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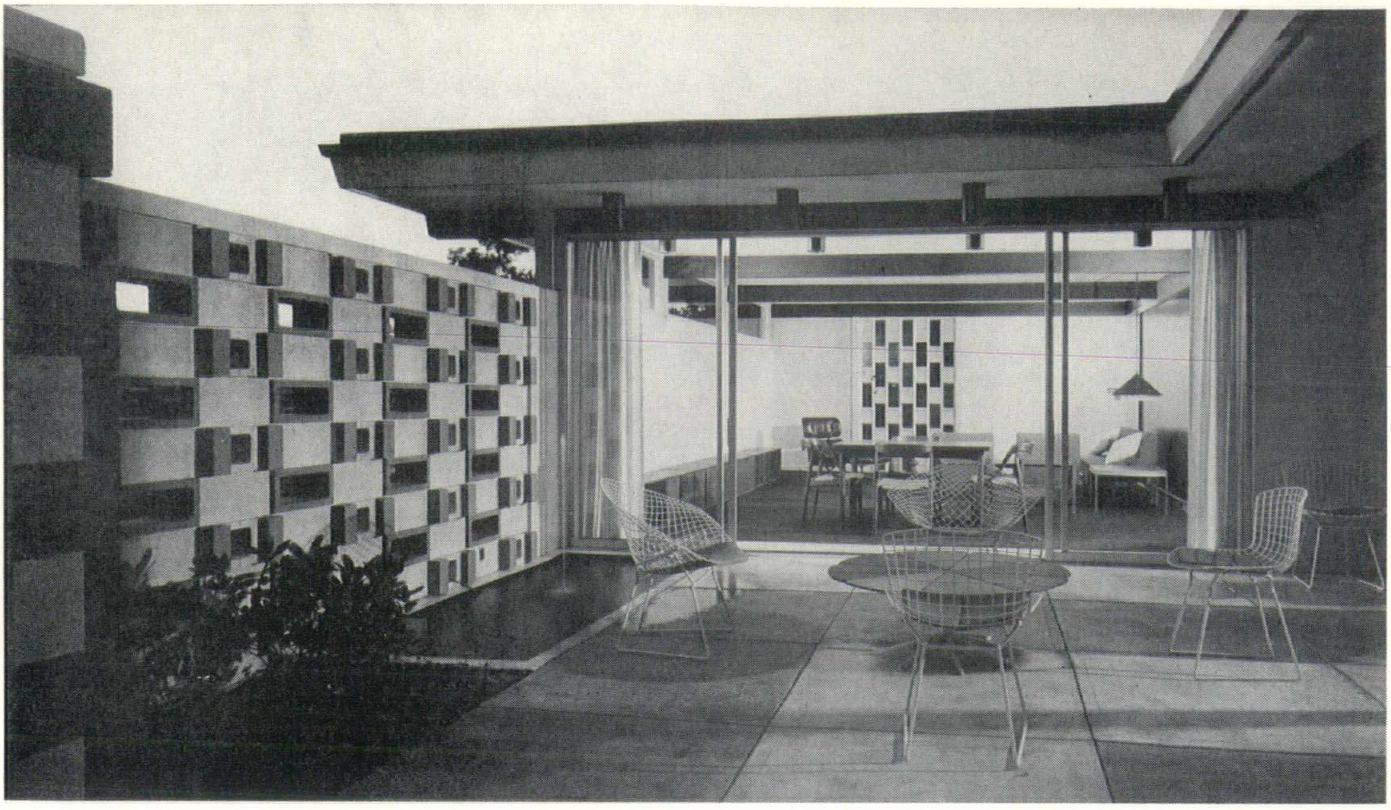
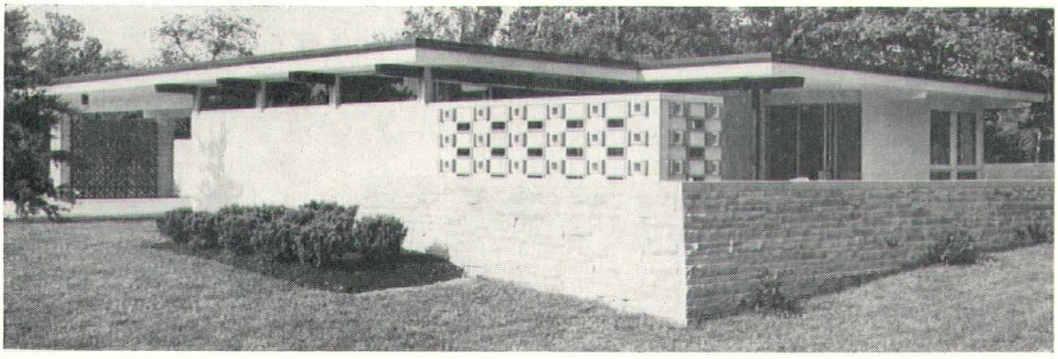


Indianapolis Horizon Home wins first place regional design award

The magnificent Indianapolis Horizon Home, designed by Indianapolis architect Fran E. Schroeder & Associates and sponsored by the Indianapolis District, Indiana Society of Architects, has been awarded regional first place honors in the Concrete Industries' annual Horizon Home competition.

Creative ideas are more exciting in concrete, as this beautiful home vividly illustrates. With walls of lightweight concrete block, lacy and imaginative (and oh so practical) screen walls of pierced concrete block, black and white concrete patio, and even a fire-safe concrete floor system over the lower level, the architect created a symphony in concrete.



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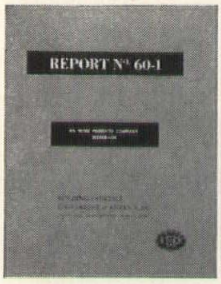

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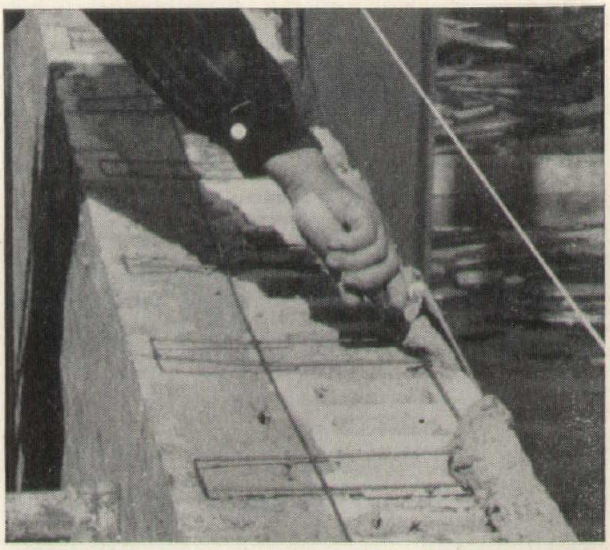

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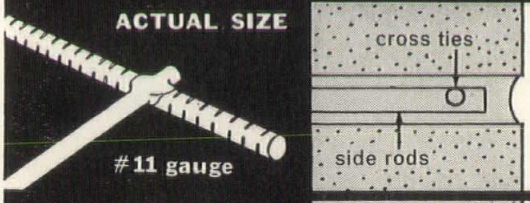

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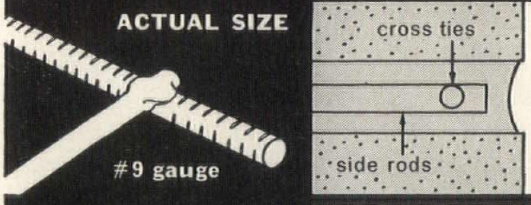

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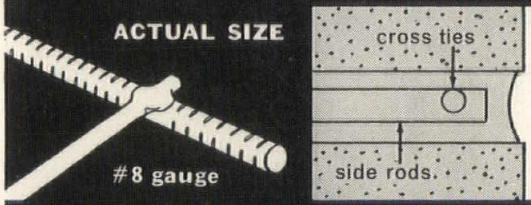

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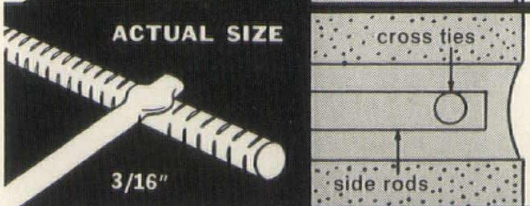

