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Reprint of SAFELOAD TESTS

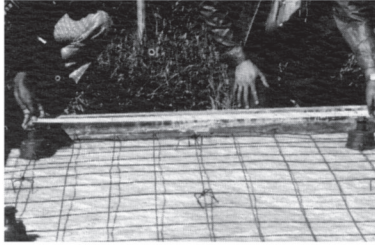
Conducted by
JONES & ASSOCIATES

April 1974

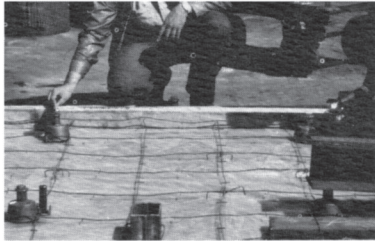
FSN

FLOATING FLOOR STRUCTURAL TEST

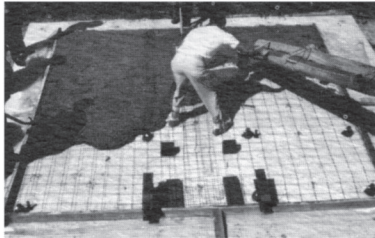
TEST BULLETIN 101



Typical 48" x 48" spacing of FSN Mountings with 6 x 6-10 gauge mesh reinforcement. (Test 1 and Test 2)

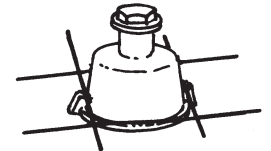
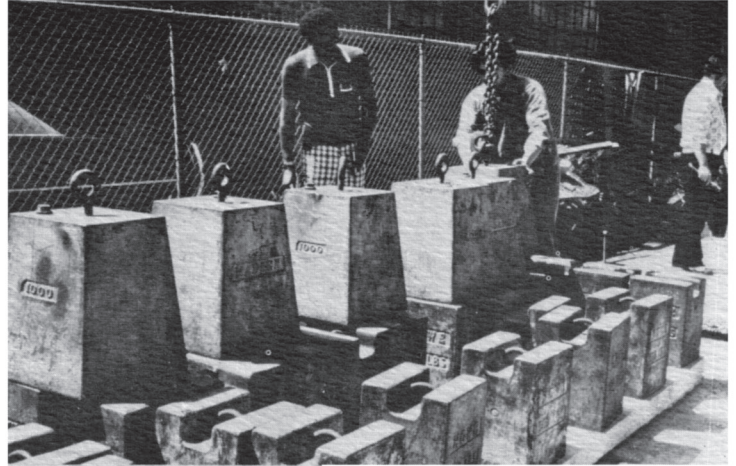


Experimental 48" x 48" spacing of FSN Mountings with 12 x 12 10 gauge mesh reinforcement. (Test 3)



Typical concrete pouring procedure for FSN Jack-up slabs.

Load Test 1.



Mount in photograph was placed on 48" centers with 6 x 6 mesh cut for test purposes only. Sketch shows the normal stronger position in center of 6 x 6 square.

Jones & Associates Engineers

CIVIL ENGINEERING

19804 SOUTH EDDINGTON DRIVE

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THEODRE JONES
Registered Civil Engineer

SAFE LOAD TESTS FOR 4" CONCRETE FLOATING FLOORS

PURPOSE OF TESTS

To determine maximum loadings on reinforced concrete slabs supported by flexible elements of unlimited deflection spaced 48" apart.

LOADING METHOD

Placement of 500 lbs and 1000 lbs certified steel weights provided by the Howe Richardson Scale Company. 500 lb weights were approximately 12"x 12" x 12". 1000 lb weights were frustums of four sided pyramids approximately 16" square at the base.

TEST SITE

The tests were performed at the yard of Mason Industries, Inc., 3335 E. Pico Blvd., Los Angeles, California, 90023 on April 29, 1974.

CONCRETE REPORT

Concrete report by California Test Labs Division dated 5/2/74 and 5/9/74.

