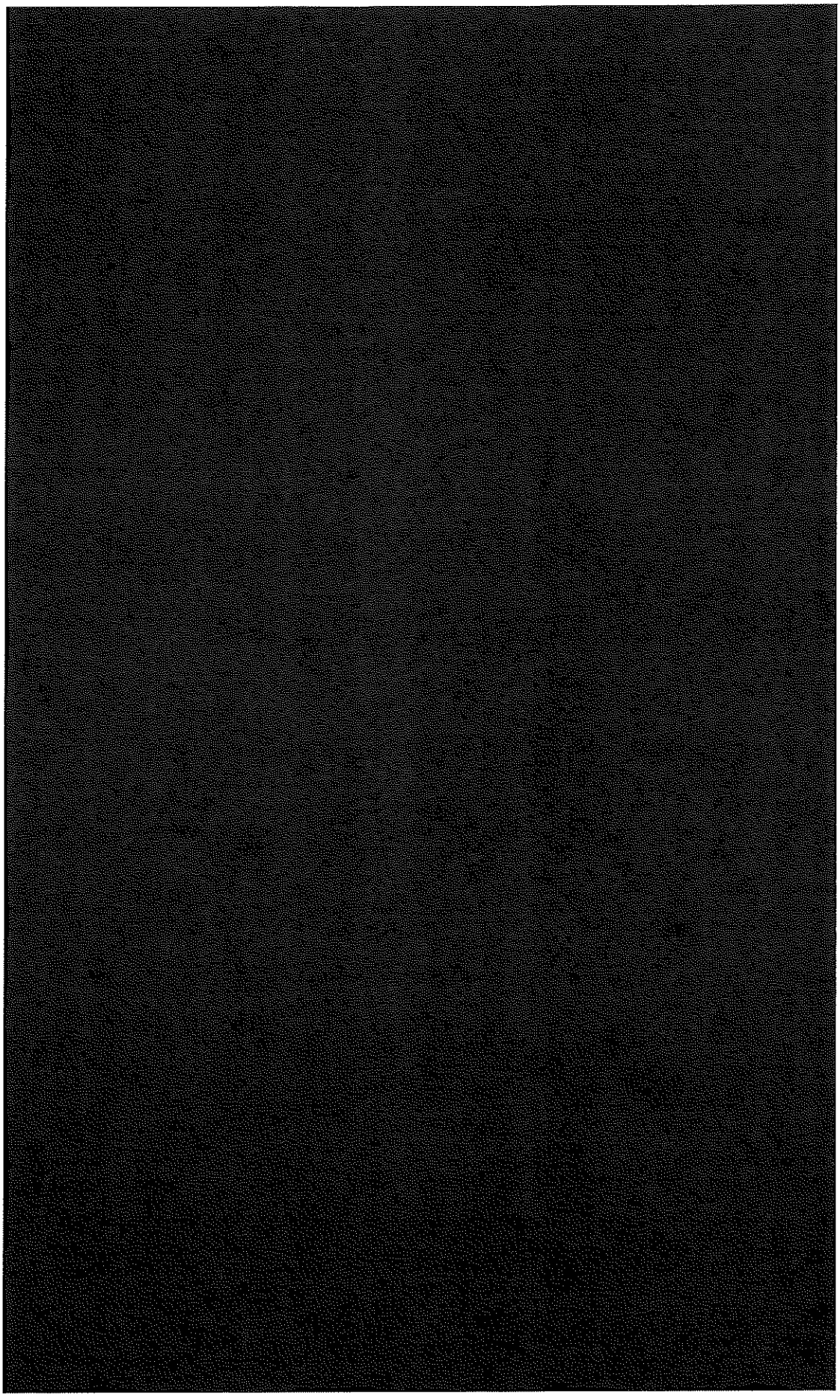


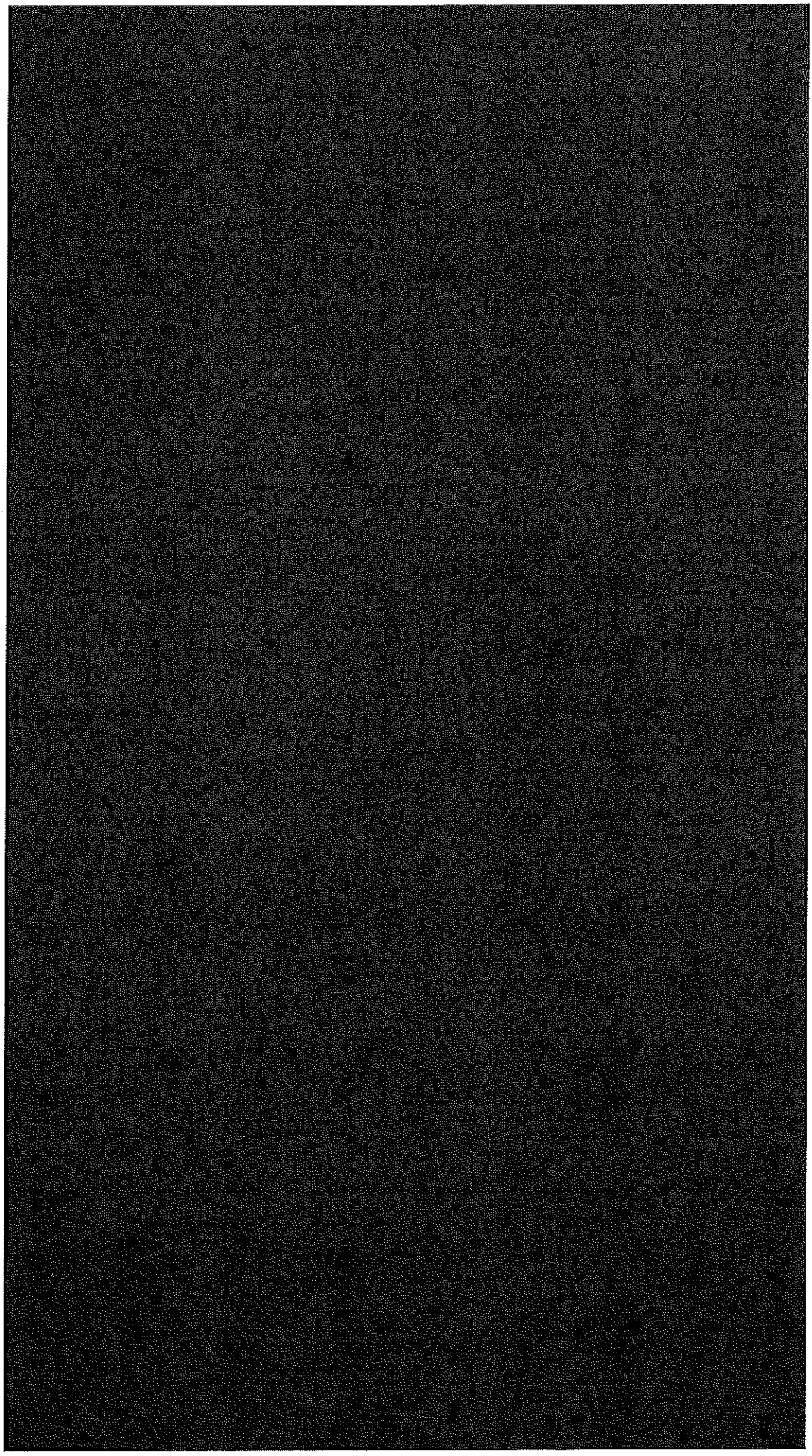


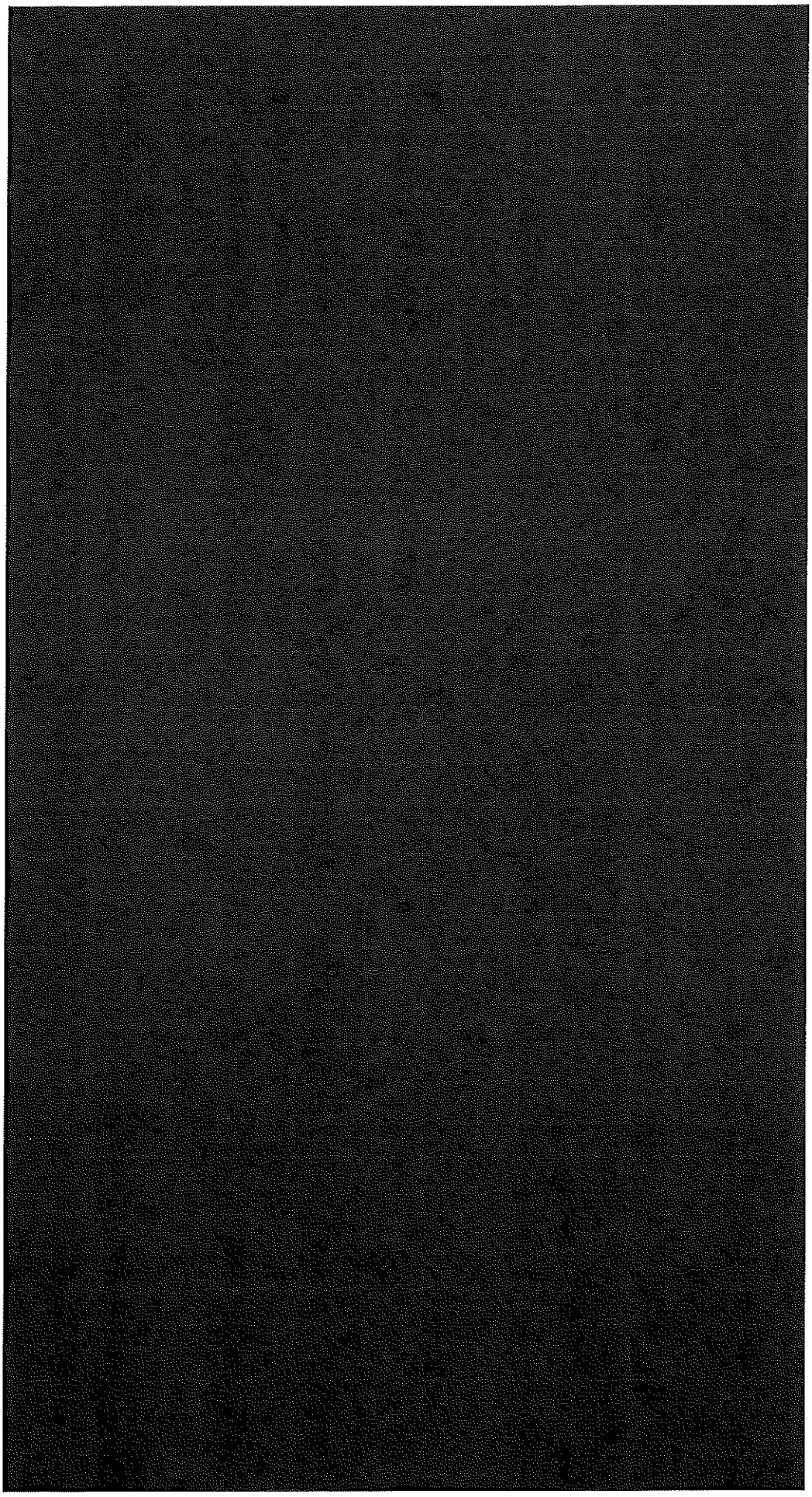


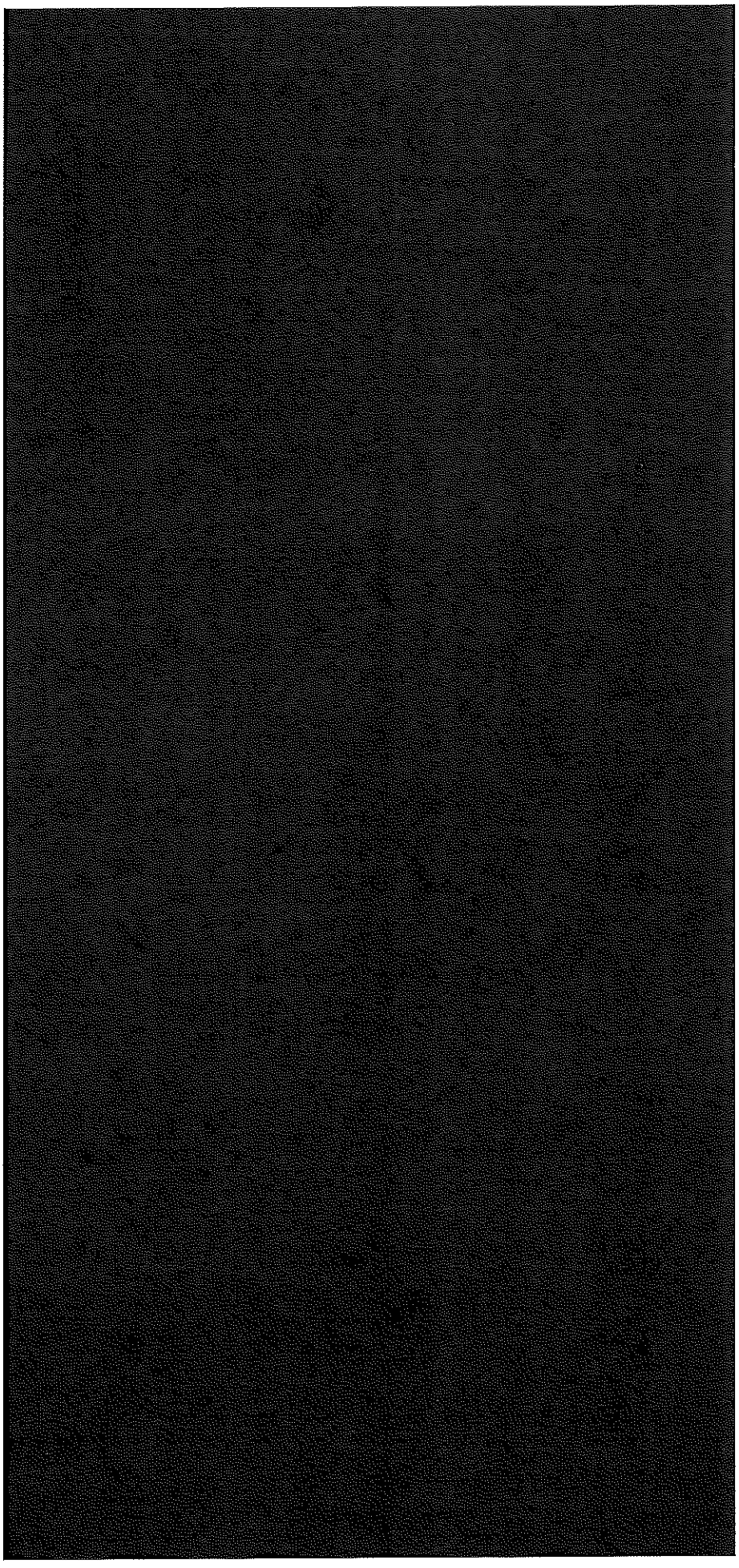


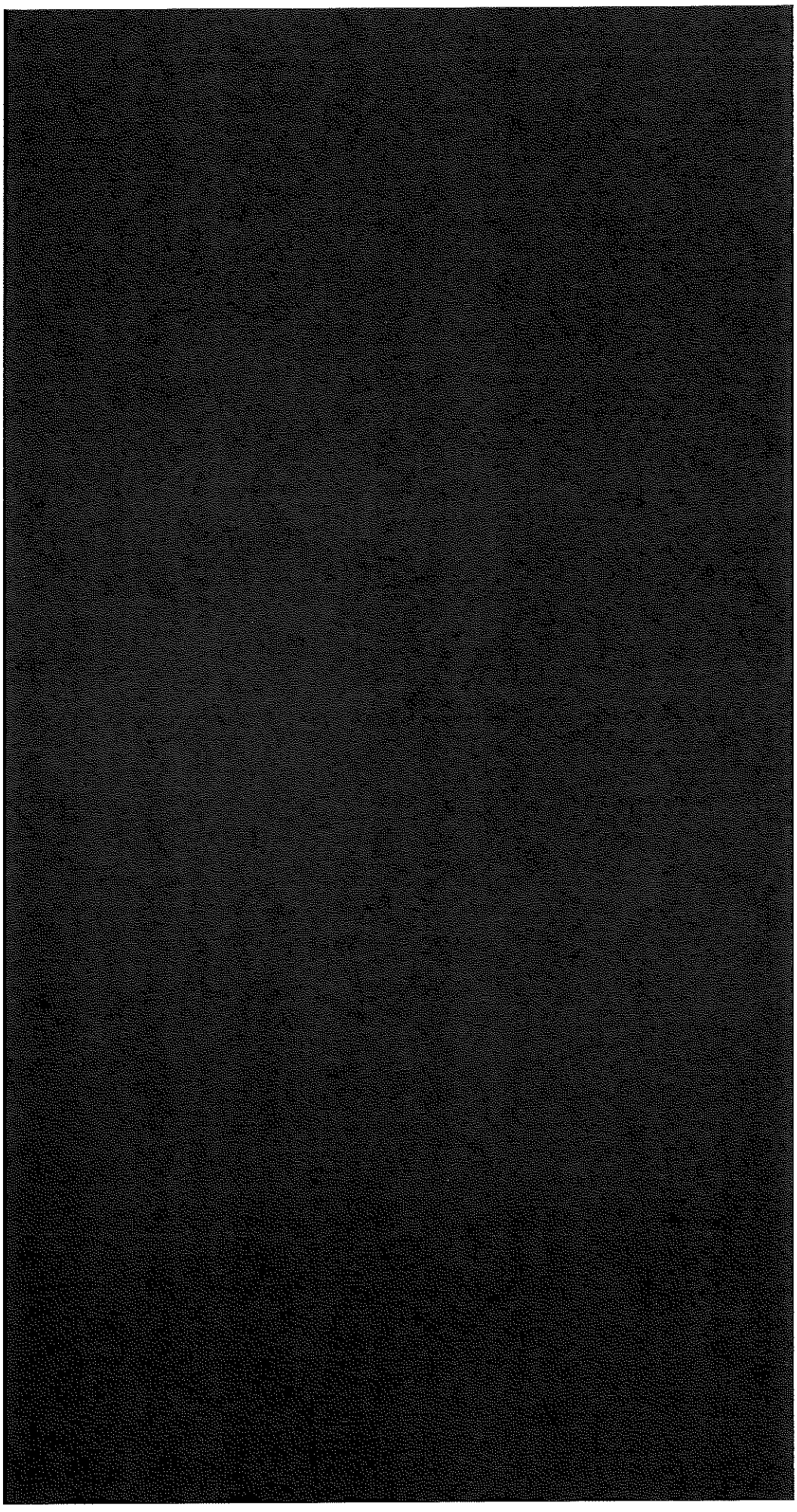


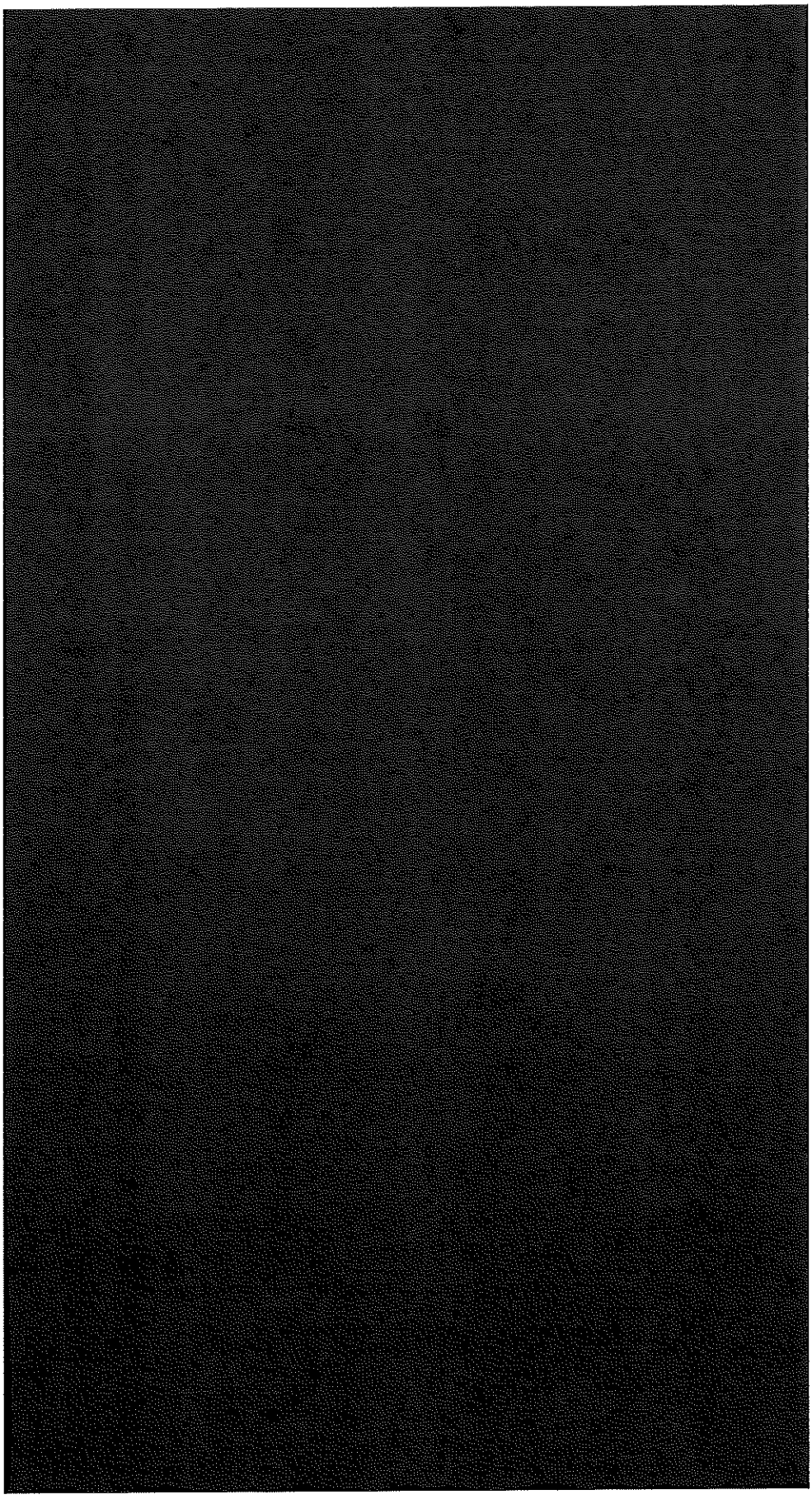


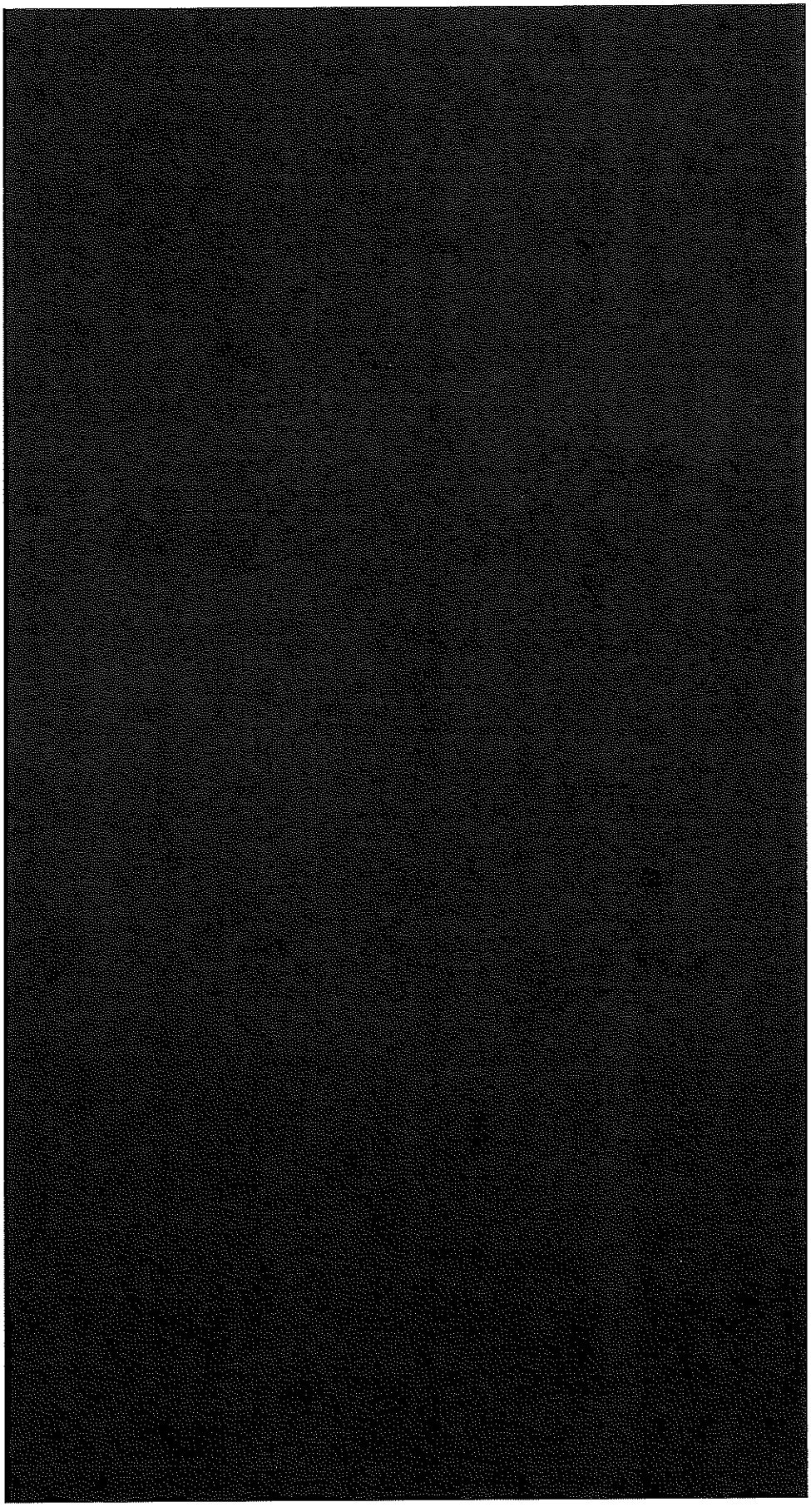












N

N

FINAL ROW PLAN REVISIONS				SUBMITTAL DATE:			1
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

H&H

NO SCALE

DRAWN BY: EWC	DATE: 06/12/2024	CS: STR. NO. 12306	SPAN 1 PHOTO LOCATION DIAGRAM
CHK'D BY: JSH CORR BY:	DESIGN UNIT:	JN:	