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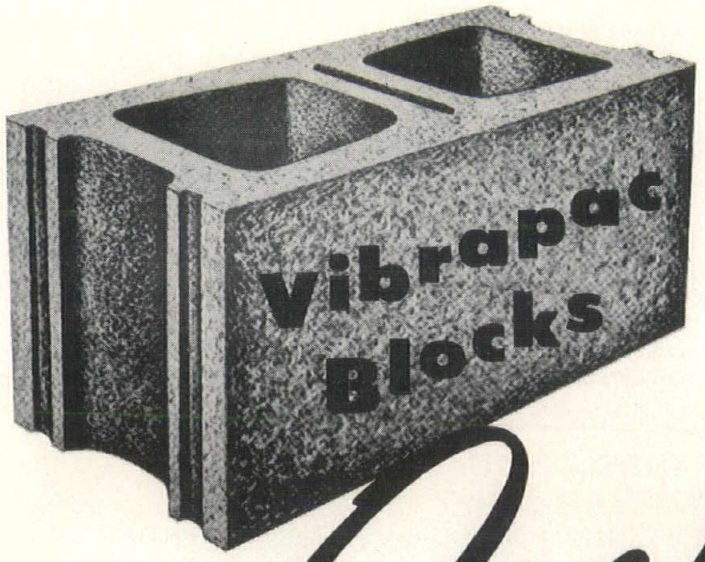

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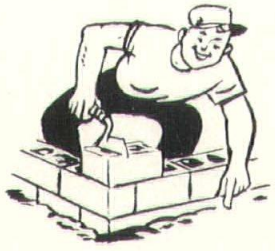

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Official Journal, Indiana Society of Architects and the Northern Indiana Chapter, both Chapters of The American Institute of Architects

Vol. VII **DECEMBER** **No. 9**

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A Flag at Half-Mast

The world is shocked, stunned, trembling; the President of the United States has been assasinated.

The loss to art and architecture is personal. In addressing the President last May, AIA President Carroll stated:

"But you, sir, are the first President of the United States — except, possibly, the first and third ones — who has had a vision of what architecture and its allied arts can mean to the people of the nation, and of what the careful nurturing of the architecture of the city of Washington can mean to the millions who come here to pay homage to the heart of their country."

Our country's loss is great, as is our sorrow, our shame. But equally great is our strength, our resolve. In these, may you find a blessed Christmas.

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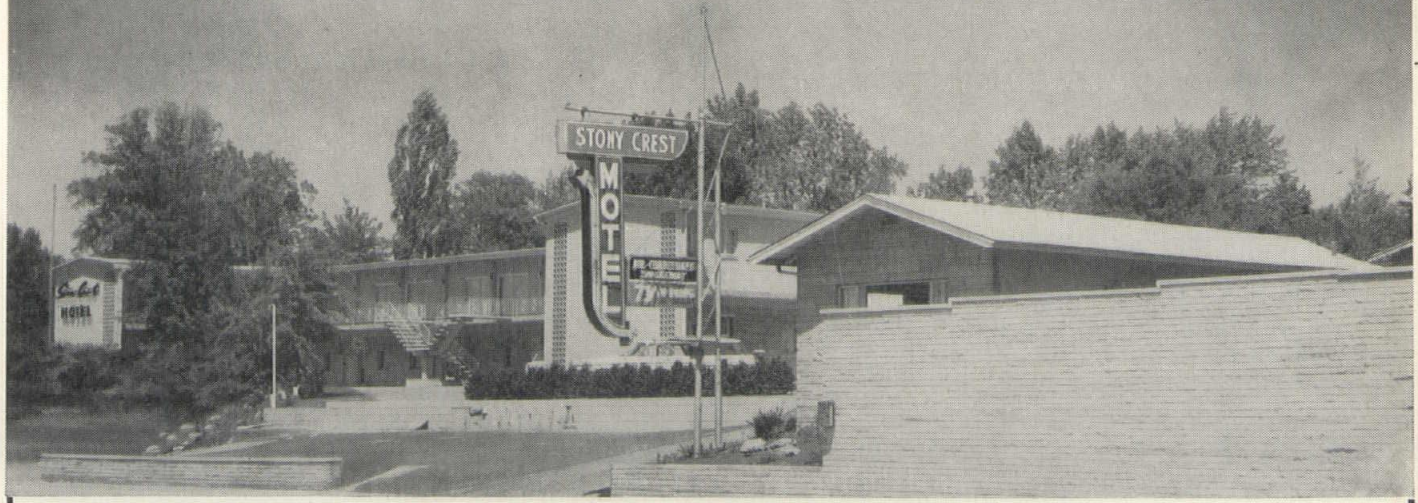

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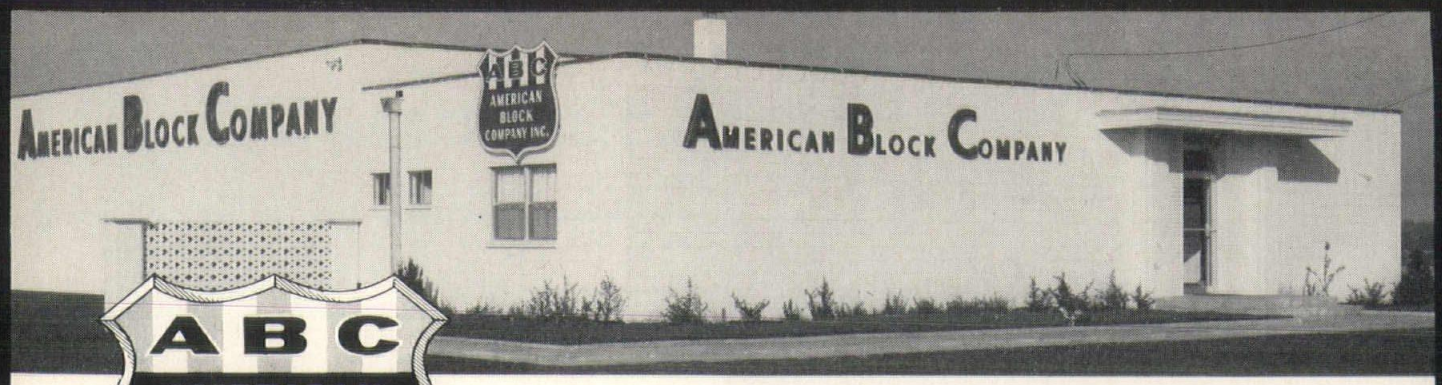

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ICMA Standardized Numbering and Terminology System and Q-Block

By W. E. THORN
L. Thorn Company, New Albany
Presidnt, Indiana Concrete Masonry Association

It is my privilege in this special Concrete Masonry Issue of the Indiana Architect to discuss briefly the more recent activities of the Indiana Concrete Masonry Association.

Many of ICMA's programs are designed to specially benefit related trades in the construction industry. Others are developed to assist block producers in the operation of their manufacturing business and often have important secondary benefits to architects, contractors and engineers.

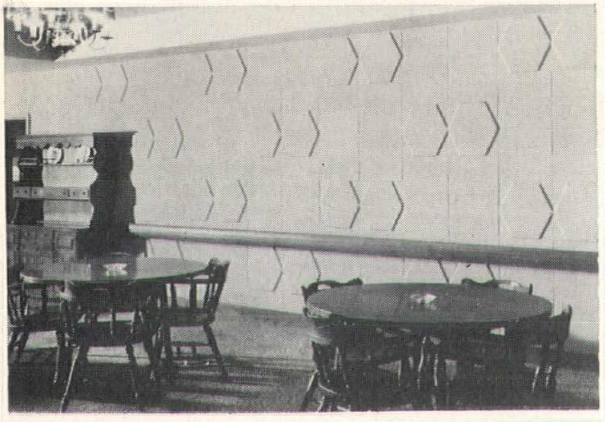
One of our most recently completed projects designed to benefit both the concrete products manufacturer and related industries and professionals is ICMA's Standardized Numbering and Terminology System. This important new system was developed by Paul Bohm, Sr. of Concrete Products Corporation, Mishawaka, Chairman of ICMA's Promotion Committee, together with George Dalby of Lake Shore Cement Products, Inc., Michigan City, and Everitte Trulock of General Dredging Company, Fort Wayne. On the surface, it would seem that assigning standard names and numbers to the various concrete masonry units manufactured in Indiana would be an easy task. Actually, a **workable** system presented many difficulties and in fact took ICMA's Promotion Committee almost two years to develop the finalized system. To be acceptable, the system had to have sufficient flexibility to provide for new products and consideration was given to automatic data processing used in evaluating controls. ICMA's completed "Catalog of Concrete Products Made By Indiana Producers" lists over 600 concrete masonry units. Tied into the catalog is ICMA's "Who Makes What In Concrete Products in Indiana" and the "A B C's of the Indiana Concrete Association's Standardized Numbering and Terminology System." The uses of the system are many. It will provide for easy exchange of information on Concrete Masonry units within and without the industry. It will eliminate mistakes when specifiers and others are designating or ordering concrete masonry products. We are proud of our new Numbering and Terminology System as it will provide a valuable business tool for our Industry and related industries and professions.