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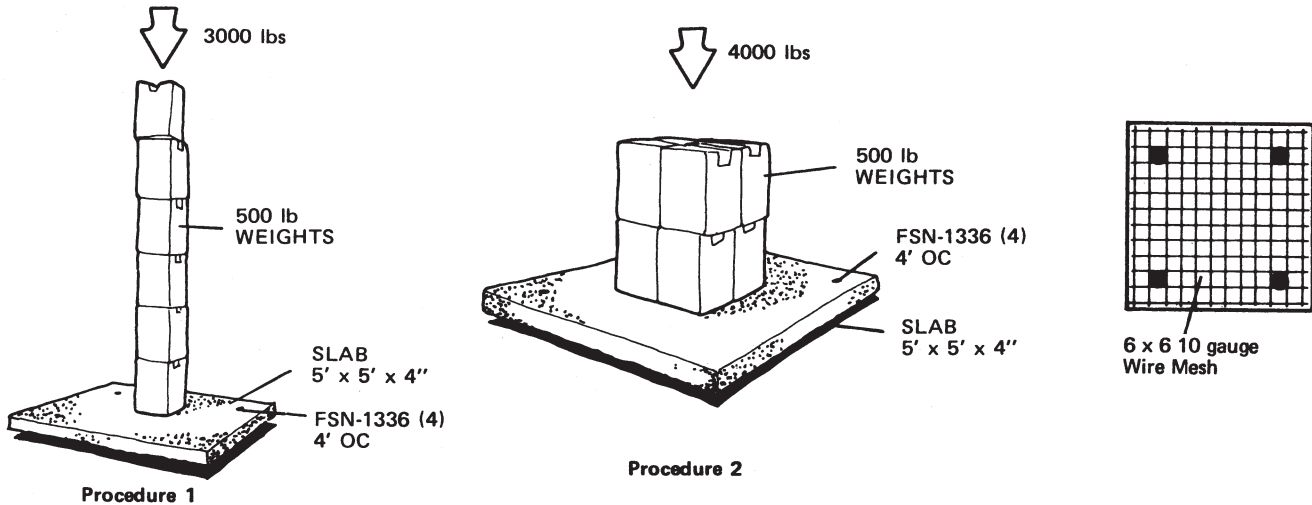
THEODRE JONES
Registered Civil Engineer

TEST ONE - 5 Foot x 5 Foot x 4 Inches thick

Concrete - 3000 psi mix

Reinforcement - 6 x 6 wire mesh 1" from bottom

Support Points - Four Mason Industries FSN-1336 castings with EAFM-7640 60 durometer white inserts. Supports were 4'0" on centers



Procedure 1

A single 500 lb weight was placed in the center of the slab and 500 lb weights added in 500 lb increments until there were six high for a total concentrated load of 3000 lbs on a one square foot area. (Test discontinued because of instability of column of weights). Measurements were taken with a steel scale near two corners and at the midpoint of the span between them.

Results

1. No visible cracking appeared at 3000 lbs concentrated loading.
2. The neoprene mountings deflected approximately 0.20" and the midpoint of the slab a total of 0.30". Therefore, the slab deflection was 0.10".

Procedure 2

Loading was arranged in a 24" square of four 500 lb weights and weights added in clusters of four or 2000 lbs increments.

Results

1. Slab was in tact, but showed tensile cracks on the bottom at 4000 lbs loading.
2. Slab failed in a simple line across the center when placing additional 2000 lb load. Failure point lies between a 4000 and 6000 lb concentrated load or 800 - 1200 lbs per lineal foot.
3. Mounts were retrieved after completion of the second procedure and showed no damage or permanent set.

Conclusion Test One

Narrow sections of 4" thick concrete reinforced with a single layer of 6 x 6 mesh can sustain a maximum concentrated load of 270 lbs per lineal foot across the short dimension with 3/1 safety factor. Deflection designs are limited to 1/360 of the loaded span. A safe deflection of 1/360 of 48"=0.13". At 600 lbs/lineal foot the deflection was 0.10". At 270 lbs/lineal foot the deflection would be only 0.045" or 29% of the allowable maximum.

