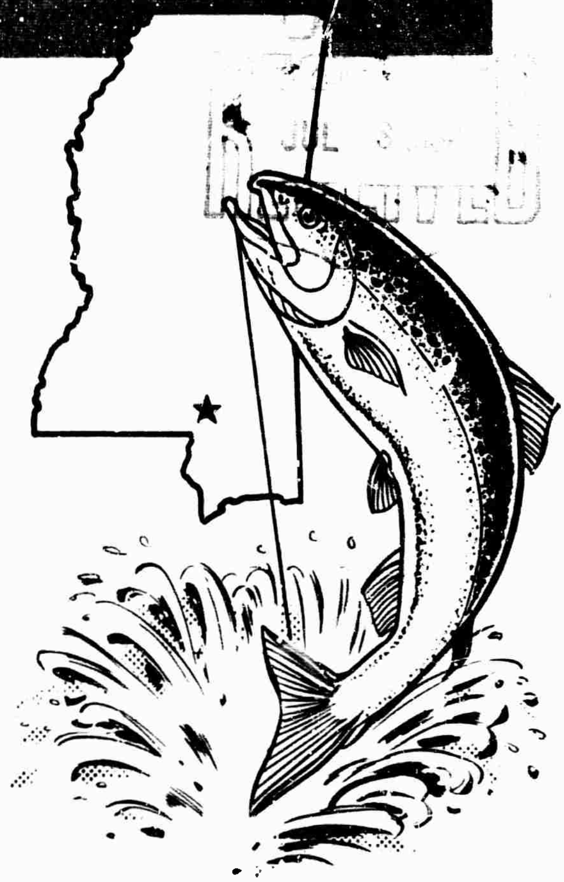
VUF-1029
FINAL REPORT



Final Report of the Pre- and Postshot Structural Survey

D. M. Harvey/M. W. Jackson/F. A. Linville
HOLMES AND NARVER, INC

ISSUED: June 14, 1968

110

LEGAL NOTICE

Printed in USA. Price $3.00. Available from the Clearinghouse for Federal Scientific and Technical Information, National Bureau of Standards, U. S. Department of Commerce Springfield, Virginia 22151.

USAEC Division of Technical Information Extension, Oak Ridge, Tennessee

VUF-1029

FINAL REPORT OF THE
PRE- AND POSTSHOT STRUCTURAL SURVEY
PROJECT DRIBBLE
SALMON EVENT

UNITED STATES ATOMIC ENERGY COMMISSION
NEVADA OPERATIONS OFFICE

NOVEMBER 1966

D. M. Harvey
M. W. Jackson
F. A. Linville

Prepared By
HOLMES & NARVER, INC.
ON-CONTINENT TEST DIVISION
Las Vegas, Nevada

ABSTRACT

The Pre-shot and Postshot Structural Survey for Project Dribble, Salmon Event was authorized by Atomic Energy Commission Work Authorization 63-529 dated 8 March 1963, with subsequent revisions; and was funded by the Advance Research Project Agency. The survey was conducted in accordance with the requirements of the "Operational Safety Plan, Project Dribble, Salmon Event, July 1964".

The structural survey consisted of two parts; part I, the Pre-shot Survey, and part II, the Postshot Survey. The Pre-shot Survey was further subdivided into three phases. The Phase 1 report issued in preliminary form in May 1963 contained data on the nature and condition of structures located on 67 parcels of land off the Dribble Site and out to 4.2 km (2.6 miles) from surface zero, (SZ). At this range the ground motion was predicted to be approximately 9 cm/sec peak particle velocity. The Phase 2 report issued August 1963 contained similar data on the condition of structures located on 215 parcels of land beyond 4.2 km (2.6 miles), but within 7.2 km (4.5 miles) of SZ. The predicted peak ground motion at this range was 4.5 cm/sec peak particle velocity. This Phase 2 report also included a survey on the condition of 11 important bridges within 4.2 km (2.6 miles) of SZ. Phase 3 survey was conducted just prior to the event to investigate changes to previously surveyed structures and to include new structures, structures on the Dribble Site, and selected structures between 7.2 km (4.5 miles) and 16.1 km (10 miles) of SZ. The Phase 3 report was issued in April 1965 to update the previous reports and to document the structural bracing which had been installed to minimize the potential damage. After the event all structures were re-examined, and the postshot conditions were described in the report on part II, Postshot Structural Survey, which was issued in May 1965.

This present report summarizes all the previous pre-shot and postshot structural survey reports, and presents final conclusions and recommendations.

CONTENTS

		Page
	PREFACE	i
I.	INTRODUCTION	1
	A. Purpose of the Survey	1
	B. Scope of this Report	1
	C. Summary	2
II.	SURVEY PROCEDURE	4
III.	GENERAL OBSERVATIONS	5
IV.	CONCLUSIONS	7
V.	RECOMMENDATIONS	9
APPENDIX A - List of Structures Surveyed		A-1
	1. Structures and Equipment Surveyed on the Dribble Site	A-2
	2. Structures Surveyed beyond the Dribble Site out to 7.2 km (4.5 miles) from Surface Zero	A-3
	3. Selected Structures Surveyed beyond the Dribble Site from 7.2 km (4.5 miles) to 16.1 km (10 miles) from Surface Zero	A-11
APPENDIX B - Selected Survey Reports		B-1
	1. Masonry Structures	B-2
	2. Frame Structures on Piers	B-17
	3. Frame Structures on Continuous Footing or Slabs	B-34

4. Elevated Water Tanks and Towers B-37

5. Compressor and Hoist Structures B-46

6. Electrical Equipment B-53

7. Water Pumps B-59

8. Bridges B-61

9. Ponds and Tunnels B-64

APPENDIX C - Pre-Shot Safety Measures and Bracing Standards C-1

APPENDIX D - List of Pertinent Dribble Reports D-1

APPENDIX E - Vicinity Maps E-1

BLANK PAGE

I. INTRODUCTION

On October 22, 1964, a coupled 5.3 ± 0.5 kiloton nuclear device was detonated at a depth of approximately 828 meters (2716 feet) in the Tatum Salt Dome, approximately 37 kilometers (23 miles) from Hattiesburg, Mississippi. This detonation, called the Salmon Event, was a part of Project Dribble in the Vela Uniform Program.

A. PURPOSE OF THE SURVEY

The structural survey consisted of two parts, a pre-shot survey and a postshot survey. The purposes of the surveys were: to estimate the ability of structures and equipment to withstand the ground motions predicted for the Salmon Event, to provide information for the design of pre-shot bracing to be installed to prevent or reduce damage, and to record the postshot condition of structures after the event for the just settlement of any claim of damage.

B. SCOPE OF THIS REPORT

The structural survey consisted of examination of structures close to Surface Zero by Holmes & Narver, Inc., (H&N) engineers. Subsequently, reports were prepared with descriptions and photographic documentation of the structural conditions. The survey included the pre-shot and postshot examination of all public and private structures within a radius of 7.2 km (4.5 miles) of SZ and any structures assumed to be vulnerable to damage beyond the 7.2 km (4.5 miles) radii to SZ. The 7.2 km distance was selected as the range of 4.5 cm/sec peak particle velocity ground motion, from predictions by Roland F. Beers, Inc. The 4.5 cm/sec peak particle velocity is equivalent to an intensity of VI on the Modified Mercalli Scale and was assumed to be the lowest intensity of ground motion causing damage to structures and to articles contained therein.

This report lists all the structures surveyed and includes a typical documentation of selected structures. The selected reports were chosen to represent the ground motion effects on various types of structures. Additional documentation is on file in the H&N Las Vegas Office of all structures surveyed.

Also, presented herein are a few conclusions and some recommendations for conducting future structural surveys.

C. SUMMARY

The damage noted in the postshot phase of the survey, though wide spread, was generally of a minor nature and confined to new and/or aggravated cracks in brittle components such as brick chimneys, masonry and plastered walls and concrete floor slabs. Except for six chimneys which required rebuilding, no other damage off the Dribble Site and within the scope of this report was of a major type.

Bracing was recommended by H&N engineers where deemed necessary to prevent or reduce damage. When the bracing was removed after the event, it was found to have served its intended purpose, in preventing any uncontrolled collapsing. However, it did not prevent damage to all masonry chimneys. Out of the approximately fifty chimneys which were braced, six had to be completely rebuilt after the bracing was removed. A major purpose of the bracing was to prevent wood frame structures from collapsing, or from suffering large permanent deformations. This bracing probably prevented many structural failures. Tag-on tests of Project Shoal permitted development of very economical systems of bracing.

The following summarizes the bracing installation and damage with respect to distances from SZ. The structures discussed are only those in the H&N pre-shot and postshot structural survey.

1. On the Dribble Site 32 of the structures and/or pieces of equipment which were to remain during the shot were selected for surveying. The predicted ground motion at the surveyed structures varied from 230 cm/sec out to 14 cm/sec. Of the 32 structures, 14 required preventive bracing or precautionary action. The postshot survey revealed that one of the 14 that were braced and nine others not braced were damaged. The damage was of a nature, however, that could not have been prevented, such as cracked concrete slabs.

2. Outside the Dribble Site and out to a distance of 4.2 km from SZ, approximately 300 structures were surveyed. The predicted ground motion varied from 49 to 9 cm/sec. Pre-shot bracing was installed on 54 of these structures, and only eight of these received any damage from the event. The postshot surveys disclosed minor damage on 45 of the 300 structures examined. Approximately 70 of the structures were residences and most of the 45 damage incidences occurred on these residences.

3. Beyond 4.2 km but within 7.2 km of SZ, approximately 913 structures were surveyed. The predicted ground motion varied from 9 cm/sec out to about 4.5 cm/sec. Preventive bracing was installed on 11 of these structures, and only one of these was seriously damaged by the event. The postshot surveys indicated 78 of the 913 structures examined sustained some form of minor damage. About 215 of the structures were residences and most of the noted damage was also on these residences.

4. From the 7.2 km to the 16.1 km distance from SZ, four structures were selected to be surveyed. The ground motion was predicted to be from 4.5 to 1 cm/sec in this region and no preventive bracing was recommended or installed prior to the event. After the event, very minor damage was noted on two of the structures.

Numerous other instances of minor damage beyond 7.2 km from SZ have been reported. Since these were not covered by pre- and postshot survey procedures, they are not evaluated here.

II. SURVEY PROCEDURE

Experience on the response of residential and public structures to ground motions generated by an underground nuclear detonation has been extremely limited. Considerable experience was available, however, on the effects of earthquake generated ground motion. The probable damage magnitude was approximated by equating the Modified Mercalli Intensity Scale with surface peak particle velocities. The following correlation is present in reference #21 "The approximate equivalence of the Modified Mercalli Scale number, and ground velocity in centimeters per second is as follows: VIII - 18 cm/sec; VII - 9 cm/sec; VI - 4.5 cm/sec; V - 2.25 cm/sec; IV - 1.12 cm/sec; III - 0.56 cm/sec; II - 0.[illegible] cm/sec; and I - 0.14 cm/sec." Intensity VI of the Modified Mercalli Scale is the lowest intensity of ground shock which is indicated to damage structures and articles therein. Based on experience from Gnome Event, Roland F. Beers, Inc. predicted the ground motions and distances for Salmon Event as: (1) 18 cm/sec at 2.57 km; (2) 9 cm/sec at 4.2 km; and (3) 4.5 cm/sec at 7.24 km from surface zero. Therefore, the threshold of minor damage based on limited previous experience and the above Modified Mercalli Scale correlation indicated an approximate range of 7.2 km.

The structural survey consisted of two parts; Part I, the Pre-Shot Survey, and Part II, the Postshot Survey. The Pre-Shot Survey was further subdivided into three phases. The Phase 1 and Phase 2 portions of Part I of the survey were initiated in May 1963, and were conducted in accordance with the "Operational Safety Plan," Project Dribble, dated April 1963 (revised July 1964). Phase 1 consisted of an on-site survey and recommendation of precautionary measures to minimize possible damage to all structures within 4.2 km of SZ. Phase 2 was conducted to document the pre-shot condition of all structures beyond the 4.2 km distance of SZ but within 7.2 km of SZ.

The U. S. Public Health Service initiated the survey by obtaining permission from the property owners and tenants to enter the premises. H&N engineering parties, consisting of a structural engineer and an estimator, examined each structure. The photographic documentation was supplemented by notation by the survey team, which included approximate coordinate locations, compass bearing of major structures, the use of the structures, age, type of construction, and an estimate was made of each structure's ability to withstand the ground motion that was predicted by Roland F. Beers, Inc. Bracing recommendations were made where it appeared that stability or structural integrity might be impaired. It was also recommended that persons owning property within 4.2 km of SZ perform preventive tasks, such as shutting off fuel lines, extinguishing fires, removing breakable objects from shelves, taping large windows, etc. The preventive bracing recommended by H&N was installed by Reynolds Electrical & Engineering Company (REECo) under the supervision of H&N engineers.

Immediately prior to the event, another survey identified as Phase 3 of Part I was performed by H&N to document any new structures in the area and any changes to structures previously surveyed. After the detonation Part II was initiated and H&N structural engineers again inspected all the surveyed structures and documented obvious physical changes which might be attributed to the ground motions generated by the event.

III. GENERAL OBSERVATI ,S

Most of the private residences in the surveyed ar old, and had been built by rural construction methods. The soil und eys, piers and foundation walls was in some instances partially was and evidence of settlement was common in the structures surveyed. P the event the masonry in chimneys and fireplaces was often in poor con Many mortar joints had cracks, apparently caused by settlement and/or ion and contraction due to heat from fires in the fireplaces.

A majority of the structures were frame buildings supported on piers. The effect of ground motions had been previously evaluated in "Dribble-type structures" tested during Project Shoal, see reference #9. Due to the inadequate stability of many of these structures additional timber bracing was recommended and was installed as part of preventive bracing. Bracing was also installed to prevent the uncontrolled collapsing of chimneys and damage from falling bricks. On the Dribble Test Site guy wires and bracing were installed on vulnerable pieces of equipment just prior to the event.

Immediately after the event mud boils or water spouts appeared in the area around ground zero and continued flowing for an hour or two after the event. These were not due to any venting from the cavity but were caused by extrusion of the ground water due to consolidation of the upper ground layers. A topographic survey after the event disclosed the surface of the ground had been altered by the detonation. The area near ground zero had depressed approximately 5 cm. The differential settlement decreased with increase in distance from SZ out to the 300 meter radius. Beyond the 300 meter radius the surface had been raised to a maximum of 3 cm at the 400 meter to 500 meter distance. This surface bulge decreased in height out to the 1000 meter radius. Beyond 1000 meters no permanent vertical displacement could be detected.

Telephones in temporary trailers on the Project Dribble Site were shaken off their cradles. There were only a few windows reported to have been cracked; and there was no interruption in water, gas, or electrical power due to broken lines.

No dams in the area failed, but several earth dams developed tension cracks across the top and on down-stream face. Braced tunnels were not damaged, nor were the wood and concrete bridges in the area. Several large structures, such as the Sandia Emplacement Shelter were within a thousand meters of surface zero and suffered no damage from the ground motion. The emplacement shelter was a steel frame building approximately 4 m wide, 8 m long and 8 m high, mounted on skids and not tied-down or braced. The shelter was subjected to a ground motion of about 92 cm/sec peak particle velocity (800 m from SZ) and sustained no damage. Another structure known as the Bleed-down Plant Shield Wall was subject to a ground motion of approximately 230 cm/sec peak particle velocity at only 76 meters from surface zero. The Shield Wall was a large wood frame structure 1½ m thick, 5½ m high and 19 m long and filled with sand and gravel. The Shield Wall was embedded 1 m into the ground and not braced or guyed. The only effect noted after the event was a settling of the sand and gravel fill of a few centimeters.

The damage noted in the postshot survey was widespread but, for the most part, of a minor nature and confined to the cracking of unreinforced concrete slabs, brick chimneys, and unreinforced masonry walls, interior plaster, gypboard or sheetrock walls, and miscellaneous damage to wood framed structures. There were, however, six chimneys out of the approximately fifty which were braced, that had to be completely rebuilt after bracing was removed.

Several masonry structures with brick veneer and concrete block walls relatively close to the SZ were reported as undamaged. A prime example was a brick residence located 3.5 km from SZ and subject to 11.5 cm/sec.

IV. CONCLUSIONS

The analysis of the pre-shot and postshot survey information for Salmon Event indicated the following effects of nuclear detonation generated ground motions on structures.

1. The recommended bracing was adequate for preventing major damage. Cribbing and braces were recommended and installed out to the predicted 4 cm/sec peak particle velocity (7.1 km) range. The bracing did not completely prevent damage in cases where the protected portion of the structure was in poor condition prior to the event. Evidence of this is presented in Section 2 of Appendix B. It is doubtful that any additional bracing could have further reduced the magnitude of damage sustained from the event.

2. Evidence indicated that structures on masonry footing and/or concrete slabs are more susceptible to damage from ground motion than structures with more flexible foundations. The selected survey reports in Section 1 and 3 Appendix B illustrate that even new, sound brick walls in some cases sustained hairline mortar joint cracks at least out to the range where the ground motion was predicted to be 5 cm/sec peak particle velocity (6 km from SZ).

3. The only apparent damage to wood frame structures on piers, see Section 2 of the selected reports, was to brick chimneys and gypsum-board walls. Existing hairline cracks in new brick chimneys attached to frame structures on piers were aggravated out to the 20 cm/sec predicted particle velocity (2-1/2 km) range. Older chimneys with poor quality mortar joints were damaged in some cases to at least the 7 cm/sec (5 km) range. The chimney damage appeared to be related to the height of piers under the houses, as well as the pre-shot condition of the masonry.

4. Nearly empty elevated water tanks suffered no structural damage from ground motions although they were located as close as 543 meters from SZ (the 147 cm/sec predicted peak particle velocity range).

5. Electrical power equipment located as close as 107 meters from SZ (the 227 cm/sec predicted peak range) was not damaged from the ground motion.

6. Concrete floor slabs of equipment shelters on the Dribble Site were cracked and displaced by the ground motion out to the 130 cm/sec predicted peak particle velocity (565 meters from SZ) range. See Section 5 of Appendix B for examples.

7. The bridges within the survey limits were substantially constructed, of wood or concrete, and suffered no apparent damage, although, the ground motion for the closest one was 25 cm/sec peak particle velocity. Section 8 of Appendix B presents examples of bridges surveyed to indicate the typical type in the area.

8. Earth dams were damaged out to approximately the predicted 12½ cm/sec peak particle velocity (3 km from SZ) range, however, no dams failed.

9. The two cribbed earth tunnels were subjected to peak particle velocity of approximately 100 cm/sec (915m from SZ) and no damage was indicated.

10. In general, the extent and nature of damage out to the predicted 10 cm/sec peak particle velocity ground motion range was consistent with the predicted ground motion. Beyond this range the percent of structures that indicate minor damage and the resultant claims were more wide spread than anticipated.

V. RECOMMENDATIONS

The planners of future structure surveys when organizing the pre-shot and postshot surveys should consider the following points:

1. Structures with masonry components appear to be more vulnerable to damage than are structures of all wood or all steel construction. Therefore, those structures with masonry components should be given more detailed pre-shot examination.

2. Damage seems to be approximately proportional to quality of design and construction. Therefore, the more deteriorated and poorly constructed structures should be scrutinized for existing and expected damage.

3. Brittle components such as exterior stucco walls, interior plaster walls, and unreinforced concrete blocks appear to sustain damage further out from a ground shock source than any other structure components. Representative structures should be examined at intervals to relatively far out distances to provide threshold radius data, For example all structures to the 10 cm/sec peak particle velocity range should be surveyed and than two or three of each representative structural type at intervals out to the 0.2 cm/sec predicted peak particle velocity range.

4. To avoid confusion with the effects of other causes of damage the pre-shot and postshot surveys should be conducted as closely as possible prior to and after the event.

5. It is further recommended that postshot photographs and notations should be coordinated with pre-shot photographs and notations in order to provide exact comparative documentation. The utlization of the same personnel in performing both surveys will contribute to the accuracy of the observations.

6. Local and regional geological features which may affect the distribution of potential damage should be considered in planning pre-shot surveys.

BLANK PAGE

APPENDIX A

List of Structures Surveyed

The structures within the survey areas are each indentified by a serial number assigned and grouped as:

1. Structures and Equipment Surveyed on the Dribble Site

2. Structures Surveyed beyond the Dribble Site out to 7.2 km from Surface Zero

3. Structures Surveyed beyond the Dribble Site from 7.2 km to 16.1 km from Surface Zero

The property owner, the distance from SZ, and any special notation is indicated for each structure.

1. STRUCTURES and EQUIPMENT SURVEYED

on the DRIBBLE SITE

Serial No.	Type of Structure	Azimuth from South	Distance from SZ
T-1	Tunnel	75°	915 meters
T-2	Emplacement Shelter	69°	733
T-3	Storage House	65°	580
T-4	Compressor House	90°	550
T-5	Hoist House No. 1	88°	565
T-5a	Electric Substation	88°	565
T-6	Motor and Generator	87°	565
T-7	Hoist House No. 2	86°	565
T-8	Disposal Pits	88°	672
T-9	Pump Crib	196°	183
T-10	Shield Wall	104°	76
T-11	Electrical Shack	104°	76
T-12	Electrical Transformers	132°	381
T-13	Electrical Transformers	140°	107
T-14	Oil Fuse Cut-out Panels	82°	427
T-15	Steel Frame Building	130°	350
T-16	Water Tank	88°	543
T-17	Electric Transformers	50°	594
T-18	Electric Substation	69°	580
T-19	Water Tank	55°	610
T-20	Truck Trailer	275°	1,647
T-21	Truck Trailer	275°	1,647
T-22	Water Tank	275°	1,647
T-23	Electrical Substation	252°	1,730
T-24	Steel Frame Structures	220°	2,650
T-25	6 Disposal Pits	230°	610
T-26	Water Tank	220°	2,650

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO

Number	Property Owner	Distance From SZ	Special Notation
1	J. L. Sauls	3,020 meters	a, b
2	Otis Sauls	3,048	b
3	G. C. Sauls	3,261	a, b
4	Arlis Rayborn-owner; J. T. Saulse-tenant	3,200	b
5	Arlis Rayborn	3,170	
6	L. C. Howard	3,292	b
7	T. Speights	1,890	b, c
8	T. Speights	1,980	b
9	T. S. Saucier	3,170	b, c
10	J. P. Higginbotham	3,500	a, b
11	W. G. Kelly	3,353	a, b
12	A. C. Mills	3,353	
13	Bay Creek Baptist Church	3,475	c
14	J. P. Higginbotham	3,170	
15	L. J. Bryant	2,408	b
16	J. W. Cliburn	2,438	
17	Old buildings removed; New buildings erected; Re-numbered 296	1,860	
18	H. Anderson	1,920	
19	W. Anderson	1,980	b
20	W. H. Nobles	2,530	a, b
21	G. W. Anderson	2,500	a, b
22	V. Hatten	2,500	b
23	B. R. Beech	2,957	a, b
24	W. W. Beech	3,048	b
25	H. Beach	3,170	b, c
26	R. B. Bond	3,720	a
27	C. Beach	3,048	a, b
28	Joseph Smith	3,230	b
29	E. Johnson	3,300	b
30	Wiley Smith	3,444	b
31	John J. Smith	3,658	b
32	J. V. Griffith	3,932	b
33	Jesse Smith	3,901	a, b
34	Jimmie Smith	3,780	b

a - Indicates structures resurveyed during the phase III survey

b - Indicates structures which had pre-shot bracing

c - Indicates structures which were selected for Appendix B

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special Notation
35	Ben Smith-owner E. Saucier-tenant	3,720 meters	b
36	Caney Baptist Church	4,115	b
37	J. D. Keith	3,566	b
38	R. F. Thompson	4,054	a
39	Edgar Smith	4,130	b
39-A	Maggie Lowe		a
40	E. Lawson	3,993	b
41	E. Johnson	3,901	
42	R. O. Hibley	3,962	b
43	Neville Anderson	1,733	b
44	H. McCraney	1,951	
45	P. T. Lee	2,530	b
46	D. T. Beech	2,438	
47	Saucier	3,505	c
48	E. Bishop	3,475	b
49	R. L. Anderson, Jr.	2,347	a, b
50	J. Radcliff	1,981	
51	Otto Tarbutton-owner; J. D. Mims-tenant	2,804	b
52	W. H. Burge	3,020	a, b,
53	W. H. Burge, Jr.	2,870	b
54	N. Young	3,570	b
55	H. D. Gipson	4,050	b, c
56	Fred Dobson	1,650	b, c
57	T. Sgt. Harry Thompson	4,110	b
58	C. M. Thompson-owner; John Durham-resident	4,050	a, b
59	H. Powell	4,020	b
60	O. Johnson	3,990	b
61	C. McCraw	4,080	
62	A. J. Bullock-owner; Buford Chambliss-tenant	3,230	a, b
63	Archie Sistrunk	4,150	a, b
64	Leo Sistrunk	4,050	a, b
65	J. Winslow	3,990	b, c
66	R. E. Thompson	3,840	b, c
67	Martin L. Anderson	4,050	
68	Lavern Smith	4,270	
69	J. Harrington	3,960	b
70	Bridge No. 1	4,330	c
71	Bridge No. 2	4,020	c
72	H. Gibson	4,450	
73	Sarah Entrekin	5,000	c