A new program attracting nationwide attention is the Q-Block Program developed by the National Concrete Masonry Association. ICMA is affiliated with the National Concrete Masonry Association and currently we are studying how we can implement this important program as a state association project. Q-Block is a new concept in the concrete masonry industry and it represents the first national quality standard for concrete masonry established by the industry itself. All Q-Block is manufactured solely by NCMA members and only block that meets Q-Block specifications can be identified with the quality control program. Blocks are tested periodically by independent testing laboratories to assure consistent quality. We are sure that all architects appreciate the importance of such a program and will be interested to see the future progress being made in this area. This is a program that is ideally adopted to association effort and will be studied very carefully by ICMA in the immediate months ahead.

Space does not permit a discussion of all the programs of ICMA, but in closing I would like to remind all Indiana Architects that we stand ready to assist them in any way in matters pertaining to concrete masonry products. Our Association office at 5231 Winthrop Avenue (CLifford 1-9246) in Indianapolis, has an extensive library of publications and copies of technical publications are available on request. Also, we will be pleased to answer any questions (or get the answers) involving concrete masonry.

On behalf of the members of Indiana Concrete Masonry Association, I wish to thank the Indiana Society of Architects for this opportunity to participate in this second special Concrete Masonry issue of the Indiana Architect, and we further extend our best wishes for a happy and most prosperous 1964.

Carousal Restaurant Lounge, Fort Wayne, Ind.
Architect: Courtney Robinson, A.I.A.
Builder: C&C Construction Co.



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Load Tests of Patterned Concrete Masonry Walls

Masonry construction is one of the oldest building techniques, and it survives today because of its beauty and its adaptability to form an architectural treatment. In the past, exposed masonry was confined to various kinds of brick and stone. Now, however, concrete masonry is being used more and more as a finished wall material for both exterior and interior walls of homes, churches, schools, and public and commercial buildings.

The structural strength and stability of load-bearing walls constructed of 8 x 8 x 16-in. units laid in running bond have been established experimentally. However, there is little published information to document the suitability of concrete masonry walls laid in other patterns.

To supply some of the needed data, the Research and Development Laboratories of the Portland Cement Association have carried out tests to determine the compressive and flexural strength of concrete masonry wall panels laid up in nine different patterns (Fig. 1). About 100 wall panels 4-ft. by 8-ft., were tested.

The tests were planned primarily to furnish information on the behavior under compressive and transverse loads of wall panels of sufficient size to represent story-height building construction. To achieve this, all compression and vertical span transverse load tests were carried out in accordance with ASTM E-72-55, Standard Methods of Conducting Strength Tests of Panels for Building Constructions.

TEST PROGRAM

The compressive strength data for all walls are summarized in Table 1. The running bond pattern has become an accepted standard, and the performance of the various wall patterns is compared to that of the running bond. Over the more than two year duration of the test program, block obtained in various shipments from the same plant showed a range in compressive strength from 1165 to 1450 psi. Because of this, a direct comparison of the ultimate strength does not provide a true comparison of the relative strengths of the various walls. The column in Table 1 that expresses the wall strength as a percentage of the standard includes a correction for the difference in compressive strength of the unit as normally tested.

There was little difference in compressive strength of walls in which all block were laid horizontally, i.e., the 4 and 8-in. running bond, horizontal stacked bond, and coursed ashlar. The strength of walls containing diagonal or vertical block was about 75 per cent of the standard. The strength of the individual block tested in a vertical direction (i.e., loaded on the ends) was 60 to 70 per cent of the strength obtained when tested in a horizontal direction, and this was reflected in the lower strength of walls containing vertical or diagonal block. The strength of the mortar did not appear to have a marked effect on the compressive strength of the wall.

In the series of transverse load tests across a vertical span, all nine wall patterns were tested with two strengths of mortar, and the results showed that the transverse strength was primarily dependent on the bond strength obtained between mortar and units. All data are recorded in Table 2, including the relative strengths of the walls compared to the standard running bond. All patterns with continuous horizontal mortar joints failed in bond between unit and mortar along one of the horizontal mortar joints at approximately

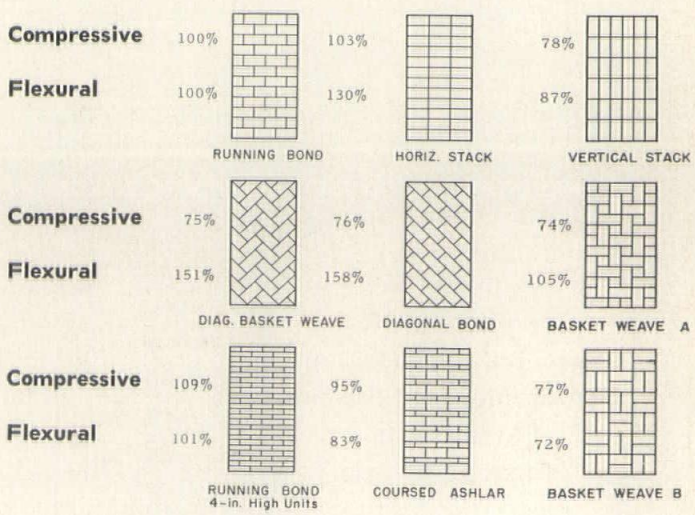

Fig. 1. Concrete masonry patterns for structural tests.

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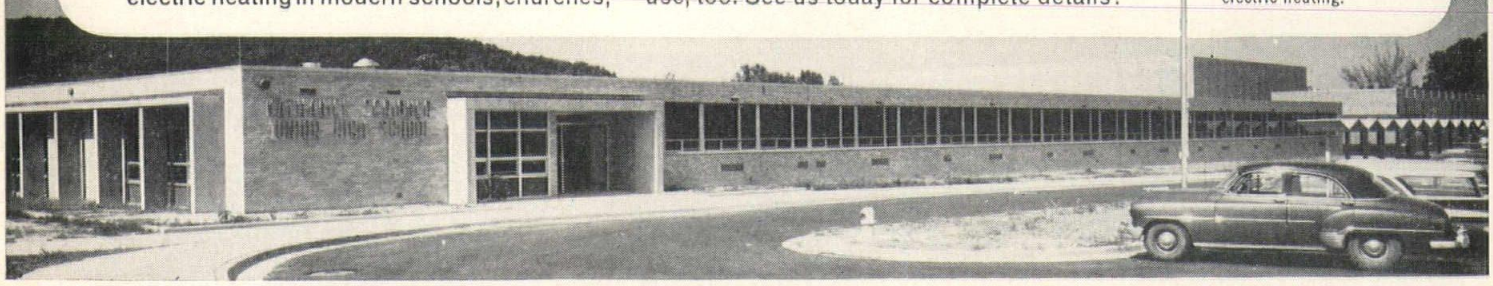

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mid-height of the wall. The diagonal patterns also failed in bond, but the failure transversed a sawtooth line across the width of the wall, following the mortar joints. The diagonal patterns developed strengths about 50 per cent higher than those of the running bond, as might be expected because of the added bond area and the angular displacement of the tensile forces along the mortar lines.