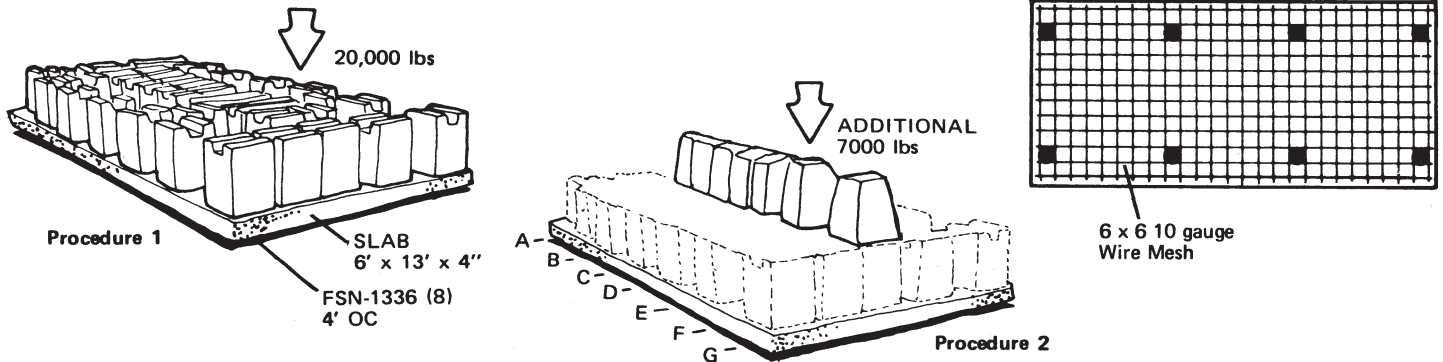
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TEST TWO - 6 Foot x 13 Foot x 4 Inches thick

Concrete - 3000 psi mix
 Reinforcement - 6 x 6 wire mesh 1" from bottom
 Support Points - Eight Mason Industries FSN-1336 castings with EAFM-7640 60 durometer white inserts. Supports were 4'0" on centers both ways.



Procedure

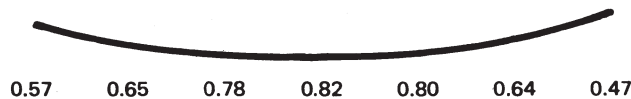
500 lb weights were added in a rough pattern over the entire slab area to approximate a "uniform" loading as it would occur in the field. Measurements were taken along one edge at each isolator and at the mid points. Weights were added until the total loading reached 20,000 lbs or 255 lbs per square foot. Test was delayed approximately three hours until additional weights were obtained. 1000 lb weights were then added one at a time as a concentrated load along the long center line of the base.

Results

1. Slab had a tensile crack to begin with at the third point before lifting and loading began. This crack had been caused by lifting the slab with a fork truck before the test to inspect the underside.
2. At 20,000 lbs loading the initial crack described above appeared to be no larger.
3. No apparent changes in the concrete slab took place during the three hour delay at the 20,000 lbs loading (2500 lbs/mount or three times rated load).
4. Measurements plotted below at 20,000 lbs show a continuous bowing of the slab rather than bending of each panel and the development of negative moments.

POINTS	A	B	C	D	E	F	G
Initial Height (in)	5.56	5.49	5.86	5.70	5.60	5.68	5.70
Height After 3 Hrs @ 20,000 lb Loading	4.99	4.84	5.08	4.88	4.80	5.04	5.23

Deflection Curve



5. Slab remained in tact and showed an additional tensile crack across the width at 23,000 lbs loading and remained in tact with 26,000 lbs. Failure in a central crack along the length occurred at 27,000 lbs or 345 lbs per square foot and 3375 lbs per mount (four times rated load).

Conclusion Test Two

1. In actual installations perimeter mounts are selected for half the stiffness of interior mounts since they receive half loadings. Softer exterior mounts would have reduced the overall bowing.
2. The uniform loading of the slab to 20,000 lbs was the approximate equivalent of 10,000 lbs concentrated loading down the center. Failure occurred with an add of 7,000 lbs or 17,000 lbs total. 17,000 lbs divided by the length of 13' is 1307 lbs/lineal foot which correlates well with the 1200 lbs/lineal foot in test one. Continuous slabs can be rated at 435 lbs concentrated load per lineal foot with the 3/1 safety deflection.
3. The slab was loaded uniformly to 20,000 lbs and the 7,000 lbs concentrated load was the equivalent 14,000 lbs uniform. This failure occurred at 34,000/78 or 435 lbs/sq ft. Using a 3/1 safety factor, this construction can be considered safe at a uniform loading of approximately 150 lbs/sq ft.
4. Mounts were examined two hours after removal and showed no damage or permanent set.