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special Notation
74	T. E. MacArthur	5,610 meters	a
75	T. W. Roseberry	5,120	a
76	J. C. Cameron	6,550	a
77	W. Cameron	7,220	a
78	Bridge No. 3	3,050	c
79	Bridge No. 4	1,950	c
80	Bridge No. 5	3,440	c
81	Bridge No. 6	3,320	c
82	L. L. Anderson (formerly listed in Phase II report)	4,110	b
83	E. Gipson	5,060	a, c
84	Dawson Johnson	5,360	a
85	A. Courtney	6,100	
86	W. O. Smith	6,160	
87	C. E. Bond	6,340	
88	Baxterville Methodist Church	6,190	
89	W. D. Kittrell	6,520	
90	Church of Christ	6,550	
91	C. L. Housley	6,500	a
92	Baxtervillle Baptist Church	6,340	
93	Bill Gipson	6,610	a
94	S. J. Gipson	6,610	
95	Alice Lewis	6,640	a
96	R. Parker	6,680	
97	B. J. Miller	6,710	
98	Leo Bond	6,550	
99	H. G. Thompson	6,710	
100	Arlis Rayborn	6,550	
101	J. F. Molsbee	6,580	
102	L. A. Anderson	6,770	
103	Virgil Whiddon	6,830	
104	R. T. Thompson	6,740	
105	George Cain, Jr.	6,800	c
106	J. W. Whiddon	6,740	
107	Bridge No. 7	2,620	c
108	Bridge No. 8	2,440	c
109	Bridge No. 9	2,440	c
110	Bridge No. 10	3,200	c
111	Bridge No. 11	3,510	c
112	John Schrader	6,640	
113	Wesley Bond	6,800	
114	Charles Gipson	6,640	a
115	Marshall Lee	6,800	
116	Baxterville School	6,950	a c

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special Notation
117	W. D. Kittrell	6,640 meters	
118	James Bilbo	6,740	
119	I. Williamson	6,460	a
120	Q. J. Kendrick	6,400	a
121	Cora Lucas	6,490	
122	O. Smith	6,310	
123	T. Smith	6,220	
124	S. E. Bond	6,830	a
125	George Boyles	6,860	
126	G. W. Rayborn	6,740	
127	C. D. Rayborn	6,980	
128	I. V. Rayborn	6,740	
129	C. S. Johnson	6,950	
130	C. G. Johnson	7,010	
131	G. D. Johnson	7,040	
132	Martha Entrekin	6,430	c
133	Lionel Rayborn	6,250	a
134	E. F. Rayborn	6,250	a
135	Donald Madison	6,740	
136	O. C. Paterson	5,640	
137	James Dearman	6,280	
138	J. C. Nobles	6,250	
139	Arthur Lowe	6,460	
140	Mason Thompson	6,800	a
141	W. D. Kittrell	6,830	
142	Douglas Lowe	7,160	b
142-A	Robert Johnson	7,160	a, b
143	W. T. Entrekin	4.570	a, b
144	R. T. Thompson	4,500	a
145	R. T. Thompson	5,210	c
146	Fred Parker	5,390	
147	Charles Martin	5,520	
148	E. C. Breshears	4,750	b
149	V. Debrow	4,330	
150	L. L. Housley	5,460	a
151	R. Saucier	6,430	a
152	R. J. Entrekin	6,550	
153	Edward Entrekin	6,580	a
154	N. A. Bolin	6,610	
155	J. E. Entrekin	6,710	
156	J. D. Entrekin	7,130	
157	Joe Housley	5,460	
158	F. Saucier	7.100	
159	J. Creel	5,360	
160	F. Saucier	5,610	a

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special Notation
161	C. Creel	5,550 meters	
162	Marvin M. Breazeale	5,520	
163	R. C. Ready	5,300	c
164	C. O. Williamson	5,700	c
165	C. V. Cain	5,880	
166	Mack Smith	5,940	b, c
167	Ray Smith	5,760	
168	John Cain	5,670	
169	Church of Christ	6,190	
170	W. G. Massey	6,3[illegible]0	
171	Herbert Bolin	6,250	
172	T. A. Henry	6,710	a
173	O. A. Ronquille	6,980	
174	H. F. Busha	6,510	
175	C. L. Slade	7,060	
176	W. Jenkins	7,190	
177	Dewey Busha	6,920	
178	James Parker	6,460	a, b
179	[illegible]. C. Massey	6,250	
180	J. H. Evans	6,250	
181	C. H. Anderson	5,850	
182	Troy Housley	7,130	
183	Mrs. B. M. Gagnon	5,520	
184	Mississippi State Forestry Service	[illegible],580	c
185	Nathan Crain	5,640	
186	Glenn Beech	5,330	
187	H. T. Beach	5,270	a
188	J. H. Busha	6,370	
189	Tatum Lumber Company	5,270	
190	G. H. Anderson	5,210	c
191	L. D. Johnson	4,910	
192	M. L. Anderson	4,600	
193	Joe Dobson	4,510	
194	A. C. Dobson	4,360	a
195	M. L. Anderson	4,470	
196	L. H. Breazeale	4,920	
197	R. H. Johnson	7,010	a
198	E. Burt	4,420	a, b
199	Virgil Smith	6,640	a
200	Tatum Estate	7,070	
201	Mrs. Casteneda	5,090	
202	A. S. Whiddon	4,850	
203	Luther Saucier	7,040	
204	Luther Saucier	6,700	
205	J. E. McArthur	6,250	

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special notation
206	Greenville Baptist Church	5,390 meters	
207	G. H. Bass	5,330	
208	Leo Saucier	5,260	
209	C. H. Hickman	5,150	a
210	Alvin Sones	5,180	
211	C. H. Housley	5,300	
212	Gladys Johnson	5,330	
213	Howard Smith	5,300	a
214	Lewis Rayborn	5,390	
215	Ben Sones	5,150	c
216	Albert H. Lee	4,390	a
217	Odell Henley	4,570	
218	Duval Sones	4,750	a
219	Perry Lee	5,000	
220	Buster Carroll	5,240	
221	Henry Bolin	5,060	
222	Luther Saucier	6,190	
223	Luther Saucier	6,660	
224	Luther Saucier	6,250	
225	Jimmy McCrow	6,430	a
226	W. J. Bass	6,550	
227	H. P. Bolin	4,790	
228	J. D. Bolin	4,940	c
229	Sophie Carroll	5,300	b
230	Carl F. Nichols	5,670	
231	Fred T. Boler	5,760	
232	James R. Boler	5,700	
233	L. W. Pittman	7,010	a
234	Tom W. Smith	6,630	c
235	J. B. Carver	7,010	
236	Tom E. Malley	5,820	c
237	Otis Temples	5,490	
238	L. M. Gipson	5,390	a
239	Fred Lowe	5,430	
240	Hulan Lowe	5,270	
241	Levi Lowe	5,210	
242	T. J. Burge	4,820	
243	Frank C. Gipson	4,600	
244	Floyd Smith	4,790	
245	S. E. Fairchild	5,000	c
246	Mark Lowe	4,540	
247	Frank Cooper	4,280	a
248	Oscar C. Burge	4,570	
249	L. R. Harvey	4,560	a

2. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special Notation
250	Clifton May	4,510 meters	
251	Cecil Johnson	4,720	a, b
252	W. A. Anderson	4,750	
253	Julius Entrekin	5,970	
254	S. E. Parker	4,680	
255	Hollis Peavy	4,600	a, c
256	T. G. Howell	4,540	c
257	Henry Smith	4,480	a, c
258	Leroy Sistrunk	4,480	
259	A. D. Bryant	5,030	a
260	G. W. Saucier	5,430	
261	H. R. Diamond	5,670	
262	James A. Lowe	5,850	
263	Marshall Seale	6,220	
264	C. H. Johnson	4,940	
265	Mrs. Monroe Smith	5,870	
266	C. E. Bond	5,850	
267	Alec Johnson	6,430	
268	L. W. Cameron	7,040	
269	D. S. Rouse	7,190	
270	H. L. Cameron	7,380	
271	Lionel Lowe	5,940	
272	T. E. Jones	6,310	
273	L. H. Rushing	6,130	
274	J. H. Brown	6,490	a
275	L. H. Rushing	7,130	a
276	L. H. Rushing	6,310	
277	David Lowe	6,640	
278	Paul Smith	6,630	a
279	Alonzo Rayborn	7,350	a
280	Houston E. Bounds	7,160	a
281	Roland Burge	6,840	a
282	Hubert Bounds	6,600	
283	Willis R. Bonds	6,830	
284	G. Anderson	5,300	
285	J. A. Gipson	5,060	b
286	Bessie Anderson	4,740	a, c
287	B. M. Gipson	4,570	a
288	W. M. Gipson	4,390	a
289	J. C. Gipson	4,830	b
290	Lavell Slade	4,300	a
291	Elmore Simmons	6,400	a
292	E. F. Cameron	6,000	
293	A. V. Johnson	7,250	a

?. STRUCTURES SURVEYED beyond the DRIBBLE SITE

out to 7.2 km from SURFACE ZERO (cont)

Number	Property Owner	Distance From SZ	Special Notation
294	G. D. Kelly	3,600 meters	a
295	Elton P. Mills	3,020	a
296	Ross Powell	1,860	a, b
297	Calvin Bolin	3,900	a, b
297-A	Roland E. Anderson	4,970	a
298	Mark Lowe	4,540	a
299	Marren Bennett	6,520	a
300	W. A. Nobles	5,000	a

3. STRUCTURES SURVEYED beyond the DRIBBLE SITE

from 7.2 km to 16.1 km from SURFACE ZERO

Number	Type of Structure	Distance from SZ	Special Notation
S-1	Movie Star of Purvis Water Tower	16.1 km	a, c
S-2	Purvis City Water Tower	15.2 km	a, c
S-3	Lamar County Court House and Jail	15.2 km	a, c
S-4	Fire Tower	9.3 km	a, c

BLANK PAGE

APPENDIX B

Selected Survey Reports

The ground motions in the vicinity of a nuclear detonation affect structures in a variety of ways and in varying magnitudes. The effects are considered as damage in the event that any materials are cracked, split, separated or twisted to alter the position or function of any portion of the structure or equipment. The damage will depend upon many factors, such as the nature, magnitude, and duration of the ground motion, the type of structure and its elements, and the supporting method of the structure. Observed damage in a number of instances was not what one would ordinarily expect from dynamic motion. Shingles and siding pulled loose, as well as water damage were considered by engineering judgment in most cases to have been caused by recent storms in the area.

Selected survey reports are presented herein in several categories to document the apparent effects of the ground motions generated by the Salmon Event.

1. MASONRY STRUCTURES

The masonry structures surveyed were built of brick, concrete block, and combinations of stone and concrete block. Examples of each type were selected to indicate the apparent damage ranges and will be discussed in relationship to their relative positions from SZ and ground motions.

A new one-story brick veneer house on a concrete slab (H&N 47) was located 3,505 meters from SZ (photo no. 1). The peak ground motion was predicted to be 11.5 cm/sec. No bracing was recommended and no damage was evident in the postshot survey of the structure.

A concrete block house at 4,480 meters (H&N 257), and another at 5,000 meters (H&N 73) were surveyed. All were similar in construction and size with numerous cracks in the walls and floor slabs prior to the event (photos no. 2 and 3). The houses were supported on concrete slabs and had wood frame and asphalt shingle roofs. The peak ground motion was predicted to be 8 cm/sec and no precautionary bracing was recommended. After the event many of the cracks appeared to be aggravated (photos no. 4 and 5), and several new cracks in the mortar joints developed (photo no. 6). Some interior sheetrock partitions appear to have developed hairline cracks also.

A new block house (H&N 83) under construction 5,060 meters from SZ revealed the type of construction practices followed in the area. No lintels were used over the openings as illustrated in photo no. 7. Very little reinforcing steel was used in the structure (photo no. 8). The peak ground motion was predicted to be 8 cm/sec. No observed new cracks were present in the concrete blocks of this structure (H&N 83) after the event, but some old cracks were aggravated and new cracks were evident in the brick chimney.

A house constructed of solid brick walls (H&N 190-1) was surveyed at 5,210 meters distance from SZ (photo no. 9). The brickwork was in good condition with few cracks in the mortar joints and through the bricks (photos no. 10 and 11). The house was supported on a continuous concrete footing with frame gables and galvanized iron roofing. The concrete front porch floor was supported on a continuous concrete block footing. This block footing had several mortar joints cracks (photos no. 12 and 13). The interior walls were either exposed brick, wood paneled, or taped sheetrock on wood studs. The central chimney appeared substantial in the Pre-shot survey. The predicted ground velocity was 7.6 cm/sec at this location and no bracing was recommended or installed. The postshot survey of this structure indicated that the old cracks noted in the pre-shot survey were aggravated (photo no. 14).

A new brick residence (H&N 166-2) was surveyed 5,940 meters from SZ. This structure was constructed on a concrete slab floor and foundation and of good workmanship (photo no. 15). The exterior walls were face brick over concrete block or solid brick, and the interior partitions were exposed or paneled concrete block. A few hairline mortar joint cracks and a crack in the rear porch floor slab were noted in the pre-shot survey (photos no. 16 and 17). The ground motion was predicted to be 6 cm/sec. Bracing of the front and rear porch roofs was recommended and installed prior to the event. The postshot survey revealed a new crack in the front entrance floor (photo no. 18) and minor aggravated cracks in the interior walls and ceiling.

A group of concrete block structures, the Baxterville School (H&N 116), were surveyed 6,950 meters from SZ. The ground motion was predicted to be 4 cm/sec. A large number of cracks were documented in the pre-shot survey (photos no. 19 to 22). The postshot survey indicated only possible minor aggravation. The engineer's report states, "It is remotely possible that some of the hairline cracks in the masonry have been aggravated". Photo no. 23 is a postshot picture of the crack illustrated in photo no. 22 taken immediately after the event. To determine the increase in the cracks with time, photo no. 24 was also taken of the same crack ten months after the event. It is apparent that there was only a small increase in the size of the crack.

An old (1906) two-story brick building, the Lamar County Courthouse and Jail (H&N S-3) was surveyed 15,300 meters from SZ, where ground motion was about 1 cm/sec. The structure was in relatively good condition prior to the event with no noticeable cracks in the exterior brick walls or interior plaster walls and ceilings (photo no. 25). The postshot survey of the courthouse and jail identified one crack on both sides of the southwest corner of the basement wall (photo no. 26). The postshot survey also revealed hairline cracks in the interior plaster walls and ceilings of 12 rooms.