Transverse load tests across a horizontal span included four wall patterns with three mortars and with various amounts of reinforcement in the horizontal joints. The horizontal stacked

Table 1. Compressive Strength of Masonry Walls

Wall pattern	Compressive load on wall at failure, lb		Primary failure	Compressive strength					Block‡ corrected	Ratio‡ wall to block percent	Safety§ factor
	Mortar type			Block*	Measured*	Adjusted†	Percent of standard				
	M	S					Individual	Average			
Runnning bond	233,700			1400	638	638	100		1400	45.6	7.5
		201,000	Block	1450	549	530		100	1450	38.9	6.5
		175,500		1165	480	576	100		1165	41.2	5.6
Horizontal stacked bond	236,250			1400	645	645	101		1400	46.1	7.6
		219,700	Block	1450	601	580	105	103	1450	41.4	7.1
Vertical stacked bond	161,100			1400	440	440	69		805[a]	54.7	5.2
		164,400	Block	1315	449	478	86	78	915[a]	49.1	5.2
Diagonal basket weave	176,700			1400	515	515	81		1100[b]	46.8	6.1
	143,750		Mortar	1165	419	503	79	75	910[b]	46.1	4.9
		131,000		1450	381	367	66		1200[b]	31.8	4.5
Diagonal running bond	150,200			1400	438	438	69		1100[b]	39.8	5.2
	146,200		Mortar	1165	426	512	80	76	910[b]	46.8	5.0
		139,000		1315	405	430	78		1115[b]	36.3	4.8
Basket weave A	205,400			1400	562	562	88		1100[c]	51.1	6.6
		129,500	Block	1450	354	341	62	74	1200[c]	29.5	4.2
Basket weave B	163,000			1450	446	430	67		1120[c]	39.8	5.2
	170,200			1450	455	438	69		1120[c]	40.6	5.4
	149,000		Block	1320	407	432	68	77	825[c]	49.4	4.8
		190,000		1315	519	551	100		1050[c]	49.4	6.1
		156,250		1315	427	454	82		1050[c]	40.7	5.0
Coursed ashlar	187,250			1450	512	554	87		1295[d]	39.6	6.0
	176,500		Block	1165	482	580	89		1165	41.3	5.7
		178,000		1315	486	554	100	95	1225[d]	39.6	5.7
		179,500		1165	491	590	106		1165	42.1	5.8
4 in. Running bond	238,750			1450	654	670	105		1365[d]	47.9	7.7
		201,250	Block	1315	550	628	113	109	1225[d]	44.9	6.5

*Gross area, psi

†Adjusted to block strength of 1400 psi

‡Corrected for position of block in wall

[a] Average unit compressive strength when tested in vertical position (as used in vertical stacked bond patterned walls)

[b] Since units are laid at a 45 deg angle the assumed unit strength used is the average of the strengths in the horizontal and vertical direction

[c] Assumed unit strength $= \dfrac{f_{c1}A_1 + f_{c2}A_2}{(A_1 + A_2)}$

f_{c1} = unit strength (horizontal position)

f_{c2} = unit strength (vertical position)

$A = A_1 + A_2$ = Area of weakest cross section of wall (cross section containing highest percentage of vertical units)

A_1 = that part of A containing horizontal units

A_2 = that part of A containing vertical units

[d] Unit strength of 4-in. high units

§Safety factor $= \dfrac{\text{Wall strength}}{\text{Wall allowable load (85 psi)}}$

Table 2. Transverse Strength of Masonry Walls

Wall pattern	Mortar type	Vertical span transverse strength, lb per sq ft				Horizontal span transverse strength				
		No compressive load			Compressive load, 85 psi	Unreinforced			Horizontal reinforcement, lb per sq ft	
		lb per sq ft	Percent of standard	Average*		lb per sq ft	Percent of standard	Average*	16 in. c-c	8 in. c-c
8 in. running bond (standard)	M	60.0	100		425.0	127.0			149.4	203.0
				100		136.0	100			
	S	34.7				127.0				
		32.2	100			123.0	100	100	149.9	202.3
Horizontal stacked bond	M	85.0	141		405.0	47.7	37		130.0	191.2
	S	39.9	120	130		29.2	24	28	131.3	190.0
Vertical stacked bond	M	60.6	101		357.5					
	S	24.6	74	87						
Diagonal basket weave	M	89.0	148		410.5	69.5	56			
						76.9	67	60		
	S	51.7	155	151		65.8	57			
Diagonal running bond	M	103.0	172		429.0					
	S	48.1	144	158						
Basket weave A	M	69.9	117		400.0					
	S	30.7	92	105						
Basket weave B	M	42.9	72							
		44.5	72	72						
	S	24.4	73							
Coursed ashlar	M	43.3	72							
		55.5	93	83						
	S	26.3	79							
		34.7	104							
4 in. running bond	M	65.0	108			169.4	129		160.0	
						173.0	133		193.0	196.0
	S	31.3	94	101		158.0	128	130	186.6	194.7

*Average for Type M and S mortars

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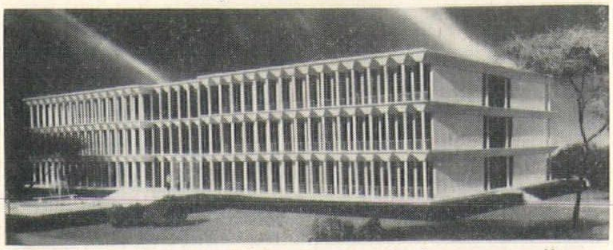
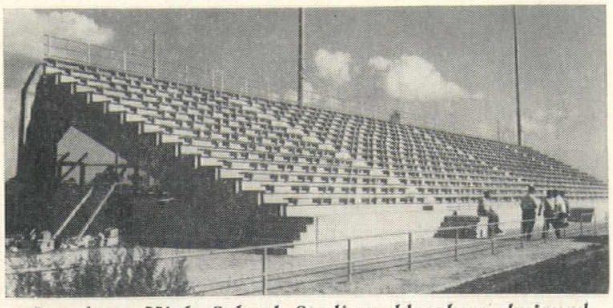


Butler University Library prestressed concrete floor and roof beams by SHUTE



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bond was chosen as representative of patterns depending entirely on mortar bond for transverse strength. Other patterns included the diagonal basket weave and the 4 and 8-in. running bonds which developed lateral strength through shear strength in the joints between interlocking units.

Six walls that had been tested across the vertical span with transverse loads, after being repaired by a polyester resin adhesive, were retested with transverse loads across the vertical span as before, but with an 85 psi compressive load applied centrally along the top of the walls. This was done to check the effect of the compressive load on the transverse load resistance of the walls. A uniform compressive load of 85 psi on a wall will produce a compressive force on the face shell mortar joints equal to 260 psi. By the standard flexural formula, this compressive force plus the bond strength of the mortar joint (both in psi) should be equal to a factor of 1.02 times the uniform transverse load on these walls (in psf) across a 7½ ft. span. The tensile bond strength average about 60 psi. At first observed cracking, the transverse loads ranged from 289 to 336 psf for the six walls tested. The test results agreed well with the calculations for all six walls tested. After first cracking, the wall continued to carry increasing loads until the transverse load had caused the wall to bend so far that the compressive load could no longer be sustained and the walls collapsed. The ultimate loads, as given in Table 2, ranged from 357 psf for the vertical stacked bond patterned wall to 427 psf for the diagonal running bond patterned wall.

SUMMARY OF TEST RESULTS

Compressive Strength

The compressive strength of walls in which all block are laid in a horizontal position is about one-third greater than that of walls containing similar block in diagonal or vertical positions. However, the weakest wall in this series had a safety factor of 4.2, based on an allowable wall load of 85 psi; therefore, it appears that any of the patterns tested would be satisfactory for load-bearing walls.

The compressive strength of a wall depends primarily on the strength of the block and is little affected by the strength of the mortar.

Flexural strength—Vertical span

Failure of all walls tested for flexural strength over a vertical span was in the bond of the mortar to the block. Walls constructed with Type M and Type S mortars showed mortar bond strengths of 60 and 30 psi, respectively, which agreed well with tests of two block piers. The diagonal patterns were about 50 per cent stronger than the standard running bond, due to the longer saw-tooth line of failure. For other patterns, continuous vertical mortar joints appeared to strengthen the walls, and patterns with wider horizontal joint spacing, as with vertical block, appeared to weaken the walls. Due to combinations of these effects, flexural strengths varied from 72 to 130% of the standard running bond.

Flexural strength — Horizontal span

The block pattern had a marked effect on the flexural strength of walls tested over a horizontal span. Running bond patterns were considerably stronger than the others, due to the interlocking action of the units. The running bond walls with 4-in. high units were about 30 per cent stronger than those with 8-in. high units. With the running bond patterns, the flexural strengths were affected only slightly by differences in the two mortars. Walls with continuous vertical joints, depending entirely on mortar bond for transverse strength, were about 30 per cent as strong as the standard running bond.

The particular joint reinforcement used did not materially increase the load at first cracking, but it was effective in increasing the ultimate strength of the walls. Joint reinforcement was particularly beneficial in walls with continuous vertical joints.

Combined Load Tests

The addition of a vertical compressive load to the walls tested in flexure across a vertical span proved to be an effective method of increasing the flexural strength. These tests showed the use of the wall's load-carrying capacity was one way of increasing the stability of the wall to transverse loads.

