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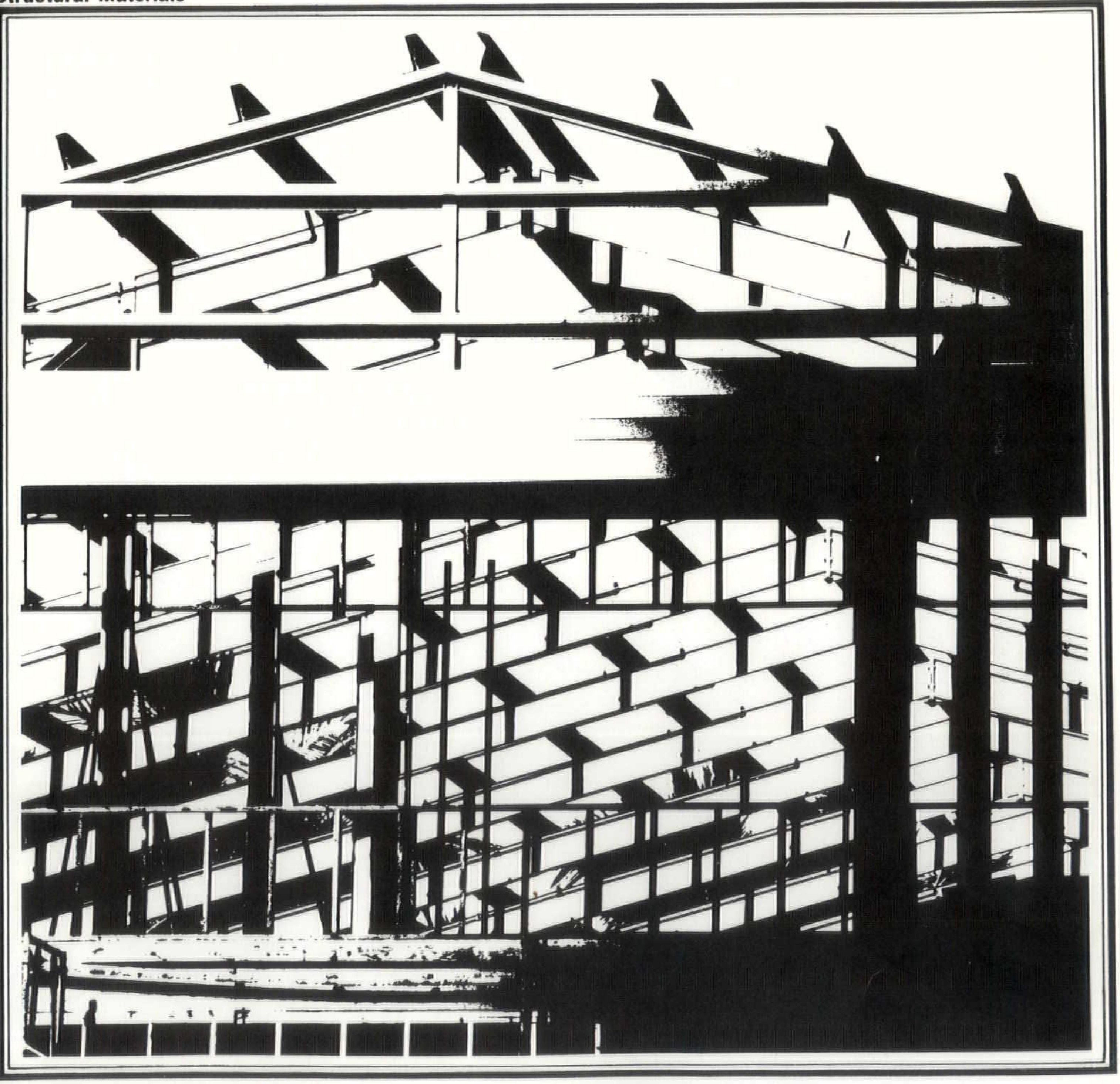
HAWAII ARCHITECT

January, 1981

Structural Materials



HAWAII ARCHITECT

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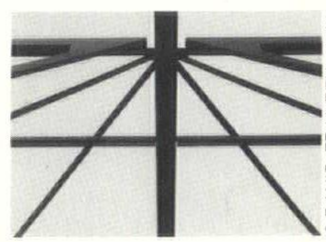

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Headlines:

Your Recycled President for 1981

by DONALD D. CHAPMAN, AIA
President, Hawaii Society/AIA

In these energy conscious days of recycled products, I trust I shall serve equally well as your recycled president. I am certainly looking forward to working with the very talented people you selected to serve as officers, directors, committee members, and also those of you who will be tapped as needed for your expertise in specific areas. Let's hope at the end of year 1981 you will be able to reflect that recycling an old can wasn't such a bad idea.