Photo No. 1 - Pre-Shot of H&N No. 47

Photo No. 2 - Pre-Shot Front Porch Slab - H&N No. 73

Photo No. 3 - Pre-Shot Cracks, H&N No. 73

Photo No. 4 - Postshot, Front Porch Slab, H&N No. 73

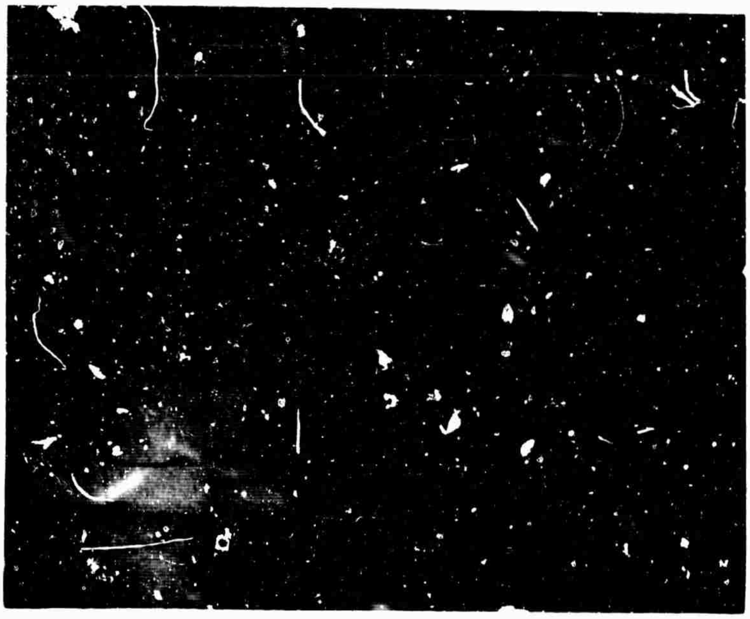


Photo No. 5 - Postshot Cracks, H&N No. 73

Photo No. 6 - Postshot Cracks, H&N No. 257

Photo No. 7 - Pre-Shot Window Construction, H&N No. 83

Photo No. 8 - Pre-Shc Shrinkage Cracks, H&N No. 83

Photo No. 9 - Pre-Shot - Solid Brick House. H&N No. 190

Photo No. 10 - Pre-Shot Cracks, H&N No. 190

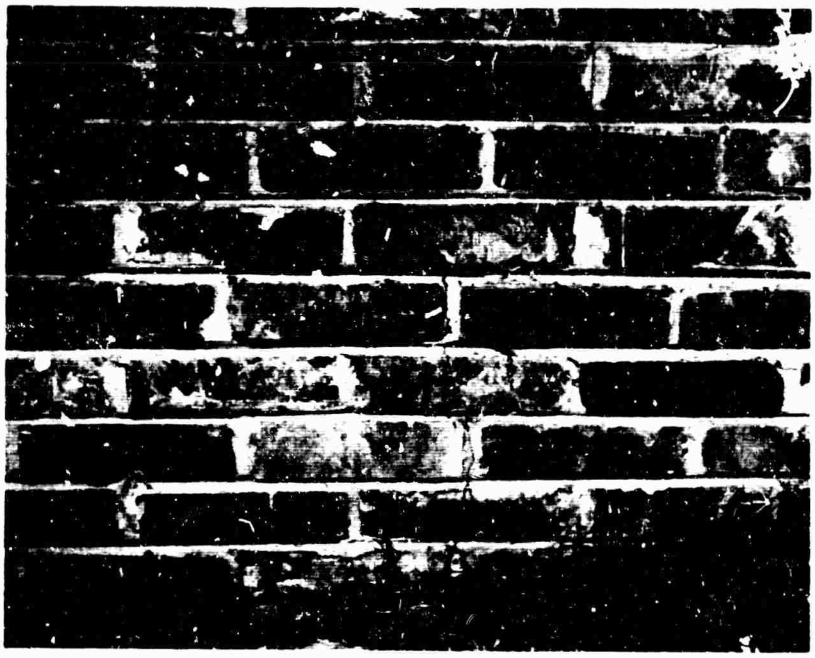


Photo No. 11 - Pre-Shot Cracks, H&N No. 190

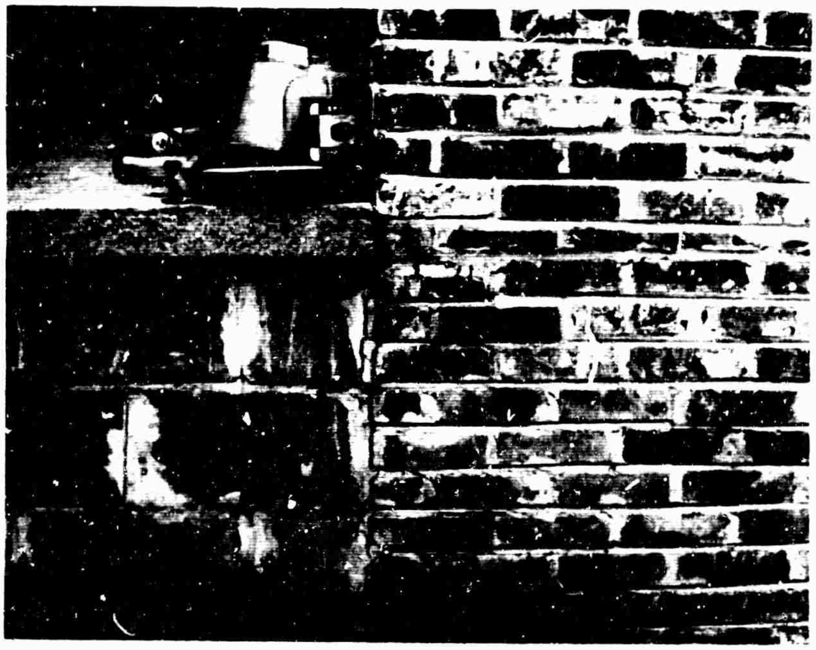


Photo No. 12 - Pre-Shot Cracks, H&N No. 190

Photo No. 13 - Pre-Shot Cracks, H&N No. 190

Photo No. 14 - Postshot - Aggravated Cracks, H&N No. 190

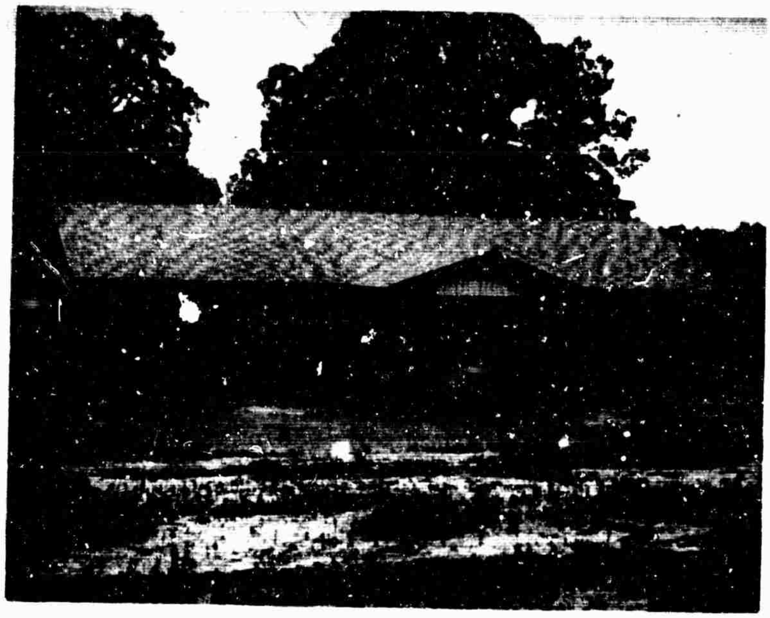


Photo No. 15 - Pre-Shot New Brick House, H&N No. 166

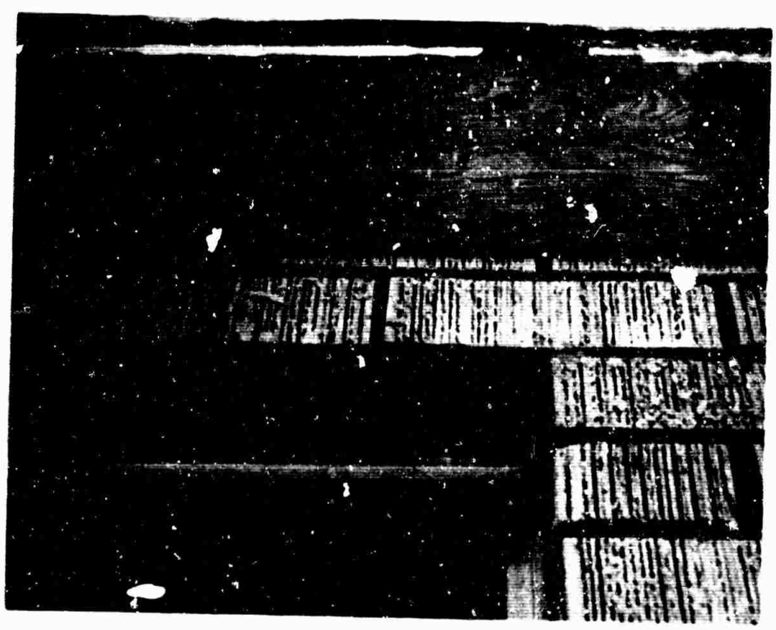


Photo No. 16 - Pre-Shot Brickwork Over Rear Door, H&N No. 166

Photo No. 17 - Pre-Shot Floor Slab at Rear Door, H&N No. 166

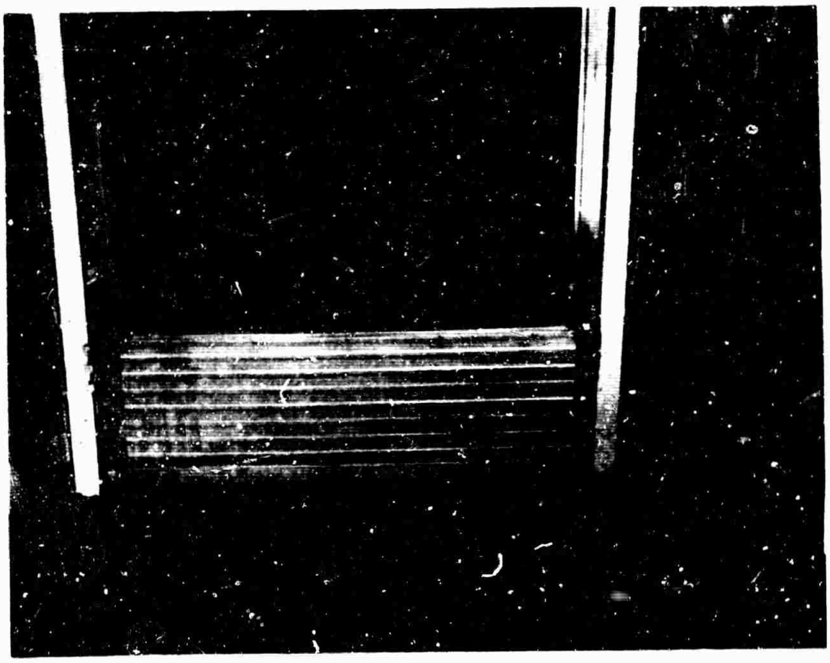


Photo No. 18 - Postshot - H&N No. 166

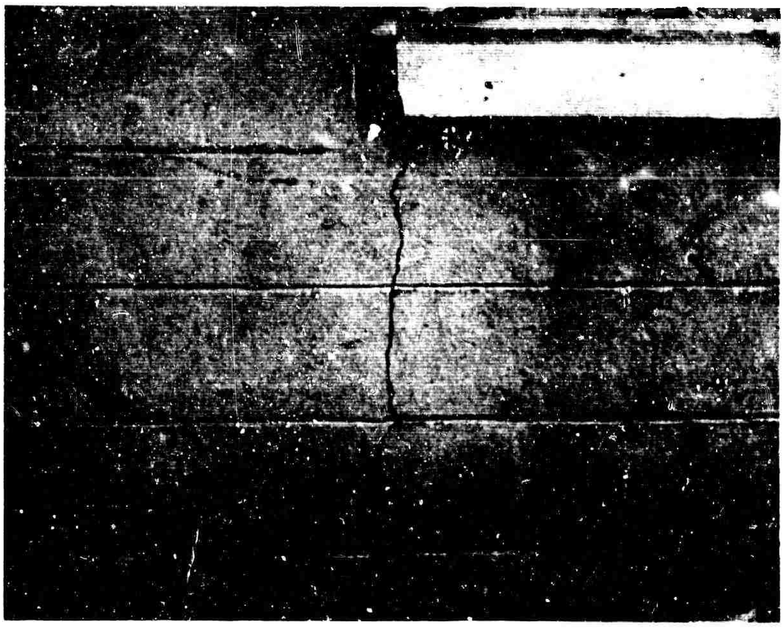


Photo No. 19 - Pre-Shot of H&N No. 116

Photo No. 20 - Pre-Shot of H&N No. 116

Photo No. 21 - Pre-Shot of H&N No. 116

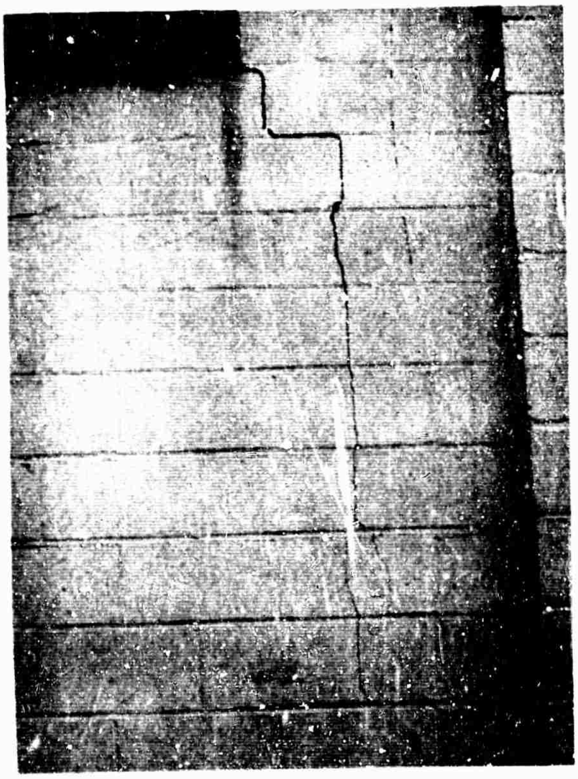


Photo No. 22 - Pre-Shot of H&N No. 116

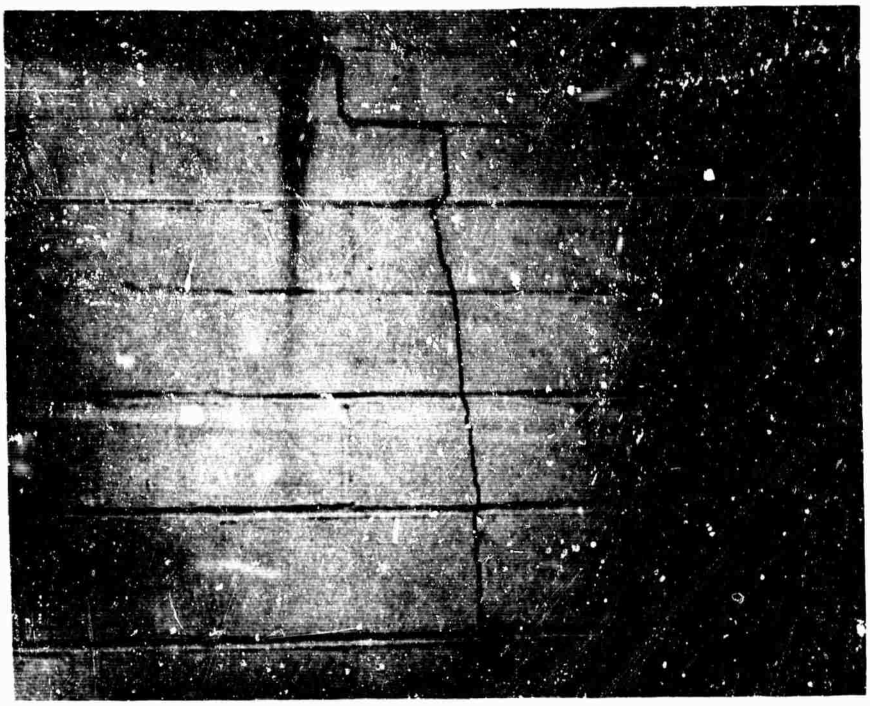


Photo No. 23 - Postshot of H&N No. 116 - Immediately After Event

Photo No. 24 - Postshot of H&N No. 116, Ten Months After Event

Photo No. 25 - Pre-Shot of Lamar County Courthouse

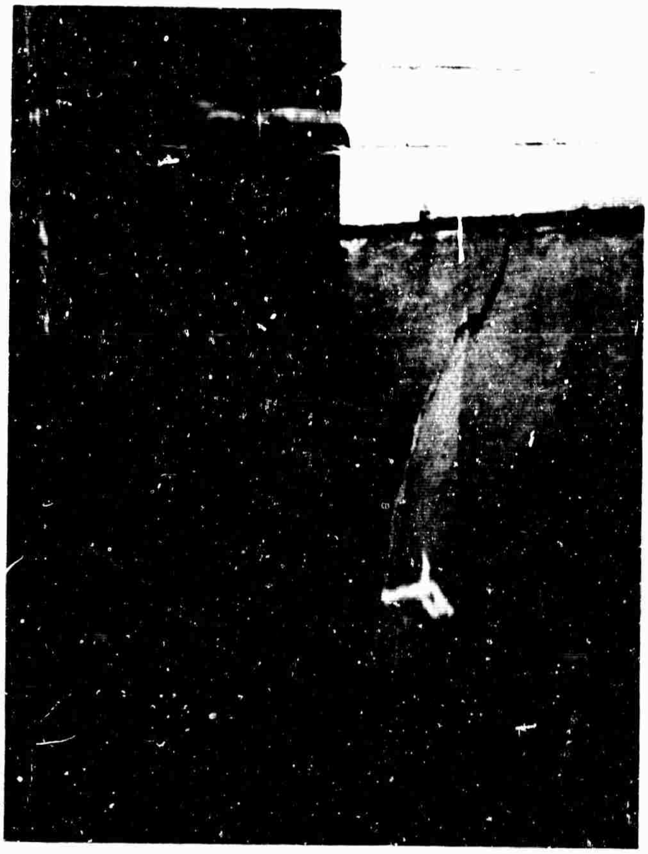


Photo No. 26 - Postshot Crack H&N No. S-3

2 FRAME STRUCTURES ON PIERS

Public and private wood frame structures off the Dribble Site were generally supported on concrete and wood piers. Bracing was installed on several of the close-in buildings and the damage was primarily limited to the chimneys.

A wood frame house (H&N 56) at 1,650 meters was supported on wood posts (photo no. 27). A chimney and fireplace (photo no. 28) were braced prior to the event, in accordance with the established standards, see sketch no. 8, of Appendix C. The predicted peak ground motion at this location was 35 cm/sec. After the event when the bracing was removed, the chimney was found to be demolished (photo no. 29). Floor beams and timber piers had been installed as a precautionary measure prior to the event. No other damage was evident in the postshot survey.

A frame house at 1,890 meters from SZ (H&N 7) was surveyed, and bracing was installed on the chimney, TV antenna, garage, barn, and corn crib. A partial basement under the house and all the piers under the remaining portion also required bracing prior to the event. The predicted peak ground motion at this location was 30 cm/sec. When the chimney bracing was removed after the event, the chimney had to be demolished. Hairline cracks also developed in the mortar joints of the basement and in the interior sheetrock walls and ceiling.

A frame house on 60 cm high piers at 3,170 meters (H&N 9) was surveyed. This house had three chimneys. The ground motion was predicted to be approximately 15 cm/sec. Bracing was installed on the chimneys and piers and on many of the outbuildings. When the bracing was removed after the event, two of the chimneys had to be taken down. Photo no. 30 illustrates the typical bracing on the chimneys, and photo no. 31 shows the chimney in photo no. 30 after the bracing was removed. The only other damage noted in the postshot survey consisted of minor cracks in the mortar joints.

Another frame house on 40 to 60 cm piers (H&N 25) at 3,170 meters from SZ had a chimney which required bracing. This chimney also had to be demolished when the bracing was removed. The ground motion at this location was 14 cm/sec.

Two frame houses on concrete block piers (H&N 66) at 3,840 meters from SZ were surveyed. The ground motion at this location was predicted to be 10 cm/sec and no bracing was recommended for the chimneys, only for the support piers (sketches 1 and 2). The postshot survey revealed only minor cracks in the chimney mortar joints (photo no. 32) and in the interior sheetrock partitions.

A frame house 4,050 meters from SZ (H&N 55) was supported on nine timber piers and one concrete block pier approximately 30 to 60 cm above ground. The chimney was in fair condition with a few heat cracks in the lower portion. The predicted ground motion was 9 cm/sec and timber piers and bracing was recommended as illustrated on sketch 3. The postshot survey revealed aggravation of the heat cracks in the chimney (photo no. 33). No other damage was noted to the structure.

The T. G. Howell residence (H&N 256 was a 9 x 12 meter asbestos-shingled frame house with a front porch. The porch was a raised concrete slab 80 cm above grade, supported by a continuous concrete block footing (photos no. 34 and 35). The porch slab had 3 full width transverse cracks plus other smaller cracks. The chimney was brick masonry in fair condition. The house was supported on low conical concrete pedestals. The residence was 4,540 meters from SZ and the peak ground motion was predicted to be 8 cm/sec. The postshot survey revealed no damage except some old cracks in the lower portion of the chimney may have opened up a small amount (photo no. 36), possible aggravation of the crack in the front porch slab, and possible movement in the concrete block was supporting this slab (photo no. 37).

The Bessie Anderson residence (H&N 286) was an asphalt-shingled frame house supported on low timber and concrete block pedestals, some tilted and some undermined. Photo no. 38 illustrates the pre-shot conditions. The residence was 4,740 meters from SZ and the peak ground motion was predicted to be 7 cm per second velocity. The postshot survey revealed the chimney weakened to such an extent that it was deemed advisable to demolish it (photo no. 39).

An asbestos-shingled frame house 4,940 meters from SZ (H&N 228) was supported on low concrete block piers (photo no. 40). The porches in the front and side had continuous concrete block footings with numerous cracks (photo no. 41). The new chimney had stepped cracks in the rear face (photo no. 42). The predicted ground motion was 6 cm/sec and no bracing was recommended. The postshot survey revealed the cracks in the porch concrete block footing and chimney were aggravated (photos no. 43 and 44). Numerous hairline cracks had developed in the interior sheetrock walls and ceilings.

A ne frame house at 5,820 meters from SZ (H&N 236) on slender pedestals as high as 100 cm (photo no 45) appeared to have suffered more extensive damage. The predicted ground motion was 5 cm/sec and no bracing was installed. One corner pier settled slightly, mortar joints in the block piers cracked, the fireplace appears to have tilted forward about 1 cm, and numerous sheetrock joints in the interior indicated slight separation.

A frame house on low concrete block piers, 6,800 meters from SZ (H&N 105) had a 1 meter high, face-brick veneer across the front and one side (photos no. 46 and 47). The predicted ground motion was 4 cm/sec and no bracing was recommended. The brick facing appears to have suffered some minor damage in the mortar joints, as shown in postshot photo no. 48.

Photo No. 27 - Pre-Shot of H&N No. 56

Photo No. 28 - Pre-Shot of H&N No. 56

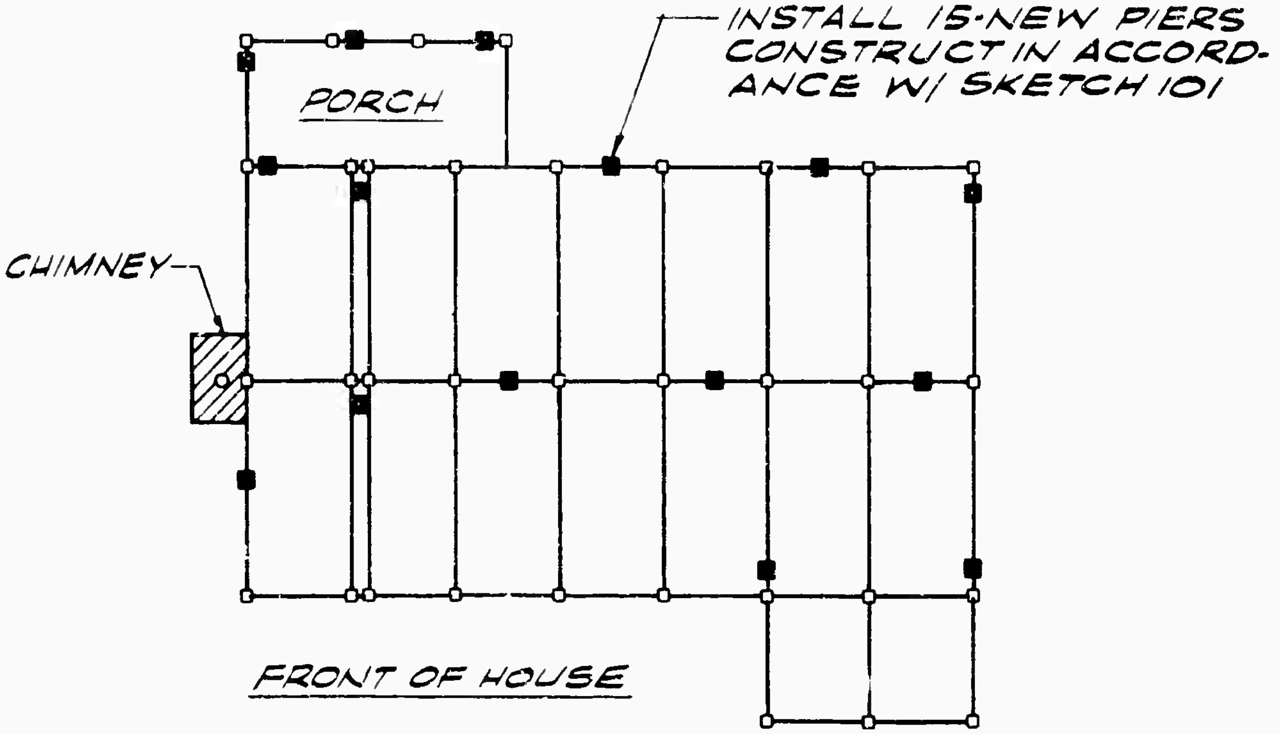
Photo No. 29 - Postshot of H&N No. 56

Photo No. 30 - Postshot of H&N No. 9 - Chimney Bracing

Photo No. 31 - Postshot of H&N 9 - After Removal of Bracing

PROJECT DRIBBLE

PRE-SHOT STRUCTURAL SURVEY



FOUNDATION PLAN

LEGEND

□ — EXISTING PIERS

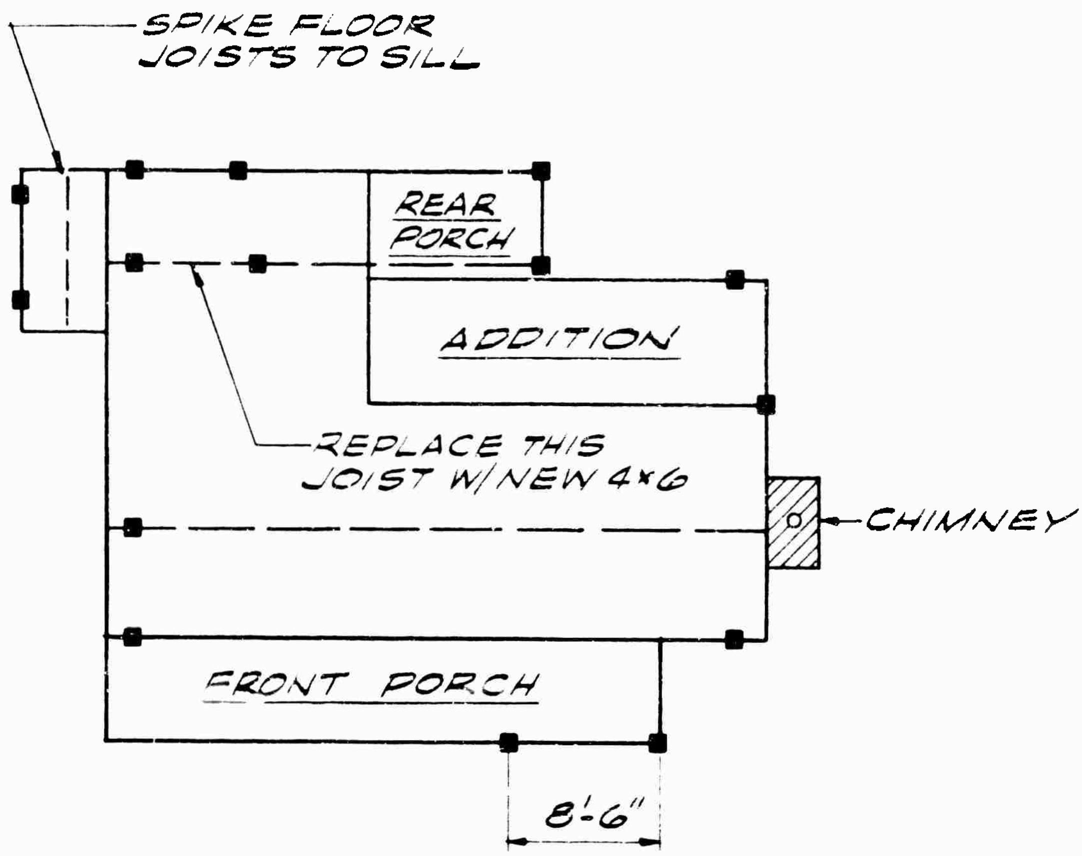
■ — NEW TIMBER PIERS

SKETCH No 1

PIER BRACING ~ H&N 60-1

PROJECT DRIBBLE

PRE-SHOT STRUCTURAL SURVEY



FOUNDATION PLAN

NOTE:

■---REPLACE ALL PIERS WHERE SHOWN, WITH NEW TIMBER PIERS-CONSTRUCT IN ACCORDANCE WITH SKETCH 101.

SKETCH Nº 2

PIER BRACING 118 N 60-4

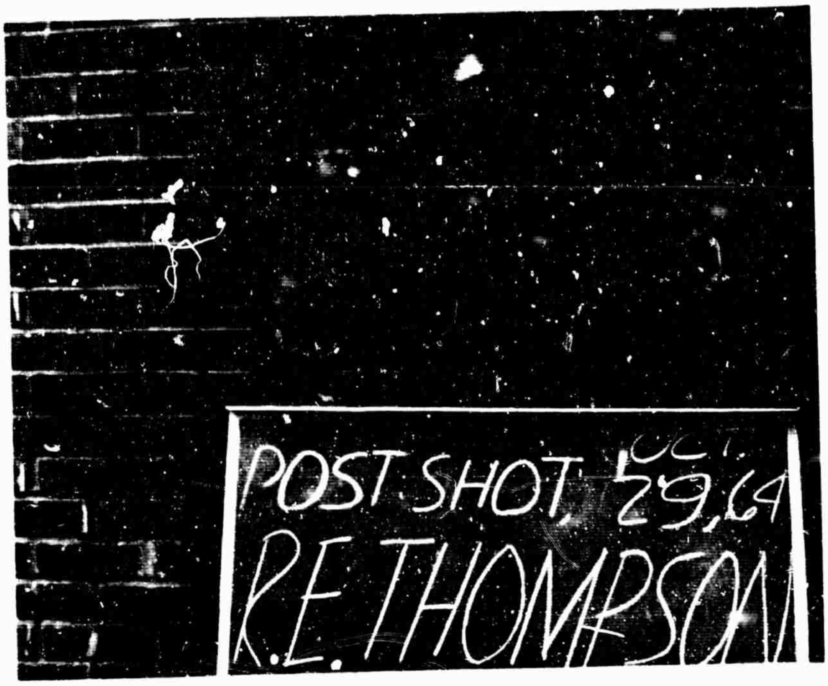
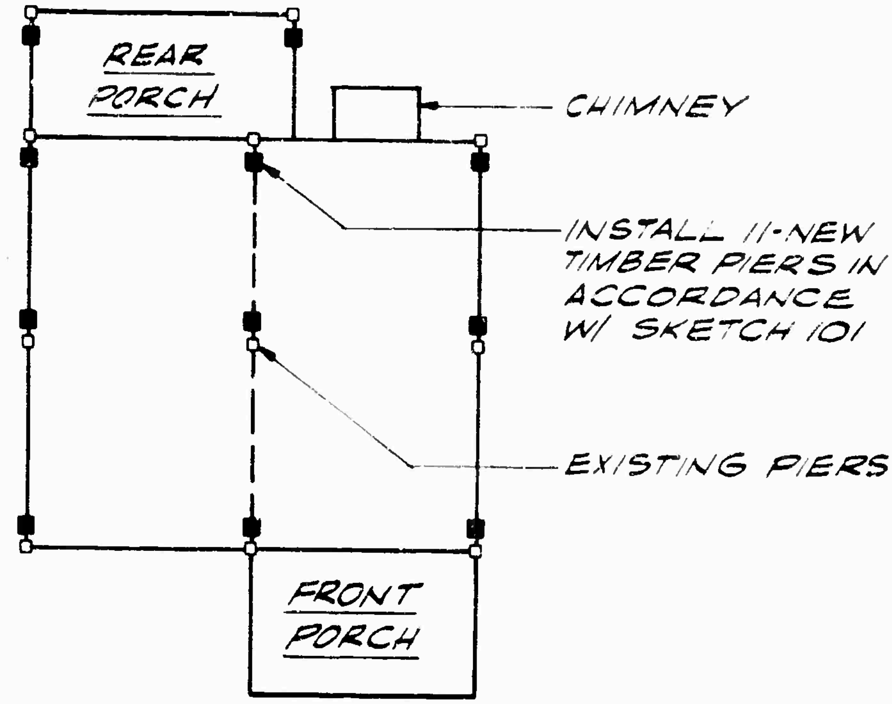


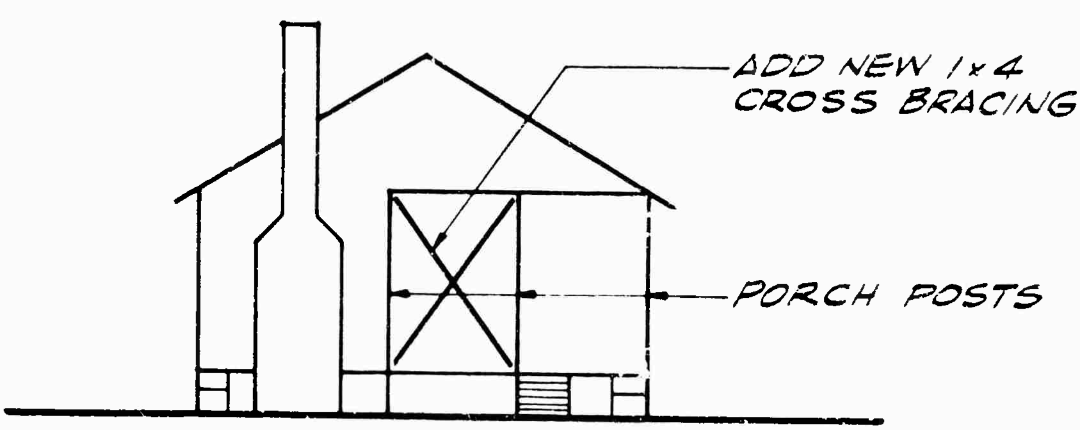
Photo No. 32 - Postshot Cracking in H&N No. 66 Chimney

