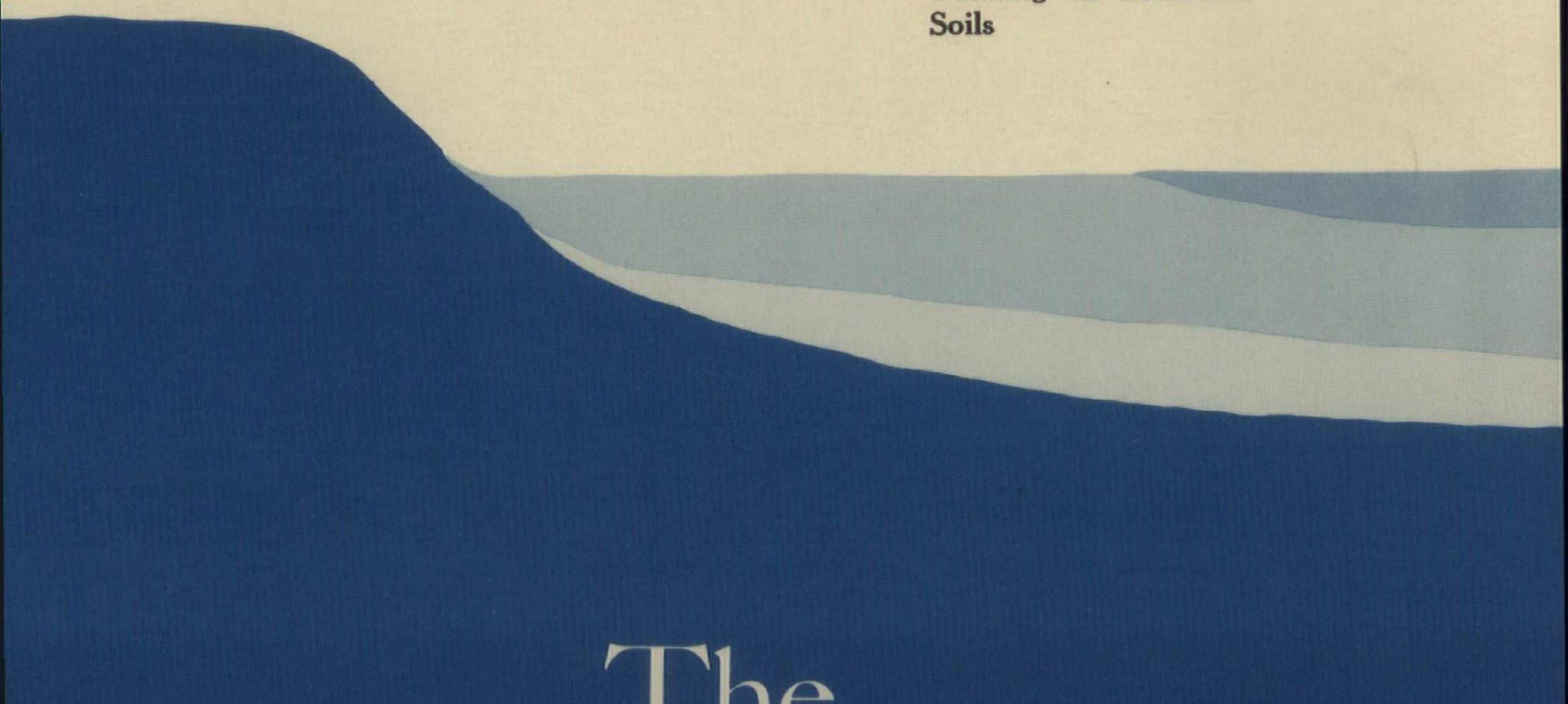
Building on Louisiana Soils



The Louisiana Architect

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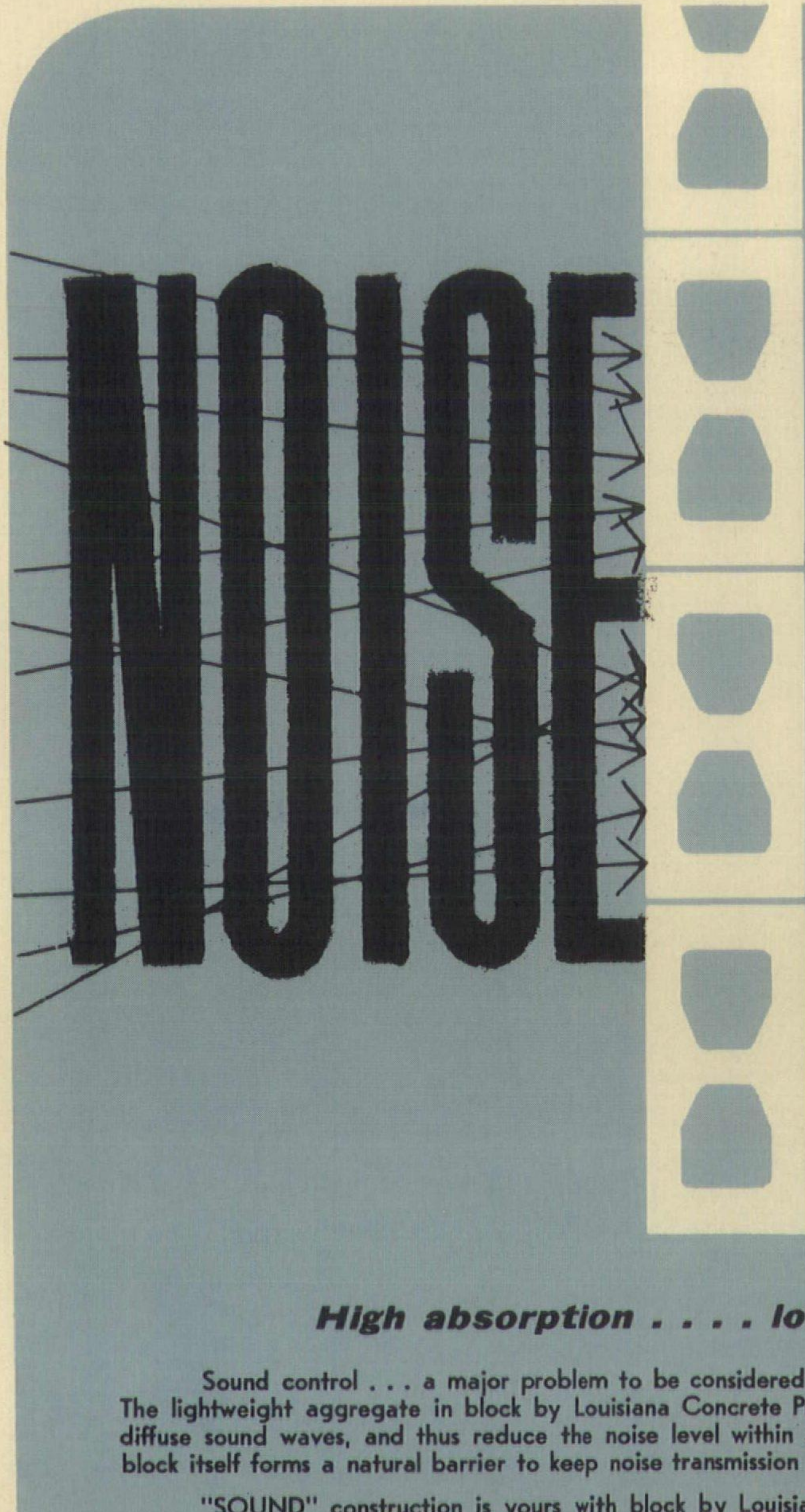

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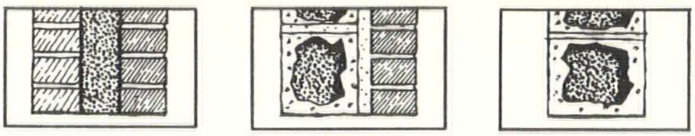


Construction Specifications Institute

. . . What It Is and What It Does

by Howard C. Sherman

Howard C. Sherman, AIA, CSI, is the immediate past president of the Shreveport Chapter, AIA and is a Vice President of the LAA. He is Chairman of the National AIA Committee on Specifications, a member of the AIA-CSI Liaison Committee, the AIA Documents Review Committee and the Joint Industry Conference on Uniform Indexing.

Mr. Sherman is a Chapter Member and Past President of the Shreveport Chapter CSI and is currently serving with the CSI-AGC Liaison. He holds a number of awards in CSI Specifications Competition.

With law suits against architects multiplying, it behooves every practitioner to use all available tools to protect himself and his clients. Despite "hold harmless" insurance, nothing is going to save one who fails the test of whether he performed his services as a careful, prudent architect would do under similar circumstances.

One of the organizations offering tools which help the architect to perform his duties carefully and prudently is the Construction Specifications Institute. Through their program of technical studies, they are building up a body of information that no architect should be without. The emphasis should be on good specifications because it is a legal rule of construction that, in the absence of any provision to the contrary, words will take precedence over drawings.

This organization formed in 1948 has, through the CSI Format, made great progress in one of their original aims, namely to eliminate the lack of uniformity in specification format which was wasteful of bidders time, detrimental to producing good specifications and conducive to errors.