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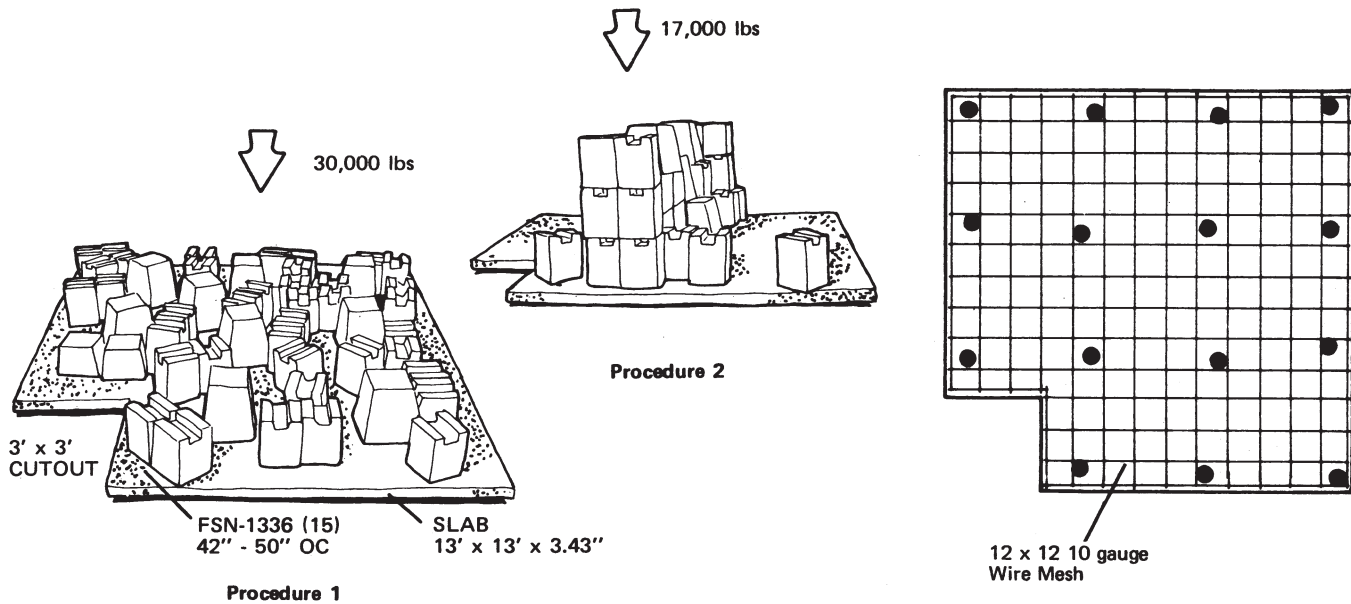
TEST THREE - 13 Foot x 13 Foot x 3.43 Inches thick with 3 Foot x 3 Foot cutout in corner

Concrete - 3000 psi mix

Reinforcement - 12 x 12 6 gauge wire mesh 1" from bottom

Support Points - Fifteen Mason Industries FSN-1336 castings with EAFM - 7640 60 durometer white inserts on 42" - 50" centers

Slab 3 was purposely constructed in a haphazard manner to simulate poor field supervision and construction. The mounting locations were inaccurate, castings were badly cocked and the pour was short to create an undersized uneven finish. 11 x 11" squares were cut out of the 6 x 6 mesh to leave a 12 x 12 six gauge pattern.



Procedure 1

Random scatter of 30,000 lbs of 500 and 1000 lb steel weights.

Results

1. At 30,000 lbs loading slab showed no cracks (188 lbs per sq. ft.).

Procedure 2

Gradual shifting of weights to a wide row between two rows of mountings.

Results

1. As weights were shifted in, a crack began to appear at a concentrated load of 17,000 lbs. Failure 22,000 lbs.

Conclusion Test Three

An undersized 4" slab with half the normally specified 6 x 6 mesh and mounts on as much as 52" centers exhibits surprising strength and serviceability and probably would show no failure in the average application.