PROJECT DRIBBLE

PRE-SHOT STRUCTURAL SURVEY



FOUNDATION PLAN



REAR ELEVATION

SKETCH No 3

PIER BRACING H&N 55-1

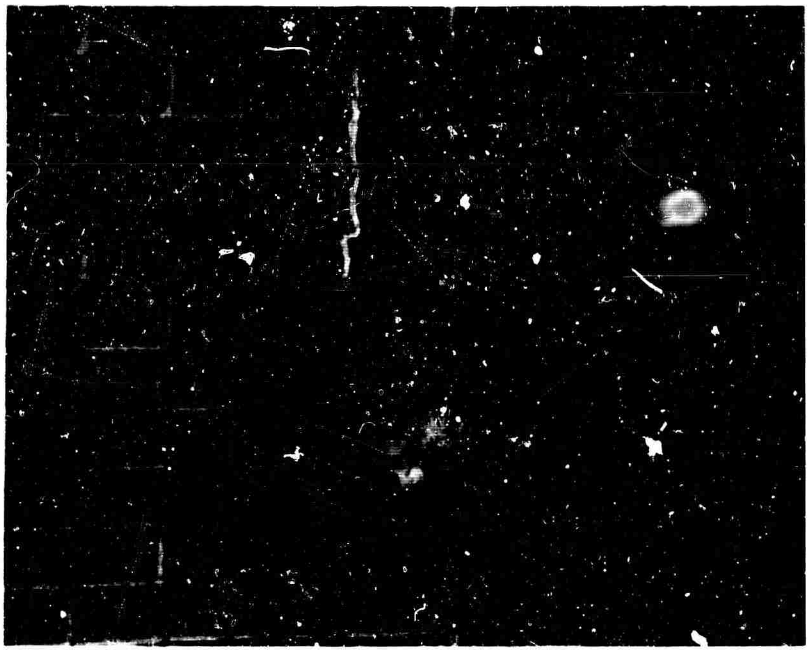


Photo No. 33 - Postshot Cracks in H&N No. 55 Chimney

Photo No. 34 - Pre-Shot of H&N No. 256

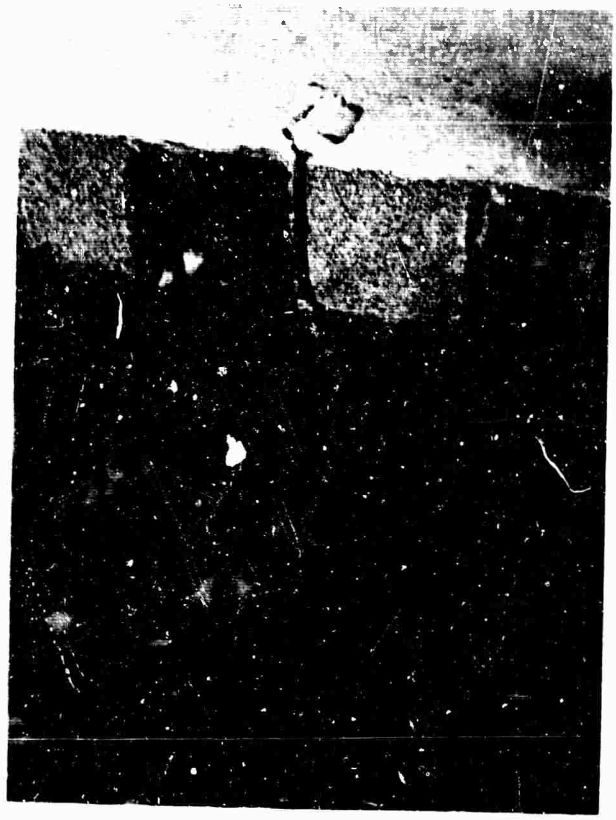


Photo No. 35 - Pre-Shot Cracks in H&N No. 256 Porch

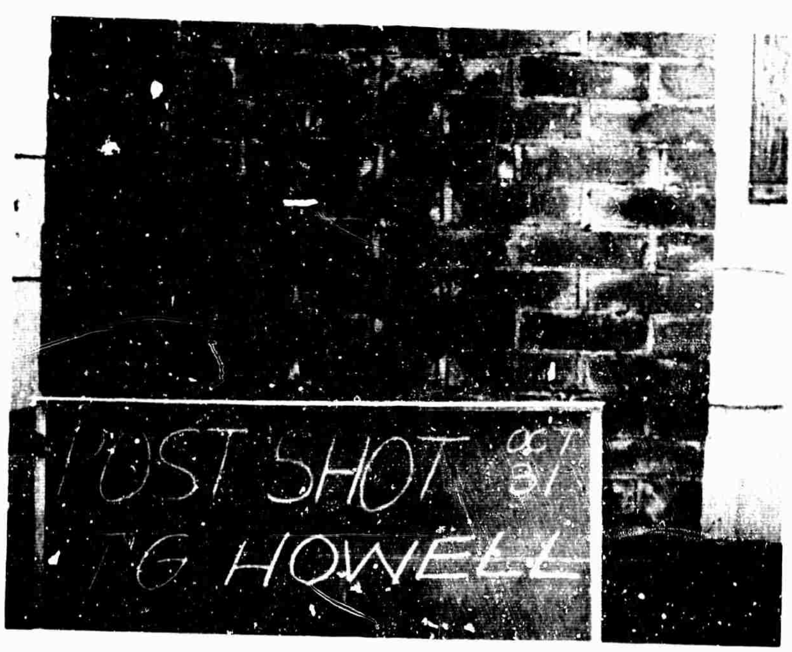


Photo No. 36 - Postshot Cracks in H&N No. 256 Chimney

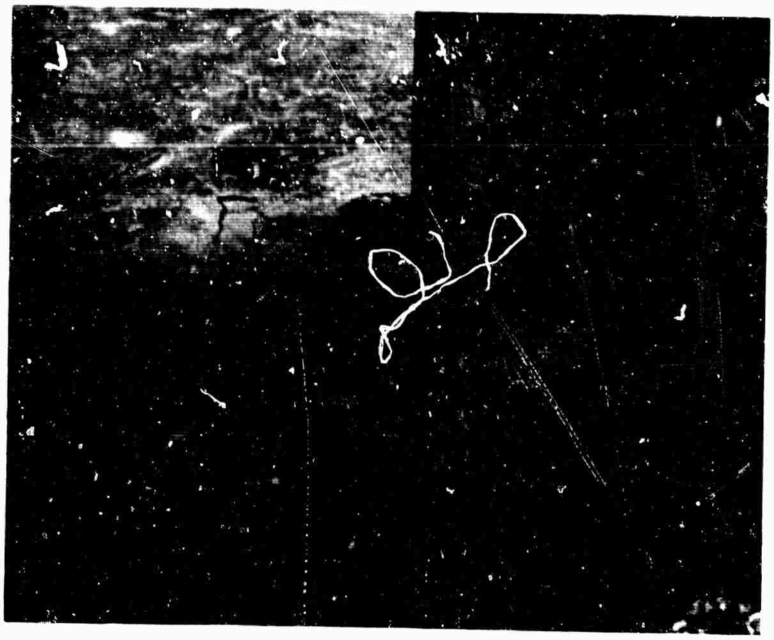


Photo No. 37 - Postshot Cracks in H&N No. 256 Porch

Photo No. 38 - Pre-Shot of H&N No. 286

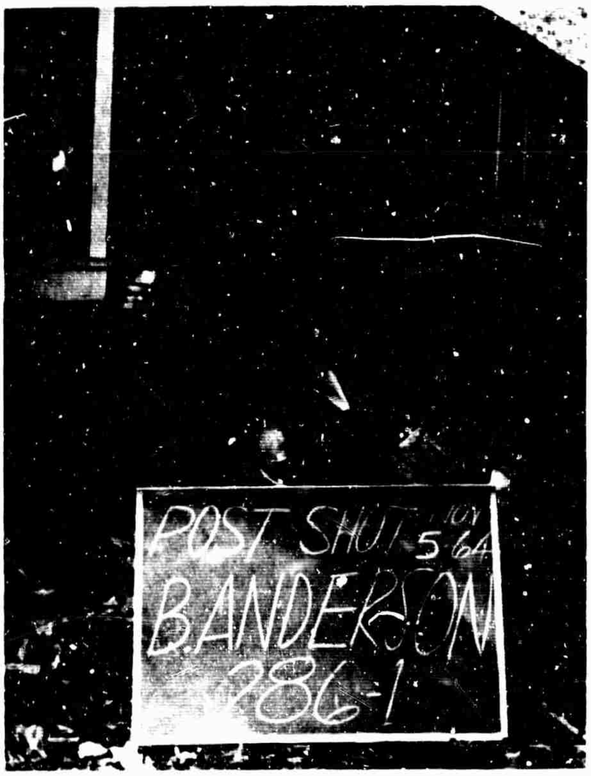


Photo No. 39 - Postshot of H&N No. 286 - Chimney

Photo No. 40 - Pre-Shot of H&N No. 228

Photo No. 41 - Pre-Shot Cracks in H&N No. 228-Porch Footing

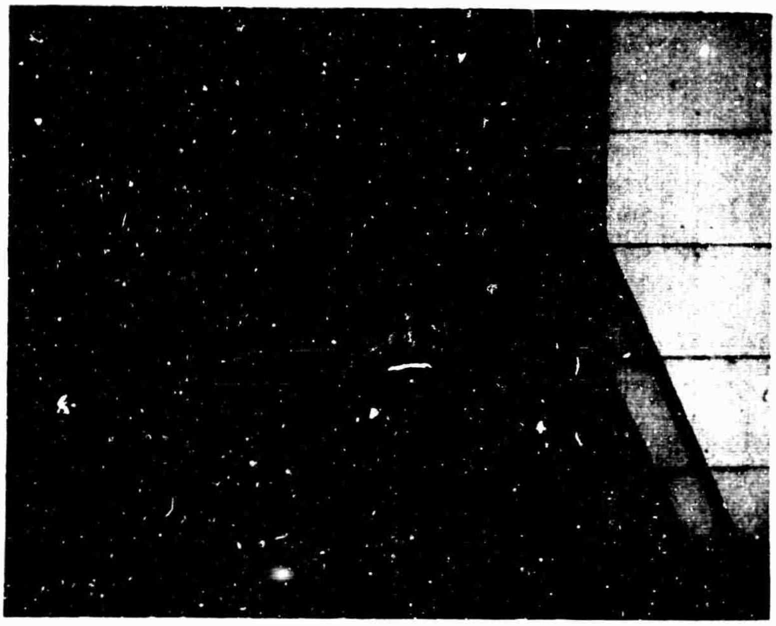


Photo No. 42 - Pre-Shot Cracks in H&N No. 228 Chimney

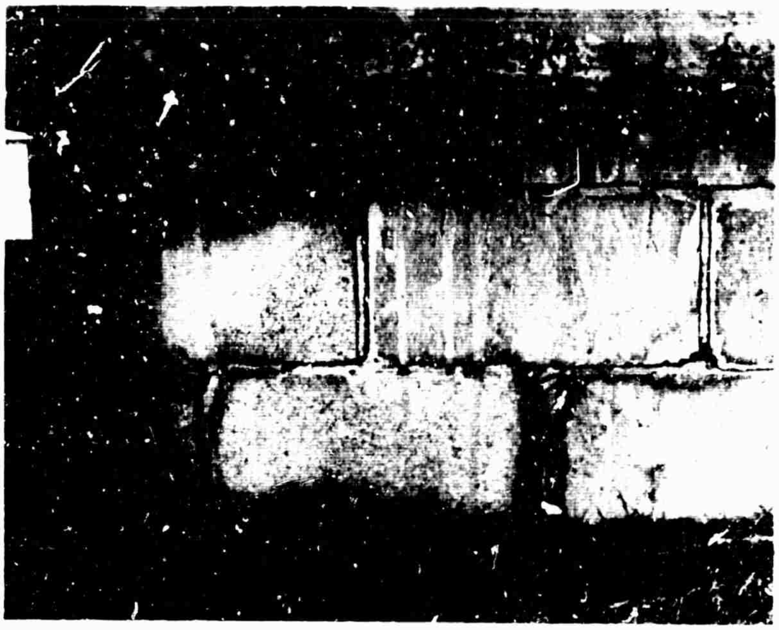


Photo No. 43 - Postshot Cracks in H&N No. 228 Porch Footing

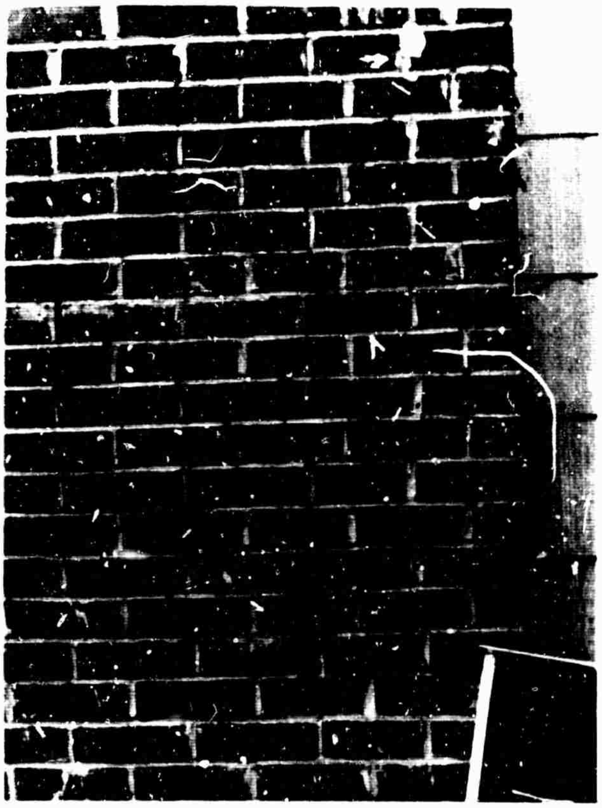


Photo No. 44 - Postshot Cracks in H&N No. 228 - Chimney

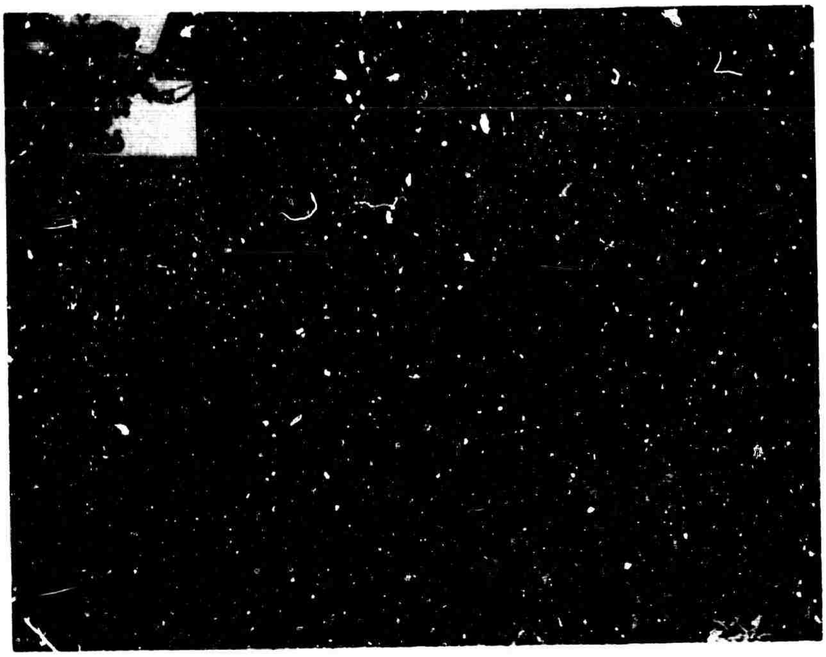


Photo No. 45 - Pre-Shot of H&N No. 236

Photo No. 46 - Pre-Shot of H&N No. 105-Facing Brick

Photo No. 47 - Pre-Shot of H&N No. 105-Facing Brick

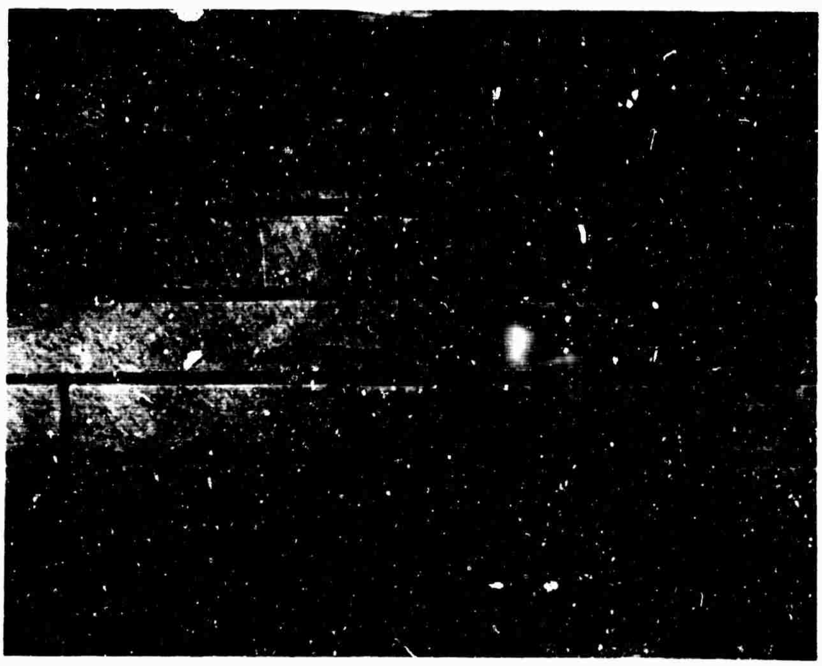


Photo No. 48 - Post-shot Cracks in H&N 105-Facing Brick

3. FRAME STRUCTURES ON CONTINUOUS FOOTING OR SLABS

The C. O. Williamson residence, (H&N 164), an asbestos-shingled frome house with a concrete slab front porch was surveyed. The house was supported by a continuous concrete block footing. The residence was 5,700 meters from SZ and the peak ground motion was predicted to be 5 cm/sec. Prior to the event numerous minor cracks were noted in the block footing, interiro ceiling and front porch slab (photo no. 49). The postshot survey revealed that minor cracks in the sheetrock ceiling increased in size, a section of ceiling molding pulled loose and the foundation walls had shifted and increased the foundation wall cracks (photo no. 50).

The Mississippi State Forestry Service Ranger's residence (H&N 184) at 6,580 meters was also surveyed (photo no. 51). This building was a 7 x 13-meter asbestos-shingled frame house on a continuous concrete block footing. The interior walls were frame with taped sheetrock. A 10-meter high doubly guyed TV antenna was fastened to one end of the house. The peak ground motion was predicted to be 4 cm/sec. The postshot survey revealed no damage to the building. A quonset hut was also surveyed on the property (photo no. 52). No damage was indicated on the postshot survey.

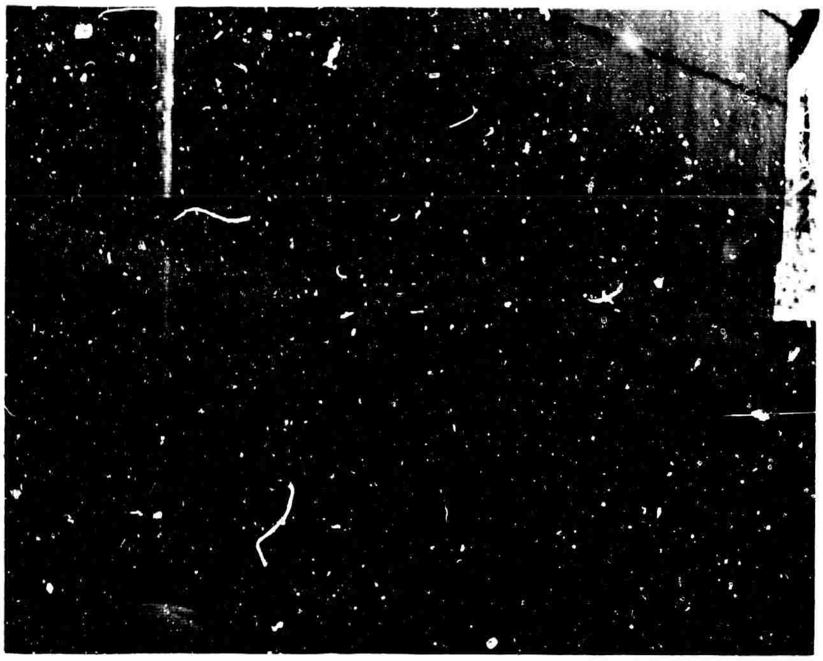


Photo No. 49 - Pre-Shot of H&N 164

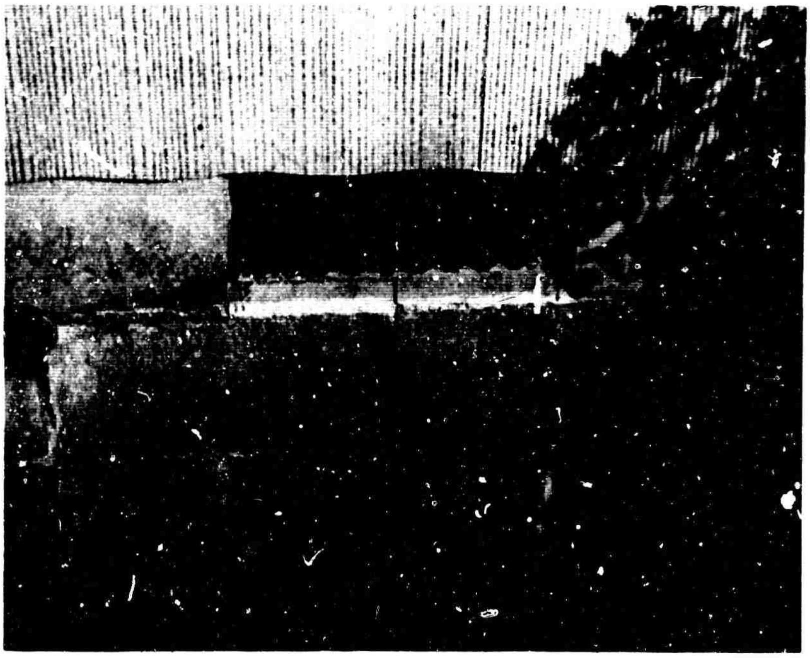


Photo No. 50 - Postshot Cracks in H&N 164 Footing

Photo No. 51 - Postshot of H&N 184, Ranger's House

Photo No. 52 - Postshot of H&N 184, Quonset hut

4. ELEVATED WATER TANKS AND TOWERS

The Patrick Harrison water tower (T-16) consisted of a steel water tank, 4½ meters long and 2 meters in diameter, supported horizontally on a steel frame. The tank was 4 meters above the ground and the frame was anchored to concrete foundation pads (photos no. 53 and 54). The water tank was located 543 meters from SZ and the peak ground motion was predicted to be 125 cm/sec velocity. It was recommended the tank be emptied, and on shot day it contained only a small amount of water. The postshot survey revealed no damage to the water tank or support; however, two of the three concrete foundation pads were cracked, as shown in sketch no. 4.

A water tank and tower (T-19) were located 610 meters from SZ. The steel tank, 2 meters high and 2 meters in diameter, was mounted vertically 4 meters above the ground on a wood platform (photo no. 55). The tower was constructed of six 15 x 15 cm posts braced with planks bolted diagonally as illustrated. The peak ground motion velocity was predicted to be 112 cm/sec at the tower, and it was almost empty on shot day. No damage was observed after the event.

A fire tower (S-4) occupied by the Mississippi State Forestry Service was surveyed 9.3 km from SZ. The steel frame, wood panelled cabin was supported on 10 x 10 cm angle columns, approximately 33.5 meters above the ground (photo no. 56). The columns were braced diagonally and horizontally with steel angles (photo no. 57). The tower is supported on individual concrete footings (photo no. 58) and anchored with two bolts through each base plate bracket. The predicted ground motion was 2 cm/sec. No damage was noted in the postshot survey of the tower.

A 12,580-liter water tank on a 14-meter tower was surveyed 9 km from SZ by the U. S. Bureau of Mines. The ground motion at this tower location was also 2 cm/s . Their postshot survey revealed no damage to the tank or tower.

Farther t from SZ, the Purvis City water tank (S-2) was surveyed. This levated 946,000 liter steel tank was located 15.2 km from SZ (photo no. 59), where the ground motion was predicted to be 1 cm/sec. The tank was estimated to be about 37 meters above the ground and was supported on five 61 cm diameter steel pipe columns. The columns were cross-braced. The exterior columns were anchored to concrete foundation pads with four steel anchor bolts for each column (photo no. 60). An interior 122 cm diameter steel pipe extended down from the center of the bottom of the tank.

Another water tower, the Movie Star of Purvis Corp. water tank (S-1) was surveyed also at a distance of 16.1 km from SZ. This is also a steel tank mounted approximately 30 meters above the ground on a steel tower (photo no. 61). The four tower legs, consisted of channel sections, with steel bars for diagonal bracing. Each column base plate was mounted to a concrete pad by one anchor bolt, as shown in photos no. 62 and 63. The ground motion at this location was also estimated to be 1 cm/sec.

The two Purvis water tanks were not expected to be damaged, and no precautionary measures were taken prior to the shot. Only the Movie Star of Purvis Corporation tank sustained any apparent damage from the Salmon Event, and this was only a small leak in the fill pipe. Since the postshot survey indicated only a small dripping, it is possible that the leak was aggrevated by the ground motion from the event.