Effect of Mortar Type

The compressive strength of masonry walls laid up with Type M mortar was only 10 per cent greater than that of walls with Type S mortar, showing that the type of mortar (M or S) is relatively unimportant with respect to compressive strength of walls. The horizontal span flexure tests with both reinforced and unreinforced walls, with the exception of the stacked bond pattern, also showed little if any difference due to mortar type. The flexural strength of the stacked bond pattern over a horizontal span without horizontal reinforcement was entirely dependent on the bond strength of the mortar; and walls with Type M mortar were considerably stronger than those with Type S mortar. Likewise, in the vertical span flexure test, the walls with Type M mortar were twice as strong as those with Type S mortar, reflecting the higher bond strength of this Type M mortar.

Architecture in the News

IVAN R. DAHLGREN, AIA

The architectural profession was deeply saddened by the death on December 8th, of IVAN R. DAHLGREN, AIA, Fort Wayne architect, retiring Treasurer of the Indiana Society of Architects, and President of the Fort Wayne Society of Architects. At 40, Ray had achieved an unusually high degree of competence in his profession, and was warmly and deeply respected by his contemporaries. His efforts for the profession were untiring and effective, and the loss will be long felt.

A member of the AIA and the ISA since 1955, Ray was born in Chicago and received his B.S. in Architecture at the University of Illinois. He had been a partner in Martindale and Dahlgren, Architects, since 1955.

The profession extends its sympathy to the survivors, daughters Barbara and Carol, son Daniel, and mother, Mrs. Esther Dahlgren.

* * * *

New officers for the Northern Indiana Chapter, AIA, have been installed for 1964:

President: WILLIAM G. RAMMEL, AIA, Fort Wayne
Vice-President: VITO A. GIRONE, AIA, South Bend
Secretary: COURTNEY E. ROBINSON, AIA, Fort Wayne
Treasurer: FORREST R. WEST, AIA, South Bend
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(newly-elected)
RICHARD L. WILDERMUTH, AIA, Gary
ROBERT J. SCHULTZ, AIA, South Bend
Past President: PAUL FRANK JERNEGAN, AIA, Mishawaka

* * * *

On November 20th, the Indiana State Legislative Advisory Commission approved a joint ISA-NIC Resolution calling for establishment of a State School of Architecture Study Committee. Named to the committee were Senators Wilfred J. Ullrich of Aurora, Keith L. McCormick of Lebanon, and V. Dewey Annakin of Terre Haute; Representatives M. Maurice Goodnight of Lafayette, William T. Sebree of Anderson, and George L. Fisher of Leesburg; Dr. Elvis J. Stahr, jr., president of Indiana University; Dr. R. W. Holmstedt, president of Indiana State College; Dr. John R. Emens, president of Ball State Teachers' College; and Dr. Frederick L. Hovde, president of Purdue University; Architects C. Eugene Hamilton, AIA, Muncie, James L. Walker, AIA, New Albany, Raymond S. Kastendieck, FAIA, Gary, Robert J. Schultz, AIA, South Bend, and Professor Frank Montana, FAIA, head of the School of Architecture, University of Notre Dame. Two deans of out-of-state schools of architecture will be appointed at a later date.

The establishment of this study committee represents the first outward step towards establishing a state-supported school of architecture and allied arts in Indiana, after more than five years' of work and investigation by many members of the profession. The first meeting of the committee was called for December 23rd by temporary Chairman Goodnight.

More on this next month.

* * * *

Indianapolis Architect Fran E. Schroeder, AIA, won 1st place regional design honors for his Indianapolis Horizon Home in the Concrete Industries' Horizon Home judging last month. The beautiful and unique home, which was open to the public late last summer, won out over entries from an eight-state area, and was one of seven designs honored in the country.

* * * *

The Lathing and Plastering Bureau of Indianapolis has announced its Annual Gold Trowel Award Competition for the best use of lath and plaster in designs completed during 1963. Entries will be received until December 31st, and entry blanks and information are available from WALTER J. STROUGH, Bureau Business Manager, VIctor 6-5394, P.O. Box 572, Indianapolis 6.

Judging this year's entries will be two architects selected by the Indiana Society and one representative of the national materials' manufacturing industry. Buildings will be physically judged by on-site examinations.

Awards (including the Gold Trowel and $300 first prize) at the Bureau's Joint Dinner Meeting for Architects scheduled in January.

Preservation Conference Post Mortem

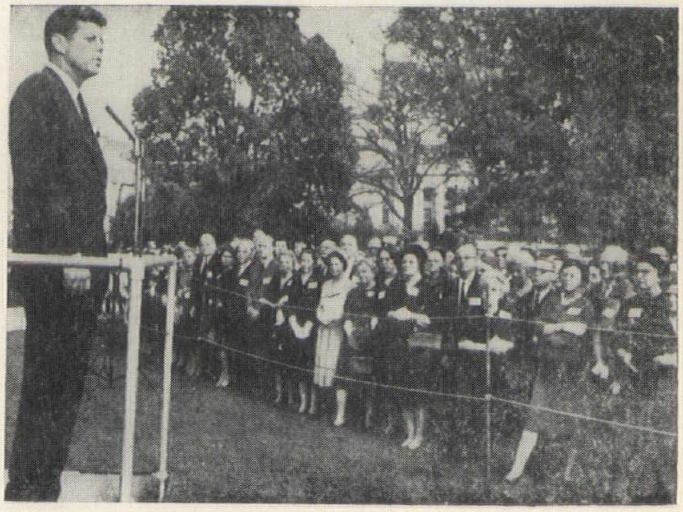
By LINDA (MRS. H. ROLL) McLAUGHLIN

"What you are attempting to do, and what interests me of course, is trying to maintain and keep alive in this country a very lively sense of our past. I flew the other day in Montana over the grave of General Custer, who was slain eighty-eight years' ago. That shows what a young country we are, and yet with all that youth and with all that sense of motion and progress and looking to the future, we have a good many things in our country that are worth retaining.

"One of these, of course the most important, is the White House; Mount Vernon; the work you have done in Decatur House; the work you have done in places here in Virginia, and along the Mississippi in other ways — making it possible for those who come now and perhaps can only catch American history through seeing and feeling it, giving them some sense of what a great procession this has been."

Thus did the late President John F. Kennedy welcome some 1,100 members of the National Trust for Historic Preservation to a special tour of the White House and tea as his personal guests late in October.

Aside from dance tunes for our entertainment by the Marine Band, resplendent in their scarlet uniforms, beautiful, authentic fresh flower arrangements in every room, and sparkling chandeliers ablaze, the remodeling of the White House is a splendid period job. We were briefed on the changes and the historic backgrounds for these changes at lunch prior to the tour by Mr. William V. Elder III, curator of the White House and an authority on "Federal Architecture" (I use quota-

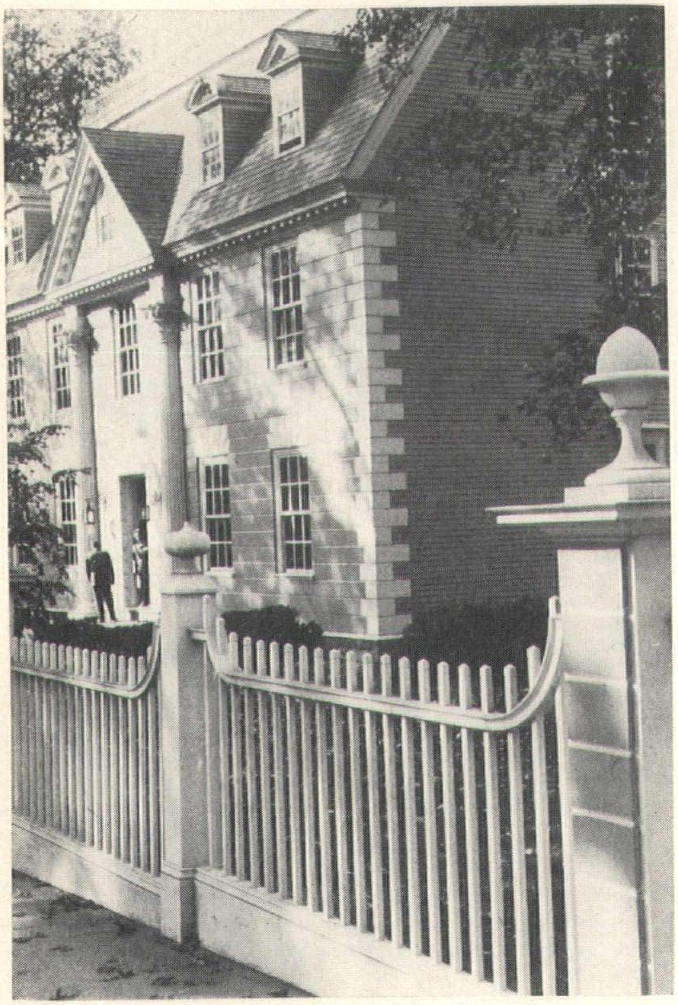


The late President John F. Kennedy Welcoming Conference Delegates

tion marks because the style is a specialized one peculiar to Washington but well-defined and recognized by many authors and scholars).