The aim of the CSI is to foster and promote the interests of persons and firms who utilize specifications in the Building Construction Industry by contributing in every way possible to the improvement of specification writing. It is the only organization where the professional and the non-professional meet regularly to discuss common problems and interests.

The program of technical studies referred to previously now comprises some 400 titles in various stages of development. Initially each study is the work of a chapter, done voluntarily and on a topic of their own choosing. All are done according to a prescribed format and include a statement of scope, an outline specification, technical discussion for the guidance of the user, a glossary of terms and an appendix listing other reference works on the subject of the study. The first printing of a study, called the Preliminary or Pink Sheet is distributed to all Chapters for comment. The comments thus received are evaluated by a technical committee at headquarters and the study revised accordingly.

The second printing called the Interim or Yellow Sheet, is distributed not only to those who commented on the preliminary study but also to appropriate allied organizations. Sometimes a sampling of the comments received on the preliminary study is included to stimulate further thinking.

Comments based on the interim study are also evaluated by the technical committee the study again revised and the final document printed on green paper. It is then an official document of the Institute.

These technical studies are the heart of the CSI Program and, even in the preliminary and interim stages can be very helpful to the specification writer. Even though you don't want to participate in the development of the studies don't deprive yourself of the help they can be to you. Join a CSI Chapter —that's the only way you can have access to the preliminary and interim studies. If there isn't a chapter in your area, promote one with the help of your non-professional acquaintances. They have a great interest in the work, can be a tremendous help in getting a chapter going and also in commenting on technical studies because of the specialized knowledge they have in the products they sell.

So, arm yourself with all the tools available including a membership in CSI. Their headquarters is 1717 Massachusetts Ave., N.W., Washington, D. C. 20036.

Building on Louisiana Soils

by Louis J. Capozzoli, PhD.

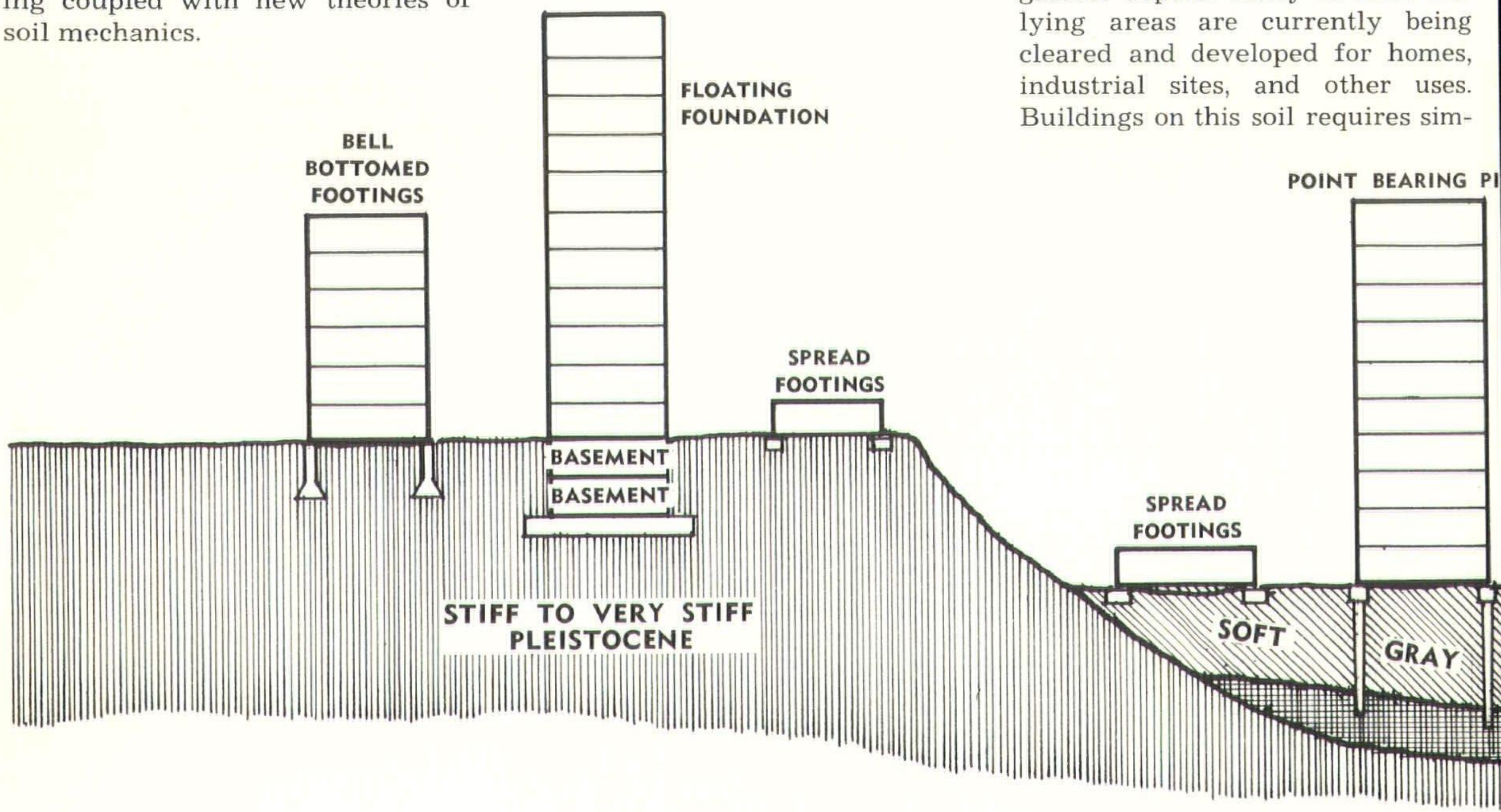
Special Problems Demand Special Solutions