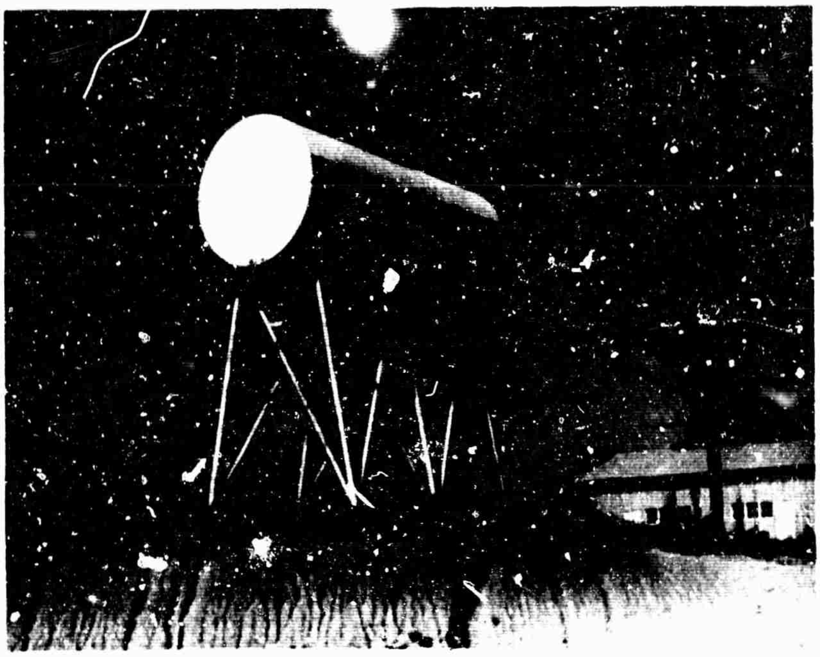


Photo No. 53 - Pre-Shot of T-16 Water Tower

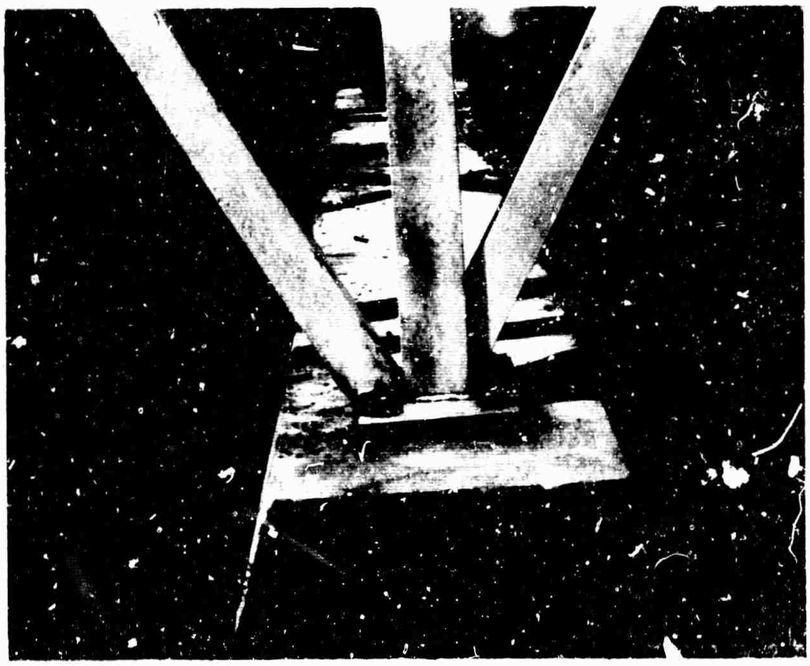
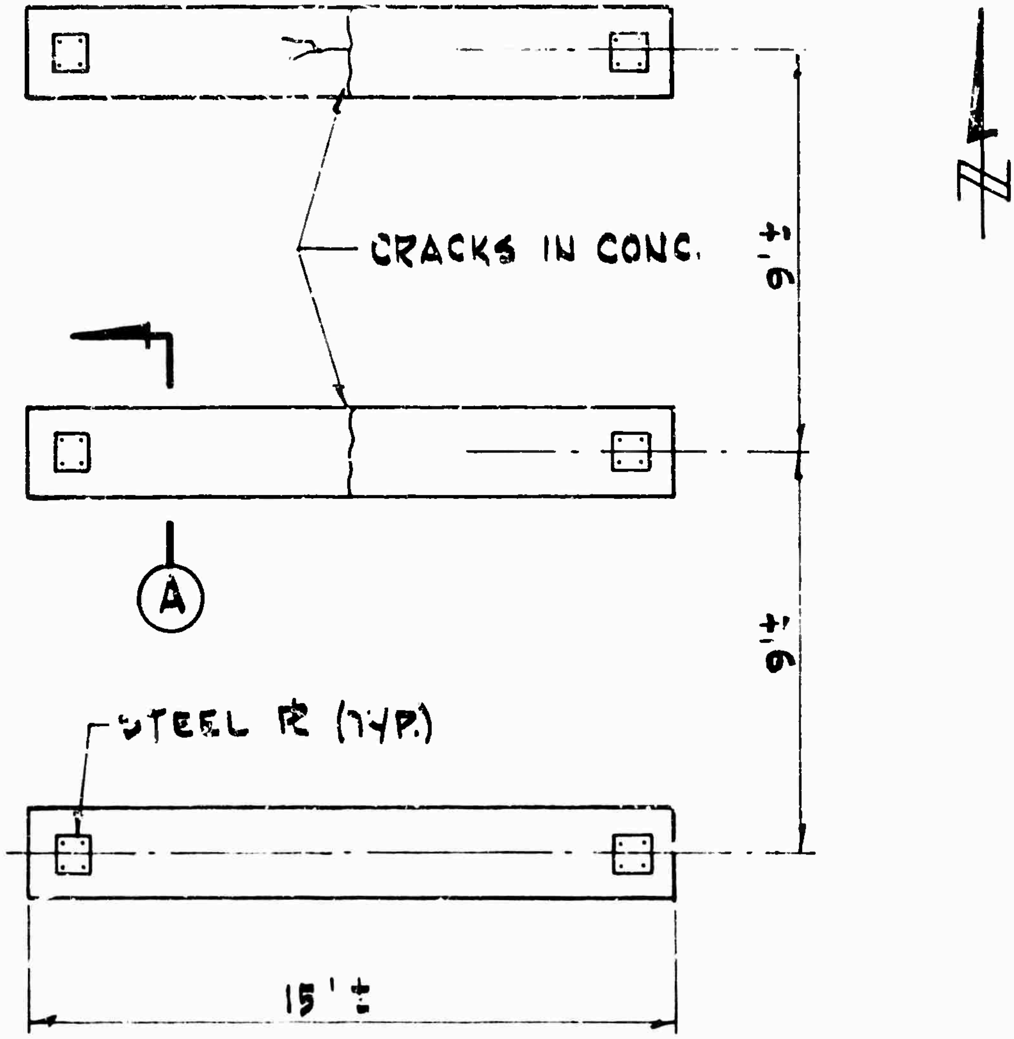


Photo No. 54 - Pre-Shot of T-16 Footing

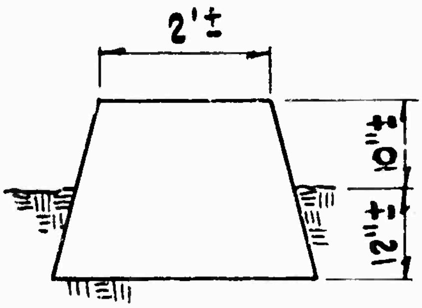
PROJECT DRIBBLE

POSTSHOT STRUCTURAL SURVEY



TOWER FOUNDATION PLAN

NO SCALE



NOTE: NO DAMAGE TO THE STRUCTURAL STEEL WAS OBSERVED.

SECTION (A)

NO SCALE

SKETCH No 4

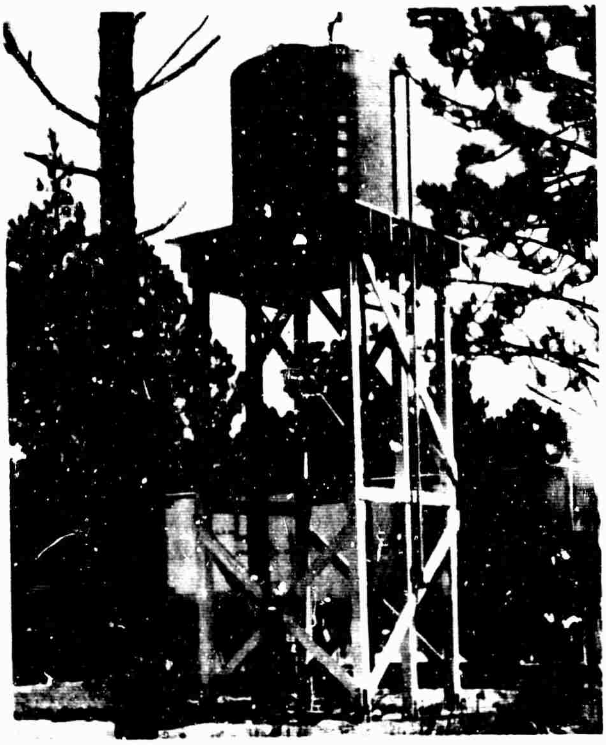


Photo No. 55 - Pre-Shot of Water Tank and Tower at First Aid Station

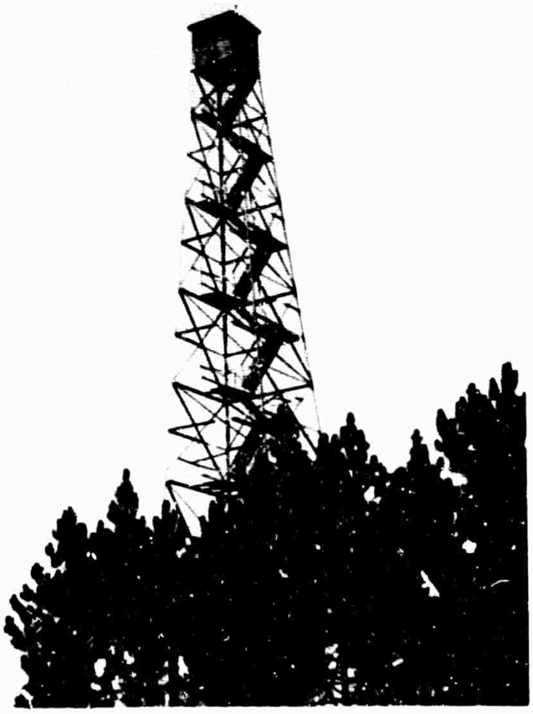


Photo No. 56 - Pre-Shot of Mississippi State Forestry Service Fire Tower

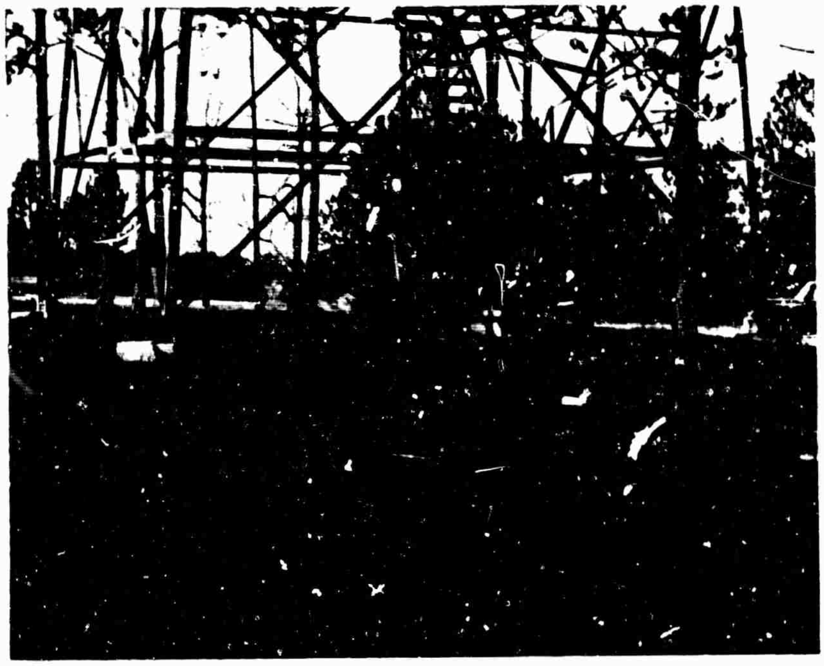


Photo No. 57 - Pre-Shot of Fire Tower Columns
Braced with Steel Angles

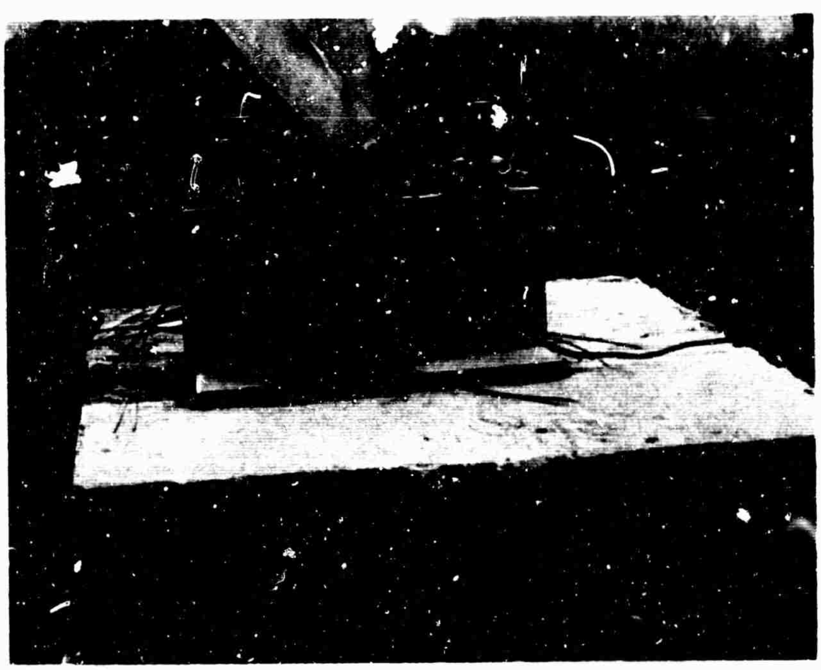


Photo No. 58 - Pre-Shot of Fire Tower Footing

Photo No. 59 - Pre-Shot of Purvis Water Tower

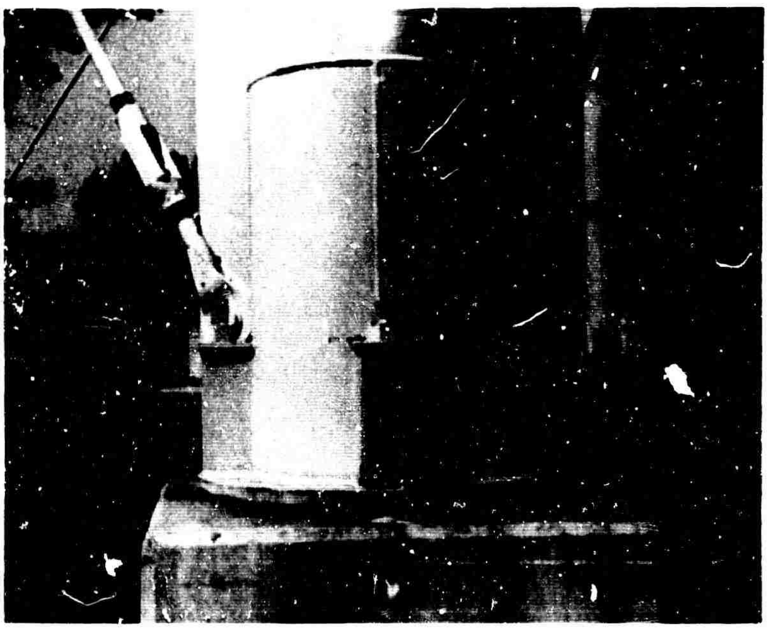


Photo No. 60 - Purvis Water Tower Footing

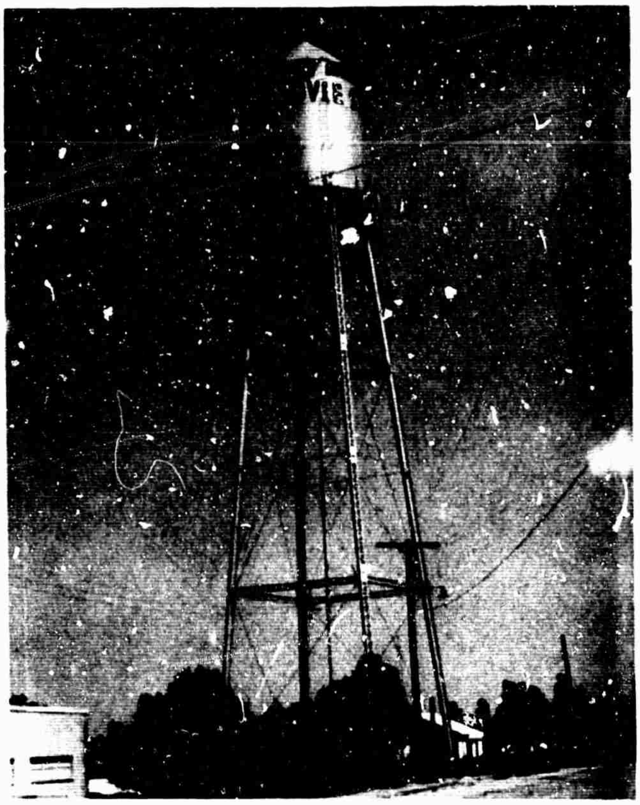


Photo No. 61 - Movie Star of Purvis Water Tower

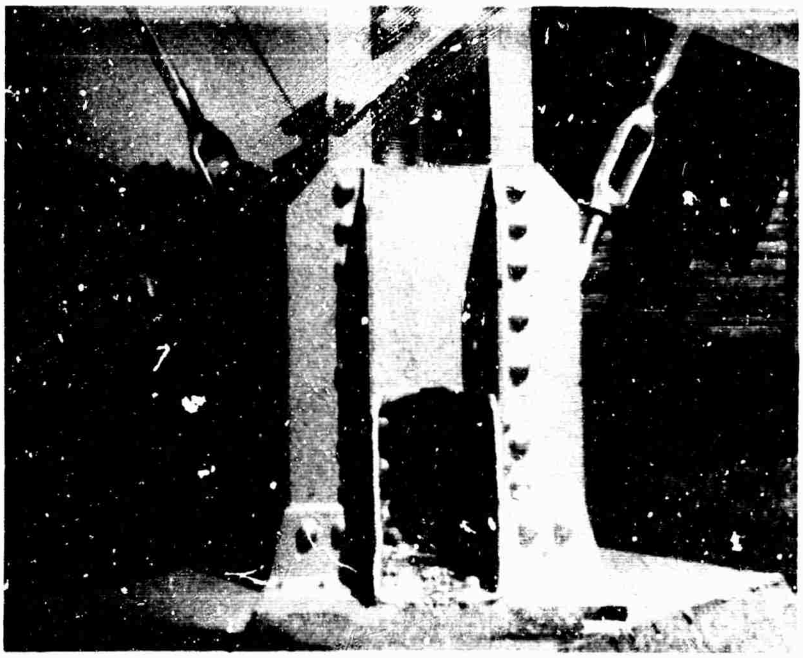


Photo No. 62 - Movie Star of Purvis Water Tower Footing

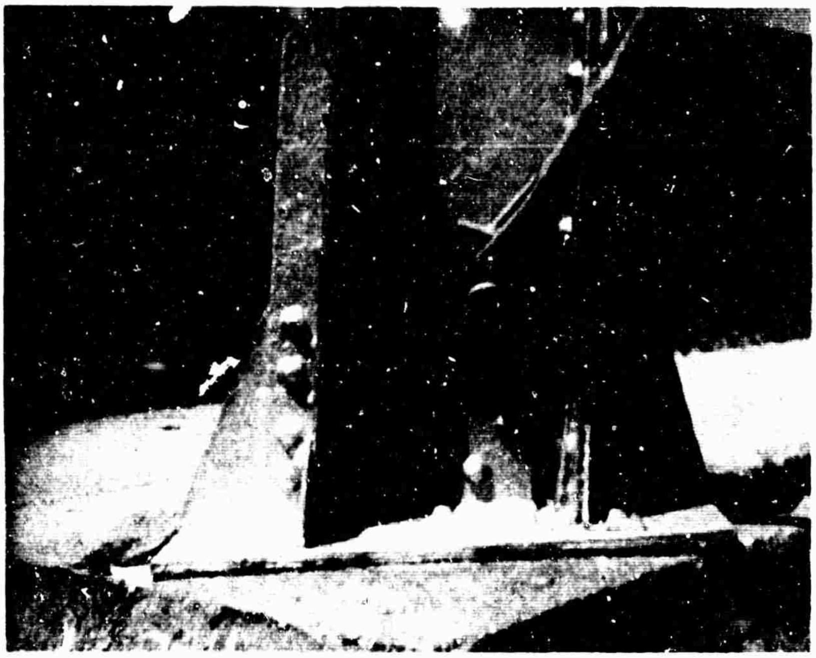


Photo No. 63 - Movie Star of Purvis Water Tower Footing

5. COMPRESSOR AND HOIST STRUCTURES

The compressor house on the Dribble Site, designated T-4, was a prefabricated building with aluminum siding (photos no. 64, 65, and 66). It had a continuous concrete slab around the compressor foundation pad. The structure was located 550 meters from SZ and the predicted peak ground velocity was 125 cm/sec at this distance. Numerous cracks developed in the concrete floor slab after the Salmon Event. The cracks extended radially out from the massive compressor foundation pads; however, no cracks appeared in the compressor foundation pads. The slab also indicated about 1 cm of settlement more than the compressor pad. Probably due to compaction of the fill under the slab. The postshot condition is shown in sketch no. 5 and in photo no. 67.

Hoists were housed in two structures on the Dribble Site. The hoist houses were prefabricated structures with aluminum siding and a continuous concrete floor slab around a large hoist pad foundation (photos no. 68 and 69). Both were located approximately 565 meters from SZ where the predicted peak ground motion velocity was 120 cm/sec. After the event, cracks were evident in the floor slabs of both structures; and approximately 1 cm of settlement of the floor slabs was also indicated after the event, however, no cracks appeared in the hoist foundation pads (sketches no. 6 and 7).

Photo No. 64 - Pre-Shot of Compressor House - Front View

Photo No. 65 - Pre-Shot of Compressor House - Rear View

Photo No. 66 - Pre-Shot of Compressor House - Side View

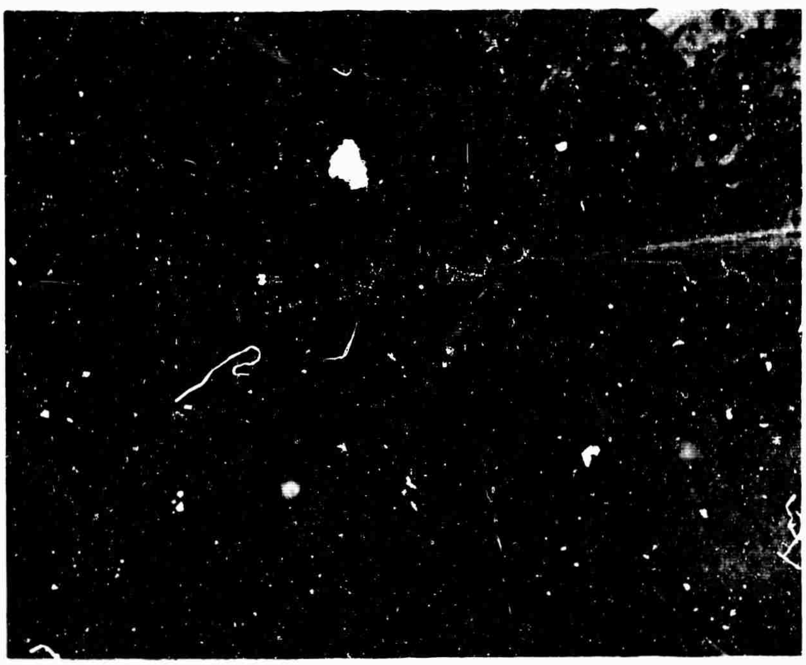
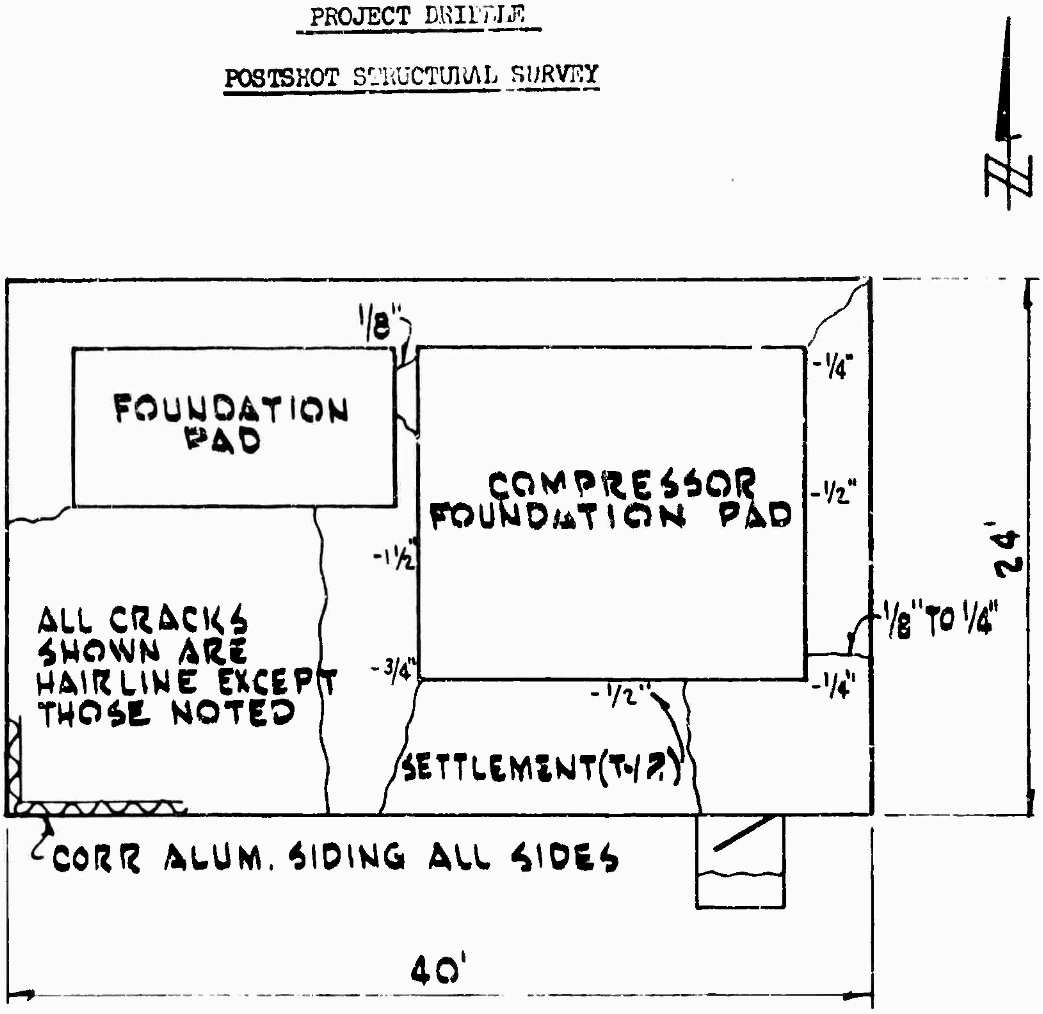