FILE:	TSC:		GROSSE ILE TOLL BRIDGE OVER THE TRENTON CHANNEL

DRAWING | SHEET | SECT

N

FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

H&H

NO SCALE

DRAWN BY: EWC		DATE: 06/12/2024	CS: STR. NO. 12306
CHK'D BY: JSH	CORR BY:	DESIGN UNIT:	JN:
FILE:		TSC:	

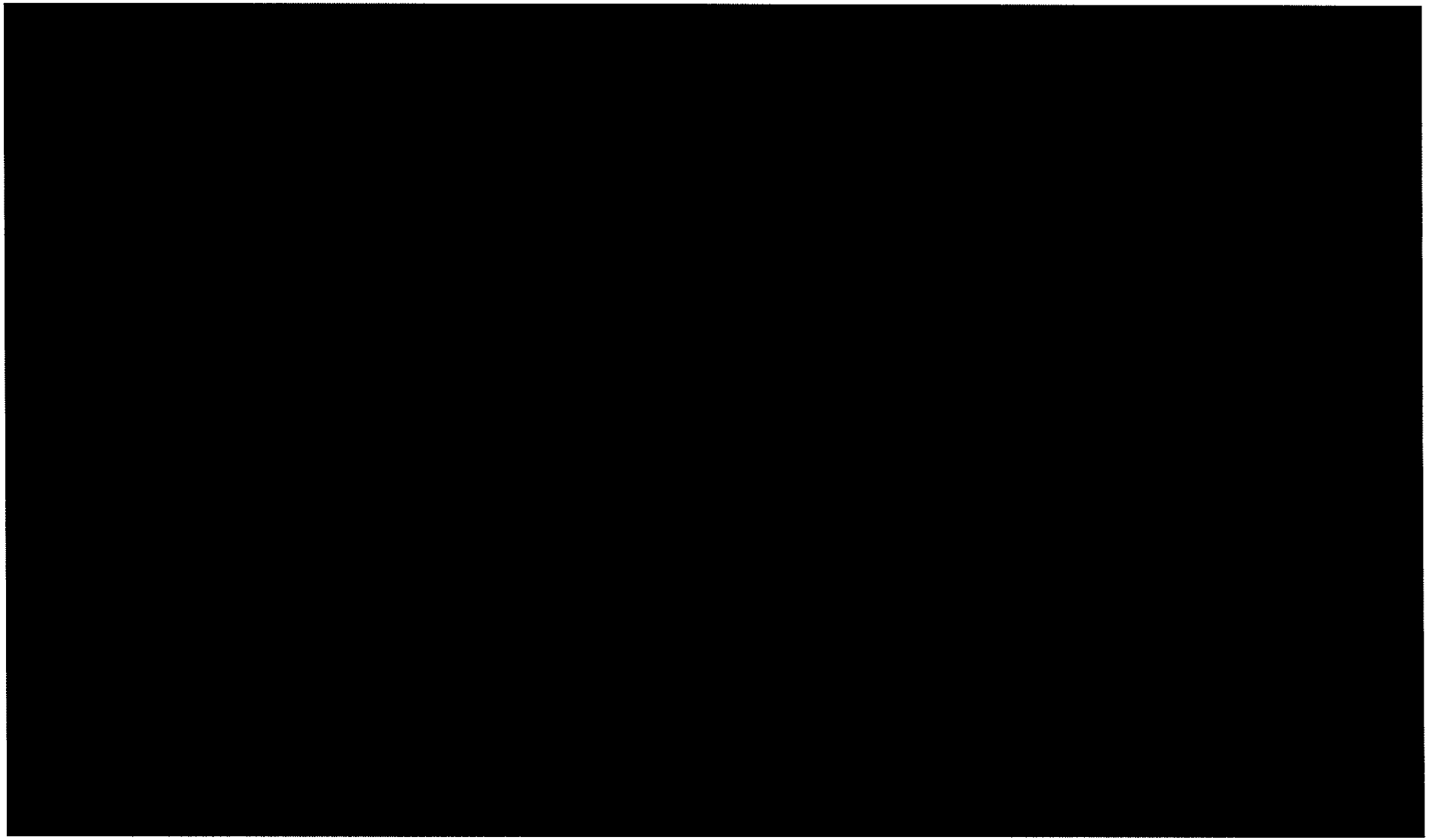
SWING SPAN PHOTO LOCATION DIAGRAM

GROSSE ILE TOLL BRIDGE OVER THE TRENTON CHANNEL

DRAWING

SHEET

SECT



FINAL ROW PLAN REVISIONS				SUBMITTAL DATE:			1
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