In any listing of Louisiana's resources for industrial expansion, soil conditions and foundation construction information are conspicuously absent. Even though soil conditions and foundation requirements cause people to hesitate venturing into Louisiana, many buildings have been and will continue to be successfully and economically supported on our soils. The problems are overcome by using proven principles of foundation engineering coupled with new theories of soil mechanics.

The predominant Louisiana soil type, found in areas not subject to natural flooding is Pleistocene clay. That is stiff clay with a color ranging from tan to light gray. Most of the time in this high land the Pleistocene is within 20 feet or less of the ground surface, however, north of Baton Rouge and Lafayette it outcrops at the ground surface.

In the river valleys and flood plains, the predominant soil type is a soft gray clay which overlies the Pleistocene or a dense sand. The depths of the Pleistocene and/or dense sand can vary from 40 feet to more than 150 feet.

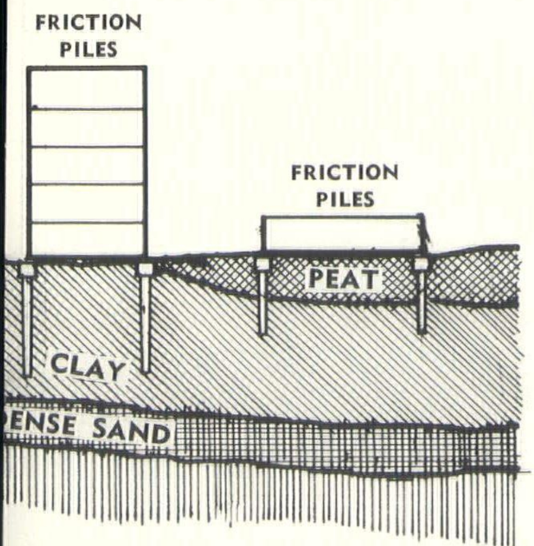
A third type, encountered frequently in the marshy area of south Louisiana, is organic soil. Here 10 to 20 feet of soft peat sometimes containing less than 20% mineral generally overlie soft gray clay with the Pleistocene or dense sand at greater depths. Many of these low lying areas are currently being cleared and developed for homes, industrial sites, and other uses. Buildings on this soil requires sim-



Shown here are Typical Louisiana Building Foundations for typical Louisiana Soils. Competant Architects bearing the A.I.A. identification have designed many outstanding buildings for difficult soil formations. Assisted by professional consultants their work stands the tests of time and weather.

ple but expensive foundations. Piles must be driven for structures of any size. Even for simple one story houses. When construction is done in such swampy areas, drainage is installed which lowers the water table and causes these organic soils to dry out and compress. The results are a downward drag on the piles that causes settlement and cracking in the structures.

Soft gray clay of river bottom land can usually support light one story structures without piling because it has sufficient strength to support the weight on shallow spread footings. The clay is relatively impervious so that draw down of the water table takes a long period of time compared to the life of the building. For the large multi-story buildings in the river bottom lands, piles are a necessity. Most of the time these piles will obtain their bearing in the underlying Pleistocene or dense sands; however, for some of the structures, it is possible to use friction piles deriving their support solely from the soft gray clay. For point bearing piles, if the soil conditions and building codes permit, treated timber piles loaded to 40



tons can be used up to 70 feet in length. Composite timber and concrete piles can be used up to 100 feet in length with loads of between 30 and 40 tons. The various patented piles consisting of a steel pipe surmounted by a concrete filled steel shell can be used for lengths in excess of 100 feet and with loads up to 100 tons. The column loads in the structure, the depth, and the strength of the underlying stratum determine which piles are most economical to use.