We were told why the old green room color had to go; why the new china room is being done in museum style (with a sample of every place setting and service used by the various First Families); and all about the historic painted wallpaper.

All of this tied in with the real reason for the conference — to learn what other parts of the country were doing in preservation. There were slide lectures on "Salvaging Historic Areas" and "Community Action for Area Revival," the first by Yale Professor of City Planning, Christopher Tunnard, the second by Edmund Bacon, Executive Director, Philadelphia City Planning Commission; "Importance and Use of Surveys" by Theodore M. Brown, Associate Professor of Architecture, University of Louisville; "Furniture and Tastes of the Federal Period" by Richard H. Randall, Jr., Assistant Curator, Decorative Arts, Boston Museum of Fine Arts; "Woodwork of the New Republic" by Robert C. Smith, Professor, History of Art, University of Pennsylvania; and others.



The Lindens

We traveled to Fort McNair for discussions of the salvage problem, passing through some of Washington's worst slums, along with their "Best" renewal program. We were sorely disappointed in the renewal program: Whole acres of filled-in tin cans and weedy sand lots, barren of grass or trees, are indeed open space but leave a great deal to be desired. Simply wrecking a block of slums merely moves the slums farther out.

We traveled by chartered train to Harper's Ferry, scene of John Brown's Civil War raid and located in the lovely valley where the Shenandoah and Potomac meet. The National Parks' Service has been several years' restoring some of the old structures in connection with the Harper's Ferry National Park.

The difference between an historical building restored because someone famous lived there or some very important event took place there, and one restored for some modern use (such as physicians' offices or fraternity national headquarters) — between an historic building refurbished as a museum and one restored as a living, useful example of a past day or style — the way in which some historic houses have been moved to new locations for another hundred years' of service to a family or the country — all these things we saw in our tours.

Reproduced left is a picture of the Lindens, built in 1754 for Robert Hooper in Danvers, Massachusetts, and moved to its present site in Washington for Mr. and Mrs. George Maurice Morris. This fine old home is in "mint" condition, thanks to the knowledge and interest of its owners (and the services of a good architect) and is furnished with priceless antiques of the useful kind. The family eats in the dining room on the magnificent old table; the chairs are sitable; the beds are slept in nightly. Modern plumbing has been unobtrusively installed, and the cooking kitchen is most modern. But the old original kitchen in the basement has been kept, with its wonderful old copper pans and wide hearth, and is now used for informal entertaining.

We visited many such examples of historic residences, but we thought the Lindens outstanding. The Woodrow Wilson House, newly acquired and opened first just for us, will be an interesting stop for school children in the future. Historic Georgetown Inc., which buys, restores, then resells buildings in the Georgetown area, has recently opened France's Restaurant, built as a private dwelling in 1790. We had dinner there, and found the food delicious, the wine selection wide, and the atmosphere intimate.

It is a small wonder that restoration is profitable; all it takes is a good architect, patience, a backer, and a little imagination.

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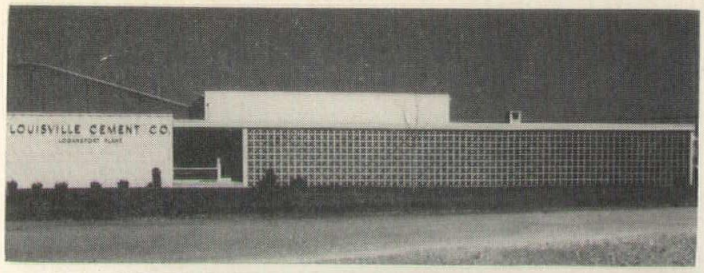

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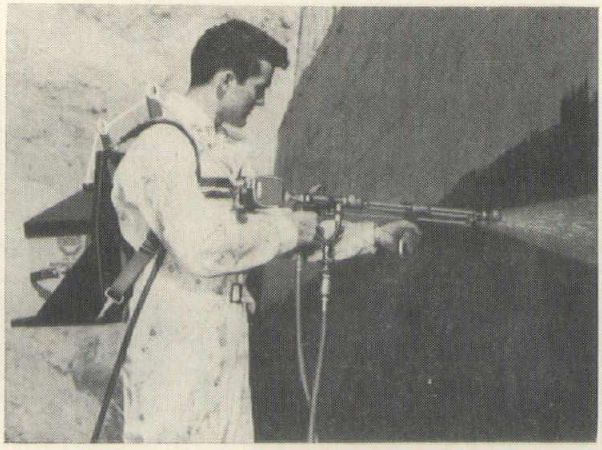

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Personnel Notices

DRAFTSMEN: Several Indianapolis architectural firms have announced that they are actively seeking additional draftsmen, some experience usually required (preferably two years), but certain firms also will consider drafting trainees. In some cases, the firm has specified architectural registration.

Information on these openings can be secured through the Indiana Society of Architects, 3637 N. Meridian Street, WAlnut 5-2325.

REGISTERED ARCHITECT: Minimum, 2 years' experience in residential and light commercial construction, to work for Indianapolis building products firm. Take-off work, some engineering and cost analysis background desired. Salary up to $10,000. Contact ISA Office, 3637 N. Meridian Street, WAlnut 5-2325, for further information.

EXPERIENCED DRAFTSMAN: Position now available for qualified, well-experienced draftsman with electronics equipment firm active in Indianapolis construction field. Experience preferably should be in architectural field with some experience in electrical engineering drafting. Contact ISA Office, 3637 N. Meridian Street, WAlnut 5-2325.

* * * *

SPECIFICATION TYPIST: Young, experienced specification typist seeking employment in architectural office in Indianapolis. Excellent references. Six years' experience, last two in specification typing. Full-time employment or contract typing. Contact ISA Office, 3637 N. Meridian Street, WAlnut 5-2325.

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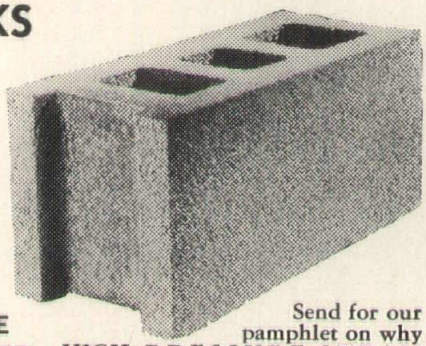

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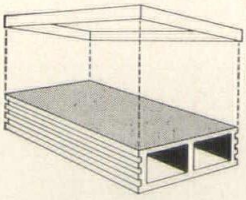

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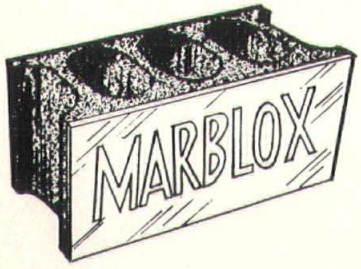

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Masonry Mortars

Masonry mortars have been used in masonry construction for over 6000 years. The Egyptians, with their massive masonry constructions originated the present day system of uniting masonry units with a mortar. However, man has brought mortars under his control only during the last one hundred years. Until the 19th century, mortar made from sand and lime was usually accepted; then cement was produced of reliable quality and introduced as an ingredient.

Good performance in our modern masonry walls is obtained through a combination of good design, skilled craftsmen and quality materials. Good mortar is necessary to good workmanship and the proper performance of masonry construction. The mortar must provide the functions of binding the masonry units together in a stable structure; presenting an effective barrier to the infiltration, absorption, or passage of moisture into or through the wall; and presenting a neat, uniform appearance.

The properties of mortars which must be considered in the effort to produce quality masonry are workability, water retentivity, strength, durability and bond.

Workability. A mortar is said to be workable when its consistency is such that it spreads easily and yet is not so fluid that it flows out of the vertical mortar joints. A workable mortar must also be sticky so that it will readily adhere to vertical surfaces and to the underside of horizontal surfaces. Workability should be obtained through the proper grading of the sand, through the use of mortar with good water retentivity and thorough mixing rather than through the use of excessive amounts of cementitious material.