H&H

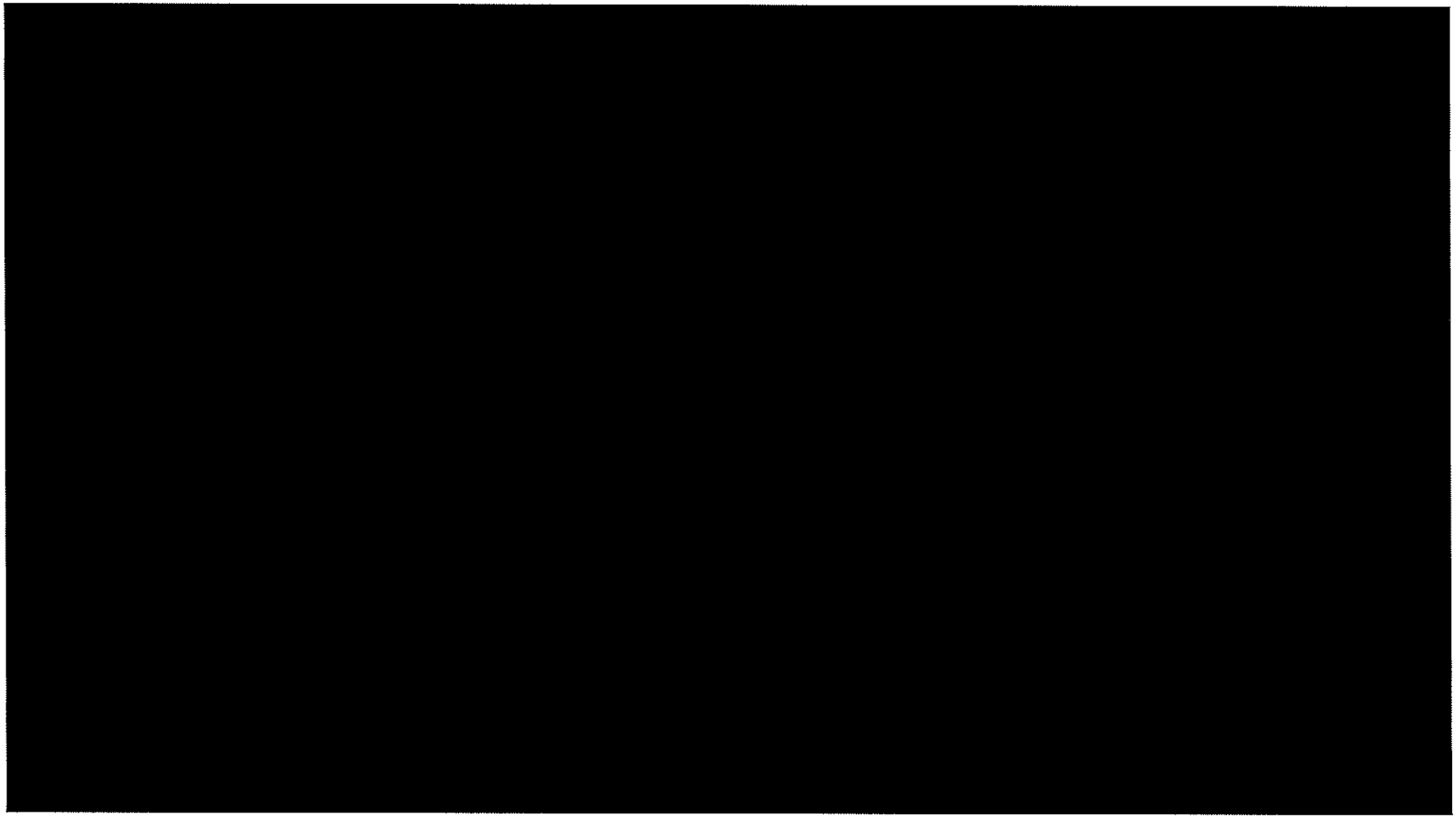
NO SCALE

DRAWN BY: EWC		DATE: 06/12/2024	CS: STR. NO. 12306
CHK'D BY: JSH	CORR BY:	DESIGN UNIT:	JN:
FILE:		TSC:	

PIER 1-4 CONCRETE DETERIORATION

GROSSE ILE TOLL BRIDGE OVER THE TRENTON CHANNEL

DRAWING	SHEET
	SECT



FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

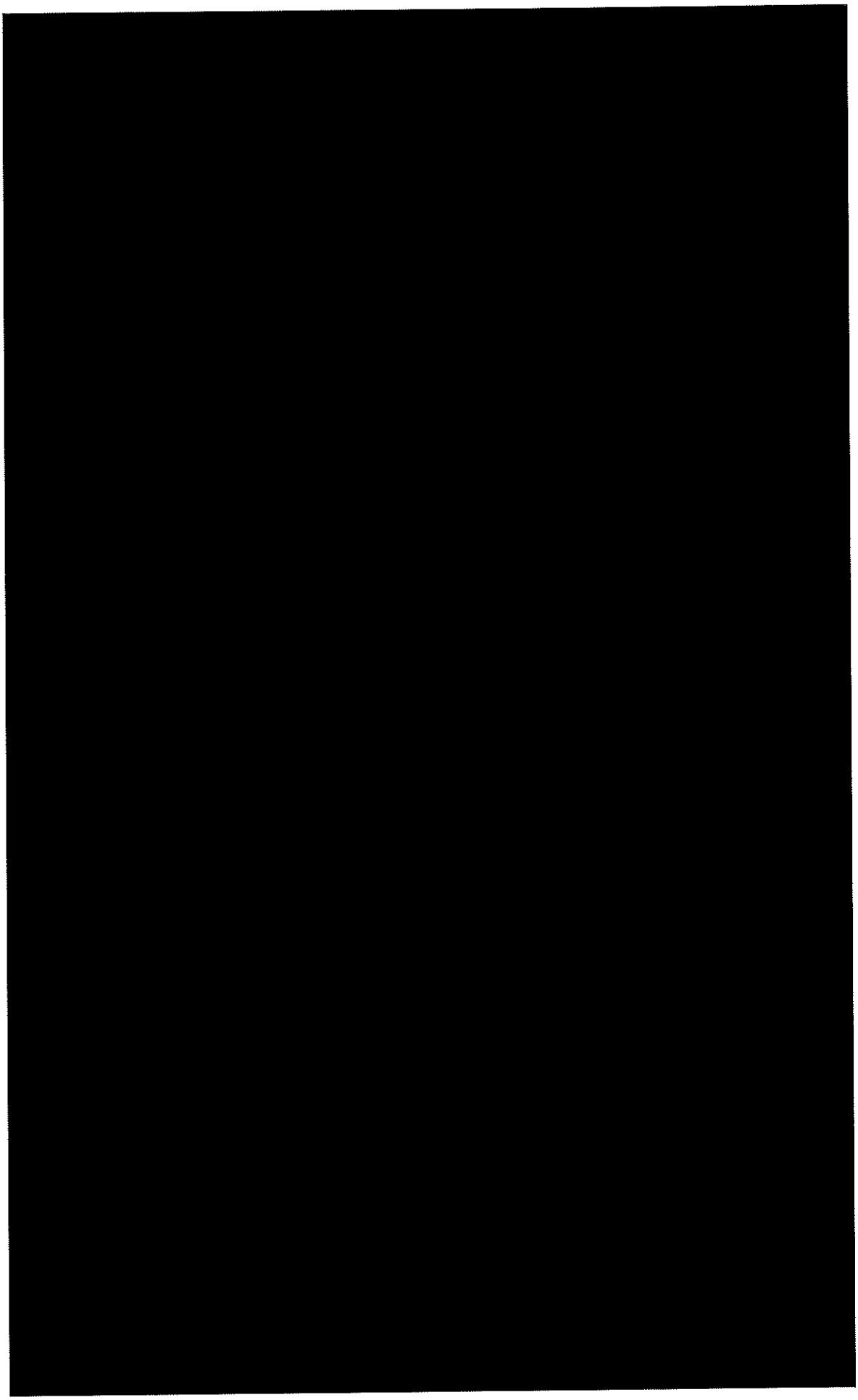
H&H

NO SCALE

DRAWN BY: EWC	DATE: 06/12/2024	CS: STR. NO. 12306	PIVOT PIER AND ABUTMENTS CONCRETE DETERIORATION
CHK'D BY: JSH CORR BY:	DESIGN UNIT:	JN:	
FILE:	TSC:		GROSSE ILE TOLL BRIDGE OVER THE TRENTON CHANNEL

DRAWING	SHEET
	SECT

MECHANICAL DIAGRAMS AND DATA



M-1: Gear tooth Measurements

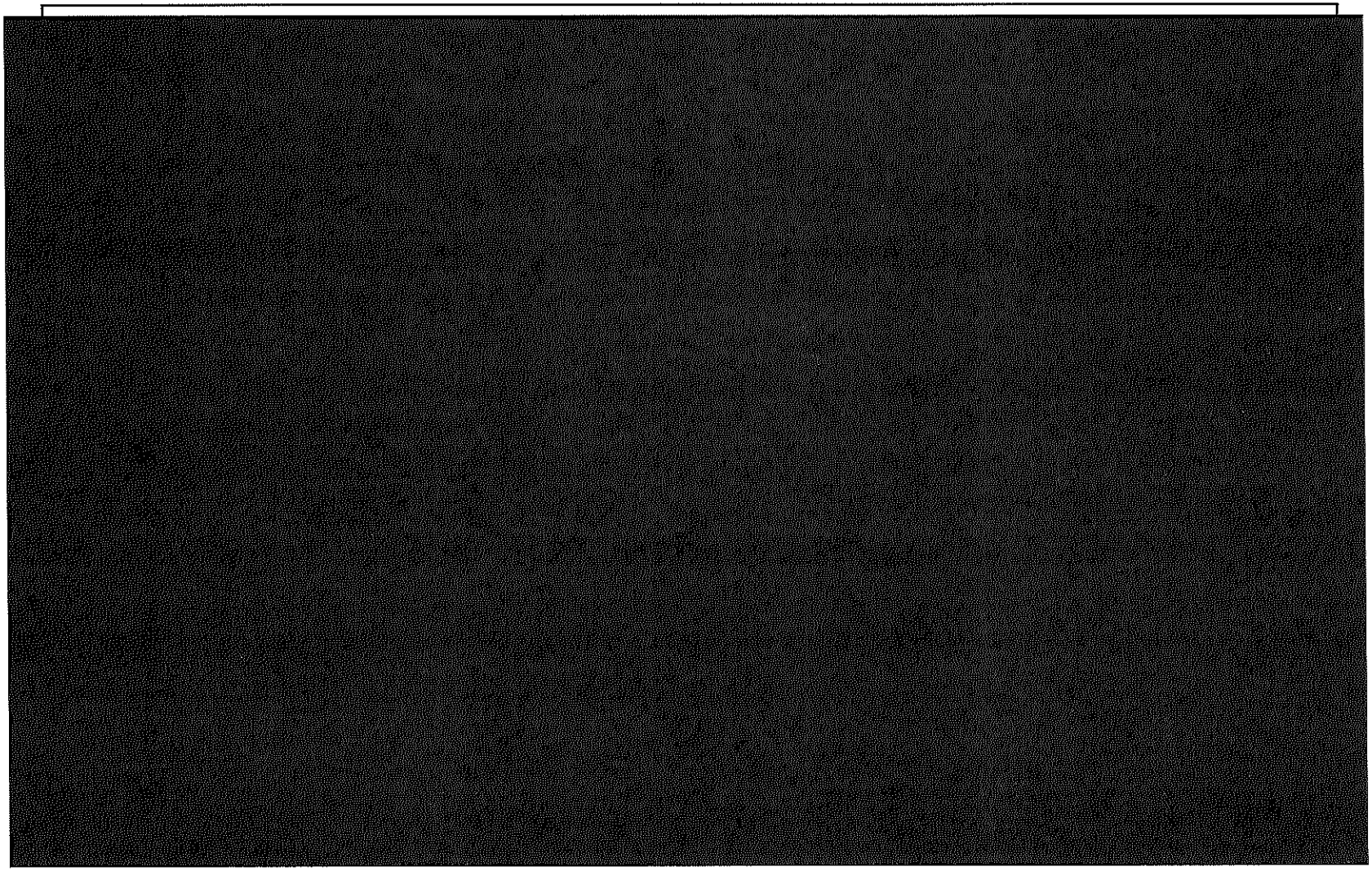


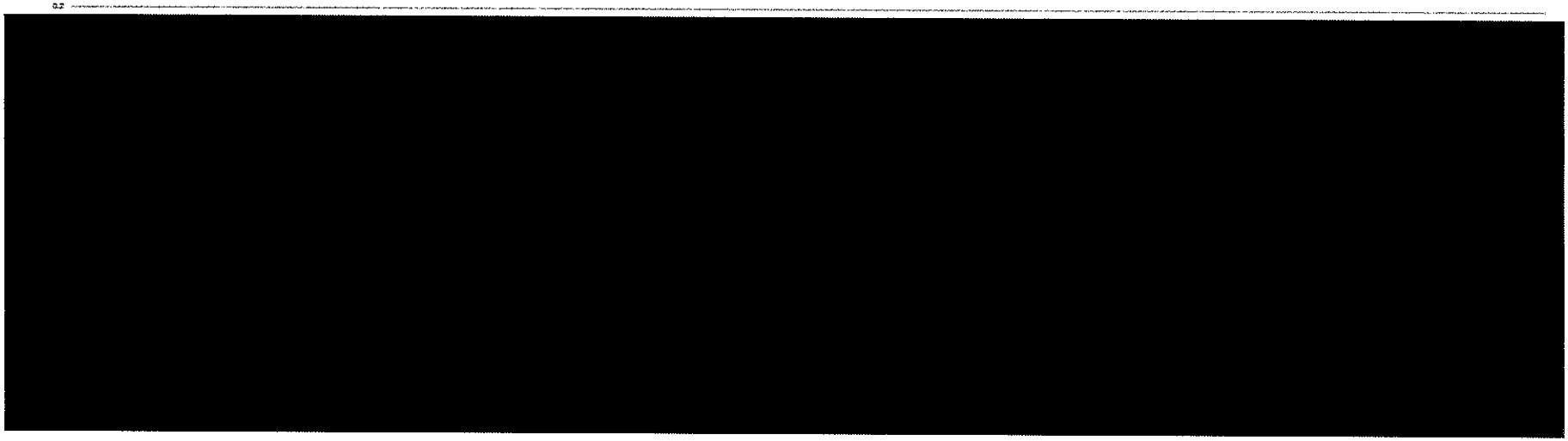
Table M-2: Bearing Measurements

Operating Machinery Bearings	Check
[redacted]	

End Lift Machinery Bearings	Check
[redacted]	