With the shortage of space in many of our downtown areas and the tendency towards air conditioned schools, light multi-story structures are being used with greater frequency. These pose problems since funds are not usually available or the loads do not justify long heavily loaded piles. Yet the loadings are three or more times what would be encountered from a one story building. Generally, if the architect tries to keep to a light structural framing system for a two story building with the columns relatively close together, the foundation can consist of spread footings tied together and made sufficiently rigid so as to decrease any differential settlements to tolerable amounts.

An example of a structure where two types of foundations were used for differing buildings is a High School in Berwick, Louisiana. The gymnasium had long spans of about 100 feet with relatively heavy dead loads, and total loads of 200,000 lbs. Piling was necessary to support these columns. The classroom buildings were two story structures with total column loads of about 100,000 lbs. The stadium had similar loadings of about 100,000 lbs. In these two latter structures, the sustained loadings were less than half, approximately ⅓ of the total loadings and continuous footings were used underneath the columns to reduce differential settlements to tolerable amounts. Needless to say, considerable cost savings were achieved by using piling on just one of the buildings rather than for the entire school.

No hard and fast rules can be set up for determining when piles should be used and when they are not needed. A general rule for river bottom soil conditions is that if the total load is less than 65,000 lbs. and/or the sustained load less than 35,000 lbs. per column, spread footings can be used. Exceptions in both directions can be cited to prove the generality of this statement.

When on the high ground where Pleistocene clay is less than 20 feet away, one story buildings are usually supported on spread footings. Multi-story buildings of 5, 6, or 8 stories can be supported on bell bottomed footings resting on the Pleistocene. Notable examples of buildings so constructed are the Student Union at L.S.U., the National American Life Insurance building, the Sears-Roebuck store, and the Fidelity National Bank Building, all in Baton Rouge, as well as the Memorial Hospital, the new Parish Court House, and the Parking Garage, all in Lafayette. Bell bottomed footings over 12 feet in diameter were installed for the Lafayette Memorial Hospital.

In the northern part of Baton Rouge and further north, the Pleistocene clay or the dense sand outcrops. The Baton Rouge Charity Hospital is supported by spread footings resting on this Pleistocene clay at a depth of 4 feet with a net bearing pressure of 6,000 pounds per square foot. Other structures, in Hammond, Jackson, and Opelousas, are supported on spread footings with bearing pressures up to 8,000 pounds per square foot.

Perhaps the most interesting foundations are those used under multi-story buildings that achieve a reduction of settlement by removing some of the soil weight. This is the flotation principle used extensively in other sections of the country where basements are necessary because of temperature conditions. The first building in this area in which the flotation effect of the basement was considered was the Employment Security building in Baton Rouge built in the late 1950's. Here a basement 10 to 15 feet deep was placed under the entire building for mechanical equipment, cafeteria, and other uses. The soil removed from the basement area was more than the weight of the building. In order to further equalize settlements, the interior footings were restricted to a maximum load of 4,000 pounds per foot on the soil. The wall footings were loaded up to 7,000 pounds per foot. This effectively prevented the usual dishing in the building foundation.

Another example of flotation is a recent addition to St. Patrick's Hospital in Lake Charles. In order to obtain a working area for the various piping and other utilities underneath the first floor, a crawl space 4 to 5 feet was excavated over the entire area. While this crawl space excavation did not equal the weight of the building, it provided a significant reduction in loading on the underlying soil so that this building was also supported on spread footings. This building was an addition to an earlier one on pile foundations and essentially similar soil conditions.

The most advanced use of flotation is in the Louisiana National Bank building now under construction in Baton Rouge. The tower section of this building will be twenty-one stories high, of reinforced concrete. The basement will go down for three levels and will contain the main banking floor as well as two levels of parking. Even with such a heavy structure, the net loading on the soil underneath the building is less than 2,000 pounds per square foot which allows for economical construction of the building on a mat foundation without piling. In performing such a deep excavation the ground will swell upward until a loading equal to that of the displaced soil is set thereon. This usually means ten or more stories of the building must be constructed to stop this upward swelling. Several months are required to go from the pouring of the foundation to the tenth floor and in this period of time the foundation moves upwards from ¼ to ½ inch. Thus, any piles underneath the foundation mat would be ineffective unless they had tension connections and were used to hold the mat down.