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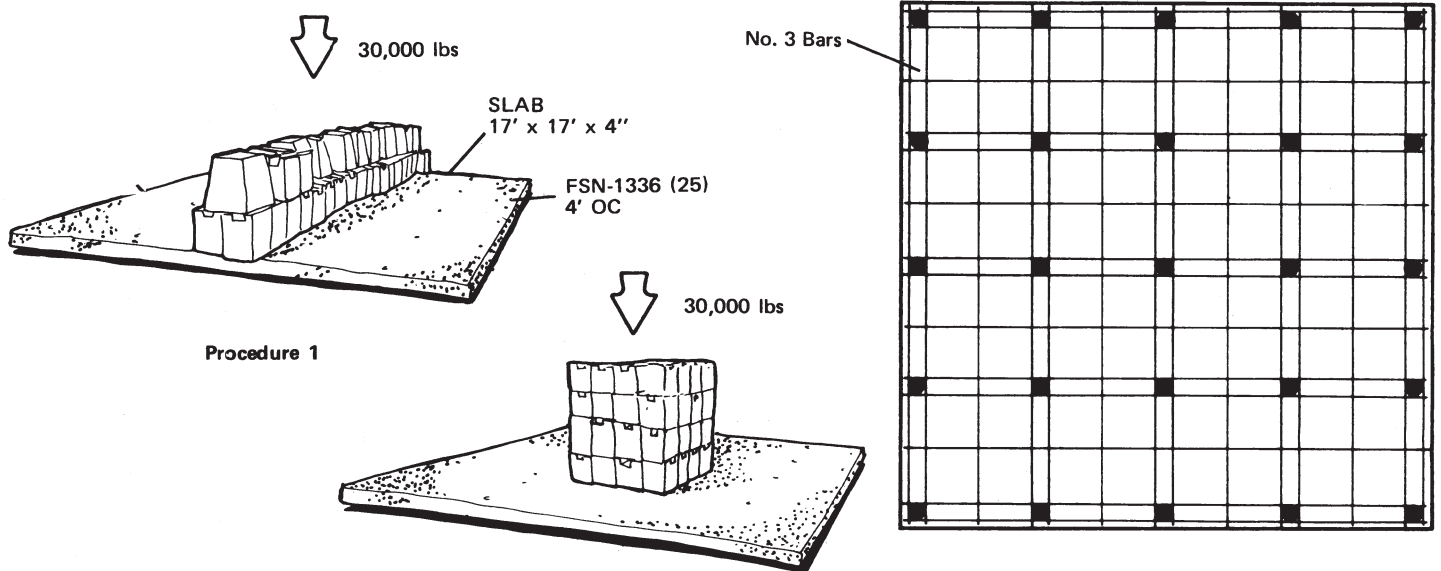
THEODRE JONES
Registered Civil Engineer

TEST FOUR - 17 Foot x 17 Foot x 4 Inches thick

Concrete - 3000 psi mix

Reinforcement - One row of No. 3 bars on either side of FSN-1336 castings running in both directions. One row of No. 3 bars down the center of panels in each direction. All bars supported by the castings 1" off the bottom

Support Points - 25 Mason Industries FSN-1336 castings with EAFM-7640, 60 durometer white inserts. Supports were 4'0" on centers.



Procedure 1

Weights were placed in a 2'0" wide row across the center of the base. Total weight 30,000lbs/17' = 1760 lbs/lineal foot.

Results

No visible cracks and slab could be seen to deflect in a uniform bow to the edges with no reverse bending.

Conclusions Procedure 1

1. Bottom reinforcing layer only is adequate as concentrated loads are spread out over large distances. Negative curve was not visible in this test. On a continuous slab it would probably be very gentle and well within 1/360 of span limitations without noticeable upper surface cracking.
2. Construction was tested to 1760 lbs/lineal foot without failure. Test could not be carried to destruction since all of the 30,000 lbs of test weights were already applied. Concentrated load of 1760 lbs/3 or 585 lbs per lineal foot could be applied without question.

Procedure 2

The 30,000 lbs of weights were stacked in a 4' x 4' pattern in the center of 17' x 17' slab.