Photo No. 67 - Postshot Cracks in Compressor House Slab

PROJECT DRIBBLE

POSTSHOT STRUCTURAL SURVEY



COMPRESSOR HOUSE PLAN

NO SCALE

SKETCH № 5

POST SHOT CRACKS OF COMPRESSOR HOUSE

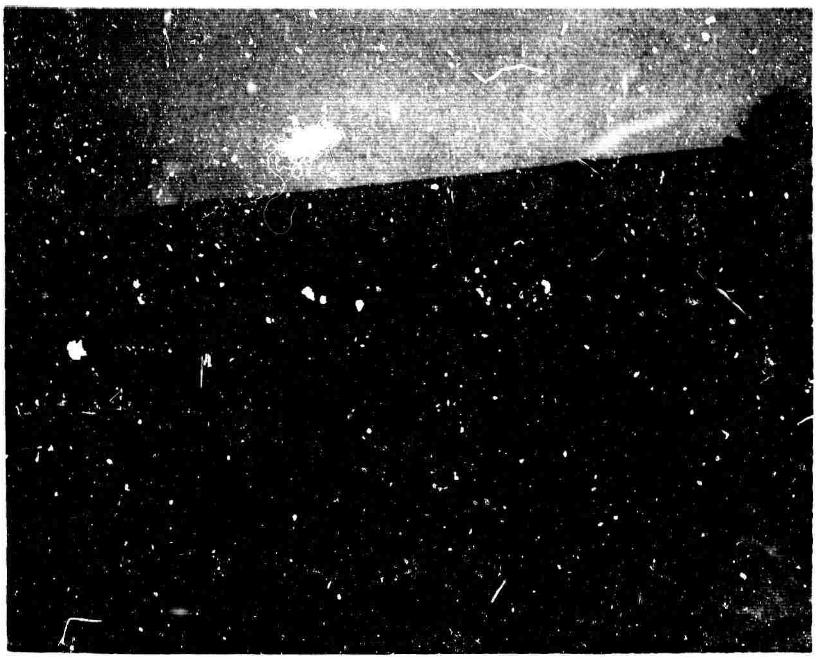
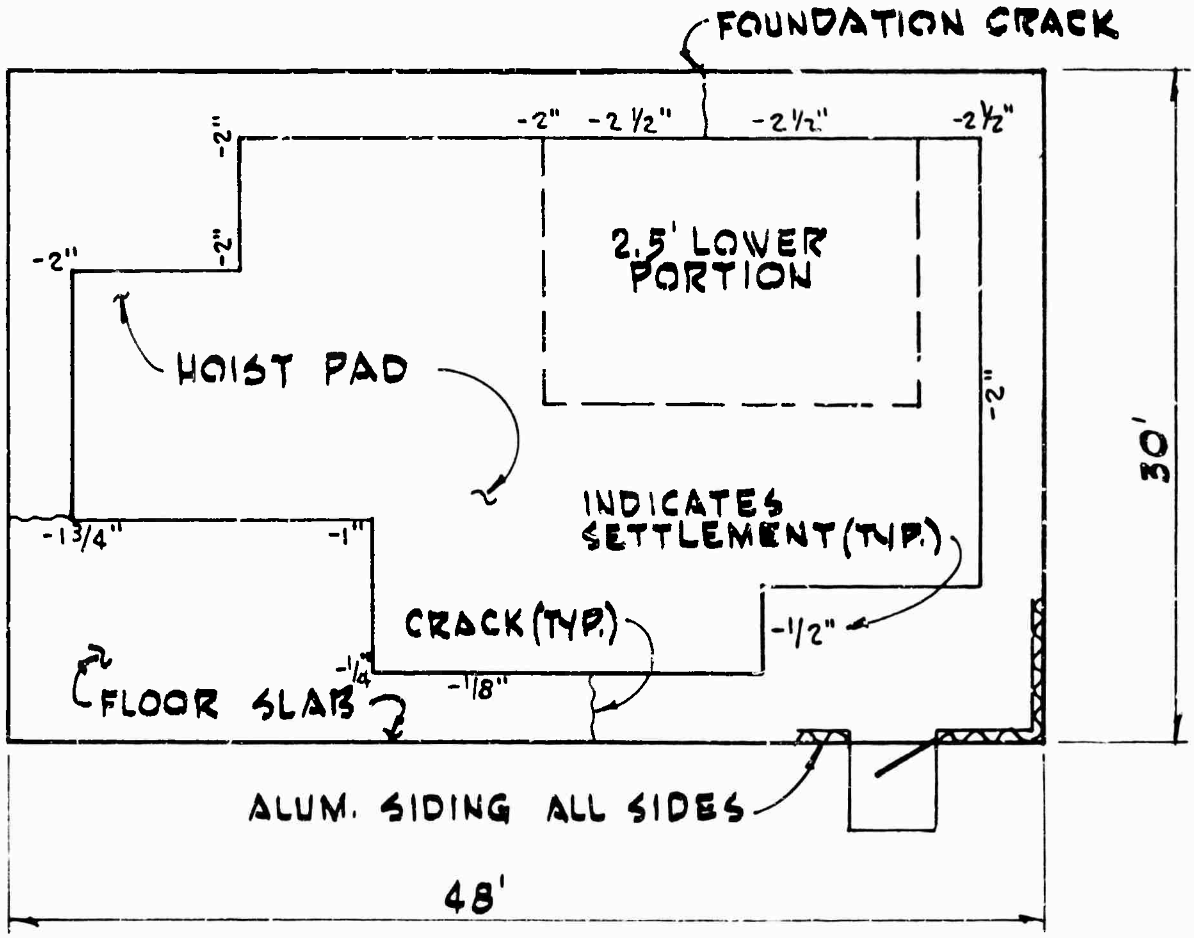


Photo No. 68 - Pre-Shot of Hoist House No. 1

Photo No. 69 - Pre-Shot of Hoist House No. 2

PROJECT DRIBBLE

POSTSHOT STRUCTURAL SURVEY



HOIST HOUSE N° 1 FLOOR PLAN

NO SCALE

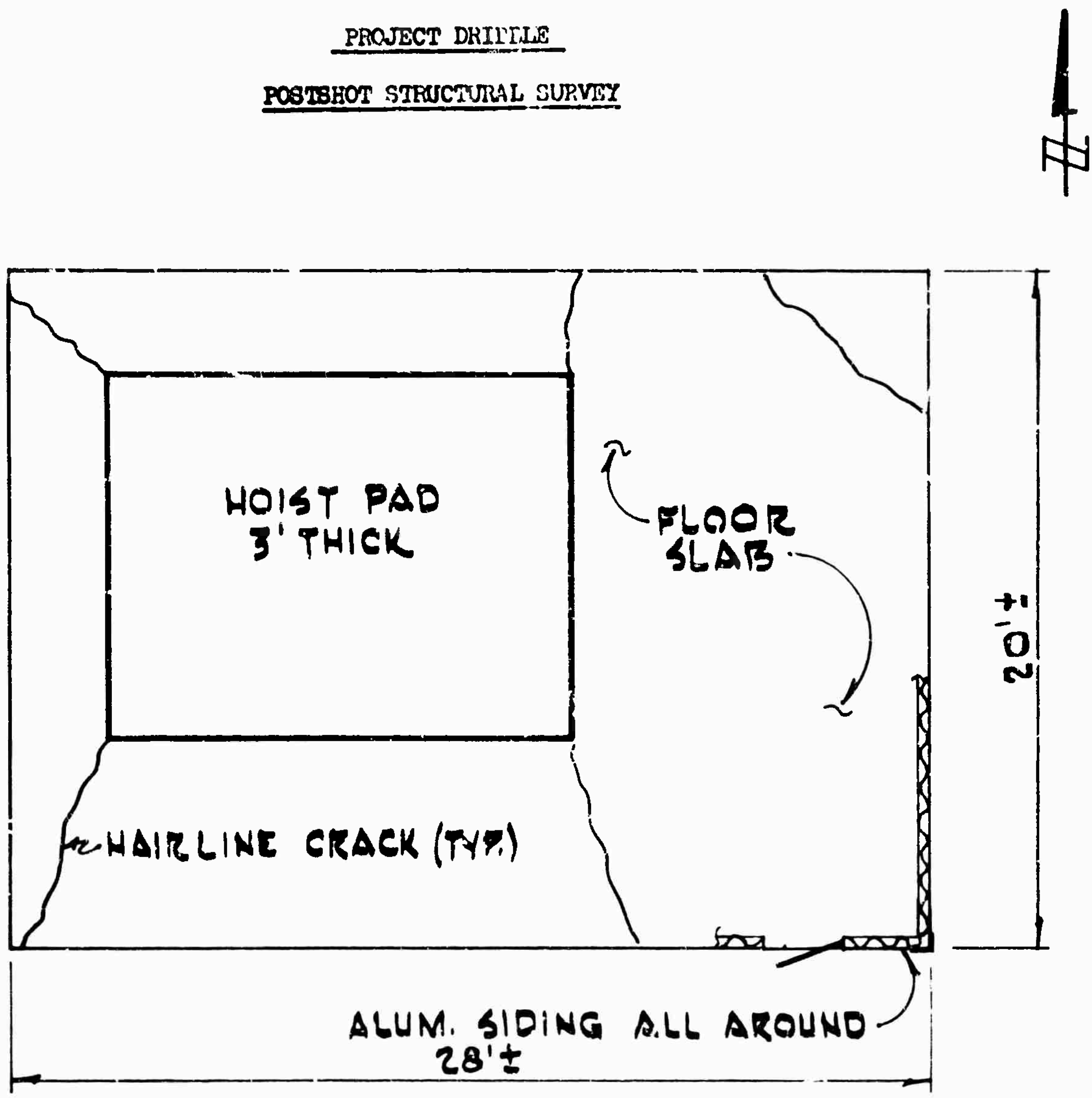
NOTE: THERE ARE VARIOUS MISC. CRACKS IN THE FLOOR IMPOSSIBLE TO TRACE BECAUSE BUILDING IS FILLED WITH BOXES AND CARTONS.

SKETCH № 6

POSTSHOT CRACKS IN HOIST HOUSE N° 1 SLAB

PROJECT DRIBBLE

POSTSHOT STRUCTURAL SURVEY



HOIST HOUSE N° 2 FLOOR PLAN

NO SCALE

SKETCH N° 7

POSTSHOT CRACKS IN HOIST HOUSE N° 2 SLAB.

6. ELECTRICAL EQUIPMENT

Two electrical transformers and equipment boxes and two oil fuse cut-out panels (T-13) were located 107 meters from SZ (photos no. 70 and 71). The oil fuse cut-out panels were bolted to a wood frame. The transformers and other equipment had not been bolted down prior to the phase 3 survey, and with the predicated peak ground motion velocity at this location of approximately 227 cm/sec, it was recommended that bracing and guy cables be installed (photo no. 72). No damage was observed to the equipment during the postshot survey.

Three electrical transformers (T-12) were located at a substation 381 meters from SZ. The transformers were supported by blocking as indicated on (photo no. 73) and the predicted peak ground motion velocity at this location was 170 cm/sec. H&N recommended guy cables which were installed as indicated on photo no. 74. The postshot survey revealed no damage to the equipment.

An oil fuse electrical cut-out (T-14) was located 427 meters from SZ (photo no. 75), an electrical substation (T-5A) was located at 565 meters (photo no. 76), another (T-18) at 580 meters (photo no. 77), and another (T-17) at 594 meters (photo no. 78), from SZ. The predicted peak ground motion velocicies were 155 cm/sec, 120 cm/sec, 115 cm/sec, and 110 cm/sec respectively.

The oil fuse panel at 427 meters was the only one requiring guy cabling. No damage was observed to any of this electrical equipment during the postshot survey.

An electrical generated unit with a Caterpillar D-8 motor (T-6) was located in an open shed 565 meters from SZ (photo no. 79). The equipment was supported on wood beams. The predicted peak ground motion velocity at this distance was 120 cm/sec and no bracing was recommended. The postshot survey revealed no damage.

An electrical substation 1730 meters from SZ (T-23) was also surveyed and no damage was observed. The ground motion at this location was 32 cm/sec.

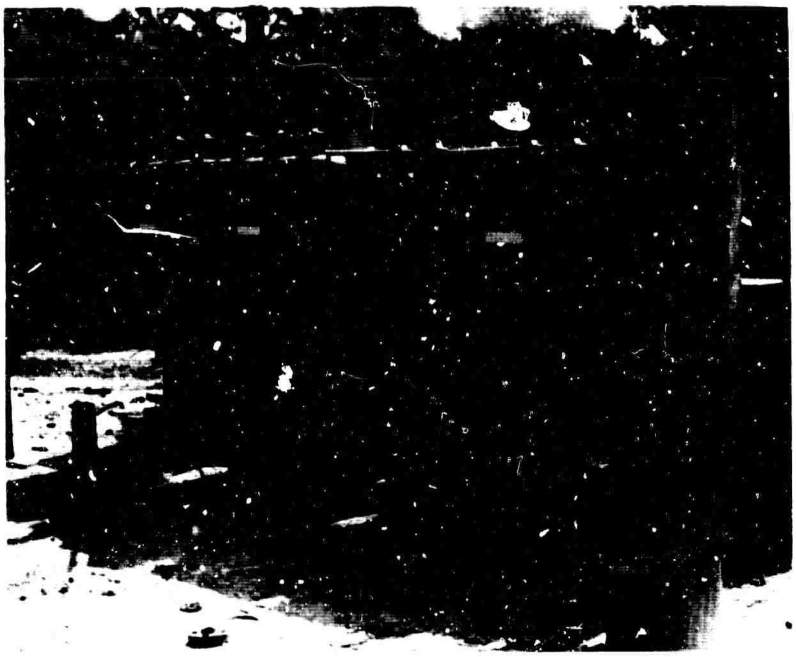


Photo No. 70 - Pre-Shot of Transformers and Oil Fuse Cut-Out Panel at Sta. 1-A

Photo No. 71 - Pre-Shot of Transformers and Oil Fuse Cut-Out Panel at Sta. 1-A

Photo No. 72 - Pre-Shot of Transformers and Oil Fuse Cut-Out
Panel at Sta. 1-A After Bracing

Photo No. 73 - Pre-Shot of Transformers Near Entrance to
Sta. 1-A (T-12) Prior to Installing Guy Wires

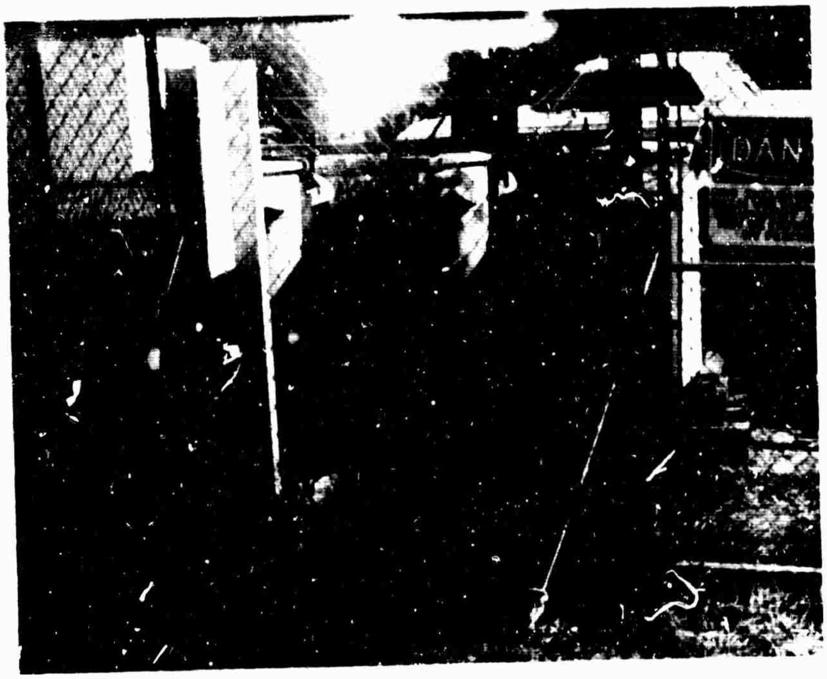


Photo No. 74 - Pre-Shot of T-12 After Installing Guy Wires

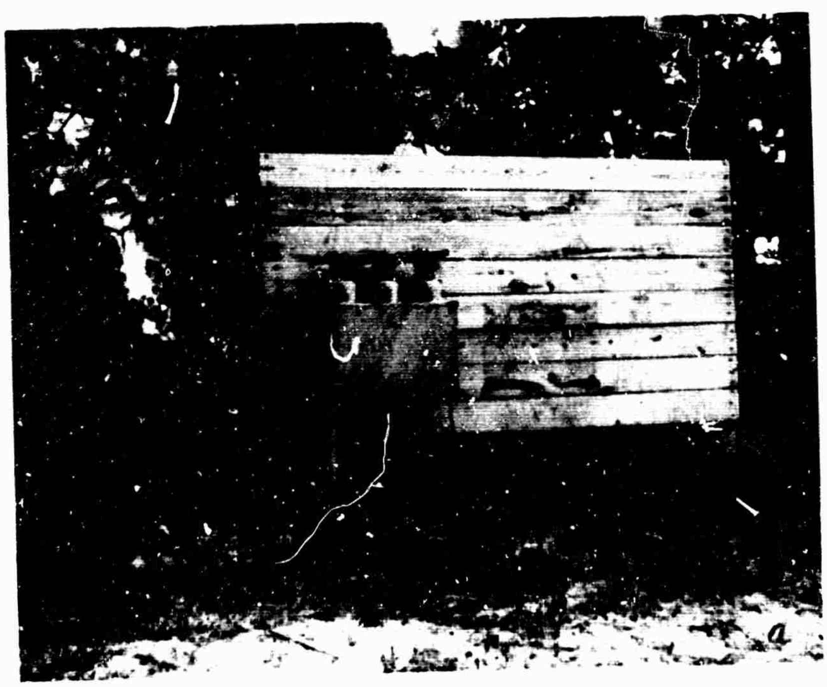


Photo No. 75 - Pre-Shot of Oil Fuse Cut-Out Panel (T-14)

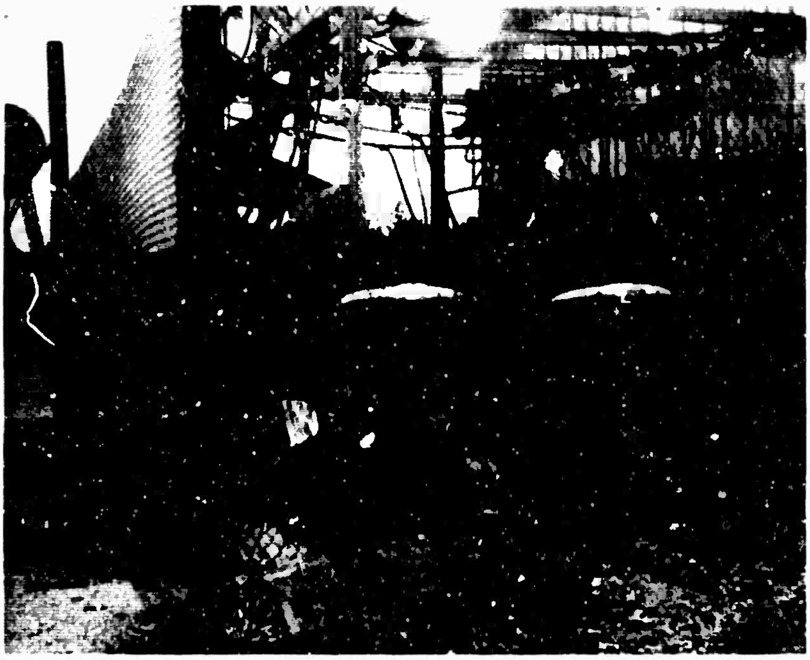


Photo No. 76 - Pre-Shot of Electric Substation at Hoist House No. 1

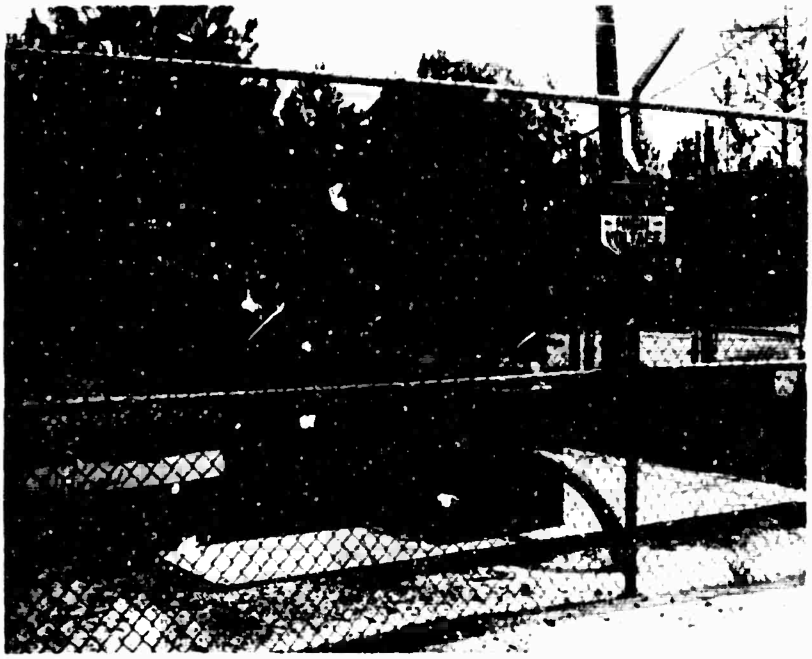


Photo No. 77 - Pre-Shot of Electric Substation at Recording Trailer

Photo No. 78 - Pre-Shot of Electrical Substation
Between Storage Park and First Aid Station

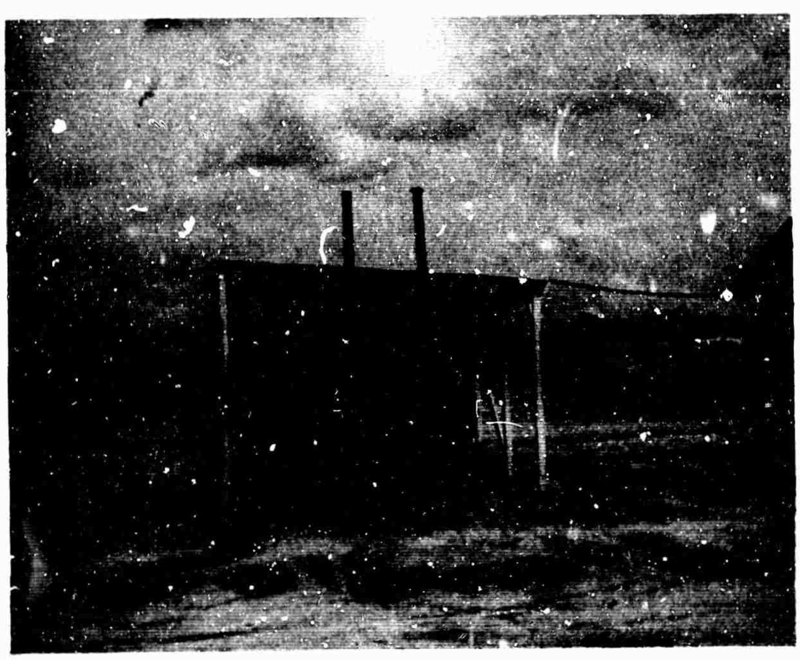


Photo No. 79 - Pre-Shot of Motor and Generator (T-6)

7. WATER PUMP

A pump (T-9) for the bleed-down plant was located on a timber crib structure 183 meters from SZ (photos no. 80 and 81). The crib was approximately 5 meters long, and 4 meters high, and was constructed of 30 x 30 cm timbers filled with rock ballast. Although the predicted peak ground motion velocity at this location was 220 cm/sec, only minor damage was predicted, therefore, no precautionary measures were taken. The postshot survey revealed no damage to the equipment or structure.

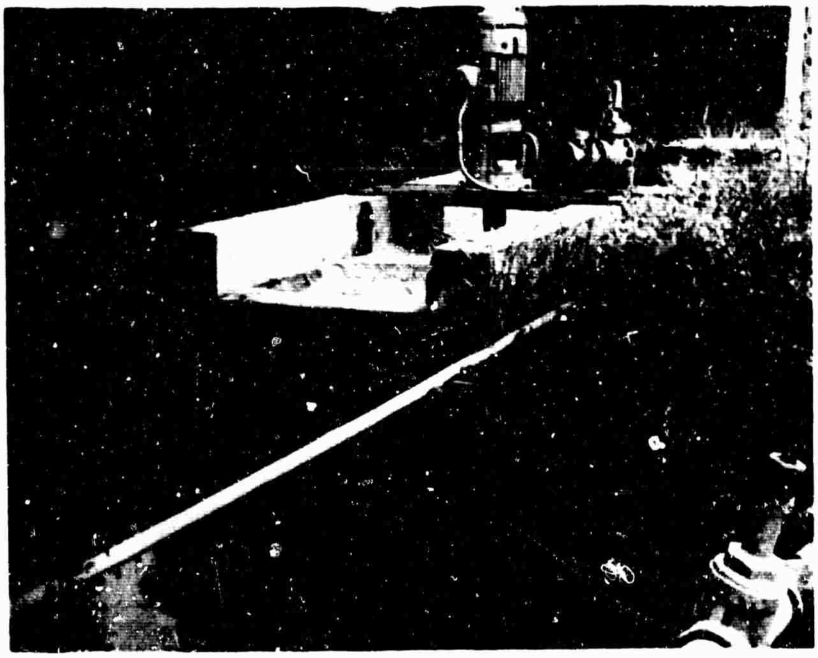


Photo No. 80 - Pre-Shot of Pump Crib for Bleed-Down Plant

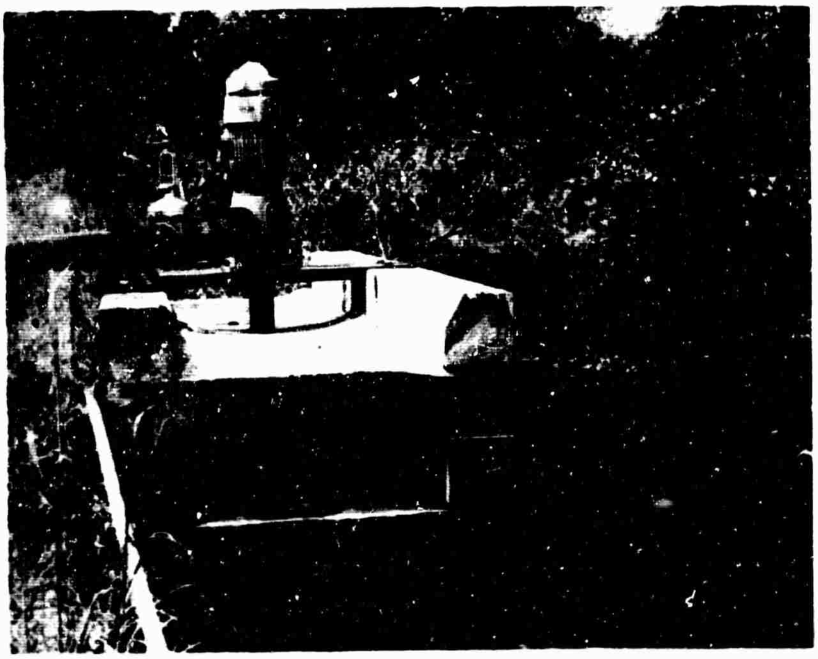


Photo No. 81 - Pre-Shot of Pump Crib for Bleed-Down Plant

8. BRIDGES

The eleven bridges surveyed were within a range of 1,955 meters to 4,330 meters from SZ. Eight of the bridges were constructed of heavy timber decking on timber pile bents and timber or concrete abutments (photos no. 82 and 83). The other three bridges were constructed of precast concrete decking on timber pile bents (photos no. 84 and 85). The predicted ground motion velocity was 25 cm/sec at 1,955 meters and 9 cm/sec at 4,433 meters. H&N engineers determined that no precautionary bracing was required prior to the event, and the postshot survey did not indicate any damage.