Water Retentivity is the property of a mortar which resists rapid loss of mixing water when the mortar is in contact with dry, absorptive masonry units. Such units have strong tendencies to absorb the mixing water from the mortar by capillary action. A mortar having poor retentivity is objectionable because the rapid removal of the water by the dry absorptive masonry units so stiffen the mortar that the joints and masonry courses cannot be properly leveled and aligned. Mortars which have rapidly stiffened because of poor water retention will not make intimate contact nor bond well with the units thereby resulting i nleaky points. A mortar that has good water retentivity remains soft and plastic long enough for the masonry units to be carefully aligned, leveled, plumbed and adjusted to proper grade without danger of breaking the intimate contact and bond between the mortar and the units.

Strength and Durability. The strength and durability of mortar depend chiefly on the kind and quality of cementitious material used in it. Walls that are to be exposed to severe structural stresses or severe frost action should be laid up in stronger, more durable mortars than walls that are built for less severe service.

Bond. Bond is the property of a hardened mortar that binds adjacent masonry units together to form a wall. The strength of the bond between the mortar and the masonry units is affected by various factors such as the quantity of the cementitious material, the workability, plasticity and water retentivity of he mortar, the surface texture of the mortar bedding areas, the rate of suction of the masonry units, and the quality of the workmanship in laying up the units.

Considering a balance of all the desirable properties in mortars, it is obvious then why combinations of portland cement and lime developed. Over the years experience led to relative standardization in most specifications on a 1:1:6 mix (portland cement, lime and sand by volume).

Limes impart workability and water retention to a mortar mix. When using a hydrated lime (a hydrated lime is added to the mortar as it comes from the bag rather than slaking for a period of time) ASTM Designation C 207 - **Type S** is recommended. Specifications for Type S place a limit on the amount of unhydrated particles. Straight lime mortars harden at a slow, variable rate, develop low compressive strength and poor durability to the freeze-thaw cycle.

Portland cement will harden in the presence of water at a consistent rate, develop high compressive strengths and good durability. Straight portland cement mortars, however, are low in workability and water retention.

Masonry cement produced by portland cement manufacturers are designed to improve and simplify the mortar mix by combining materials in one package under careful control. The propor-

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tions of the materials (such as portland cement, natural cement, finely ground limestone or Type S hydrated lime) in a bag of masonry cement are chosen to give a **good balance** of all the desirable properties. These desirable properties are enhanced by additions of an air-entraining agent and gypsum to regulate the time of set.

Masonry cement mortars are considered to have these principal advantages:

1. The materials are inter-ground before they enter the package, therefore the uniformity of the mix is not so dependent upon working conditions as for the job mixed combinations. As a result, the mortar from batch to batch and day to day is consistent in quality and appearance.
2. By ASTM and Federal Specifications, masonry cements are required to entrain a minimum of 12 per cent air. With proper job mixing, air-entrainment insures a high degree of durability to the freeze-thaw cycles and contributes to the workability, cohesiveness, plasticity and water retention of the mortar. Air-entraining agents are added in measured quantities during manufacture. For proper air content in job-mixed portland cement-lime mortars, an air-entraining agent would need to be added at the job and the mix would have to be checked regularly with an air meter.
3. Standard Specifications for Masonry Cement, ASTM Designation C 91, limits the autoclave expansion to not more than one per cent. Tests have shown masonry cement mortars to be well below this limit.

The sand should be clean and well-graded, complying with the Specifications for Aggregate for Masonry Mortar, ASTM C-144. There should be all sizes of particles ranging from very fine to coarse for best workability. Too much sand of any one size should be avoided. Sands deficient in fines generally produce harsh mortars, while an excess of fines will increase the mixing water demand (and possibly the cementitious material requirement) which will increase shrinkage.

Thorough mixing is important to the development of the potential desirable properties of any mortar — and thorough mixing requires time. Mortar should be mixed at least five minutes after all materials are in the mechanical mixer. Less mixing time may result in non-uniformity, poor workability, low water retention and less than optimum air content.

Retempering may be accomplished at any time within the first few hours after mixing, without damage to the mortar, by the necessary additions of water and additional mixing. The mortar should at all times contain as much water as it can carry while maintaining good "body" and water retention. It is only wet plastic mortar that can develop good bond with absorptive masonry units. Therefore, retempering should be done as frequently as it may be needed — or, preferably, mortar batches should be kept to a size which can be used in the work in a reasonably short time.

The time mortar will retain its full plasticity prior to need for retempering depends upon the natural "setting" characteristics of the cement, the temperature of the mixture, and the temperature and humidity of the surrounding air, as well as the amount of sunlight and wind to which the mortar is exposed. Mortar will retain plasticity longest on still, cool, damp, cloudy days. Plasticity will disappear most rapidly on hot, dry, windy days, or on cold, dry, windy days during which the water used should be heated to 80°F. Old mortar left overnight should never be used by retempering or otherwise.

Prepared Masonry Cements are manufactured to develop setting properties which blend best with most masonry operations, that is, to set fast enough to permit speed in construction and yet slow enough to permit reasonably large batches to be mixed and used before stiffening.

Masonry Cement Mortar Specification

(Short Form)

Materials

Masonry Cement (Type II) ASTM C 91
Aggregate ASTM C 144
Water — Clean and free of deleterious amounts of acids, salts, alkalies, or organic material.

Proportions (by volume)

Ordinary service — 1 part masonry cement
2¼ to 3 parts damp, loose mortar sand
Masonry subjected to conditions requiring extra strength —
1 part masonry cement
1 part portland cement
4½ to 6 parts damp, loose mortar sand

Mixing

Mortar shall be mixed in a power mixer for a period of not less than five minutes after all materials have been placed in the mixer. After initial mixing, the mortar shall be kept tempered; add water as required, so that the mortar will contain the maximum amount of water consistent with good workability. Mortar not used within these time limits shall be discarded; temperature 80°F. or higher — 2½ hours; 80°F. or lower, 3½ hours.

Tooling

(Conclave or V-joint) The surface shall be thumb-print hard or have lost the water sheen before tooling.

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Removing Stains from Masonry

The procedures involved for the removal of stains from masonry is dependent on both the surface to be cleaned and the composition of the discoloring material. Each type of stain is to be treated with a cleaning agent suitable only for that particular case and such treatments may require repeated efforts to eradicate old, stubborn stains.

Together with the chemicals and procedures outlined below, there are proprietary cleaners available which are suitable for particular stains. For stains of unknown origin, experimentation may be necessary to determine the proper agent. In all cases however, before undertaking any over all general cleaning of the entire area, test clean a small inconspicuous location to assure that no discoloration occurs.

Roofing Tar. For small areas or interior work, mix together enough solvent (naphtha, benzene or trichlorocthylene) with talc or whiting to develop a poultice with the consistency of a smooth paste. Apply to the stained area and allow to dry, then brush or wash off.

Tobacco Stains. Dissolve 2-lb. of trisodium phosphate in 5 qt. of water. In a separate container, make a smooth, stiff paste of 12-oz. of chloride of lime in water. Pour the former into the paste and stir thoroughly. Make a stiff paste of this with powdered talc and apply and remove in the same way as described above for iron stains. To apply with a brush, add about 1 tsp. of sugar to each pound of powdered talc. This mixture is a strong bleaching agent and is corrosive to metals.

Vanadium or Molybdenum. Occasionally a green stain will appear on buff or gray facing brick or tile. This may be a form of efflorescence resulting from vanadium or molybdenum compounds in the clay unit. Hydrochloric acid should not be used in attempting to remove efflorescence resulting from such compounds. The acid may react with the vanadium or molybdenum compounds, converting them to an insoluble brown stain that is practically impossible to remove except with abrasives. A cleaning method that has been used successfully in many such cases is to wash the wall with a solution of caustic soda, such as 1 part sodium hydroxide crystals (lye) to 10 parts water. Here again, the wall should be washed with clear water, both before and after the application of the caustic soda solution, and precautions taken to protect clothing and skin.

Weld Spot Burns. For removal from glazed surfaces, mix together one lb. ammonium bifloride, two lb. oxalic acid and two gal. of water together with enough powdered bentonite to form a poultice. Apply the poultice to the burned spots and when completely dry, remove with a wooden scraper. After each application of the poultice (several treatments may be necessary), wash the burned area with clean water.