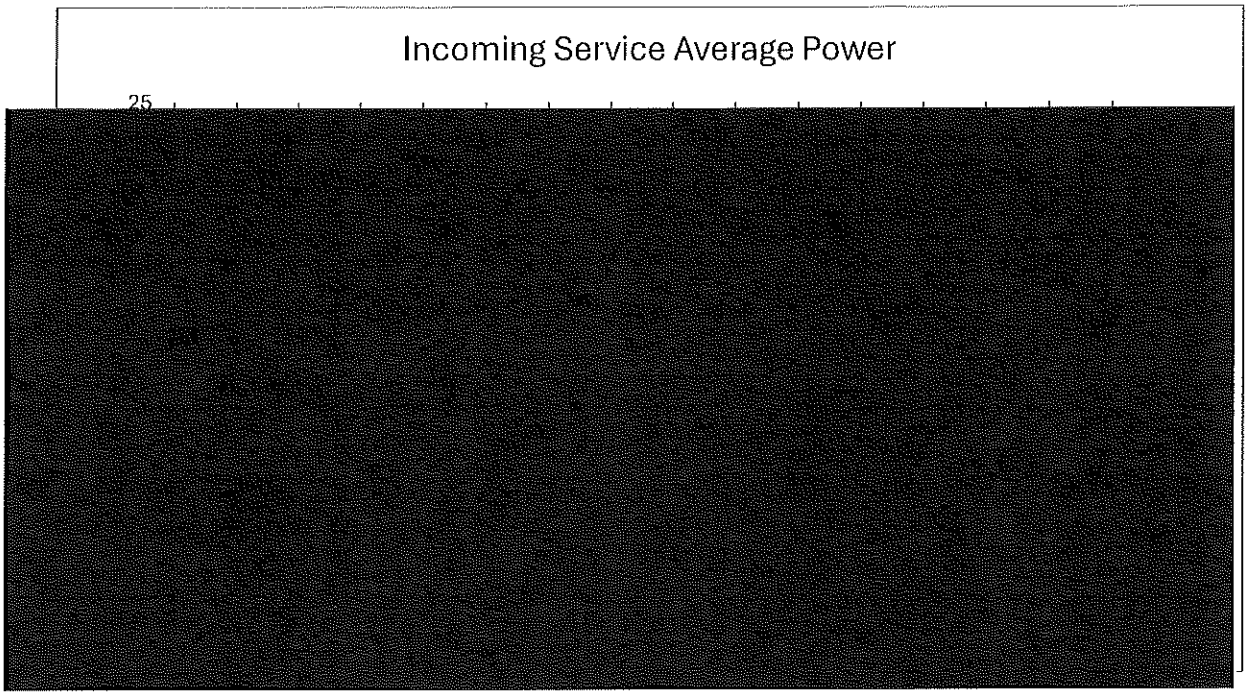
Track Levelness

0.2

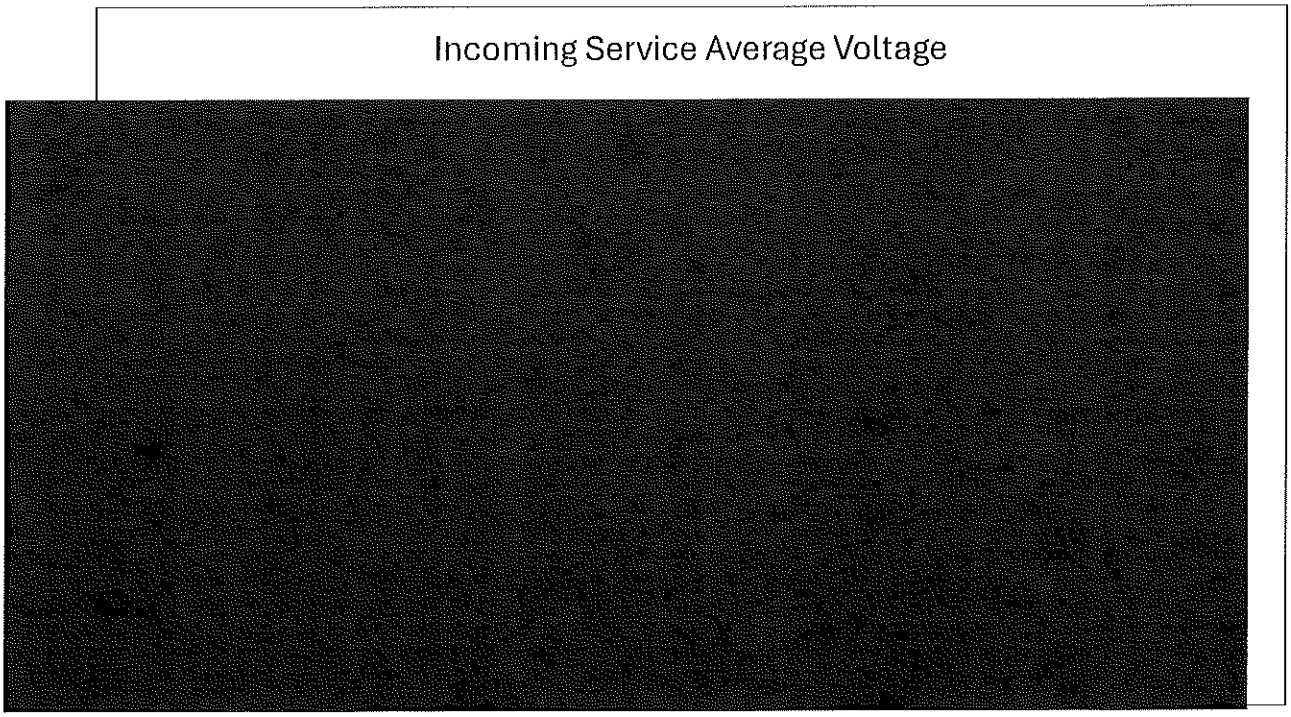


ELECTRICAL DIAGRAMS

Incoming Service Power:

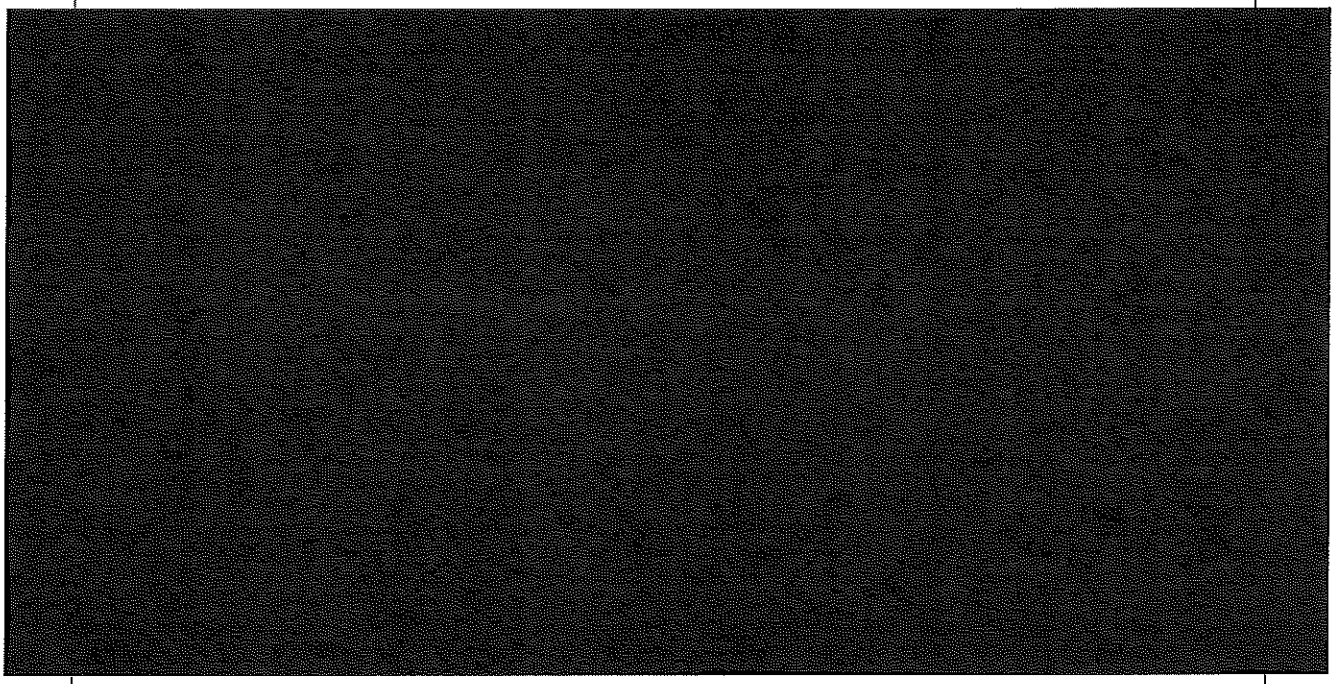


Incoming Service Voltage:

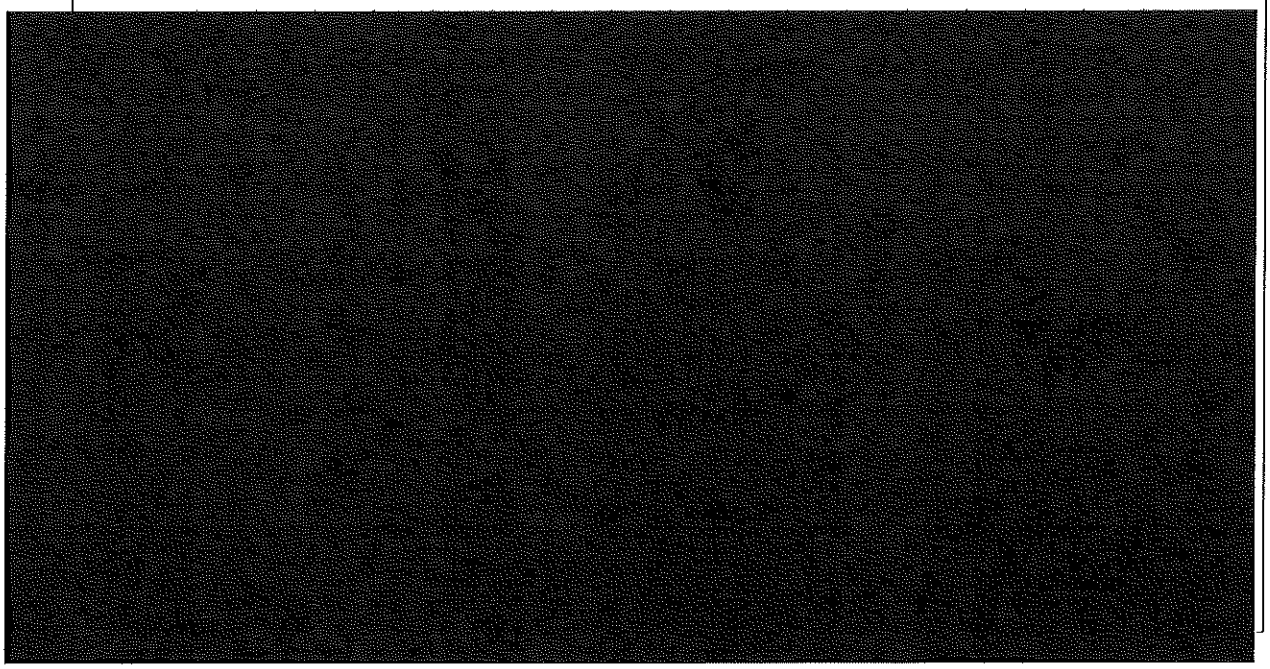


Incoming Service Current:

Incoming Service Average Current



Motor Average Power



Motor Voltage:

Motor Average Current

COST ESTIMATE DATA

2024

BRIDGE COST ESTIMATE WORKSHEET

- CPM, REHAB, REPLACE -

REV. 01/31/2023

DATE: 6/27/2024

OWNER: Grosse Ile Bridge Company FISCAL YEAR: 2028 ENGINEER: M. Helinski

REGION:

TSC: PR: MP:

	LENGTH	Out to Out WIDTH	Curb to Curb WIDTH
	1038.5	24.7	21.7

STRUCTURE ID:

BRIDGE ID: 82680000008010

LOCATION: Grosse Ile Toll Bridge over Trenton Channel

PRIMARY WORK ACTIVITY Short Term Repair/Rehabilitation DECK AREA: 25,651 SFT STR. TYPE: Steel Cont. & Mov. Swing

OTHER WORK: See Recommendations Section of Report CLEAR ROADWAY: 22,535 SFT

WORK ACTIVITY	MDOT Bridge Design Guides		QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE	(increase deck area based on design standards and hydraulic requirements)					
Single or Multiple Spans, Grade Separation		(add demo, approach, MOT)		SFT	$415.00 /SFT	
Single Span, Over Water	Length < 100ft	(add demo, approach, MOT)		SFT	$500.00 /SFT	
Multiple Spans, Over Water	Length > 100ft	(add demo, approach, MOT)		SFT	$450.00 /SFT	
Precast Culvert	Length < 40ft	(add demo, approach, MOT)		SFT	$540.00 /SFT	
NEW SUPERSTRUCTURE						
New Superstructure, Grade Separation		(incl. remove exist deck/super; add MOT & approach)		SFT	$295.00 /SFT	
New Superstructure, Over Water		(incl. remove exist deck/super; add MOT & approach)		SFT	$300.00 /SFT	
WIDENING						
Structure Widening, ____ ft		(incl. deck/super/sub widening, add approach transition)		SFT	$630.00 /SFT	
NEW DECK						
New Bridge Deck & Barrier		(incl. remove exist deck/railing, add approach, MOT)		SFT	$150.00 /SFT	
DEMOLITION						
Entire Structure, Grade Separation				SFT	$75.00 /SFT	
Entire Structure, Over Water				SFT	$95.00 /SFT	
DECK REPAIR / TREATMENTS						
Bridge Guardrail Replacement		(incl. removal and replacement)	2,077.0	FT	$150.00 /FT	$311,550.00
Concrete Brush Block / Curb Patch		(incl. hand chipping and formwork)		FT	$29.00 /FT	
Concrete Barrier Patch		(incl. hand chipping and formwork)		SFT	$85.00 /SFT	
Concrete Deck Patch		(incl. hand chipping)	250.0	SFT	$68.00 /SFT	$17,000.00
Deep Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
Epoxy Overlay		(incl. warranty)	1,736.0	SYD	$48.00 /SYD	$83,328.00
Expansion Joint Gland Replacement		(remove and replace elastomeric gland)		FT	$125.00 /FT	
Expansion Joint Replacement		(incl. removal)	87.0	FT	$860.00 /FT	$74,820.00
Full Depth Patch				SFT	$140.00 /SFT	
Healer / Sealer		(penetrates cracks in bridge deck) (Approach Trusses)		SYD	$30.00 /SYD	
HMA Overlay with WP membrane				SYD	$60.00 /SYD	
Overlay Removal		(Epoxy: $22/syd | Latex: $26/syd | HMA: $7/syd)		SYD	$22.00 /SYD	
Reseal Bridge Joints				FT	$28.00 /FT	
Shallow Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
SUPERSTRUCTURE REPAIR						
Bearing Realignment / Replacement		(incl. temporary supports)		EA	$6,450.00 EA	
Heat Straightening		(incl. clean and coat)		EA	$57,000.00 EA	
Pack Rust Repair		(greater than 3/8" separation)		FT	$1,150.00 /FT	
Paint - Complete		(incl. clean & coat)		SFT	$22.00 /SFT	
Paint - Partial / Spot / Zone		(incl. clean & coat - $20k minimum)	30,250.0	SFT	$35.00 /SFT	$1,058,750.00
PCI Beam End Blockout		(incl. temporary supports)		EA	$7,200.00 EA	
Eyebar Replacement		(incl. required bracing)	4.0	EA	$135,000.00 EA	$540,000.00
Structural Steel Repair		(based on 6ft repair length)		EA	$4,000.00 EA	
Structural Steel Repair - Stiffener		(includes each side of beam)		EA	$1,500.00 EA	
SUBSTRUCTURE REPAIR						
Substructure Patching		(measured x 2) replace if repair area > 30%		CFT	$360.00 /CFT	
Substructure Replacement		(incl. temporary supports, excavation)		CFT	$375.00 /CFT	
Substructure Horizontal Surface Sealer				SYD	$75.00 /SYD	
Temporary Supports		(add Structural Steel Repair - Stiffener for ea steel beam)		EA	$4,000.00 EA	
MISCELLANEOUS						
Articulating Concrete Block System (ACB)				SYD	$320.00 /SYD	
Concrete Surface Coating				SYD	$47.00 /SYD	
Culvert Cleanout				FT	$125.00 /FT	
Epoxy Crack Injection		(structural crack repair)		FT	$70.00 /FT	
Metal Mesh Panels		(48" width, max 6'-6" length)		SFT	$28.00 /SFT	
Pressure Relief Joint		(use when approach concrete roadway exceeds 1,000ft)		FT	$110.00 /FT	
Riprap		(assume 10ft distance around perimeter of substructure)		SYD	$275.00 /SYD	
Silane Treatment		(penetrating sealer for concrete surfaces)		SFT	$7.00 /SFT	
Slope Protection Repairs				SYD	$150.00 /SYD	
Other						
					STRUCTURE CONSTRUCTION BUDGET	$2,085,448
ROAD WORK						
Approach Pavement, 12" RC		(incl. removal; add curb, gutter, guardrail) 40' ea. end		SYD	$230.00 /SYD	
Approach Curb & Gutter		(incl. removal) 40' ea. quadrant		FT	$57.00 /FT	
Guardrail Anchorage to Bridge		(each quadrant)		EA	$2,640.00 /EA	
Guardrail		(incl. removal) < 200ft beyond reference line		FT	$41.00 /FT	
Guardrail Terminal		(each quadrant)		EA	$3,900.00 /EA	
Roadway Approach Work		(beyond approach pavement)		LSUM	LSUM	
Utilities				LSUM	LSUM	
TRAFFIC CONTROL	*Unit Cost to be determined by Region or TSC Traffic & Safety*					
Part Width Construction				LSUM	LSUM	
Crossovers				EA	/EA	
Temporary Traffic Signals				set	/set	
RR Flagging				LSUM	LSUM	
Detour			1.0	LSUM	$250,000.00 LSUM	$250,000.00
					RELATED ROAD/TRAFFIC CONSTRUCTION BUDGET	$250,000
CONTINGENCY	(10% - 20%) (use higher contingency for small projects)		10	%	$2,335,000.00	$234,000
MOBILIZATION	(estimate at 10%)		10	%	$2,569,000.00	$257,000
INFLATION	(assume 4% per year, beginning in 2025)		16	%	$2,826,000.00	$452,000