Eliminating piles from the foundation for a multi-story building, ten stories or more, and substituting a floating foundation, will produce several thousands of square feet of floor space for the cost that would have been spent on the piles. Comparison figures on two buildings built recently show that the floor space obtained in the floating foundation costs approximately $10 per square foot. This of course, is unfinished basement space, suitable for storage, garaging, and other similar uses. Stated otherwise, for the same amount of money, the owner gets 10 to 20 percent more floor space in his building.

There is no substitute for a knowledge of the soil conditions and foundation engineering principles when planning and designing building foundations. As a last example, two buildings were designed by the same architect at the same time in downtown Shreveport. Both buildings were about fifteen stories in height. The architect knew of an old lake and stream on one site which was confirmed by later soil investigations, and planned his building for a pile foundation with just the elevator pit below street level. The piles used were 60 foot long prestressed concrete piles 14 inches square, loaded to 100 tons each. On the second site, the soil was better and two basements were planned. This allowed the use of another floating foundation. The center columns were supported on a mat loaded to 8,000 pounds per square foot. The wall columns were supported on wall footings loaded to 10,000 pounds per square foot.

Building on Louisiana soil requires a knowledge of the soil conditions and how they will affect the proposed building. The time to obtain services of a foundation engineer is when preliminary plans are being prepared. If the structure is small enough, assumed soil conditions can be used in the preparation of preliminary drawings, subject to later verification by a foundation engineer. This will assure a safe and economical foundation design for the owner.

Louis J. Capozzoli, PhD., of Baton Rouge, is a practicing professional engineer specializing in soil and foundation analysis. He has since 1947 practiced throughout the U. S. and very extensively in the Gulf South. He holds a Bachelor of Civil Engineering cum laude from New York University, a Master of Science Degree from Harvard University and a Doctor of Science Degree from Massachusetts Institute of Technology.

The New Architecture

Jesse T. Grice

# of Coastal Louisiana

The new affluence of oil wealth in Coastal Louisiana is reflected in its modern and attractive buildings. Shown here is the Citizen's National Bank in Morgan City. Architect, Lloyd J. Guillory, A.I.A.

by Lloyd J. Guillory, AIA

Architecture has always been affected by various external forces beyond the control of the architect, and here in the region of the newly formed Coastal Section of the A.I.A. there are two such major forces—oil and hurricanes. They present a challenge, either singularly or together, to test the imagination and mettle of any practicing architect. Although the oil industry has had no direct influence on architecture, as far as this writer can determine, the affluence which accompanied this remarkable industry has indeed affected our profession in this area. It has enabled us to design and erect structures which never would have been built without such wealth, as is evidenced by the Morgan City Municipal Auditorium, the largest in the country for a community of its size.

The building boom which accompanied the oil industry has also produced an unbelievable number of bad buildings, as usually occurs in any booming area. Here "pre-fab steel" is by far the largest culprit. The lack of adequate zoning restrictions and inadequate master planning is also profusely in evidence. But, these factors make the role of the architect more necessary and definitely more challenging.

The other major force, hurricanes, had a rather negligible influence on architecture prior to hurricanes Hilda and Betsy. But, after these two 150 mile per hour monsters slammed into the coast in a period of eleven months, the results dictated the future of this area in a dramatic way. The fear which accompanied these great natural disasters caused a mass exodus unequalled in modern history. We found, to our dismay, that the dangers and discomfort of these evacuations were almost as bad as staying behind to face the winds. The inadequacies of the highway system to evacuate such a large mass and the uncertainties of lodging accommodations in other cities presented great discomforts and dangers in themselves. It became dramatically apparent during Betsy that with only one highway running east and west, as it does in Morgan City, there is no right way to run and be assured you are going away from the storm. If you wait long enough to make sure, you have waited too long. I mention this only to emphasize that here the architect enters into a strange and unusual role as the man responsible for the answer to this monumental problem. The public is demanding a solution, and they are getting one, slowly but surely.

If enough safe buildings are erected, they can be used to meet the big shelter demand created by hurricanes. The Morgan City Auditorium housed nearly a thousand people during Betsy. Its large cooking and rest room facilities were able to handle the crowd without great inconvenience to anyone. Two emergency generators provided lighting and ventilation, and hot food was served to all who needed it. The building has no windows or glass other than the front lobby. Its masonry and steel structure, designed for 150 mile per hour winds, gave physical protection and mental comfort to worried minds. The main floor of the building is 10 feet above sea level. This may not mean much to people from the hill country, unless they realize that some parts of levied-in Morgan City, are below sea level.

The Morgan City Municipal Auditorium is the largest in the U. S. for a city of this size. In addition to its primary function it serves as a community disaster shelter. Designed by Lloyd J. Guillory, A.I.A.