Photo No. 82 - Pre-Shot of Bridge No. 1, H&N No. 70

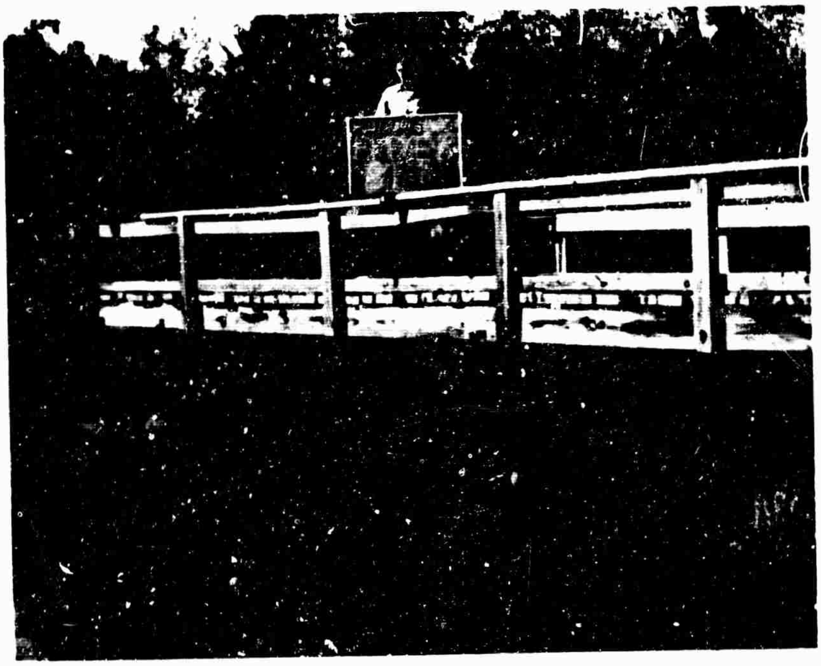


Photo No. 83 - Pre-Shot of Bridge No. 6, H&N No. 81

Photo No. 84 - Pre-Shot of Bridge No. 11, H&N 111

Photo No. 85 - Pre-Shot Details of Deck & Supports, H&N No. 110

9. PONDS AND TUNNELS

There were six disposal pits (T-25) approximately 610 meters northeast of SZ. The particle velocity of the ground motion in this area was approximately 120 cm/sec. The disposal pits contained "drilling mud" which is a mixture of water, oil, grease, bentonite, salt, etc. The disposal pits were constructed of compacted earth dams. Following is a description of each pit and the damage incurred.

Pit no. 1 - This pit was full to it's maximum depth of approximately 2 meters, with a storage volume of about 415,000 liters (photo no. 86 for pre-shot picture). Upon recommendation of H&N engineers, this pit was partially drained prior to the Salmon Event. No damage was observed after the test.

Pit no. 2 - This pit was also filled to full capacity of about 1,760,000 liters and a liquid depth of 1½ meters. There was evident of seepage through the roadside dike prior to the test, as shown in photo no. 87. After the test longitudinal cracks developed on the berm of the dike (photo no. 88).

Pit no. 3 - This pit was also full to a depth of 2 meters, however, this was a natural dike formed by excavation and was not expected to cause trouble. After the event only a few minor cracks were evident.

Pit no. 4 - This pit was about ½ meter from it's maximum height of about 6 meters and capable of storing about 3,400,000 liters. Drainage had caused considerable erosion and saturated the toe of the dike (photos no. 89 and 90). After the event longitudinal and transverse cracks were evident (photo no. 91).

Pit no. 5 - This pit was similar in height to no. 4, however, it was only partially filled and it was recommended that several of the other pits be reduced in quantity of liquid by pumping into no Prior to the event "mud" was pumped from no. 2 into no. 5 until the level of no. 5 was 2 meters (photo no. 92) from the top. After the event, many longitudinal cracks developed in the berm, and sloughing was evident on both the upstream and downstream faces (photo no. 93).

Pit no. 6 - The dike for this pit was constructed of loose material bulldozed in a berm without compaction, however, the pit was small, about 125,800 liters, and only 2 meters of liquid (photo no. 94). The postshot survey revealed only minor cracks (photo no. 95).

In addition to the disposal pits only one dam was surveyed. A postshot survey only was made for a dam on the property of W. H. Burge. The dam (H&N 52) was located approximately 3 km from SZ, and was about 6 meters high and 30 meters longitudinally across the top. The dam was constructed of compacted fill, and was reported by the owner to be in a sound condition prior to the Salmon Event. The peak ground motion was predicted to be 12½ cm/sec at this location. The postshot survey revealed large cracks in the tops and sides.

Two tunnels (T-1), one 5 meters long and one 6.4 meters long, were located 915 meters from SZ. The tunnels were supported with 10 cm x 10 cm timber frames spaced 122 cm apart with 5 cm thick planking on the roof and sides (photo no. 96). The earth covering over the tunnels was approximately 1 meter thick, and the predicted ground motion velocity at their location was 68 cm/sec. No damage was anticipated, and no special bracing was recommended. The postshot survey revealed no physical damage, although the ground motion from recording instruments was approximately 100 cm/sec at these locations.

Photo No. 86 - Pre-Shot of Disposal Pit No. 1 (September 30, 1964)

Photo No. 87 - Pre-Shot of Disposal Pit No. 2 (Background) and Disposal Pit No. 3 (Foreground) on September 30, 1964)

Photo No. 88 - Postshot of Disposal Pit No. 2

Photo No. 89 - Pre-Shot of Disposal Pit No. 4
(September 30, 1964)

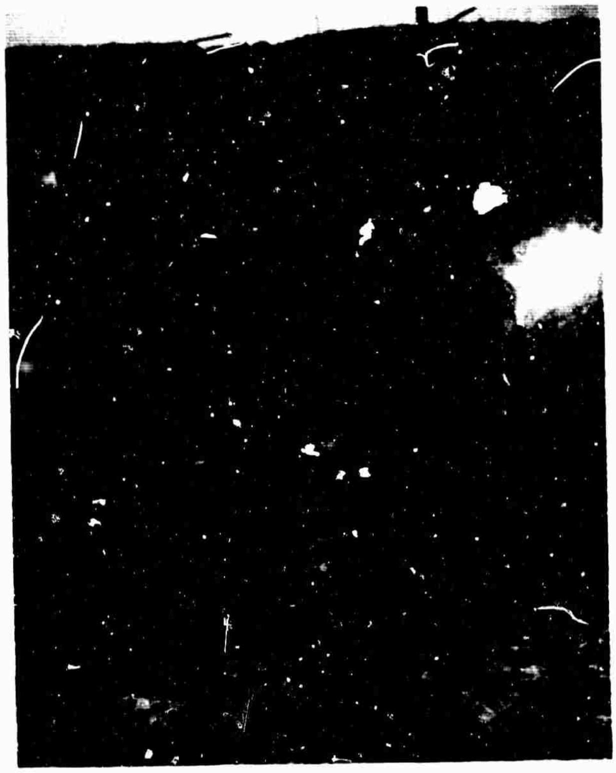


Photo No. 90 - Postshot of Disposal Pit No. 4 (August 12, 1964)
(Erosion of Downstream Face)

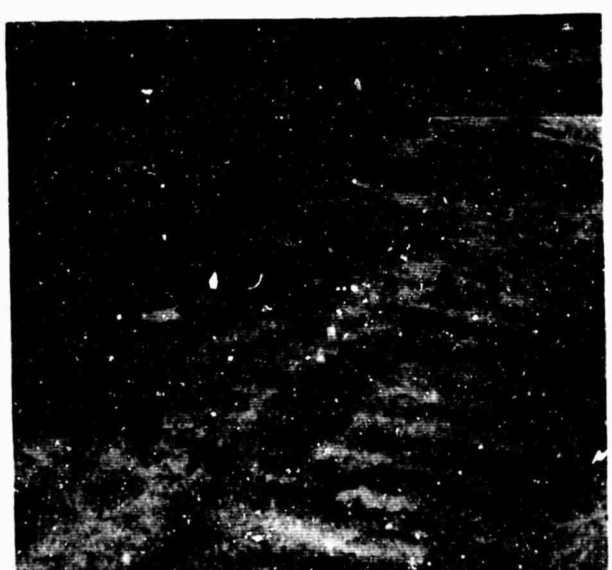


Photo No. 91 - Postshot of Disposal Pit No. 4

Photo No. 92 - Pre-Shot of Disposal Pit No. 5
(August 12, 1964)

Photo No. 93 - Postshot of Disposal Pit No. 5

Photo No. 94 - Pre-Shot of Disposal Pit No. 6
(August 12, 1964)

Photo No. 95 - Postshot of Disposal Pit No. 6

Photo No. 96 - Pre-Shot of Tunnel

BLANK PAGE

APPENDIX C

Pre-Shot Safety Measures and Bracing Standards

Certain precautionary safety measures were initiated, prior to the Salmon Event, for all structures out to 4.2 km distance from GZ. These steps were recommended to reduce the occurrence of fires and damage to breakable objects. The following list was distributed to all householders in the area:

1. Shut off all fuel supply lines

2. Extinguish all fires in stoves or fireplaces, indoors or outdoors.

3. Disconnect all electrical circuits by opening main switch.

4. Where electrically operated pump and tank supply system is used, turn off valve between tank and house. Where such a valve is not present, reduce tank pressure to zero.

5. Remove breakable materials from shelves and window sills, etc.; remove pictures, mirrors, and breakable materials hanging on walls. Pack all such items in cartons provided and place cartons on floor.

6. Apply strong adhesive tape extensively to all large windows.

7. Check all window mounted fans and remove or secure as may be required.

8. Special recommendations for butane supply systems:

   a. Inspect all butane supply systems completely. Check out all components for operability, and repair or replace components as required.

   b. An operable manual "shut-off" valve in the supply line is required close to the tank. If such a valve is not present at this location, install one. If flow control valve can be manually shut off, this is acceptable.

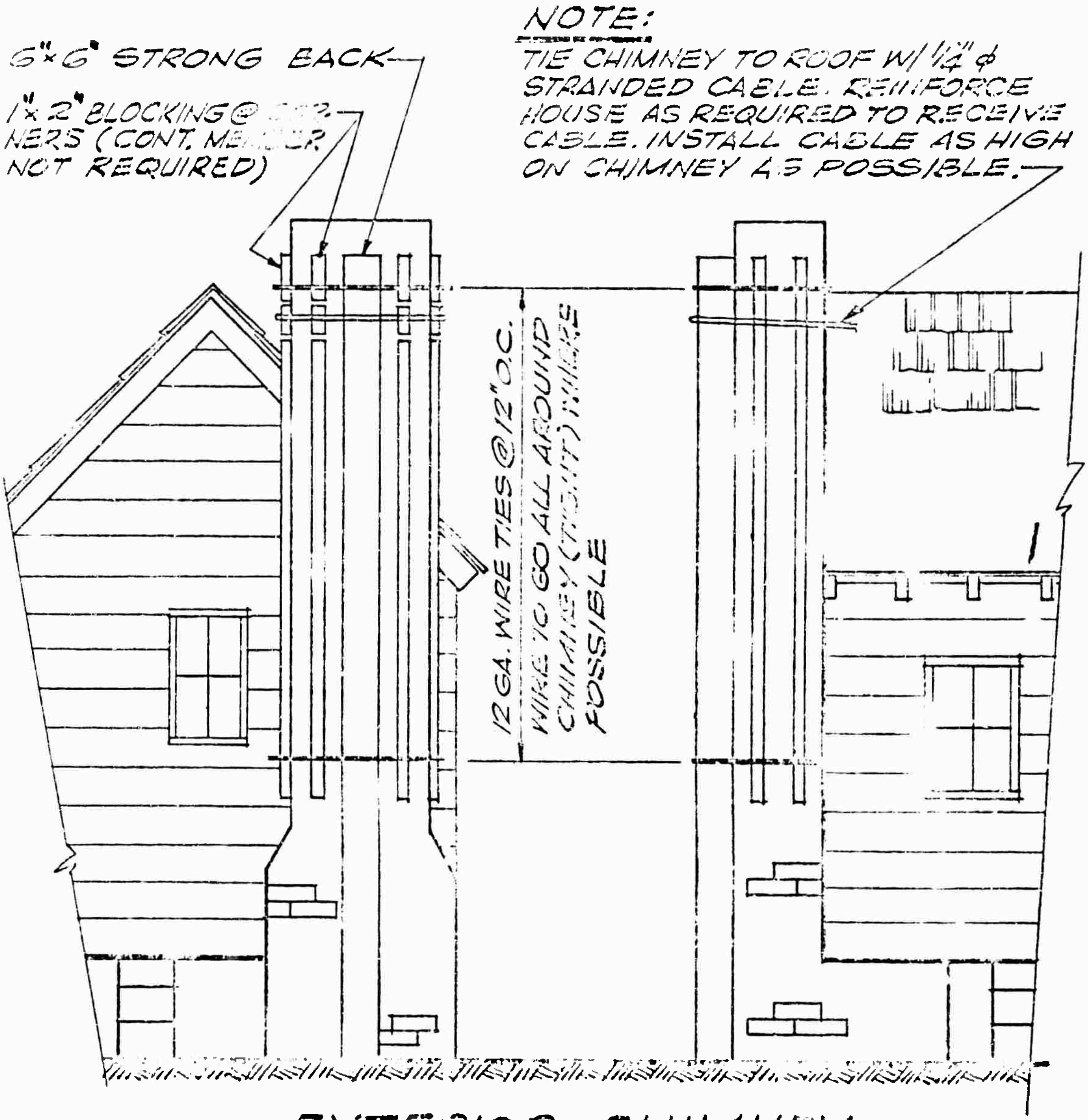
   c. There must be an operable safety valve in the system between the tank and the "shut-off" valve described in Paragraph b, above. If there is none present, install one.

d. Check gas supply lines at tanks and burners for flexibility. If sufficient flexibility is not present, install a loop. Supply lines should have a 7½ cm minimum clearance of tanks and burners.

As part of the precautionary measures, bracing was installed where feasible in accordance with standards illustrated on the following pages.

PROJECT DRIBBLE

PRE-SHOT STRUCTURAL SURVEY



EXTERIOR CHIMNEY

NOTE: THE 6"x6" STRONG BACK MAY BE BUILT UP FROM SMALLER MEMBERS AND SPLICED SUCH THAT THE FULL STRENGTH OF A 6"x6" MEMBER IS DEVELOPED.

SKETCH Nº 8
STANDARD BRACING OF EXTERIOR CHIMNEY

APPENDIX D

List of Pertinent Dribble Reports

1. Investigation of Salmon Ground Motions and Effects, Roland F. Beers, Inc., NVO-1163-51, April 1, 1965.

2. Test of Shoal - Type Structures, Holmes & Narver, Inc., VUF-1016; January 1964.

3. Analysis of Ground Motion and Containment, Roland F. Beers, Inc., VUF-1026, November 30, 1965.

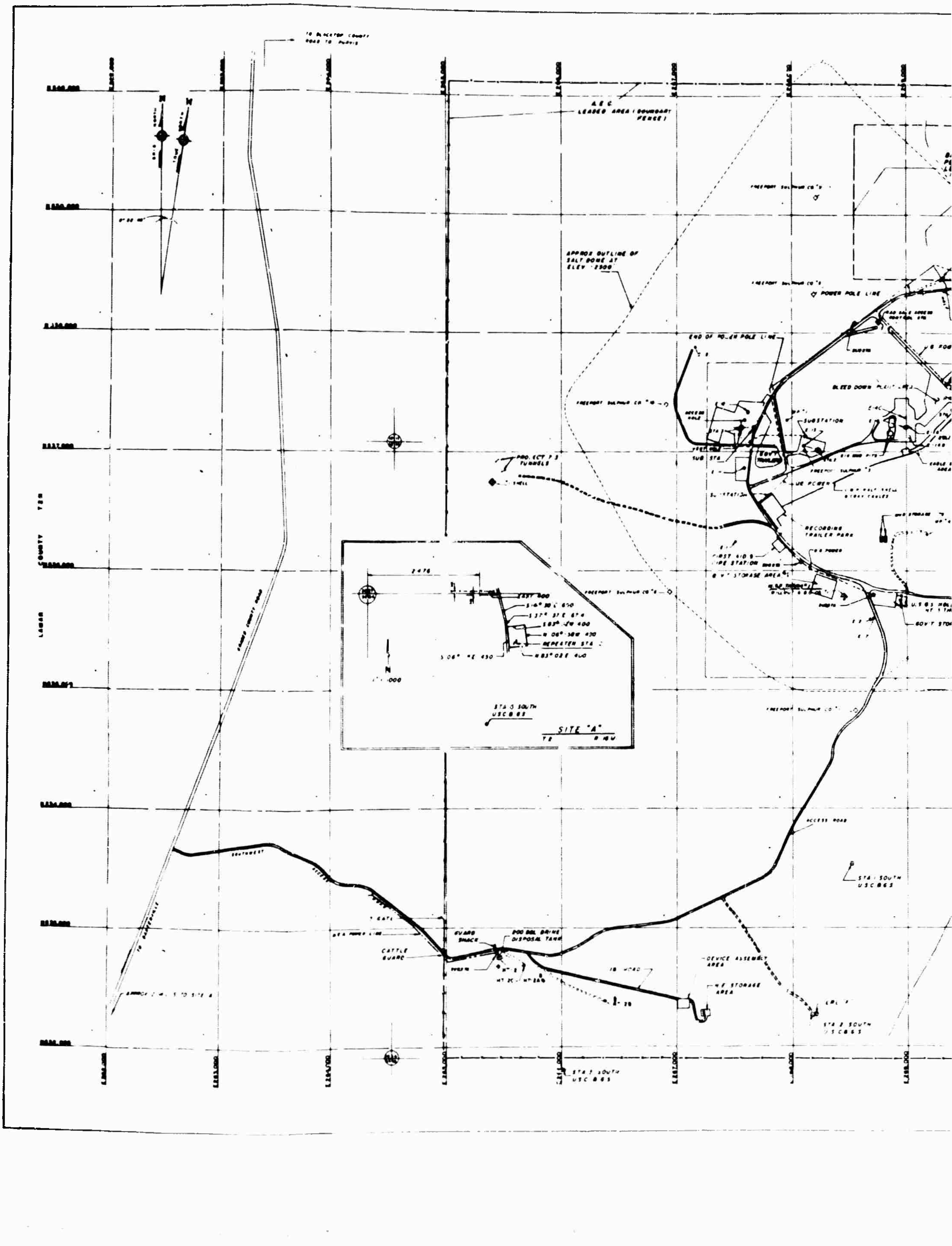
4. Structural Response of Residential-Type Structures in Close Proximity to an Underground Nuclear Detonation, John A. Blume and Associates, VUF-1030, November 15, 1965.

5. Earth Vibrations from a Nuclear Explosion in a Salt Dome, Salmon Event, W. V. Mickey, L. M. Lowrie and T. . Shugart. U. S. Coast and Geodetic Survey, April 1965.

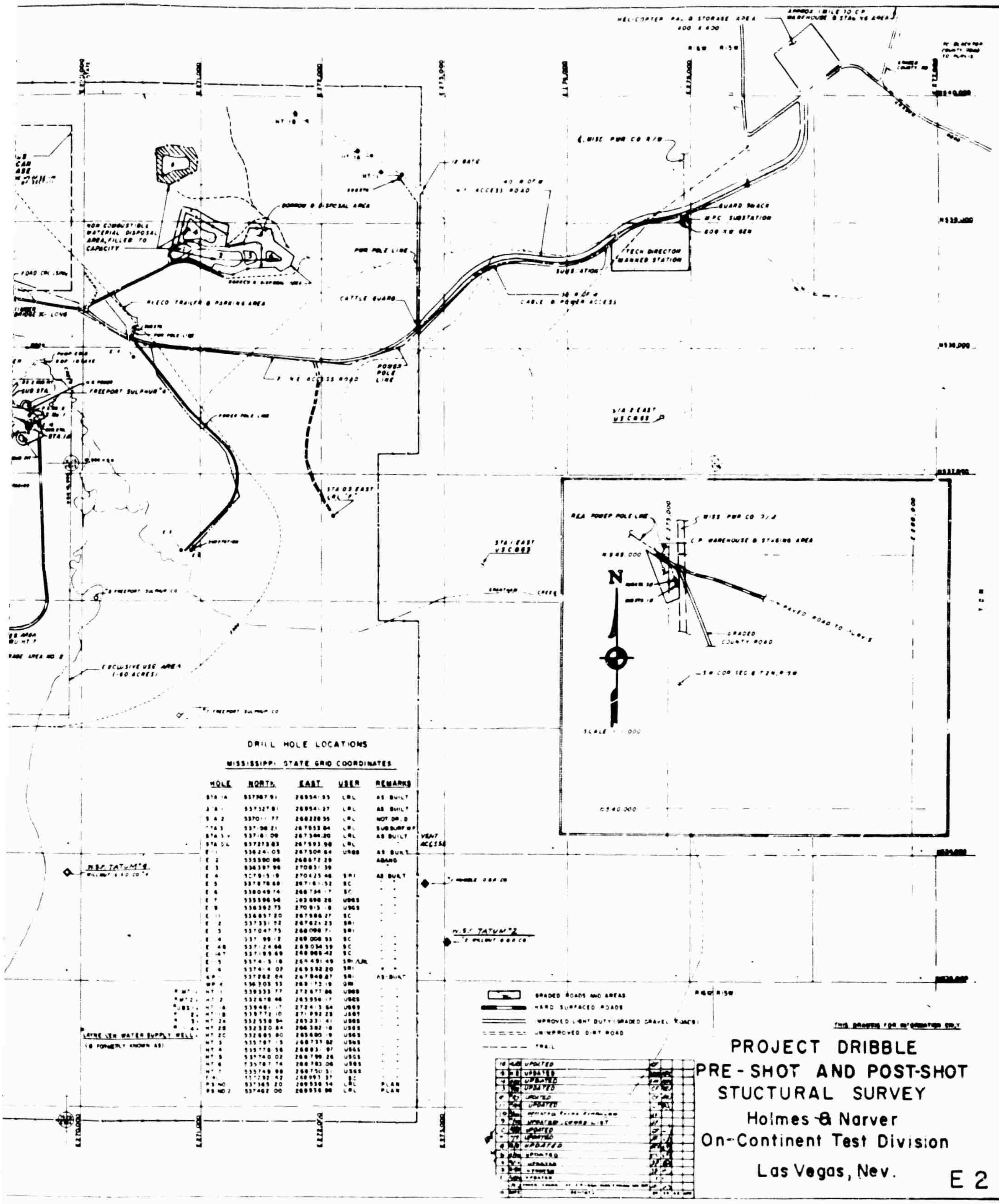
6. A Study of the Long Period Motions Observed at Hattiesburg and Columbia, Mississippi from Event Salmon, Thomas R. Shugart. U. S. Coast and Geodetic Survey, May 1965.