(Does not include PE or CE) **TOTAL CONSTRUCTION BUDGET** $3,278,000

(Refer to programming guidelines in Bridge Cost Estimating Worksheet-Key for CE,PE & PE-S)

% CE	CON BUDGET	$3,278,000
% PE	PE BUDGET	$0
% PE	PE-S BUDGET	$0

2024

BRIDGE COST ESTIMATE WORKSHEET

- CPM, REHAB, REPLACE -

REV. 01/31/2023

DATE: 6/27/2024

OWNER: Grosse Ile Bridge Company FISCAL YEAR: 2034 ENGINEER: M. Helinski

REGION:

TSC: PR: MP:

	LENGTH	Out to Out WIDTH	Curb to Curb WIDTH
	1038.5	24.7	21.7

STRUCTURE ID:

BRIDGE ID: 82680000008010

LOCATION: Grosse Ile Toll Bridge over Trenton Channel

PRIMARY WORK ACTIVITY Long Term Repair/Rehabilitation DECK AREA: 25,651 SFT STR. TYPE: Steel Cont. & Mov. Swing

OTHER WORK: See Recommendations Section of Report CLEAR ROADWAY: 22,535 SFT

WORK ACTIVITY		MDOT Bridge Design Guides	QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE		(increase deck area based on design standards and hydraulic requirements)				
Single or Multiple Spans, Grade Separation		(add demo, approach, MOT)		SFT	$415.00 /SFT	
Single Span, Over Water	Length < 100ft	(add demo, approach, MOT)		SFT	$500.00 /SFT	
Multiple Spans, Over Water	Length > 100ft	(add demo, approach, MOT)		SFT	$450.00 /SFT	
Precast Culvert	Length < 40ft	(add demo, approach, MOT)		SFT	$540.00 /SFT	
NEW SUPERSTRUCTURE						
New Superstructure, Grade Separation		(incl. remove exist deck/super; add MOT & approach)		SFT	$295.00 /SFT	
New Superstructure, Over Water		(incl. remove exist deck/super; add MOT & approach)		SFT	$300.00 /SFT	
WIDENING						
Structure Widening, ____ ft		(incl. deck/super/sub widening, add approach transition)		SFT	$630.00 /SFT	
NEW DECK						
New Bridge Deck (Swing Span, Steel Open Grid)		(incl. remove exist deck, add approach, MOT)	6,608.0	SFT	$200.00 /SFT	$1,321,600.00
New Bridge Deck (App. Spans, Steel Grid with Fill)		(incl. remove exist deck, add approach, MOT)	15,624.0	SFT	$250.00 /SFT	$3,906,000.00
DEMOLITION						
Entire Structure, Grade Separation				SFT	$75.00 /SFT	
Entire Structure, Over Water				SFT	$95.00 /SFT	
DECK REPAIR / TREATMENTS						
Bridge Railing Replacement		(incl. removal and replacement)		FT	$750.00 /FT	
Concrete Brush Block / Curb Patch		(incl. hand chipping and formwork)		FT	$29.00 /FT	
Concrete Barrier Patch		(incl. hand chipping and formwork)		SFT	$85.00 /SFT	
Concrete Deck Patch		(incl. hand chipping)		SFT	$68.00 /SFT	
Deep Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
Epoxy Overlay		(incl. warranty)		SYD	$48.00 /SYD	
Expansion Joint Gland Replacement		(remove and replace elastomeric gland)		FT	$125.00 /FT	
Expansion Joint Replacement		(incl. removal)		FT	$860.00 /FT	
Full Depth Patch				SFT	$140.00 /SFT	
Healer / Sealer		(penetrates cracks in bridge deck)		SYD	$30.00 /SYD	
HMA Overlay with WP membrane				SYD	$60.00 /SYD	
Overlay Removal		(Epoxy: $22/syd | Latex: $26/syd | HMA: $7/syd)		SYD	$22.00 /SYD	
Reseal Bridge Joints				FT	$28.00 /FT	
Shallow Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
SUPERSTRUCTURE REPAIR						
Bearing Realignment / Replacement		(incl. temporary supports)	16.0	EA	$6,450.00 EA	$103,200.00
Heat Straightening		(incl. clean and coat)		EA	$57,000.00 EA	
Pack Rust Repair		(greater than 3/8" separation)		FT	$1,150.00 /FT	
Paint - Complete		(incl. clean & coat)	118,500.0	SFT	$22.00 /SFT	$2,607,000.00
Paint - Partial / Spot / Zone		(incl. clean & coat - $20k minimum)		SFT	$35.00 /SFT	
Joist Stringer Replacement		(Furn, Fab & Erect)	250.0	FT	$350.00 /FT	$87,500.00
Stringer Replacement		(Furn, Fab & Erect)	2,135.0	FT	$600.00 /FT	$1,281,000.00
Eyebar Replacement		(incl. required bracing)	12.0	EA	$135,000.00 EA	$1,620,000.00
Floorbeam End Repair		(based on 6ft repair length)	1.0	EA	$4,000.00 EA	$4,000.00
SUBSTRUCTURE REPAIR						
Substructure Patching		(measured x 2) replace if repair area > 30%	1,000.0	CFT	$360.00 /CFT	$360,000.00
Substructure Replacement		(incl. temporary supports, excavation)		CFT	$375.00 /CFT	
Substructure Horizontal Surface Sealer				SYD	$75.00 /SYD	
Temporary Supports		(add Structural Steel Repair - Stiffener for ea steel beam)		EA	$4,000.00 EA	
MISCELLANEOUS						
Articulating Concrete Block System (ACB)				SYD	$320.00 /SYD	
Concrete Surface Coating				SYD	$47.00 /SYD	
Culvert Cleanout				FT	$125.00 /FT	
Epoxy Crack Injection		(structural crack repair)		FT	$70.00 /FT	
Metal Mesh Panels		(48" width, max 6'-6" length)		SFT	$28.00 /SFT	
Pressure Relief Joint		(use when approach concrete roadway exceeds 1,000ft)		FT	$110.00 /FT	
Riprap		(assume 10ft distance around perimeter of substructure)		SYD	$275.00 /SYD	
Silane Treatment		(penetrating sealer for concrete surfaces)		SFT	$7.00 /SFT	
Slope Protection Repairs				SYD	$150.00 /SYD	
Other						
					STRUCTURE CONSTRUCTION BUDGET	$11,290,300
ROAD WORK						
Approach Pavement, 12" RC		(incl. removal; add curb, gutter, guardrail) 40' ea. end		SYD	$230.00 /SYD	
Approach Curb & Gutter		(incl. removal) 40' ea. quadrant		FT	$57.00 /FT	
Guardrail Anchorage to Bridge		(each quadrant)	4.0	EA	$2,540.00 /EA	$10,160.00
Guardrail		(incl. removal) < 200ft beyond reference line	300.0	FT	$41.00 /FT	$12,300.00
Guardrail Terminal		(each quadrant)	2.0	EA	$3,900.00 /EA	$7,800.00
Roadway Approach Work		(beyond approach pavement)		LSUM	LSUM	
Utilities				LSUM	LSUM	
TRAFFIC CONTROL	*Unit Cost to be determined by Region or TSC Traffic & Safety*					
Part Width Construction				LSUM	LSUM	
Crossovers				EA	/EA	
Temporary Traffic Signals				set	/set	
RR Flagging				LSUM	LSUM	
Detour			1.0	LSUM	$250,000.00 LSUM	$250,000.00
					RELATED ROAD/TRAFFIC CONSTRUCTION BUDGET	$260,260
CONTINGENCY	(10% - 20%) (use higher contingency for small projects)		10	%	$11,571,000.00	$1,157,000
MOBILIZATION	(estimate at 10%)		10	%	$12,728,000.00	$1,273,000
INFLATION	(assume 4% per year, beginning in 2025)		40	%	$14,001,000.00	$5,600,000

(Does not include PE or CE) **TOTAL CONSTRUCTION BUDGET** $19,601,000

(Refer to programming guidelines in Bridge Cost Estimating Worksheet-Key for CE,PE & PE-S)

% CE	CON BUDGET	$19,601,000
% PE	PE BUDGET	$0
% PE	PE-S BUDGET	$0

2024

BRIDGE COST ESTIMATE WORKSHEET

- CPM, REHAB, REPLACE -

REV. 01/31/2023

OWNER: Grosse Ile Bridge Company FISCAL YEAR: 2028 DATE: 6/27/2024
REGION: ENGINEER: M. Helinski
TSC: PR: MP:

	LENGTH	Out to Out WIDTH	Curb to Curb WIDTH
	1038.5	24.7	21.7

STRUCTURE ID:
BRIDGE ID: B26B0000000B010

LOCATION: Grosse Ile Toll Bridge over Trenton Channel
PRIMARY WORK ACTIVITY Long Term Repair/Rehabilitation DECK AREA: 25,651 SFT STR. TYPE: Steel Cont. & Mov. Swing
OTHER WORK: See Recommendations Section of Report CLEAR ROADWAY: 22,535 SFT

WORK ACTIVITY	MDOT Bridge Design Guides	QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE	(increase deck area based on design standards and hydraulic requirements)				
Single or Multiple Spans, Grade Separation	(add demo, approach, MOT)		SFT	$415.00 /SFT	
Single Span, Over Water Length < 100ft	(add demo, approach, MOT)		SFT	$500.00 /SFT	
Multiple Spans, Over Water Length > 100ft	(add demo, approach, MOT)		SFT	$450.00 /SFT	
Precast Culvert Length < 40ft	(add demo, approach, MOT)		SFT	$540.00 /SFT	
NEW SUPERSTRUCTURE					
New Superstructure, Grade Separation	(incl. remove exist deck/super; add MOT & approach)		SFT	$295.00 /SFT	
New Superstructure, Over Water	(incl. remove exist deck/super; add MOT & approach)		SFT	$300.00 /SFT	
WIDENING					
Structure Widening, ft	(incl. deck/super/sub widening, add approach transition)		SFT	$630.00 /SFT	
NEW DECK					
New Bridge Deck (Swing Span, Steel Open Grid)	(incl. remove exist deck, add approach, MOT)	6,608.0	SFT	$200.00 /SFT	$1,321,600.00
New Bridge Deck (App. Spans, Steel Grid with Fill)	(incl. remove exist deck, add approach, MOT)	15,624.0	SFT	$250.00 /SFT	$3,906,000.00
DEMOLITION					
Entire Structure, Grade Separation			SFT	$75.00 /SFT	
Entire Structure, Over Water			SFT	$95.00 /SFT	
DECK REPAIR / TREATMENTS					
Bridge Railing Replacement	(incl. removal and replacement)		FT	$750.00 /FT	
Concrete Brush Block / Curb Patch	(incl. hand chipping and formwork)		FT	$29.00 /FT	
Concrete Barrier Patch	(incl. hand chipping and formwork)		SFT	$85.00 /SFT	
Concrete Deck Patch	(incl. hand chipping)		SFT	$68.00 /SFT	
Deep Overlay	(incl. joint repl & hydro)		SFT	$46.00 /SFT	
Epoxy Overlay	(incl. warranty)		SYD	$48.00 /SYD	
Expansion Joint Gland Replacement	(remove and replace elastomeric gland)		FT	$125.00 /FT	
Expansion Joint Replacement	(incl. removal)		FT	$860.00 /FT	
Full Depth Patch			SFT	$140.00 /SFT	
Healer / Sealer	(penetrates cracks in bridge deck)		SYD	$30.00 /SYD	
HMA Overlay with WP membrane			SYD	$60.00 /SYD	
Overlay Removal	(Epoxy: $22/syd | Latex: $26/syd | HMA: $7/syd)		SYD	$22.00 /SYD	
Reseal Bridge Joints			FT	$28.00 /FT	
Shallow Overlay	(incl. joint repl & hydro)		SFT	$46.00 /SFT	
SUPERSTRUCTURE REPAIR					
Bearing Realignment / Replacement	(incl. temporary supports)	16.0	EA	$6,450.00 EA	$103,200.00
Heat Straightening	(incl. clean and coat)		EA	$57,000.00 EA	
Pack Rust Repair	(greater than 3/8" separation)		FT	$1,150.00 /FT	
Paint - Complete	(incl. clean & coat)	118,500.0	SFT	$22.00 /SFT	$2,607,000.00
Paint - Partial / Spot / Zone	(incl. clean & coat - $20k minimum)		SFT	$35.00 /SFT	
Joist Stringer Replacement	(Furn, Fab & Erect)	250.0	FT	$350.00 /FT	$87,500.00
Stringer Replacement	(Furn, Fab & Erect)	2,135.0	FT	$600.00 /FT	$1,281,000.00
Eyebar Replacement	(incl. required bracing)	12.0	EA	$135,000.00 EA	$1,620,000.00
Floorbeam End Repair	(based on 6ft repair length)	1.0	EA	$4,000.00 EA	$4,000.00
SUBSTRUCTURE REPAIR					
Substructure Patching	(measured x 2) replace if repair area > 30%	1,000.0	CFT	$360.00 /CFT	$360,000.00
Substructure Replacement	(incl. temporary supports, excavation)		CFT	$375.00 /CFT	
Substructure Horizontal Surface Sealer			SYD	$75.00 /SYD	
Temporary Supports	(add Structural Steel Repair - Stiffener for ea steel beam)		EA	$4,000.00 EA	
MISCELLANEOUS					
Articulating Concrete Block System (ACB)			SYD	$320.00 /SYD	
Concrete Surface Coating			SYD	$47.00 /SYD	
Culvert Cleanout			FT	$125.00 /FT	
Epoxy Crack Injection	(structural crack repair)		FT	$70.00 /FT	
Metal Mesh Panels	(48" width, max 6'-6" length)		SFT	$28.00 /SFT	
Pressure Relief Joint	(use when approach concrete roadway exceeds 1,000ft)		FT	$110.00 /FT	
Riprap	(assume 10ft distance around perimeter of substructure)		SYD	$275.00 /SYD	
Silane Treatment	(penetrating sealer for concrete surfaces)		SFT	$7.00 /SFT	
Slope Protection Repairs			SYD	$150.00 /SYD	
Other					
				STRUCTURE CONSTRUCTION BUDGET	$11,290,300
ROAD WORK					
Approach Pavement, 12" RC	(incl. removal; add curb, gutter, guardrail) 40' ea. end		SYD	$230.00 /SYD	
Approach Curb & Gutter	(incl. removal) 40' ea. quadrant		FT	$57.00 /FT	
Guardrail Anchorage to Bridge	(each quadrant)	4.0	EA	$2,540.00 /EA	$10,160.00
Guardrail	(incl. removal) < 200ft beyond reference line	300.0	FT	$41.00 /FT	$12,300.00
Guardrail Terminal	(each quadrant)	2.0	EA	$3,900.00 /EA	$7,800.00
Roadway Approach Work	(beyond approach pavement)		LSUM	LSUM	
Utilities			LSUM	LSUM	
TRAFFIC CONTROL	*Unit Cost to be determined by Region or TSC Traffic & Safety*				
Part Width Construction			LSUM	LSUM	
Crossovers			EA	/EA	
Temporary Traffic Signals			set	/set	
RR Flagging			LSUM	LSUM	
Detour		1.0	LSUM	$250,000.00 LSUM	$250,000.00
				RELATED ROAD/TRAFFIC CONSTRUCTION BUDGET	$280,260
CONTINGENCY	(10% - 20%) (use higher contingency for small projects)	10	%	$11,571,000.00	$1,157,000
MOBILIZATION	(estimate at 10%)	10	%	$12,728,000.00	$1,273,000
INFLATION	(assume 4% per year, beginning in 2025)	16	%	$14,001,000.00	$2,240,000