The new Southern Bell Telephone Co. building, designed by Bodman, Murrell, and Webb, AIA Architects of Baton Rouge, is another fine example of a building whose design was motivated by hurricane consideration. This is another structure which will never have to be evacuated during a hurricane.

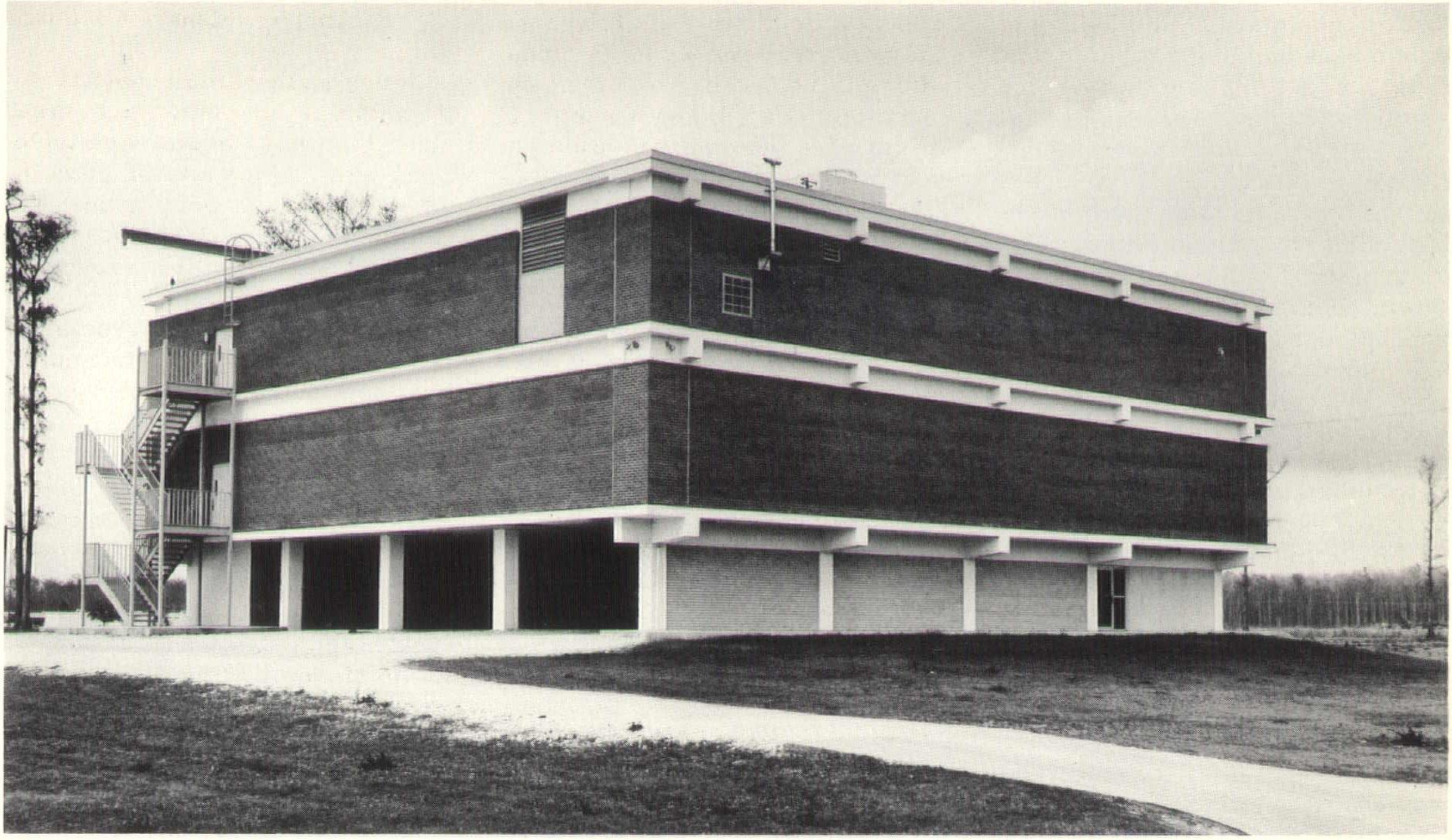
Quite likely every public building and nearly every major private building to be built in this area in the future will be designed to withstand the two great forces and dangers associated with any hurricane —high winds and tidal waves. The first is the easier of the two to provide protection against, since any well designed structure will withstand hurricane winds.

We are now taking a long hard look at the liberal use of glass in large areas because, during a hurricane, the number and size of projectiles flying through the air is beyond imagination. Having spent the last two hurricanes here, I know from

experience that most objects fly through the air with such great speed that they are unrecognizable. Since the boarding-up of glass on a large building is not practical, the simple solution is to reduce these areas, or provide built-in protection devices such as louvers, and protruding fins. Emergency generation is a must in nearly all public buildings now being constructed or on the drawing boards.