Donald Chapman, AIA

Speaking for the Hawaii Society, but also very selfishly for myself, I'd like to express heartfelt thanks for Jack Lipman's leadership in negotiating a favorable settlement on our burned out office and for securing new space in the Stanford Court building. Those of us on your executive committee know the countless tedious, frustrating hours he personally put in so that 1981's excom would not be burdened with the search for a home. Jack— *mahalo!*

With the setting up of committees and programs for the coming year, a legislative session about to begin, and the continued escalation of preparations for the 1982 National AIA Convention in Hawaii, we will all be busy. Some thoughts on the coming year.

First, the monthly programs at the Hawaiian Regent will be continued. It's a difficult task continually to achieve programs of interest be they orientated educationally, socially, or as a forum for controversy within our profession. Last year's multiple chairmen did a bang-up job that set our benchmark. In addition to the programs, I personally believe a great deal is accomplished just being together on a regular basis.

Those of you who attended the state convention at Makaha are familiar with our legislative goals for 1981. Top priority will be given to the enactment of legislation concerning lien laws, frivolous suits, reducing the statute of limitations, and limitation of liability. As stated earlier, I intend to combine the wisdom of years with the energy of youth within this Society so please kokua when asked. Remember he who helps also helps himself. If other vital issues spring up I will address them, however, as a general rule will not weaken our efforts on the above by shotgunning a number of lesser issues.

The 1980 Wage Survey by Case & Co. is complete and will be compared with the California and DAGS rates by a special task force. Should the results warrant, the task force will be directed to negotiate a new schedule with DAGS.

As a closing thought I'd like to drop the state convention this year and concentrate the Society's efforts on preparations for the 1982 National Convention and wind up the year with a gala party. It should be a dressy affair that installs the new officers in style, honors and exhibits the Honor Awards, and revives the Pan Pacific Architectural Citation.

I think it's time. HA

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Innovations in Concrete Forming Methods

by DICK ACKERSON,
Charles Pankow Associates

With construction costs increasing even faster than the inflation rate and cost of living indexes, it has become imperative that the concrete industry continue to develop new, more cost-effective forming systems.

There have been innovative improvements to existing methods which have been used successfully in the last few years, and have helped to keep project costs in line. Some of the forming systems used in typical high-rise projects include flying forms, tunnel forms, lift slabs, slip forms, and mechanical jump forms.

Whenever possible, a project should be designed to accommodate a contractor's particular area of expertise, since familiarity with a certain forming method will be reflected in the final costs.

The flying form system has proven to be one of the most economical slab forming systems when each floor is typical in design. A flying form is usually a large prefabricated table top which makes up the formwork prior to pouring a typical elevated floor slab. The forms are designed to carry the dead load of the concrete deck plus the construction live load, and are sized within the allowable crane capacity. There are flying form systems available for purchase or rent and are usually designed with steel or aluminum components.

Although these systems usually perform well, they are generally more costly than designing and building your own system with conventional scaffold towers, lumber, and plywood. Most contractors are now using a flying form system although each has his own preference for type of system and utilizes various techniques in the flying operations.

Tunnel forming is another system that has been used successfully on the Mainland and is picking up popularity in the Islands. It involves the pouring of walls and slabs at the same time by use of a combined wall and slab form known as a tunnel form. Because of the collapsible corners required, the system is usually fabricated in steel with heavy hardware for durability. Consequently, the initial cost of the material is extremely high.

The system also lacks flexibility for various architectural designs and is best suited for rectangular shaped, standard width bays. This system is functional for simply designed structures where re-use is anticipated.