Results

The slab deformed in a concave pattern from the center out in a wide radius of at least 7'0".

Conclusions Procedure 2

The 30,000 lb weights were insufficient to produce failure. Once again, no negative moments were observed and the concentrated load spread over a wide area. Bottom reinforcement alone was adequate and since no failure resulted, applying a 3/1 safety factor to the system suggests a concentrated load of 10,000 lbs is well within safety limits.

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GENERAL CONCLUSIONS AND CLOSING COMMENTS

As stated at the beginning of this report the purpose of these tests was to determine maximum loadings on reinforced concrete slabs supported by flexible elements spaced 48" apart with unlimited deflection.

Our conclusions and recommendations were stated at the end of each test. The recommendations are conservative because in actual practice floating floors are never allowed to deflect through deflections approaching the 0.75" as shown in the report. In actual practice floor deflections are limited to 0.3" with differential deflections actually being even less. Mounting systems of adequate stiffness are in place to receive concentrated loads to keep deflections to this maximum 0.3" limit. We are told by Mason Industries that their recommended method of installing floating floors keeps the concentrated equipment weight off the floating floor. This equipment is either supported by piers or continuous foundations that penetrate the floating floor and rest on the main structure itself.

These findings are interesting since some floating floors are poured at elevation, or on some occasion, lift slabs might be elevated before the mechanical equipment is put in place. Thus, a low capacity area of the floor similar to that used in these tests would be subjected to temporary loading as the equipment is moved across the more lightly supported areas to those places where the mountings are concentrated. These tests confirm Mason Industries' contention that concentrated loads are actually transmitted by the floor on the flexible supports over a wide area until the total number of mountings affected by the floor's deflection curve assume the total load. Since each mounting has a low stiffness, and any manufacturer supplying these systems would tend to supply about the same stiffness per total area of free floor not permanently subjected to concentrated loads, the spacing of the individual isolators would seem to be unimportant as the load would disperse itself over a wide area as shown in Test Four. The shape of this curve would probably be little different whether a number of softer isolators were placed on 1 foot centers or higher capacity units were used as in these tests. A factor to be considered, however, would be the total allowable floor deflection in supporting loads, using one device as compared to another.

In terms of possible structural floor difficulties a comparison of isolator stiffnesses would be appropriate and the isolator having the minimum deflection for a specified frequency would be the most desirable from a structural point of view.



Theodore Jones
Registered Civil Engineer

CALIFORNIA TEST LABS DIVISION
APPROVED ENGINEERING TEST LABORATORIES

600 EAST WASHINGTON BOULEVARD • LOS ANGELES, CALIFORNIA 90015 • TELEPHONE: (213) 747-4235

RECEIVED
MAY 13 1974

Mason Industries, Inc.
3335 East Pico
Los Angeles, Calif.

MJO NO. 553-2588
REPORT NO.
DATE 5/2/74 & 5/9/74
P.O. NO. 1477

CLIENT **Mason Industries, Inc.** CONTR.
PROJECT 3335 East Pico
Los Angeles, Calif.

MATERIAL YARDS **Concrete**

MIX
CEMENT USED
SAND USED
ROCK USED
ADMIXTURE
TIME IN MIXER MIN.
WATER GAL.
DESIGN STRENGTH 28 DAYS PSI 3000

BRAND
PLANT
PLANT
MADE BY
DATE MADE 4-3-74
DELIVERED BY Others
DATE RECEIVED 4-3-74

LAB NO.	MARK	LOCATION	AGE DAYS	SUMP INCHES	HEIGHT INCHES	DIAMETER INCHES	AREA SQ. IN.	MAX. LOAD LBS.	COMP. STR. PSI	DATE TESTED
BB2105										
-1			29		12.00	6.00	28.27	131000	4630	5-2
-2			29		12.00	6.00	28.27	140000	4950	5-2
-3			36		12.00	6.00	28.27	146500	5180	5-9
-4			36		12.00	6.00	28.27	158500	5610	5-9
-5			36		12.00	6.00	28.27	152000	5380	5-9
-6			36		12.00	6.00	28.27	110000	3890*	5-9

*CYLINDER NOT PROPERLY CURED.