It is important that heavy particles in the burned areas first be removed with sand paper before applying the poultice. (You may expect some scratching of the glazed surface and a slight discoloration or fading of the surface where the poultice is applied).

Wood Stains. Under damp conditions, wood will rot and cause a chocolate-colored stain that is readily distinguished from most other stains by its dark color. The best treatment is that recommended for fire stains. Action may be accelerated by first scrubbing the surface thoroughly with glycerin diluted with four times its volume of water.

Paint Stains. For fresh paint, apply a commercial paint remover or a solution of trisodium phosphate in water — 2-lb. of trisodium phosphate to 1 gal. of water. Allow to stand and remove paint with scraper and wire brush. Wash with clear water.

Perspiration Stains. Secretions from the hands or oil from the hair may produce stains on concrete. The stain is usually brown or yellow and may be mistaken for an iron stain. The best treatment is that recommended for fire and smoke stains. Bad stains may require several treatments.

Plant Growth. Occasionally an exterior masonry surface that is not exposed to sunlight and remains in a constantly damp condition will exhibit signs of a plant growth such as moss. Application of ammonium sulfamate (available in gardening supply stores) according to directions furnished with the compound has been used successfully in the removal of such growths.

Aluminum Stains. Aluminum stains usually appear as a white deposit which may be removed by scrubbing with a 10 per cent solution of muriatic acid. Rinse the area thoroughly with clean

water **both** before and after the application of the acid solution, and precautions should be taken to protect the clothing and skin of the user.

Bronze and Copper Stains. Copper and bronze stains are nearly always green, but in some cases they may be brown. Mix together in the dry form or 1 part aluminum chloride sal ammoniac and 4 parts of powdered talc. Add ammonia water and stir until a thick paste is obtained. Place this over the stain and leave until dry. When working on glazed tile, use a wooden paddle to scrape off the paste. An old stain of this kind may require several applications.

Coffee Stains. Coffee stains may be removed by applying a cloth saturated in glycerin diluted with four times its volume of water. Javelle water or the method described under fire and smoke stains is also effective.

Fire and Smoke Stains. Make a smooth, stiff paste of trichlorethylene and powdered talc. Apply with a trowel, cover to prevent rapid evaporation, and scrape off when dried. Precaution should be taken to ventilate a closed space.

Soap and water applied with a stiff-bristle brush are frequently effective in removing soot and coal-smoke stains. A small amount of powdered pumice added to the soap solution helps.

Ink Stains. For ordinary blue writing inks, make a solution of sodium perborate (obtained from any druggist) in hot water. Mix with whiting (which may be obtained at any paint store) to a thick paste, apply in a ¼-in. layer, and leave until dry. If some of the blue color is visible after this poultice is removed, repeat. If only a brown stain remains, treat it by the method described for iron stains.

Many red, green, violet, and other bright-colored inks are water solutions of synthetic dyes. Stains made by this type of ink can usually be removed by the sodium perborate poultice described above. Often the stain can be removed by applying ammonia water on cotton batting. Javelle water is also effective, used the same as ammonia water, or mixed to a paste with whiting and applied as a poultice. A mixture of equal parts of chlorinated lime and whiting reduced to a paste with water may also be used as a poultice.

Some blue inks contain Prussian blue, a ferrocyanide of iron. These stains cannot be removed by the perborate poultice, Javelle water, or chlorinated lime poultice. Such stains yield to treatment of ammonia water applied on a layer of cotton batting.

Indelible ink often consists entirely of synthetic dyes. Stains may be treated as outlined above for that type. However, some indelible inks contain silver salts, which cause a black stain. This may be removed with ammonia water. Usually several applications are necessary.

Iodine Stains. An iodine stain will gradually disappear of its own accord. It may be removed quickly by applying alcohol and covering with whiting or talcum powder. If on a vertical wall, mix talcum to a paste with alcohol, apply some alcohol to the stain, then cover with the paste.

Iron Stains. Mix 7 parts lime-free glycerine with a solution of 1 part sodium citrate in 6 parts lukewarm water, and mix with whiting or kieselguhr to make a thick paste. Apply paste to stain with trowel, and scrape off when dried out. Repeat until stain has disappeared and wash thoroughly with clear water. (Ammonium citrate may produce quicker results than sodium citrate).

Oil Stains. Make a paste of a solution of 1-lb. of trisodium phosphate to 1 gal. of water and sufficient whiting to thicken. Spread this paste in a layer about ½-in. thick over the surface to be cleaned and leave it until it dries (approximately 24 hours). Remove the paste and wash surface with clear water.

An alternate treatment consists of the application of a poultice made by adding powdered talc or whiting to a 5 per cent solution of caustic soda.

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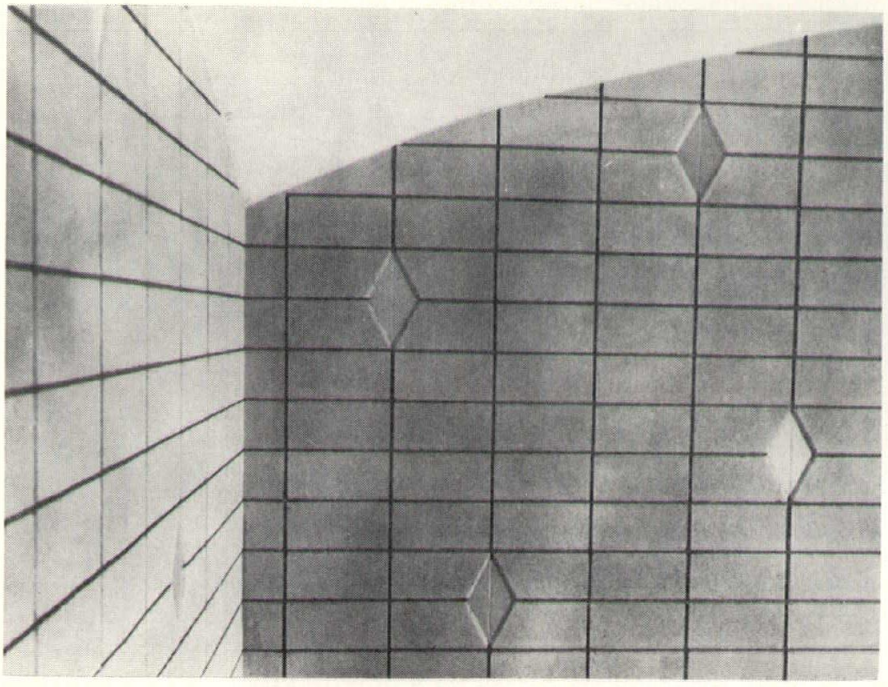

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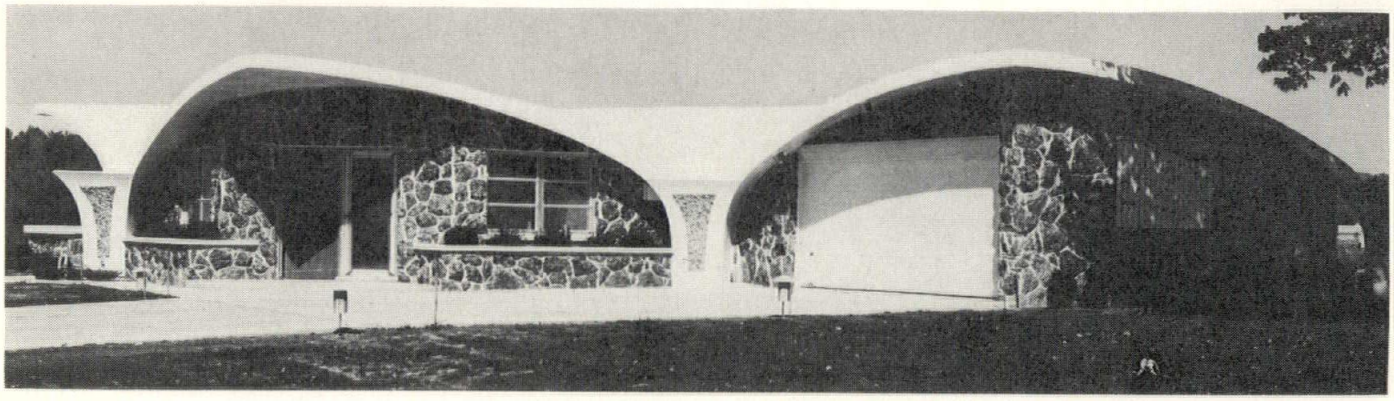

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