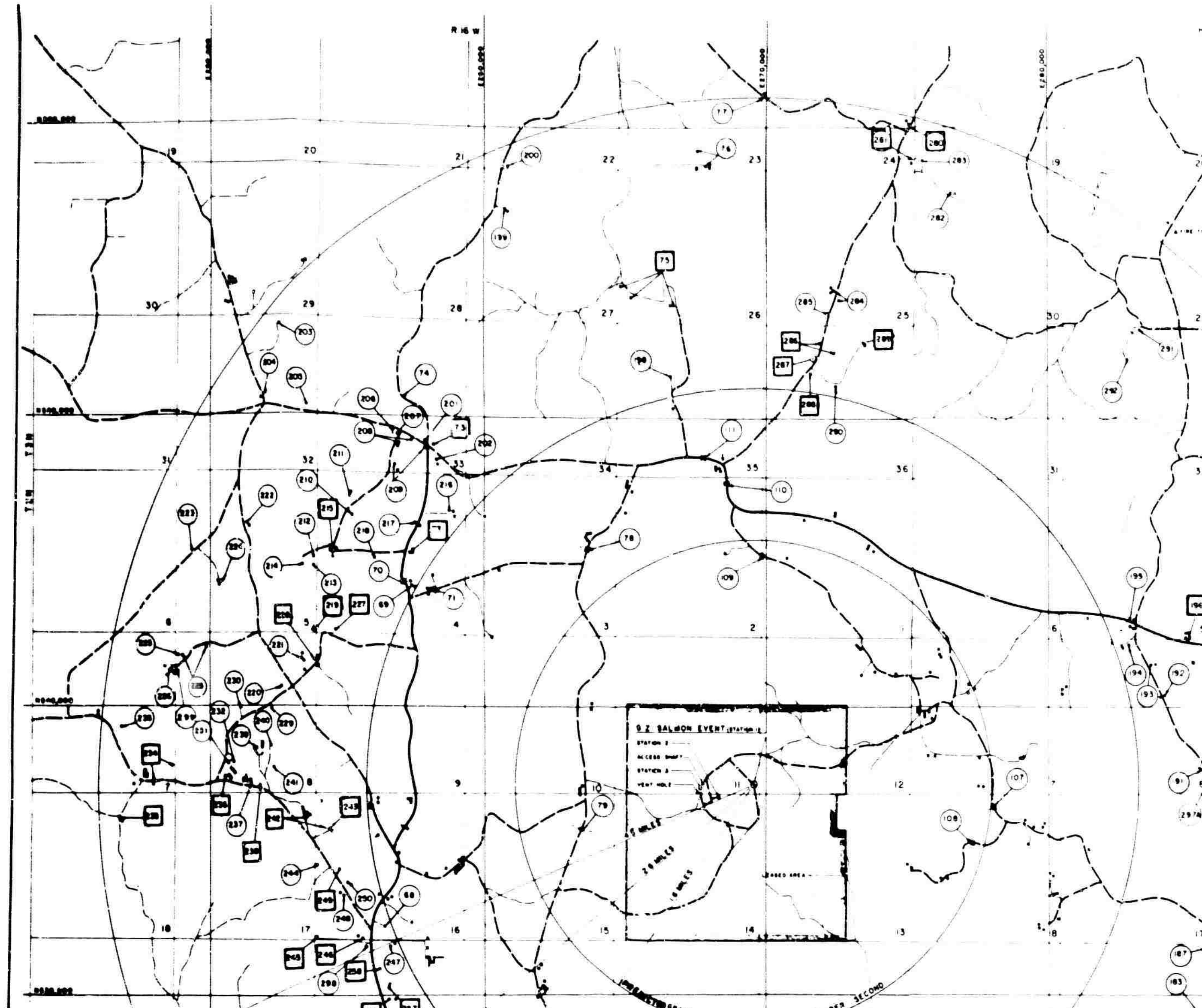
7. Structural Response of Tall Industrial and Residential Structures to an Underground Nuclear Detonation, John A. Blume and Associates Research Division, VUF-1031, November 15, 1965.

BLANK PAGE

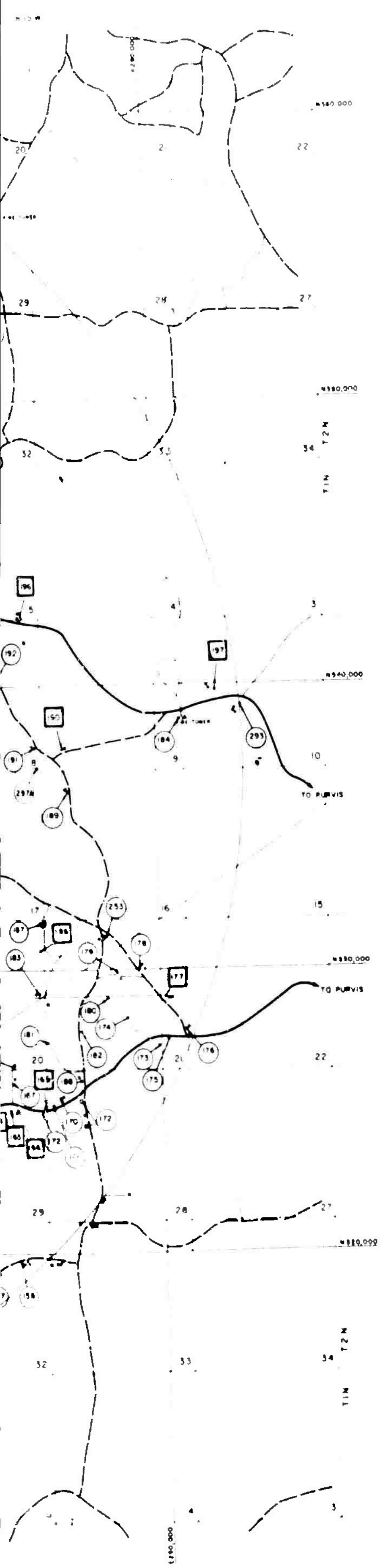


A.E.C. LEASED AREA (BOUNDARY FENCE)
APPROX OUTLINE OF SALT DOME AT ELEV -1500
POWER POLE LINE
END OF POWER POLE LINE
SUBSTATION
BLEED DOWN PLANT AREA
RECORDING TRAILER PARK
FIRST AID & FIRE STATION
SITE "A"
REPEATER STA
ACCESS ROAD
CATTLE GUARD
GUARD SHACK
200 BBL BRINE DISPOSAL TANK
DEVICE ASSEMBLY AREA
H.E. STORAGE AREA
STA 1 SOUTH USC&GS
STA 2 SOUTH USC&GS


HELICOPTER PAD & STORAGE AREA
BORROW & DISPOSAL AREA
NON COMBUSTIBLE MATERIAL DISPOSAL AREA, FILLED TO CAPACITY
ACCESS ROAD
PWR POLE LINE
CATTLE GUARD
GUARD SHACK
MPC SUBSTATION
TECH DIRECTOR MANNED STATION
SUBSTATION
POWER POLE LINE
FREEPORT SULPHUR CO
EXCLUSIVE USE AREA (160 ACRES)
STA 1 EAST USC&GS
C.P. WAREHOUSE & STAGING AREA
N
GRADED COUNTY ROAD
SCALE
DRILL HOLE LOCATIONS
MISSISSIPPI STATE GRID COORDINATES
HOLE
NORTH
EAST
USER
REMARKS
AS BUILT
ABAND
PLAN
VENT ACCESS
LAYNE LEH WATER SUPPLY WELL
GRADED ROADS AND AREAS
HARD SURFACED ROADS
IMPROVED LIGHT DUTY (GRADED GRAVEL ROADS)
UNIMPROVED DIRT ROAD
TRAIL
UPDATED
PROJECT DRIBBLE
PRE - SHOT AND POST-SHOT
STUCTURAL SURVEY
Holmes & Narver
On-Continent Test Division
Las Vegas, Nev.
E 2



MAP OF PORTION OF LAMAR COUNTY, MISSISSIPPI — SITE OF PROJECT DRIBBLE



DRIBBLE

PROPERTY OWNERS

68	LAVERN SMITH
69	HARRINGTON
70	BRIDGE NO 1
71	BRIDGE NO 2
72	H GIBSON
73	SARAH ENTREKIN
74	T E MAC ARTHUR
75	T W ROSEBERRY
76	J C CAMERON
77	W CAMERON
78	BRIDGE NO 3
79	BRIDGE NO 4
80	BRIDGE NO 5
81	BRIDGE NO 6
82	L ANDERSON
83	E GIPSON
84	DAWSON JOHNSON
107	BRIDGE NO 7
108	BRIDGE NO 8
109	BRIDGE NO 9
110	BRIDGE NO 10
111	BRIDGE NO 11
135	O C PATERSON
137	JAMES DEARMAN
138	J C NOBLES
139	ARTHUR LOWE
140	MASON THOMPSON
141	W D KITTRELL
142	DOUGLAS LOWE
143	W T ENTREKIN
144	R T THOMPSON
145	R T THOMPSON
146	FRED PARKER
147	CHARLES MARTIN
148	T C BRESHEARS
149	V DEBROW
150	L L HOUSLEY
151	R SAUCIER
152	R J ENTREKIN
153	EDWARD ENTREKIN
154	[illegible]
155	J E ENTREKIN
156	J D ENTREKIN
157	JOE HOUSLEY
158	MRS JESSE PARKER
159	JACK HOUSLEY
160	F SAUCIER
161	C CREEL
162	MARVIN M BREAZEALE
163	R C READY
164	C D WILLIAMSON
165	C V CAIN
166	MACK SMITH
167	RAY SMITH
168	JOHN CAIN
169	CHURCH OF CHRIST
170	W G MASSEY
171	HERBERT BOLIN
172	T A HENRY
173	O A RONQUILLE
174	H F BUSHA
175	C L SLADE
176	W JENKINS
177	DEWEY BUSHA
178	JAMES PARKER
179	H G MASSEY
180	J H EVANS
181	C H ANDERSON
182	TROY HOUSLEY
183	MRS B M GAGNON
184	MISSISSIPPI STATE FORESTRY SERVICE
185	NATHAN CAIN
186	GLENN BEECH
187	H T BEACH
188	J H BUSHA
189	TATUM LUMBER CO
190	G H ANDERSON
191	L D JOHNSON
192	M L ANDERSON
193	JOE DOBSON
194	A C DOBSON
195	M L ANDERSON
196	L H BREAZEALE
197	R H JOHNSON
198	E BURT
199	VIRGIL SMITH
200	TATUM ESTATE
201	MRS CASTANEDA
202	A S WHIDDON
203	LUTHER SAUCIER
204	LUTHER SAUCIER
205	J E McARTHUR
206	GREENVILLE BAPTIST CHURCH
207	G H BASS
208	LEO SAUCIER
209	C V HICKMAN
210	ALVIN SONES
211	C H HOUSLEY
212	GLADYS JOHNSON
213	HOWARD SMITH
214	LEWIS RAYBORN
215	BEN SONES
216	ALBERT H LEE
217	ODELL HENLEY
218	DUVAL SONES
219	PERRY LEE
220	BUSTER CARROLL
221	HENRY BOLIN
222	LUTHER SAUCIER
223	LUTHER SAUCIER
224	LUTHER SAUCIER
225	JIMMY McCROW
226	W J BASS
227	H P BOLIN
228	J J BOLIN
229	SOPHIE CARROLL
230	CARL F NICHOLS
231	FRED T BOLER
232	JAMES R BOLER
233	L W PITTMAN
234	TOM W SMITH
235	J B CARVER
236	TOM E MAILEY
237	OTIS TEMPLES
238	L M GIPSON
239	FRED LOWE
240	HULAN LOWE
241	LEVI LOWE
242	T J BURGE
243	FRANK C GIPSON
244	FLOYD SMITH
245	S E FAIRCHILD
246	MARK LOWE
247	FRANK COOPER
248	OSCAR C BURGE
249	L R HARVEY
250	CLIFTON MAY
251	CECIL JOHNSON
252	W A ANDERSON
253	JULIUS W ENTREKIN
254	S E PARKER
255	HOLLIS PEAVY
256	T G HOWELL
257	HENRY SMITH
258	LEROY SISTRUNK
259	A D BRYANT
260	G W SAUCIER
261	H R DIAMOND
262	JAMES A LOWE
263	MARSHALL SEALE
264	C H JOHNSON
265	MRS MONROE SMITH
266	C E BOND
267	ALEX JOHNSON
268	L W CAMERON
269	D S ROUSE
270	H L CAMERON
271	LIONEL LOWE
272	T E JONES
273	L H RUSHING
274	J H BROWN
275	L H RUSHING
276	L H RUSHING
277	DAVID LOWE
278	PAUL SMITH
279	ALONZO RAYBORN
280	HOUSTON E BOUNDS
281	ROLAND BURGE
282	HUBERT BOUNDS
283	WILLIS R BOUNDS
284	G ANDERSON
285	J A GIPSON
286	BESSIE ANDERSON
287	B M GIPSON
288	W M GIPSON
289	J C GIPSON
290	LOVELL SLADE
291	ELMORE SIMMONS
292	E F CAMERON
293	A V JOHNSON
294	ROLAND E ANDERSON
298	MARK LOWE
299	MARRON TENNETT
142A	ROBERT JOHNSON
300	W A NOBLES

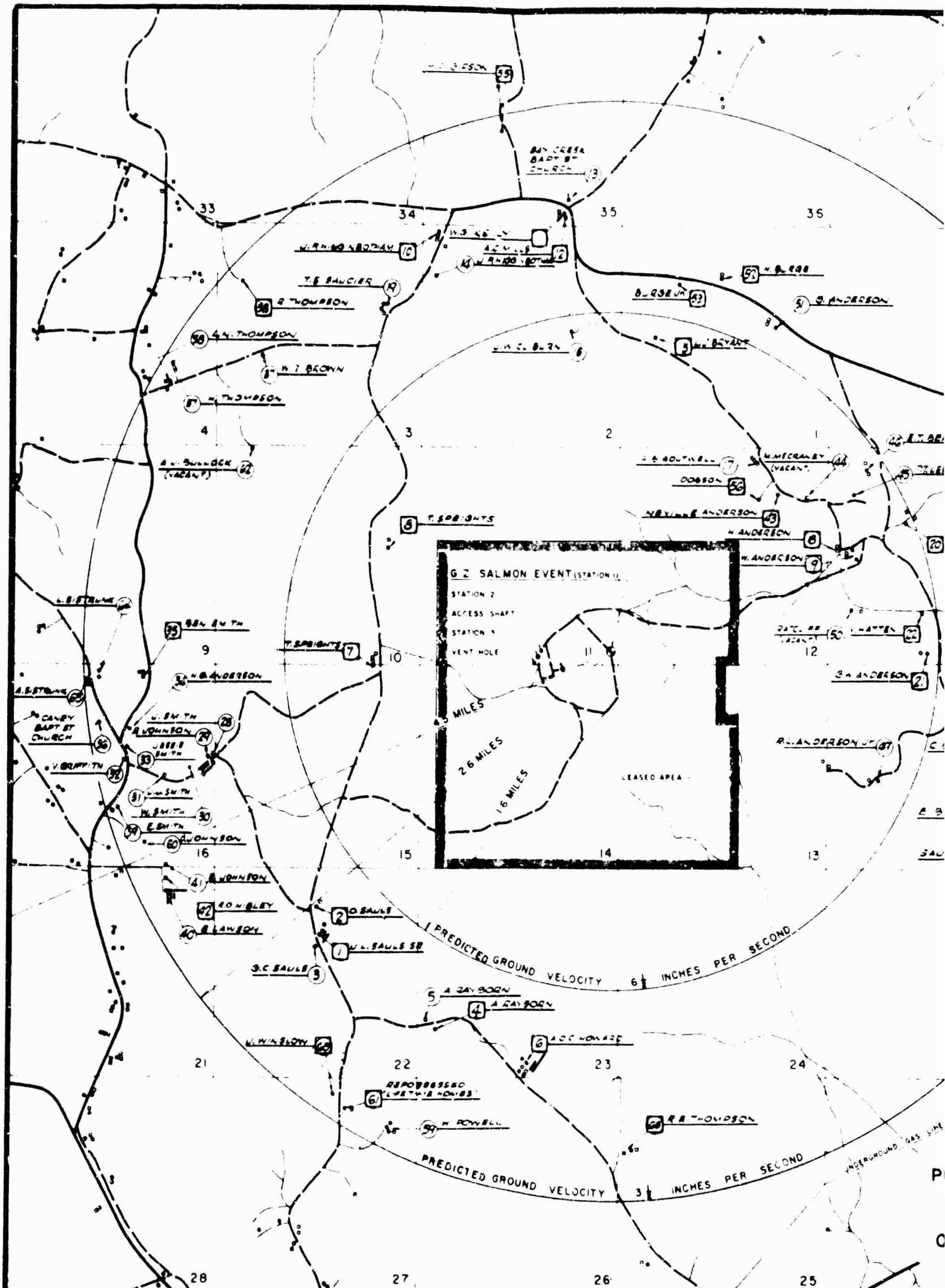
LEGEND

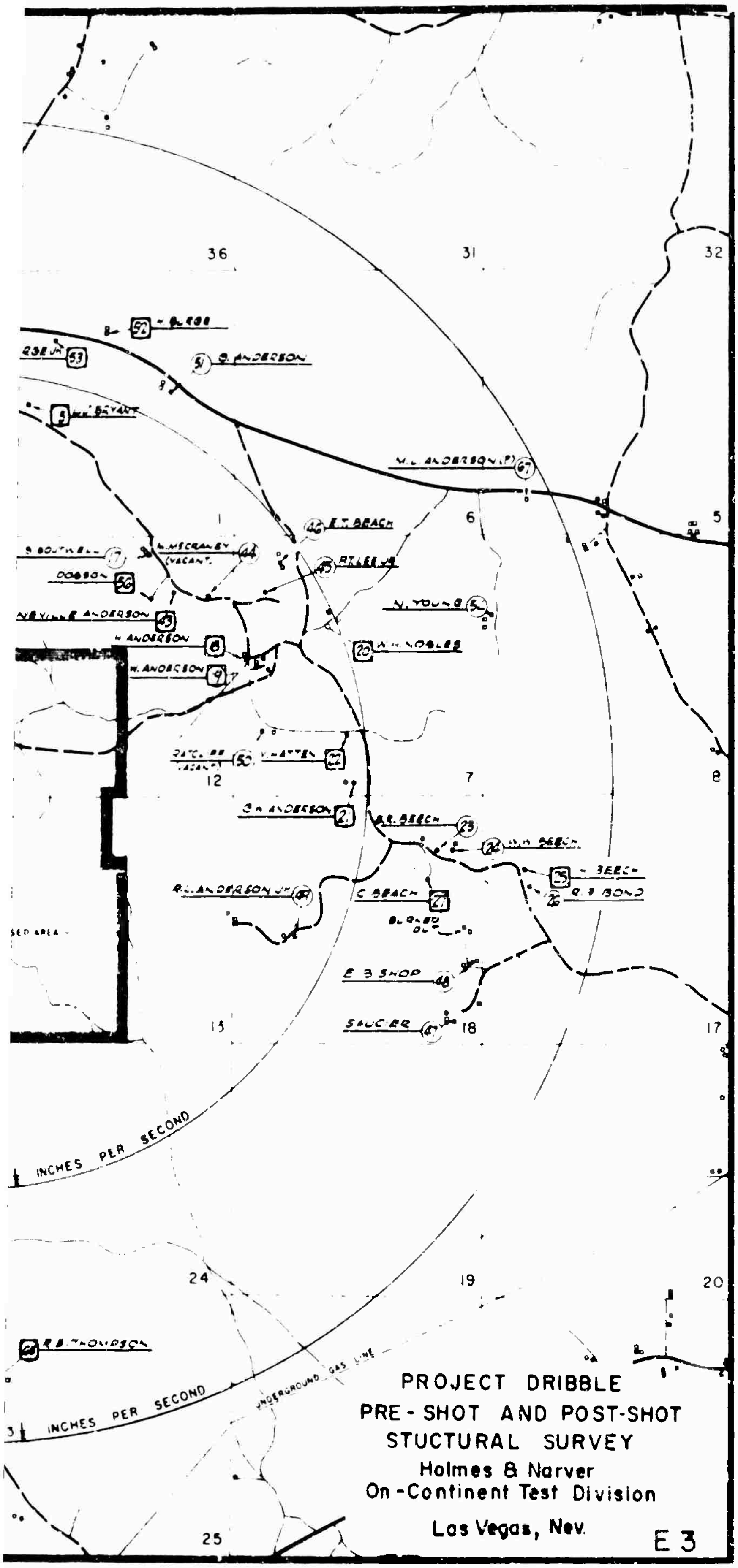
NOTE

SCALE IN MILES

PROJECT DRIBBLE
PRE-SHOT AND POST-SHOT
STUCTURAL SURVEY
Holmes & Narver
On-Continent Test Division
Las Vegas, Nev.

E 4


G Z SALMON EVENT (STATION 1)
STATION 2
ACCESS SHAFT
VENT HOLE
LEASED AREA
2.6 MILES
1.6 MILES
PREDICTED GROUND VELOCITY 6½ INCHES PER SECOND
PREDICTED GROUND VELOCITY 3½ INCHES PER SECOND
T. SPEIGHTS
BEN SMITH
33
34
35
36
4
3
2
1
9
10
11
12
16
15
14
13
21
22
23
24
28
27
26
25


PROJECT DRIBBLE
PRE-SHOT AND POST-SHOT
STUCTURAL SURVEY
Holmes & Narver
On-Continent Test Division
Las Vegas, Nev.
E 3
INCHES PER SECOND
INCHES PER SECOND
UNDERGROUND GAS LINE
36
31
32
6
5
7
12
13
18
17
24
19
20
25
M. L. ANDERSON (P)
E. T. BEACH
DOBSON
C. BEACH
E. B. SHOP

BLANK PAGE

TECHNICAL AND SAFETY PROGRAM REPORTS SCHEDULED FOR ISSUANCE BY AGENCIES PARTICIPATING IN PROJECT DRIBBLE

SAFETY REPORTS

Agency	Report No.	Subject or Title
USWB	VUF-1020	Weather and Surface Radiation Prediction Activities
USPHS	VUF-1021	Final Report of Off-site Surveillance
USBM	VUF-1022	Pre and Post-Shot Safety Inspection of Oil and Gas Facilities Near Project Dribble
USGS	VUF-1023	Analysis of Geohydrology of Tatum Salt Dome
USGS	VUF-1024	Analysis of Aquifer Response
REECo	VUF-1025	On-Site Health and Safety Report
RFB, Inc.	VUF-1026	Analysis of Dribble Data on Ground Motion and Containment - Safety Program
H-NSC	VUF-1027	Ground-Water Safety
FAA	VUF-1028	Federal Aviation Agency Airspace Advisory
H&N	VUF-1029	Summary of Pre and Post-Shot Structural Survey Reports
JAB	VUF-1030	Structural Response of Residential-Type Test Structures in Close Proximity to an Underground Nuclear Detonation
JAB	VUF-1031	Structural Response of Tall Industrial and Residential Structures to an Underground Nuclear Detonation.

NOTE: The Seismic Safety data will be included in the USC&GS Technical Report VUF-3014

TECHNICAL REPORTS

Agency	Report No.	Subject or Title
SL	VUF-3012	Free-Field Particle Motions from a Nuclear Explosion in Salt - Part I
SRI	VUF-3013	Free-Field Particle Motions from a Nuclear Explosion in Salt - Part II
USC&GS	VUF-3014	Earth Vibration from a Nuclear Explosion in a Salt Dome
UED	VUF-3015	Compressional Velocity and Distance Measurements in a Salt Dome

LRL	VUF-3016	Vent-Gas Treatment Plant
LRL	PNE-3002 *	Response of Test Structures to Ground Motion from an Underground Nuclear Explosion
SRI	VUF-3017	Feasibility of Cavity Pressure and Temperature Measurements for a Decoupled Nuclear Explosion
LRL	VUF-3018	Background Engineering Data and Summary of Instrumentation for a Nuclear Test in Salt
WES	VUF-3019	Laboratory Design and Analyses and Field Control of Grouting Mixtures Employed at a Nuclear Test in Salt
LRL	VUF-3020	Geology and Physical and Chemical Properties of the Site for a Nuclear Explosion in Salt
EG&G	VUF-3021	Timing and Firing

* This report number was assigned by SAN

In addition to the reports listed above as scheduled for issuance by the Project DRIBBLE test organization, a number of papers covering interpretation of the SALMON data are to be submitted to the American Geophysical Union for publication. As of February 1, 1965, the list of these papers consists of the following:

Title	Author(s)	Agency(s)
Shock Wave Calculations of Salmon	L. A. Rogers	LRL
Nuclear Decoupling, Full and Partial	D. W. Patterson	LRL
Calculation of P-Wave Amplitudes for Salmon	D. L. Springer and W. D. Hurdlow	LRL
Travel Times and Amplitudes of Salmon Explosion	J. N. Jordan W. V. Mickey W. Helterbran	USC&GS AFTAC UED
Detection, Analysis and Interpretation of Teleseismic Signals from the Salmon Event	A. Archambeau and E. A. Flinn	SDC
Epicenter Locations of Salmon Event	E. Herrin and J. Taggart	SMU USC&GS
The Post-Explosion Environment Resulting from the Salmon Event	D. E. Rawson and S. M. Hansen	LRL
Measurements of the Crustal Structure in Mississippi	D. H. Warren J. H. Healy W. H. Jackson	USGS

All but the last paper in the above list will be read at the annual meeting of the American Geophysical Union in April 1965.

LIST OF ABBREVIATIONS FOR TECHNICAL AGENCIES

BR LTD	Barringer Research Limited Rexdale, Ontario, Canada
ERDL	Engineering Research Development Laboratory Fort Belvoir, Virginia
FAA	Federal Aviation Agency Los Angeles, California
GIMRADA	U. S. Army Geodesy, Intelligence and Mapping Research and Development Agency Fort Belvior, Virginia
H-NSC	Hazleton-Nuclear Science Corporation Palo Alto, California
H&N, INC	Holmes & Narver, Inc. Los Angeles, California Las Vegas, Nevada
II	Isotopes, Inc. Westwood, New Jersey
ITEK	Itek Corporation Palo Alto, California
JAB	John A. Blume & Associates Research Division San Francisco, California
LRL	Lawrence Radiation Laboratory Livermore, California
NRDL	U. S. Naval Radiological Defense Laboratory San Francisco, California
REECo	Reynolds Electrical & Engineering Co., Inc. Las Vegas, Nevada
RFB, INC.	R. F. Beers, Inc. Alexandria, Virginia
SDC	Seismic Data Center Alexandria, Virginia
EG&G	Edgerton, Germeshausen & Grier, Inc. Las Vegas, Nevada
SL	Sandia Laboratory Albuquerque, New Mexico
SMU	Southern Methodist Universi Dallas, Texas
SRI	Stanford Research Institute Menlo Park, California
TI	Texas Instruments, Inc. Dallas, Texas
UA	United Aircraft El Segundo, California
UED	United Electro Dynamics, Inc. Pasadena, California
USBM	U. S. Bureau of Mines Washington, 25, D. C.
USC&GS	U. S. Coast and Geodetic Survey Las Vegas, Nevada
USGS	U. S. Geologic Survey Denver, Colorado
USPHS	U. S. Public Health Service Las Vegas, Nevada
USWB	U. S. Weather Bureau Las Vegas, Nevada