We have come to realize now, after more than 500 deaths in Cameron during hurricane Audrey, that the really great danger from a hurricane in this coastal area, even greater than the wind, is the tidal wave. Not only is the danger greater, I found from personal experience that the architectural solution is difficult and costly. Prime examples are the new parish court house and the new Lakewood Hospital. Here we are using a ground floor devoted either to parking or

Jesse T. Grice



Jesse T. Grice

to areas of such unimportance that their flooding can be tolerated. The solution of this problem in the case of a hospital becomes unusually difficult and again expensive.

The construction budget on Lakewood is $6,000,000, but ½ million of that is allocated to elevating the building on stilts and providing ramps to all entrances. When I informed the board of this cost, without hesitation they insisted that it be done. They also agreed on a total energy concept with 3 — 400 KW units providing all necessary power. Emergency water and gas will be stored on site. We will end up with a hurricane-proof, self contained hospital that need never be evacuated as the old Lakewood was during the last big winds.

It is what the public wants and insists on, and it is the role, no, the duty, of the architect to accomplish this goal.

The new architecture of Coastal Louisiana is seen in its churches as well as its commercial buildings. Holy Cross Church, Morgan City, Louisiana, designed by Lloyd J. Guillory, AIA.

The Southern Bell Telephone Company Communications Center in Morgan City is perhaps the best fortified building in coastal Louisiana. Here the vital link with weather scouts, rescue teams and emergency forces are secure. Design by Bodman, Murrell and Webb, A.I.A. Architects.

Jesse T. Grice

Reproduction Methods

by T. Clayton Smith, AIA

"It behooves us to work closely with the blueprinters to improve efficiency and save money."

It is doubtful that many offices ever consider their local blueprinter as providing any services other than preparing blue prints or blue lines of projects and serving as a supply house for drafting materials, papers, etc. In actuality, the local blue printers have many highly sophisticated reproduction procedures that not only produce a more visually appealing project but can also save money and lower overhead.

One of the most expensive items for the production of any project is drafting time. Anything that can be done to increase efficiency in the drafting room will certainly accrue as greater profits and a more professional job. Surprisingly enough, this is one area that your local blueprinter can be of great help.

We are all familiar with "scissor drafting," however, this usually results in a patchy looking print and a reproducible that does not store or wear well. Quite often in high rise structures, basic floors are repetitive and certainly basic floor plans are used by the mechanical and electrical divisions of each office. In the past, sepias were sometimes used to reproduce these repetitive elements; however, this was not too successful as sepias tend to fade and the systems of eradication left marks and ghosts on prints that were not of as good quality as the original tracing.

The blueprinting industry has now developed a film sepia that has all the qualities of a good tracing including the ability to erase in lieu of using a liquid eradicator. One other method of using the sepia process to save drafting time is the production of a reproducible from an original that has material you wish deleted.

Instead of tracing the original less the unwanted material, the blueprinter can prepare a blue line print, cut the unwanted material out and run the sensitized film with the print on top to expose only the areas that are to be deleted, then you use the original tracing with the sensitized film in the regular process and you now have a reproducible with only the wanted material remaining. This is much faster, less chance of error and cheaper.

A prime example of a significant savings in the preparation of prints for bidding and construction is to use a reduced film positive. In this process, tracings are reduced 50% to a film positive and blue prints are then run from the films. Care must be used in preparing the tracings as all scales will be reduced by half; therefore, the noted scale should be the final reduced scale. As an example, assume that you have 30 originals that measure 24″ x 48″ and you wish to have 20 sets of plans prepared; this entails eight square feet per original or 240 square feet per set, or a total of 4800 square feet of blue printing at a cost of 6¢ per square foot for a total cost of $288.00. By using the reduction process, the film positives cost $2.25 per square foot for 2 square feet per original or a total of 60 square feet of film at a total cost of $135.00. Blue printing would now cost 6¢ per square foot for 1,200 square feet for a total of $72.00. The blue printing of originals cost $288.00, the film process and printing cost $207.00 for a net savings of $81.00 for the job. This is a savings of 28%. If your originals are of top quality, this savings can be increased by use of paper in lieu of film at a cost of $1.25 per square foot. An additional savings that is inherent but hard to measure is drafting efficiency in that it is easier to draw at a large scale than a small scale.

It behooves us to work closely with the blueprinters to improve efficiency and save money. Please remember that in order to serve you at his best, he must have good quality originals. He can not reproduce what isn't there and he can not know of your problems unless you ask for his help.

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