(Does not include PE or CE) **TOTAL CONSTRUCTION BUDGET** $16,241,000

(Refer to programming guidelines in Bridge Cost Estimating Worksheet-Key for CE,PE & PE-S)

% CE	CON BUDGET	$16,241,000
% PE	PE BUDGET	$0
% PE	PE-S BUDGET	$0

2024

BRIDGE COST ESTIMATE WORKSHEET

- CPM, REHAB, REPLACE -

REV. 01/31/2023

DATE: 6/27/2024

OWNER: Grosse Ile Bridge Company FISCAL YEAR: 2028 ENGINEER: M. Helinski

REGION:

TSC: PR: MP:

	LENGTH	Out to Out WIDTH	Curb to Curb WIDTH
	1100.0	33.0	24.0

STRUCTURE ID:

BRIDGE ID: 82680000008010

LOCATION: Grosse Ile Toll Bridge over Trenton Channel

PRIMARY WORK ACTIVITY Bridge Replacement DECK AREA: 36,300 SFT STR. TYPE: Steel Cont. & Mov. Swing

OTHER WORK: CLEAR ROADWAY: 26,400 SFT

WORK ACTIVITY		MDOT Bridge Design Guides (increase deck area based on design standards and hydraulic requirements)	QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE						
Single or Multiple Spans, Grade Separation		(add demo, approach, MOT)		SFT	$415.00 /SFT	
Single Span, Over Water	Length < 100ft	(add demo, approach, MOT)		SFT	$500.00 /SFT	
Movable with App Spans, Over Water	Length > 100ft	(add demo, approach, MOT)	36,300.0	SFT	$3,500.00 /SFT	$127,050,000.00
Precast Culvert	Length < 40ft	(add demo, approach, MOT)		SFT	$540.00 /SFT	
NEW SUPERSTRUCTURE						
New Superstructure, Grade Separation		(incl. remove exist deck/super; add MOT & approach)		SFT	$295.00 /SFT	
New Superstructure, Over Water		(incl. remove exist deck/super; add MOT & approach)		SFT	$300.00 /SFT	
WIDENING						
Structure Widening, ft		(incl. deck/super/sub widening, add approach transition)		SFT	$630.00 /SFT	
NEW DECK						
New Bridge Deck (Swing Span, Steel Open Grid)		(incl. remove exist deck, add approach, MOT)		SFT	$200.00 /SFT	
New Bridge Deck (App. Spans, Steel Grid with Fill)		(incl. remove exist deck, add approach, MOT)		SFT	$250.00 /SFT	
DEMOLITION						
Entire Structure, Grade Separation				SFT	$75.00 /SFT	
Entire Structure, Over Water			25,639.0	SFT	$95.00 /SFT	$2,435,705.00
DECK REPAIR / TREATMENTS						
Bridge Railing Replacement		(incl. removal and replacement)		FT	$750.00 /FT	
Concrete Brush Block / Curb Patch		(incl. hand chipping and formwork)		FT	$29.00 /FT	
Concrete Barrier Patch		(incl. hand chipping and formwork)		SFT	$85.00 /SFT	
Concrete Deck Patch		(incl. hand chipping)		SFT	$68.00 /SFT	
Deep Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
Epoxy Overlay		(incl. warranty)		SYD	$48.00 /SYD	
Expansion Joint Gland Replacement		(remove and replace elastomeric gland)		FT	$125.00 /FT	
Expansion Joint Replacement		(incl. removal)		FT	$860.00 /FT	
Full Depth Patch				SFT	$140.00 /SFT	
Healer / Sealer		(penetrates cracks in bridge deck)		SYD	$30.00 /SYD	
HMA Overlay with WP membrane				SYD	$60.00 /SYD	
Overlay Removal		(Epoxy: $22/syd | Latex: $26/syd | HMA: $7/syd)		SYD	$22.00 /SYD	
Reseal Bridge Joints				FT	$28.00 /FT	
Shallow Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
SUPERSTRUCTURE REPAIR						
Bearing Realignment / Replacement		(incl. temporary supports)		EA	$6,450.00 EA	
Heat Straightening		(incl. clean and coat)		EA	$57,000.00 EA	
Pack Rust Repair		(greater than 3/8" separation)		FT	$1,150.00 /FT	
Paint - Complete		(incl. clean & coat)		SFT	$22.00 /SFT	
Paint - Partial / Spot / Zone		(incl. clean & coat - $20k minimum)		SFT	$35.00 /SFT	
Joist Stringer Replacement		(Furn, Fab & Erect)		FT	$500.00 /FT	
Stringer Replacement		(Furn, Fab & Erect)		FT	$600.00 /FT	
Eyebar Replacement		(incl. required bracing)		EA	$100,000.00 EA	
Floorbeam End Repair		(based on 6ft repair length)		EA	$4,000.00 EA	
SUBSTRUCTURE REPAIR						
Substructure Patching		(measured x 2) replace if repair area > 30%		CFT	$360.00 /CFT	
Substructure Replacement		(incl. temporary supports, excavation)		CFT	$375.00 /CFT	
Substructure Horizontal Surface Sealer				SYD	$75.00 /SYD	
Temporary Supports		(add Structural Steel Repair - Stiffener for ea steel beam)		EA	$4,000.00 EA	
MISCELLANEOUS						
Articulating Concrete Block System (ACB)				SYD	$320.00 /SYD	
Concrete Surface Coating				SYD	$47.00 /SYD	
Culvert Cleanout				FT	$125.00 /FT	
Epoxy Crack Injection		(structural crack repair)		FT	$70.00 /FT	
Metal Mesh Panels		(48" width, max 6'-6" length)		SFT	$28.00 /SFT	
Pressure Relief Joint		(use when approach concrete roadway exceeds 1,000ft)		FT	$110.00 /FT	
Riprap		(assume 10ft distance around perimeter of substructure)		SYD	$275.00 /SYD	
Silane Treatment		(penetrating sealer for concrete surfaces)		SFT	$7.00 /SFT	
Slope Protection Repairs				SYD	$150.00 /SYD	
Other						
					STRUCTURE CONSTRUCTION BUDGET	$129,485,705
ROAD WORK						
Approach Pavement, 12" RC		(incl. removal; add curb, gutter, guardrail) 40' ea. end	250.0	SYD	$230.00 /SYD	$57,500.00
Approach Curb & Gutter		(incl. removal) 40' ea. quadrant	160.0	FT	$57.00 /FT	$9,120.00
Guardrail Anchorage to Bridge		(each quadrant)	4.0	EA	$2,540.00 /EA	$10,160.00
Guardrail		(incl. removal) < 200ft beyond reference line	500.0	FT	$41.00 /FT	$20,500.00
Guardrail Terminal		(each quadrant)	4.0	EA	$3,900.00 /EA	$15,600.00
Roadway Approach Work		(beyond approach pavement)		LSUM	LSUM	
Utilities				LSUM	LSUM	
TRAFFIC CONTROL	*Unit Cost to be determined by Region or TSC Traffic & Safety*					
Part Width Construction				LSUM	LSUM	
Crossovers				EA	/EA	
Temporary Traffic Signals				set	/set	
RR Flagging				LSUM	LSUM	
Detour			1.0	LSUM	$250,000.00 LSUM	$250,000.00
					RELATED ROAD/TRAFFIC CONSTRUCTION BUDGET	$362,880
CONTINGENCY	(10% - 20%) (use higher contingency for small projects)		10	%	$129,849,000.00	$12,985,000
MOBILIZATION	(estimate at 10%)		10	%	$142,834,000.00	$14,283,000
INFLATION	(assume 4% per year, beginning in 2025)		16	%	$157,117,000.00	$25,139,000

(Does not include PE or CE) **TOTAL CONSTRUCTION BUDGET** $182,256,000

(Refer to programming guidelines in Bridge Cost Estimating Worksheet-Key for CE,PE & PE-S)

% CE	CON BUDGET	$182,256,000
% PE	PE BUDGET	$0
% PE	PE-S BUDGET	$0

2024

BRIDGE COST ESTIMATE WORKSHEET

- CPM, REHAB, REPLACE -

REV. 01/31/2023

OWNER: Grosse Ile Bridge Company FISCAL YEAR: 2054 DATE: 6/27/2024

REGION: ENGINEER: M. Helinski

TSC: PR: MP:

	LENGTH	Out to Out WIDTH	Curb to Curb WIDTH
	1100.0	33.0	24.0

STRUCTURE ID:

BRIDGE ID: 82680000008010

LOCATION: Grosse Ile Toll Bridge over Trenton Channel

PRIMARY WORK ACTIVITY Bridge Replacement DECK AREA: 36,300 SFT STR. TYPE: Steel Cont. & Mov. Swing

OTHER WORK: CLEAR ROADWAY: 26,400 SFT

WORK ACTIVITY		MDOT Bridge Design Guides	QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE		(increase deck area based on design standards and hydraulic requirements)				
Single or Multiple Spans, Grade Separation		(add demo, approach, MOT)		SFT	$415.00 /SFT	
Single Span, Over Water	Length < 100ft	(add demo, approach, MOT)		SFT	$500.00 /SFT	
Movable with App Spans, Over Water	Length > 100ft	(add demo, approach, MOT)	36,300.0	SFT	$3,500.00 /SFT	$127,050,000.00
Precast Culvert	Length < 40ft	(add demo, approach, MOT)		SFT	$540.00 /SFT	
NEW SUPERSTRUCTURE						
New Superstructure, Grade Separation		(incl. remove exist deck/super; add MOT & approach)		SFT	$295.00 /SFT	
New Superstructure, Over Water		(incl. remove exist deck/super; add MOT & approach)		SFT	$300.00 /SFT	
WIDENING						
Structure Widening, ft		(incl. deck/super/sub widening, add approach transition)		SFT	$630.00 /SFT	
NEW DECK						
New Bridge Deck (Swing Span, Steel Open Grid)		(incl. remove exist deck, add approach, MOT)		SFT	$200.00 /SFT	
New Bridge Deck (App. Spans, Steel Grid with Fill)		(incl. remove exist deck, add approach, MOT)		SFT	$250.00 /SFT	
DEMOLITION						
Entire Structure, Grade Separation				SFT	$75.00 /SFT	
Entire Structure, Over Water			25,639.0	SFT	$95.00 /SFT	$2,435,705.00
DECK REPAIR / TREATMENTS						
Bridge Railing Replacement		(incl. removal and replacement)		FT	$750.00 /FT	
Concrete Brush Block / Curb Patch		(incl. hand chipping and formwork)		FT	$29.00 /FT	
Concrete Barrier Patch		(incl. hand chipping and formwork)		SFT	$85.00 /SFT	
Concrete Deck Patch		(incl. hand chipping)		SFT	$68.00 /SFT	
Deep Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
Epoxy Overlay		(incl. warranty)		SYD	$48.00 /SYD	
Expansion Joint Gland Replacement		(remove and replace elastomeric gland)		FT	$125.00 /FT	
Expansion Joint Replacement		(incl. removal)		FT	$860.00 /FT	
Full Depth Patch				SFT	$140.00 /SFT	
Healer / Sealer		(penetrates cracks in bridge deck)		SYD	$30.00 /SYD	
HMA Overlay with WP membrane				SYD	$60.00 /SYD	
Overlay Removal		(Epoxy: $22/syd | Latex: $26/syd | HMA: $7/syd)		SYD	$22.00 /SYD	
Reseal Bridge Joints				FT	$28.00 /FT	
Shallow Overlay		(incl. joint repl & hydro)		SFT	$46.00 /SFT	
SUPERSTRUCTURE REPAIR						
Bearing Realignment / Replacement		(incl. temporary supports)		EA	$8,450.00 EA	
Heat Straightening		(incl. clean and coat)		EA	$57,000.00 EA	
Pack Rust Repair		(greater than 3.8" separation)		FT	$1,150.00 /FT	
Paint - Complete		(incl. clean & coat)		SFT	$22.00 /SFT	
Paint - Partial / Spot / Zone		(incl. clean & coat - $20k minimum)		SFT	$35.00 /SFT	
Joist Stringer Replacement		(Furn, Fab & Erect)		FT	$500.00 /FT	
Stringer Replacement		(Furn, Fab & Erect)		FT	$600.00 /FT	
Eyebar Replacement		(incl. required bracing)		EA	$100,000.00 EA	
Floorbeam End Repair		(based on 6ft repair length)		EA	$4,000.00 EA	
SUBSTRUCTURE REPAIR						
Substructure Patching		(measured x 2) replace if repair area > 30%		CFT	$360.00 /CFT	
Substructure Replacement		(incl. temporary supports, excavation)		CFT	$375.00 /CFT	
Substructure Horizontal Surface Sealer				SYD	$75.00 /SYD	
Temporary Supports		(add Structural Steel Repair - Stiffener for ea steel beam)		EA	$4,000.00 EA	
MISCELLANEOUS						
Articulating Concrete Block System (ACB)				SYD	$320.00 /SYD	
Concrete Surface Coating				SYD	$47.00 /SYD	
Culvert Cleanout				FT	$125.00 /FT	
Epoxy Crack Injection		(structural crack repair)		FT	$70.00 /FT	
Metal Mesh Panels		(48" width, max 6'-6" length)		SFT	$28.00 /SFT	
Pressure Relief Joint		(use when approach concrete roadway exceeds 1,000ft)		FT	$110.00 /FT	
Riprap		(assume 10ft distance around perimeter of substructure)		SYD	$275.00 /SYD	
Silane Treatment		(penetrating sealer for concrete surfaces)		SFT	$7.00 /SFT	
Slope Protection Repairs				SYD	$150.00 /SYD	
Other						