Test supervised by Civil Engineer Licensed by State of California

Respectfully submitted
S. Chinn

ORIGINAL SIGNED COPY ON FILE

THIS REPORT DOES NOT IMPLY GENERAL APPROVAL BUT APPLIES ONLY TO THE INVESTIGATION REPORTED.

HOWE RICHARDSON SCALE COMPANY

EXECUTIVE OFFICES: CLIFTON, NEW JERSEY

Howe Richardson

CITY OF LOS ANGELES
DEPARTMENT OF WEIGHS AND MEASURES
DIVISION OF METROLOGICAL SERVICES

CERTIFICATE NO. 2615

Certificate of Accuracy

ON WRITTEN REQUEST BY: HOWE RICHARDSON SCALE COMPANY

THIS CERTIFIES THAT THE SERVICE DESIGNATED BELOW HAVE BEEN COMPARED WITH WEIGHTS AND MEASURES TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS AND HAVE BEEN TESTED TO SPECIFICATIONS AND TOLERANCES OF THE NATIONAL BUREAU OF STANDARDS THE MANUFACTURER OWNER

ITEM	DESCRIPTION	CALIBRATION DATA		
		NOMINAL	MEASURED	ACCEPTED TOLERANCE
1	Howe Cast Iron Test Weights (8 pcs.) S/N 1-500, 8-500	500 lbs.	Adjusted to Conform	Class C
2	Howe Cast Iron Test Weights (4 pcs.) S/N 1-1000, 4-1000	1,000 lbs.	Adjusted to Conform	Class C

AMBIENT TEMPERATURE _____
RELATIVE HUMIDITY _____

OUR STANDARDS ARE CALIBRATED BY CGS, TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS

George Hall
Inspector
5-7-69

1919A-CDS-648

Tom Warren
Service Manager

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 29th DAY OF April 1974
A. J. Pettigrew
NOTARY PUBLIC - CALIFORNIA

OFFICIAL SEAL
A. J. PETTIGREW
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
My Commission Expires July 30 1976

8660 ATLANTIC AVENUE, SOUTH GATE, CALIFORNIA 90281 / 213 564-5881 / TELEX 674594



1.



2.



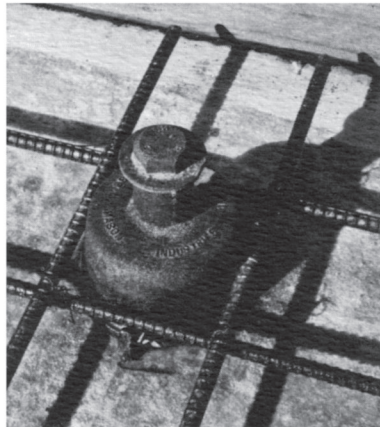
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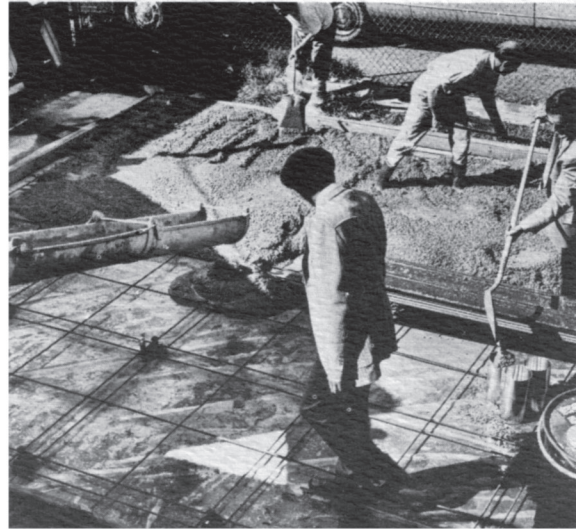
5.



6.



7.



Pouring Test Slab 4. Filling concrete cylinders.



Raising Test Slab 4.



Applying 3000 lb concentrated load to Test Slab 1.

1. Loading Test Slab 4.
2. 6000 lbs on Test Slab 1.
3. Deflection measurements.
4. Loading Test Slab 3.
5. 1000 lb test weights.
6. Close-up of Test Slab 4 with FSN Mount using No. 3 bar reinforcement.
7. Certified Test Service.