Another slab system which may find its place in Hawaii is the lift slab. This system entails the stack casting of slabs on grade and jacking each slab mechanically into its respective elevated positions. The slabs are poured on the ground, eliminating the need for formwork and safety railings, providing a safer, more controlled environment, and decreasing manpower and equipment requirements.

The slabs can also be stacked with drywall, glass, fixtures, and other finishes on the ground, decreasing the normal hoisting requirement. The slabs are then lifted into position by use of heavy-duty hydraulic jacks bearing on the structural walls and columns. There are a number of jacking systems available for rent which can be obtained with qualified manpower for the jacking operation. This system is effective on mid-size structures generally from three to about eight stories and in areas where

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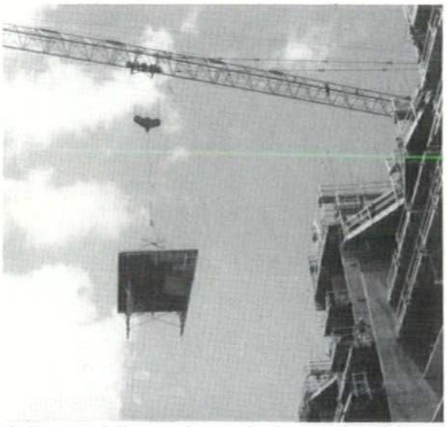

A typical flying form being raised from one level to another.

A slip form operation at Kinalau Tower.

Innovations in Concrete Forming Methods

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equipment and qualified labor are not available. This system may find its place on various Neighbor Island projects where available manpower is a problem.

Concrete wall/column forms are the other major forming expense in a typical high-rise structure. These elements are usually formed by means of a slipform, mechanical jump form, gang forms, or pre-engineered jump form systems.

Slipform construction is one of the most controversial systems used in the construction industry. The continuous slipping movement of the form and the unsecured nature of the concrete introduces a number of variables that are often hard to control unless performed by experienced personnel. When performed correctly, slipforming is one of the most effective methods of achieving a fast construction cycle and controlling the project schedule.

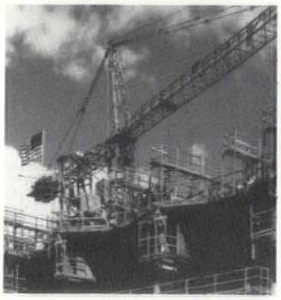
Because of the many variables involved during the slipforming operation, the initial fabrication and assembly of the form is critical. The forms must provide rigidity and yet enough flexibility to accommodate the variables as they occur during the operation of the form. The wall form that contains the concrete is generally four feet high and is supported by a system of horizontal walers (strong backs) that interconnect and tie together all of the typical wall forms into a single unit. This unit is then raised simultaneously by a series of jacks, usually air or hydraulic, that are connected to the walers by yokes. The jacks and entire system are supported on steel rods embedded in the concrete walls and columns and spaced as required to support the loading. Between the wall forms are joists and plywood, creating a working deck for placement of steel and concrete and for maintaining the form. This working deck also serves as a safety platform to protect the men working in the building below.

The slipping operation is more critical than most systems because of the continuous movement of the form, and it requires experienced personnel that can control the variable conditions. With a four-foot form, the slip generally runs with two feet of soft concrete and rises at the rate of about 27 inches per hour. Close monitoring of the concrete is necessary to ensure that it's delivered on schedule and contains the proper mix designs so that the proper concrete characteristics are maintained.

The form must be cleared free of the concrete at the end of each pour to prevent the form from adhering to the concrete. This is done by continuing to jack the form until its top is about 18 to 20 inches above the concrete. The following morning, the form is jacked again about two inches further to prevent any bonding of the form to the concrete.

The walls usually are poured two to three floors above the floor slabs, which requires close coordination with the structural engineer. Details of floor to wall connections and placement of vertical reinforcing must be reviewed with the engineer and properly inspected on the project.

Slipforming generally relieves the equipment requirement since the form is raised by jacks and does not require the use of a crane.



This allows the crane to be used for other requirements and helps to assure a faster cycle. Another advantage of the slipform is that it can generally be maintained and operated by two or three carpenters after it has been fabricated and assembled.