STRUCTURE CONSTRUCTION BUDGET $129,485,705

ROAD WORK						
Approach Pavement, 12" RC	(incl. removal; add curb, gutter, guardrail) 40' ea. end	250.0	SYD	$230.00 /SYD		$57,500.00
Approach Curb & Gutter	(incl. removal) 40' ea. quadrant	160.0	FT	$57.00 /FT		$9,120.00
Guardrail Anchorage to Bridge	(each quadrant)	4.0	EA	$2,540.00 /EA		$10,160.00
Guardrail	(incl. removal) < 200ft beyond reference line	500.0	FT	$41.00 /FT		$20,500.00
Guardrail Terminal	(each quadrant)	4.0	EA	$3,900.00 /EA		$15,600.00
Roadway Approach Work	(beyond approach pavement)		LSUM		LSUM	
Utilities			LSUM		LSUM	
TRAFFIC CONTROL	*Unit Cost to be determined by Region or TSC Traffic & Safety*					
Part Width Construction			LSUM		LSUM	
Crossovers			EA		/EA	
Temporary Traffic Signals			set		/set	
RR Flagging			LSUM		LSUM	
Detour		1.0	LSUM	$250,000.00	LSUM	$250,000.00

RELATED ROAD/TRAFFIC CONSTRUCTION BUDGET $362,860

CONTINGENCY	(10% - 20%) (use higher contingency for small projects)	10	%	$129,849,000.00	$12,985,000
MOBILIZATION	(estimate at 10%)	10	%	$142,834,000.00	$14,283,000
INFLATION	(assume 4% per year, beginning in 2025)	120	%	$157,117,000.00	$188,540,000

(Does not include PE or CE) **TOTAL CONSTRUCTION BUDGET** $345,657,000

(Refer to programming guidelines in Bridge Cost Estimating Worksheet Key for CE,PE & PE-S) % CE CON BUDGET $345,657,000

% PE PE BUDGET $0

% PE PE-S BUDGET $0

Electrical Component Short-Term Cost Data

SHORT-TERM COST ESTIMATE DATA		
Item	**Description**	**Estimated Cost**
Span Motor Drive System	Modify motor span control	$15,000
Control System	Remove latching lowering circuit from gate controls	$50,000
Submarine Cables	Repair detached submarine cable ducts	$10,000

Electrical Component Long-Term Cost Data

LONG-TERM COST ESTIMATE DATA		
Item	**Description**	**Estimated Cost**
Power Distribution	Provide new 480 VAC utility source	$250,000
	Provide new backup generator for control house and span operation power	$200,000
	Provide new power distribution switchgear	$300,000
Span Motor Drive System	Replace Span Motors & Drives	$200,000
	New Span Drive Brakes	$100,000
	Provide Electrical End Machinery	$250,000
Control System	New Network Based PLC Control System	$300,000
Traffic Control Devices	New Green, Amber, and Red Signal Heads	$50,000
	Reconfiguration of Traffic Gates	$25,000
	New Resistance Style Barrier Gates	$350,000
Submarine Cable	New Submarine Cable Ducts & Boxes	$500,000
	New Submarine Cable Ducts Wiring	$250,000
Conduit & Cable	New Conduit System	$150,000
	New Cabling	$100,000
	New Traveling Cables	$200,00
House & Roadway Lighting	New House Lighting	$50,000
	New Roadway Access Lighting	$150,000
	New Control House HVAC system	$75,000
Navigation Lights & Marine Signaling	New Fender Lights	$50,000
	New Span Navigation Lights	$100,000
	New Air Horn	$75,000

BRIDGE INSPECTION REPORT FORM

STR 12306	BRIDGE SAFETY INSPECTION REPORT		
Facility	**Latitude / Longitude**	**MDOT Structure ID**	**Structure Condition**
Grosse Ile Toll Br	42.173 / -83.1602	826800000000B0110	Serious Condition(3)
Feature	**Length / Width**	**Owner**	
Trenton Channel	1038.50 / 24.70	County: Grosse Ile Bridge Company	
Location	**Built / Recon. / Paint / Ovly.**	**TSC**	**Operational Status**
Btw. Riverview & Grosse Ile	1913 / / /	Taylor(25)	P Posted for load
Region / County	**Material / Design**	**Last NBI Inspection**	**Scour Evaluation**
Metro(7) / Wayne(82)	4 Steel Cont / 17 Movable-Swing	5/20/2024	6 Calcs not made

NBI INSPECTION

Inspector Name	Agency / Company Name	Insp. Freq.	Insp. Date
Jeremy Vanlerberg, PE Austin Urban, PE	Hardesty & Hanover, LLC	12	5/20/2024

GENERAL NOTES

Assisted By: Jared Heinze, PE and Evan Campua

DECK

	05/24	
1. Surface (SIA-58A)	4	Swing span open grid steel deck in poor condition with cracked welds in grid bars. Steel grid serrations are worn smooth in wheel paths. Fixed truss span concrete filled grid deck in fair condition with sporadic hairline cracks and spalls. Minor spalls present near deck joints. Sealed cracks at filled grid panel joints in spans 3 and 4. Loss of concrete grooves in wheel paths (05/24)
2. Expansion Joints	5	Minor cracks and spalls at joints. Minor leakage. Debris accumulated on glands. (05/24)
3. Other Joints	5	Open joints at swing span ends have minor spalls and cracks on fixed span side. Joint allows rotation as intended. (05/24)
4. Railings	3	Coating failure to more than 10%. Collision damage, broken bracket connections and missing bolts at connections. Guard rail loose and impacting truss in multiple locations. (05/24)
5. Sidewalks or Curbs	5	Galvanized steel HSS section with several cracked welds at joints. Coating failure at curb repair sections on swing span near L6 and L6' north, <1%. Holes in curb rail tops at warning gates. Swing span and fixed span curb rails not aligned, approximately 4 inch offset. (05/24)
6. Deck Bottom Surface (SIA-58B)	4	Swing span open grid has small holes in main bearing bars at 2 purlin locations. Galvanized steel form pans remain under concrete filled grid, with small areas of corrosion at deck joints. (05/24)
7. Deck (SIA-58)	4	Measurible section loss to steel open grid in swing span. Cracks in top surface of steel open grid deck. (05/24)
8. Drainage	N	Off structure. (05/24)

SUPERSTRUCTURE

	05/24	
9. Stringer (SIA-59)	3	Rating may raise to a 4 following the in progress load rating to confirm 7.5 ton posting capacity. Section loss up to 25% in purlins, stringers and floorbeams. Pack rust deforming plates in chord members and gusset plates throughout trusses. Section loss observed in eye-bar tension members supporting swing trusses in open position, sealed repairs at L6 and L6' north truss.
10. Paint (SIA-59A)	3	Swing span paint in serious conditon below open grid deck. Widespread areas with corrosion or chalky paint that is not effective. Fixed trusses have widespread areas of corrosion and failed paint. (05/24)
11. Section Loss	1	Purlins, stringers and floorbeams in swing span have advanced section loss >10% (05/24)
12. Bearings	5	PTFE Sliding bearing appear in good condtion. Span 3 fixed bearing shimmed. (05/24)

STR 12306	BRIDGE SAFETY INSPECTION REPORT		
Facility	**Latitude / Longitude**	**MDOT Structure ID**	**Structure Condition**
Grosse Ile Toll Br	42.173 / -83.1602	826800000000B0110	Serious Condition(3)
Feature	**Length / Width**	**Owner**	
Trenton Channel	1038.50 / 24.70	County: Grosse Ile Bridge Company	
Location	**Built / Recon. / Paint / Ovly.**	**TSC**	**Operational Status**
Btw. Riverview & Grosse Ile	1913 / / /	Taylor(25)	P Posted for load
Region / County	**Material / Design**	**Last NBI Inspection**	**Scour Evaluation**
Metro(7) / Wayne(82)	4 Steel Cont / 17 Movable-Swing	5/20/2024	6 Calcs not made

SUBSTRUCTURE

	05/24	
13. Abutments (SIA-60)	6	Cracks, minor spalls and delaminations at both abutments. Minor areas of efflorescence. (05/24)
14. Piers (SIA-60)	4	Cracks present in Piers 1,2,4 and 5 with rust staining. Pivot pier (3) in fair condition. Concrete surface coating on all surfaces above the waterline. (05/24)
15. Slope Protection	6	Riprap, grout bags and concrete placed on slopes. (05/24)
16. Channel (SIA-61)	6	Minor damage to embankement protection in all quadrants. Channel banks are well vegitated, south west quadrant has sheetpile wall protecting adjacent property. (05/24)
17. Scour Inspection	6	Grout bags placed at piers 1, 2,4 and 5. Minor undermining of sheeting noted in 2024 underwater inspection report. Holes in sheeting noted, with grouted repairs functioning as intended. (05/24)

APPROACH

18. Approach Pavement	6	HMA cracks sealed. Minor settelement noted. (05/24)
19. Approach Shoulders Sidewalks	6	Minor deterioration to concrete curb. No gutter present. No shoulder or sidewlak present. (05/24)
20. Approach Slopes	6	Minor deterioration and settlement of approach slopes not impactin roadway. Riprap and concrete placed in holes. Vegatative cover is adequate. (05/24)

MISCELLANEOUS

Guard Rail

Item	Rating
36A. Bridge Railings	0
36B. Transitions	0
36C. Approach Guardrail	0
36D. Approach Guardrail Ends	0

Other Items

Item	Rating
71. Water Adequacy	8 Equal Desirable
72. Approach Alignment	5 Above Tolerable
Temporary Support	0
High Load Hit (M)	No
Special Insp. Equipment	9 Other (Describe)
Underwater Insp. Method	3 Diver Required

False Decking (Timber) Removed to Complete Inspection N/A - No False Decking

Critical Feature Inspections (SIA-92)

	Freq	Date
92A. Fracture Critical	24	05/2024
92B. Underwater	60	06/2024
92C. Other Special		
92D. Fatigue Sensitive		

STR 12306	BRIDGE SAFETY INSPECTION REPORT		
Facility Grosse Ile Toll Br	**Latitude / Longitude** 42.173 / -83.1602	**MDOT Structure ID** 826800000000B0110	**Structure Condition** Serious Condition(3)
Feature Trenton Channel	**Length / Width** 1038.50 / 24.70	**Owner** County: Grosse Ile Bridge Company	
Location Btw. Riverview & Grosse Ile	**Built / Recon. / Paint / Ovly.** 1913 / / /	**TSC** Taylor(25)	**Operational Status** P Posted for load
Region / County Metro(7) / Wayne(82)	**Material / Design** 4 Steel Cont / 17 Movable-Swing	**Last NBI Inspection** 5/20/2024	**Scour Evaluation** 6 Calcs not made

WORK RECOMMENDATIONS

Inspector Name	Agency / Company Name	Insp. Freq.	Insp. Date
Jeremy Vanlerberg, PE	Hardesty & Hanover, LLC	12	5/20/2024

RECOMMENDATIONS & ACTION ITEMS

Recommendation Type	Priority	Description
Zone Paint	High	Paint swing span lower truss members below guardrail.
Superstructure Repair	High	Replace tension bars at L6 and L6' in north truss of swing span
Overlay	Low	Apply epoxy overlay to concrete filled grid deck
Superstructure Repair	High	Repair members with section loss. Replace mechanical machinery components systems.

GROSSE ILE GIRDER BRIDGE (GB)
INSPECTION REPORT

Gross Ile Toll Bridge Condition Assessment Report

Gross Ile Girder Bridge (GB) Inspection Report

Prepared for:
Hardesty & Hanover

Fishbeck Project No. 240866
June 26, 2024

fishbeck
Engineers | Architects | Scientists | Constructors

Grosse Ile Bridge Condition Assessment Report

Grosse Ile Girder Bridge (GB)
Inspection Report

Prepared For:
Hardesty & Hanover
Grosse Ile, MI

June 26, 2024
Fishbeck Project No. 240866

Review Draft

Summary 2

Existing Bridge 3

Bridge Assessment 3
- Superstructure 3
  - Deck Surface 3
  - Joints 3
  - Railing 4
  - Beams/Diaphragms 4
- Substructure 5
  - Abutments 5
  - Steel Bent Cross Girders 5
- Channel 5
- Approach/Quadrants 6
- Utilities 6

Recommendations 6

List of Appendices

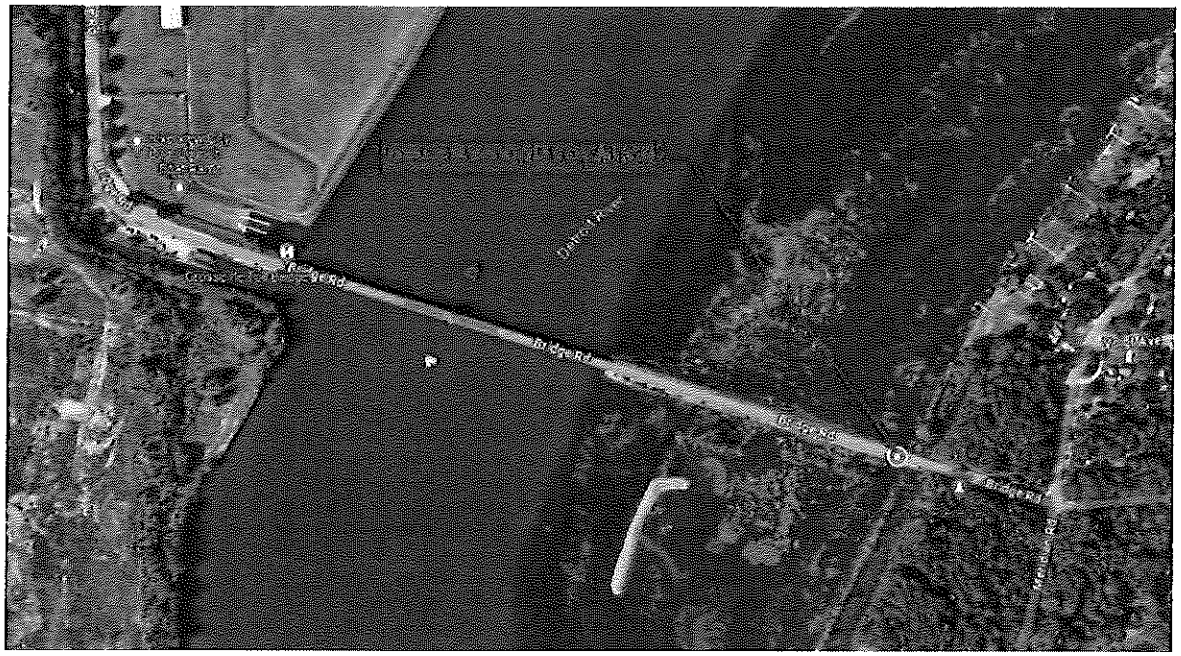
Appendix 1 (GB)	Girder Bridge (GB) Photolog
Appendix 2 (GB)	Girder Bridge (GB) Cost Estimate
Appendix 3 (GB)	Superstructure Replacement As-Built Plans

List of Abbreviations/Acronyms

GB	Girder Bridge
GITB	Grosse Ile Toll Bridge
HH	Hardesty and Hannover
HMA	hot-mix asphalt
MDOT	Michigan Department of Transportation

Summary

The City of Grosse Ile requested Fishbeck, as the subconsultant to Hardesty and Hanover (HH), to inspect the girder bridge (GB) leading up to the Grosse Ile Toll Bridge (GITB). On May 21st, 2024, Fishbeck performed a field investigation of the existing bridge elements. These included inspecting the girder bridge's deck surface, superstructure, railing, substructure, embankments, and approaches. Fishbeck's recommendations for repair are addressed based on immediate, 5-10 year, and 15-20 year recommendations.



Girder Bridge Site

Existing Bridge

The existing Girder Bridge (GB) was inspected on Tuesday May 21, 2024. Original as-built plans are unavailable for this bridge, therefore, conclusions made about the existing bridge are estimations. Some as-builts for a superstructure replacement done in 2001 were available. The following describes our findings of each bridge element and summarizes are recommendations.

The existing bridge is a 32'-0" simple span steel girder bridge with a clear roadway width of 24'-4", original construction date unknown, located approximately 900 ft from the east end of the GITB end and spans a portion of the Detroit River. A superstructure replacement was completed in 2001. This included 10" reinforced concrete deck, six W21x57 beams with stay-in-place forms, expansion joints, guardrail railings and approach slabs on both ends. The substructure is estimated to be pile supported reinforced concrete with concrete wingwalls. The toll road and bridge is load rated for 7.5 tons which is most likely due to the deterioration of the girder bridge and GITB. Appendix 1 (GB) includes a photolog showing the findings and elements of the bridge. Appendix 2 (GB) includes a cost estimate for our recommended repair options. Appendix 3 (GB) includes as-builts provided for this bridge.

Bridge Assessment

Superstructure

Deck Surface

Tined reinforced concrete deck (10") that spans a portion of the Detroit River. New deck was poured during 2001 superstructure replacement. No visible spalling or delaminations on the surface, minor edge spalls located at expansion joints on both ends of bridge. Continuous steel bent plate ¼"x6"is welded to the top flange of both fascia beams and extends up the deck fascia. Water is infiltrating between the deck fascia and steel bent plate which is causing deterioration along the deck bottom surface stay-in-place forms (see Deck Bottom Surface description).

Typical Deck Surface

The deck surface is in good condition with no immediate repairs along the surface recommended. Immediate full depth patching will be needed based on stay-in-place form deficiencies. It is recommended that in 5-10 years a deck replacement could be needed depending on the severity of the deck bottom surface deficiencies at that time.

Joints

The joints on the west and east end of the bridge are steel expansion joints. Minor debris build-up within the joint along with some surface rust is present. Upon visual inspection, the expansion joint is slightly settling. Water is leaking through both joints as rusting occurring with stay-in-place forms below. A joint replacement would be necessary on both ends to ensure full depth patching of the deck can take place along these joints.

A longitudinal construction joint located between the lane lines is in good condition. This was believed to be needed for part width construction during superstructure replacement. No issues noted above or below with water infiltrating the construction joint.

Railing

The bridge railings consist of galvanized highway guardrail with five W6x20 guardrail posts spaced at 7'-8" and was constructed during the 2001 superstructure replacement. The posts are welded to the top portion of the fascia beam webs and are considered a fatigue Category E due to the bending that would occur by a potential vehicular impact. Galvanized TS7x4x ¼"curb is attached at the bottom of the both railings. The railings have minor freckled rust throughout and a small dent located at the steel curb section, likely from a minor vehicle hit.

The railings are in good condition, but do not meet MDOT standard requirements. These will need to be updated to MDOT code when a deck replacement (5-10 years) or bridge replacement (15-20 years) are necessary.

Typical Railing

Beams/Diaphragms

The superstructure consists of six W21x57 beams spaced at 5'-7 ½", with the middle beam sections 1'-6" apart (Appendix 3 (GB)). W10x22 diaphragms located at third points with no deficiencies noted. All beams are in good condition, with no section loss present. Deficiencies noted are some slight rusting along the top flanges from the significant rusting of the stay-in-place forms along both fascias and end joints.

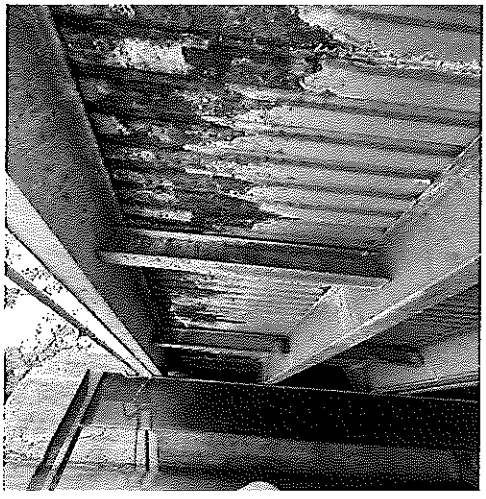
The bearings were difficult to inspect visually, but the steel bent cross girder is now supporting most of the bridge span with the bottom beam flanges welded to the top flange of the steel bent plate cross girders. Approximately 4'-0", at the end of each beam, is cantilevered and resting on the abutment seat, shimmed accordingly.

No recommended repairs are required for the W21x57 beams for W10x22 diaphragms. Only minor rust along the top fascia beams flanges is occurring.

Deck Bottom Surface

The deck bottom surface consists of stay-in-place forms between all five beam bays. Some freckled rust is taking place along isolated areas in middle bays. There is severe section loss along the entirety of both fascia bays, presumably from water infiltrating between the deck fascia and the steel bent plate attached to the fascia top flange. The concrete deck can be seen through the stay-in-place forms in these areas in multiple locations. Below both expansion joints, severe rusting is taking place from water leaking through the joints. Visual inspection could not determine if there is section loss at these stay-in-place forms, but Fishbeck believes it would be similar based on our findings on the fascia bays.

Much of the deck bottom surface is in good condition, with the outside fascia bays and end joint bay locations being in severe condition. Immediate full depth patching at these locations is necessary to prolong the service life of the bridge and prevent further deterioration.

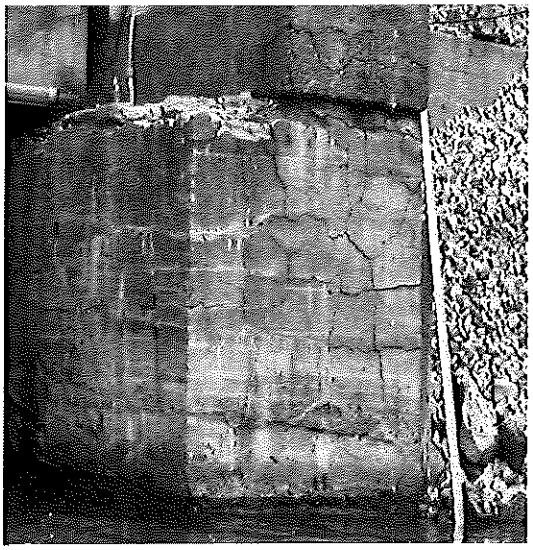


Typical Stay-in-Place Form Fascia Rusting

Substructure

Abutments

Both abutments are assumed to be reinforced concrete with concrete wingwalls at each quadrant. These are in severe condition. The abutments and wingwalls are experiencing severe scaling, spalling, and cracking across the entirety. Washouts behind the wingwalls are occurring and will need to be filled in to ensure no further deterioration. Riprap is placed along abutment faces and wingwalls and looks sufficient. W33x118 steel bent cross girders with two HP10x42 piles were constructed, as-built plans not provided, between original construction and superstructure replacement to minimize the load on the abutments (see Steel Bent Cross Girders description).

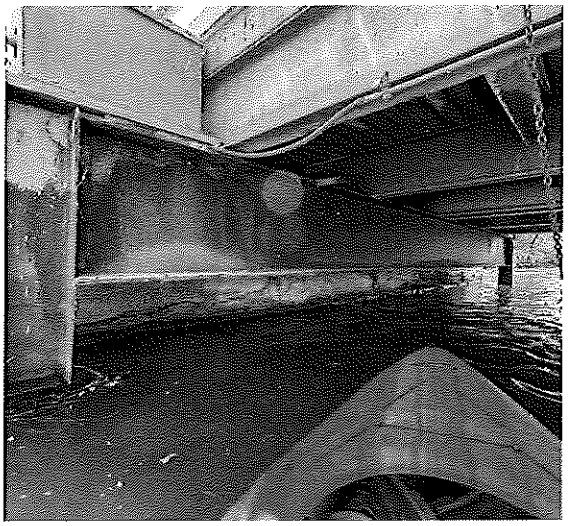


Typical Wingwall Deterioration

Immediate repair of washouts behind wingwalls are recommended. The amount of fill required to fill in the washouts will be minimal. Rehabilitation of the abutments and wingwalls is not feasible, we recommend in 15-20 years that a bridge replacement with new substructure units will be necessary.

Steel Bent Cross Girders

W33x118 steel bent cross girder with two HP10x42 piles were constructed to minimize the load on the abutments. The centerline of W33x118 steel bent cross girder is located approximately 2'-6" ± from front face of existing abutment. There are no as-builts for this rehabilitation. It is assumed this took place sometime between original construction and superstructure replacement in 2001. Both W33x118 steel bent cross girders have isolated areas of section loss along the top and bottom webs that are approximately between 1/8" to 3/16" deep. The larger section loss is located along the lower portion of the webs. Some areas of pitting along the bottom and top flanges is present. The HP10x42 piles seems to be in good condition but an underwater inspection was not needed at this location to confirm.



Typical Steel Bent Cross Girder

Immediate bolted beam web repairs are recommended at areas of section loss. It is not known how long these steel bent cross girders have been in service, therefore at all locations that exhibit section loss we will recommend a bolted beam web repair.

Channel

The channel appears to be in good condition. Southwest bank has less riprap when compared to the other quadrants. A small sandbar with trees is located approximately 75 ft downstream of north bridge fascia. A larger sandbar is located approximately 100 ft southwest from the south bridge fascia. All banks have minor washouts occurring. Some tree debris is located on the southeast bank. Banks are mostly vegetated with fairly steep slopes.

Probing was done along wingwalls, and no scour was present. Access in front of abutment is limited, but visually inspecting the bottom of the abutments, scour does not seem present.

Immediate recommended repairs would be placing minimal riprap in all quadrants and in front of abutments to ensure scour does not occur.

Approach/Quadrants

There are 8'-6" concrete approaches at both ends of the bridge. Both approaches are in good condition with minor longitudinal cracks in both lanes. These were replaced during the 2001 superstructure replacement. The concrete approaches and HMA roadway interaction on both ends is sealed to prevent any water to infiltrate. West approach has a small defect in the sealant, with a 1sft failed patch in the concrete approach. The approach quadrants are in good condition with only minor washouts. Old, rusted guardrail is in the northeast bank. Guardrails departing each approach quadrant but are not attached to the railing.

No recommended repairs are required at this time. When a bridge replacement is necessary, updating guardrails to MDOT standards will be required.

Utilities

There are multiple utilities located at the bridge location. Overhead lines running just off the south fascia. Three steel electrical lines, two 1" and one 2", are attached to the south railing posts and run across the bridge. A steel post, with no sign, is located in the southeast quadrant. In the northeast quadrant, resting on the W33x118 steel bent cross girder, is a water pump box with lines that run east underground and a broken lines that runs along the bottom of the north fascia girder flange.

Immediate repairs are to replace missing signpost. Relocation of most utilities will be necessary depending on the type of work done at this location.

Recommendations

Overall, the bridge is in fair condition. Below are the required repairs based on imminent and future recommendations. An estimated scoping cost is provided in Appendix 2 (GB) for each option.

- **Immediate Recommended Repairs (Estimated Cost Including CE,PE and PE-S = $223,000)**
  - Full depth patching at the end joints and midway across both fascia bays is necessary to prolong the life of the bridge.
  - An expansion joint replacement will be necessary to complete the full depth patching at both approach ends.
  - Bolted beam web repairs to the W33x118 steel bent cross girders at various locations will be recommended. The unknown construction date of steel bent cross girders makes it necessary to perform at both steel bent cross girder locations.
  - Filling in washouts behind wingwall locations to mitigate any future problems and replacing missing signpost in southeast quadrant.
  - Riprap in front of abutments and wingwalls to prevent any future scour issues.
- **5-10 Year Recommended Repairs (Estimated Cost Including CE,PE and PE-S = $542,000)**
  - It is recommended that a deck replacement be completed in 5-10 years. The beams are in good condition, but the stay-in-place forms are holding water and rusting heavily at the stated locations. When this deck replacement occurs, it is recommended to not use stay-in-place forms.
- **15-20 Year Recommended Repairs- (Estimated Cost Including CE,PE and PE-S = $1,527,000)**
  - It is recommended that a bridge replacement be completed in 15-20 years. The substructures are failed, and the steel bent cross girders and HP piles age is unknown. If washouts behind the wingwalls keep occurring, there will be an issue with the approach pavement washing out. The steel bend cross girders and HP piles are not a long-term solution to keep the bridge in service.

Appendix 1 (GB)

Girder Bridge (GB) Photolog

June 2024
Grosse Ile, MI
Fishbeck JN 240866

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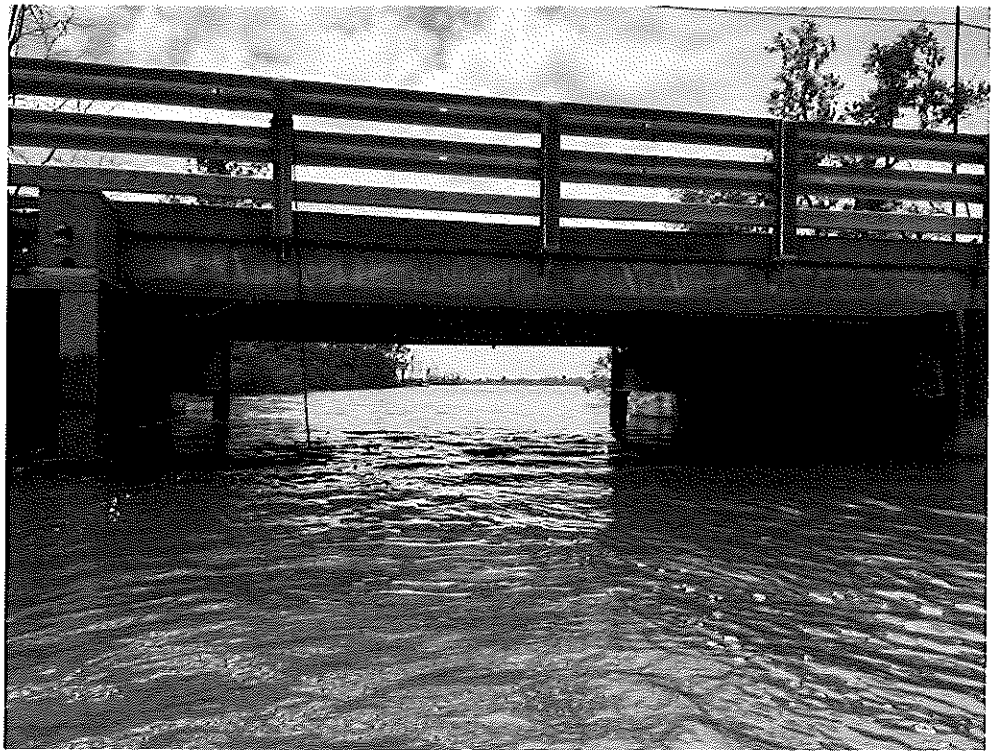
Grosse Ile Girder Bridge (GB) Photolog
Location: Grosse Ile, Michigan
Date of Site Visit: May 21, 2024



1) North Elevation

2) South Elevation

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Grosse Ile Girder Bridge (GB) Photolog
Location: Grosse Ile, Michigan
Date of Site Visit: May 21, 2024

3) Deck Surface, Looking Northwest

4) Deck Surface, Looking Northwest

Grosse Ile Girder Bridge (GB) Photolog
Location: Grosse Ile, Michigan
Date of Site Visit: May 21, 2024

5) East Approach, Looking Southeast

6) West Approach, Looking South

Grosse Ile Girder Bridge (GB) Photolog
Location: Grosse Ile, Michigan
Date of Site Visit: May 21, 2024

7) East Expansion Joint, Looking North

8) West Expansion Joint, Looking South

9) Northeast Approach Quadrant

10) Southeast Approach Quadrant