The disadvantages of a slipform system are the initial fabrication costs, lack of flexibility in changes to the walls, and the architectural treatment that can be made to the surface of the walls. The walls also come out of the forms with an uneven texture and require more finishing costs than other available systems.

"Slipform construction is . . . controversial . . ."

The mechanical jump form system is one alternative to the slipform. It has the same advantage of being a self-jacking system which reduces the tower crane requirements. It is also fabricated in a full floor-to-floor height (as compared to the four-foot slipform) which enables easier placement of concrete, reinforcing, and electrical requirements. Another advantage of the jump form is that it produces a higher quality wall finish than in slipform or conventional forming systems. The jump form is also flexible to changes from floor to floor and can utilize form liners to provide other architectural treatment to the walls.

The disadvantages of the mechanical jump form is the cost. It has a high initial cost because all the moveable parts require special machining and the form generally requires an extensive amount of structural steel members. The operation of the form also requires

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A Fresh Look at Structural Steel

Index

by RICHARD M. LIBBEY
Structural Engineer
Richard M. Libbey, Inc.

Over the last few years we have been the structural engineer on a wide range of projects utilizing structural steel. With these as a backdrop, I would like to share with you our experiences and observations relative to the usage of structural steel in Hawaii. It is generally considered that Hawaii is concrete oriented, however structural steel has a major place in our design and construction environment. Its design can be a challenge and the finished product a notable contribution to our architecture.

An analysis of structural steel construction, with total sales of 30 to 40 million annually, may be subdivided into five types of structures:

- High-rise buildings.
- Low-rise office and commercial buildings.
- Pre-engineered metal buildings.
- Special structures.
- Miscellaneous metals, such as stairs, railings, angle support brackets, and such.

Although many don't realize it, there are many structural steel buildings which have been built over the years, including: the Amfac and Hawaii buildings, the Hawaiian Telephone Building, Sheraton Waikiki Hotel, Bank of Hawaii Office Building in Waikiki, and the City Bank Building.

Structural steel low-rise office and commercial buildings include the Ward Centre, First Methodist Church Office and Classroom Building, Pearl Harbor Naval Shipyard Electrical Shop, and the Neal Blaisdell Center.

The examples of pre-engineered metal buildings are too numerous to mention. The range and adaptability of the pre-engineered metal frames, roofing, and siding systems are extremely varied and adaptable. Special structures have included power plants, industrial structures such as the HC&D Mansand plant, and gymnasium roofs such as Punahou School gymnasium currently under construction.

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Miscellaneous metals are significant ingredients of any reasonably large project, including in some instances, metal stairs, angle brackets, railings, and so forth.

With the above range of structures and the different techniques and preferences in detailing of metal structures, it becomes very difficult for an engineer to "learn his trade" except through experience and reliance upon the manufacturer's representatives, material suppliers, and steel fabricators.

In the process of the design and erection of the structures which we have completed in the last few years, we have relied heavily on this capability. The local steel industry is aggressively promoting its products, and we find its representatives very capable and anxious to

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assist us in any way possible, and it takes only a phone call to obtain their assistance.

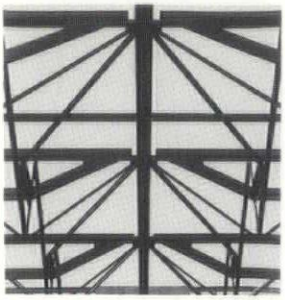
As a group, 19 years ago, they formed an association, The Steel Fabricators and Erectors of Hawaii, to assist in the promotion and the usage of structural steel. Its members consist of the various steel fabricators, material suppliers, and independent detailers all serving the industry here in Hawaii. Ken Sudo of Industrial Welding is this year's president. They meet monthly, and anyone interested in attending one of the meetings may contact Sudo for more information. It would be an excellent opportunity to meet a broad cross section of the structural steel industry. We have heavily relied upon a number of their members in the formulation of design and selection of materials and found them to be most knowledgeable and helpful.

With the challenge of a broad range of projects and the assistance of fabricators and suppliers, over the last few years we have become more familiar with the broad capability of the structural steel industry here in Hawaii. The following four projects will illustrate conditions under which the architectural, functional, and structural requirements resulted in the selection of structural steel:

Punahou School Gymnasium

As part of the Punahou Athletic Facility Development Program, one pavilion and two gymnasium structures are required. John Hara, architect for the project, included in the program for the gymnasiums a requirement for the installation of solar water heating panels on the roof and north clear story lighting, both as energy conservation measures.

This form, coupled with a general feeling that a gymnasium roof wants to be structural steel, led to its selection. The truss form was chosen and different configurations analyzed prior to final selection of the framing system. Mutual Welding, the steel fabricator and erector, assisted greatly in the detailing of the structures to facilitate erection and to obtain maximum economy. Here is a project wherein



function, architecture, and structure have been combined with structural steel being the most logical solution.

The Ward Centre

For an extension of the successful Ward Warehouse concept, the Victoria Ward Estate whose Chapman, Cobeen, Desai, Sakata, Inc., as architects. In order to obtain a somewhat similar yet differently appearing project, Duane Cobeen wanted a two-story structure with a sloping roof system wherein mezzanines could be installed in either the first or second floor spaces. It was anticipated that the structure would be left exposed and, accordingly, some interest was desired in a structural system. Wide flange structural columns, girders and beams were chosen with a composite metal deck and concrete floor system, and deep rib metal roofing supported by Zee purlins similar to those used in pre-en-

"Detailing was straightforward . . ."

gineered metal buildings.

Detailing was straightforward and an economical structure was obtained in compliance with the architectural requirements. S&M Welding was the fabricator and assisted in the detailing. A three-inch composite metal and concrete deck floor system was chosen at a slight premium over a one and one-half-inch metal and concrete deck floor system, but with considerably greater rigidity to provide a stiffer floor. The overall architectural requirements were obtained together with the flexibility for the installation of the mezzanine structures and future change.

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Laurels

HS/AIA Awards Program House of Music, Music and Record Shop

Award for Design Excellence
by Noe & Noe Architects/Bruce Hopper

PROJECT
The House of Music
LOCATION
Ala Moana Center
OWNER
Surfside Hawaii, Inc.
ARCHITECT
Noe & Noe Architects, AIA
PRINCIPAL ARCHITECT
Leon Noe
DESIGN
Noe & Noe Architects/
Bruce Hopper Design
GRAPHICS
Bruce Hopper
INTERIOR DESIGNER
Joanne Clarke
MECHANICAL/ELECTRICAL ENGINEER
Cedric D.O. Chong & Associates, Inc.
ACOUSTICS/VIDEO
Wm Walters
GENERAL CONTRACTOR
Robert M. Kaya Builders, Inc.
CONSTRUCTION PERIOD
April 20 to May 20, 1979

PROJECT DESCRIPTION

MAIN FLOOR
Existing concrete slab on grade
MEZZANINE FLOOR
Existing structural steel frame with wood floor
EXTERIOR/PARTY WALLS
8" reinforced concrete block
PARTITIONS
Gypsum drywall, plaster, Miller Accon Panels

SPECIAL FEATURES

STOREFRONT
½" polished plate, silicone butt glazed
Mezzanine Rail
⅜" tempered polished plate, specially designed stops, chrome pipe rail
LISTENING POST
Mirrored stainless steel, vandal proof speaker
Covers, etched House of Music
General Lighting
5 custom designed high intensity metal halide
Fixtures with spun aluminum dome and stainless
Shields
Sound System
Engineered for sound in specific areas with minimal spillover; integrated with t.v. monitors for video display

COST

Architectural	$190,300
Structural	6,500
Mechanical	15,000
Electrical	*33,200
Total Construction Cost	$245,000
Cost Per Square Foot	65
Furnishings, Including Record Bins	35,000
Graphics (Trademark, Printing, Uniforms, Signage, Displays)	25,000
Sound and Video System	25,000
Wall Covering	5,000
Carpeting	15,000
Total Interior Design Cost	$105,000
GRAND TOTAL	$350,000

*Includes $10,000 for custom designed light fixtures

The House of Music is an existing established musical product store in the Ala Moana Center, Honolulu.

After acquiring the business from its founder, the new owner desired a new image without compromising customer service which is the hallmark of House of Music.

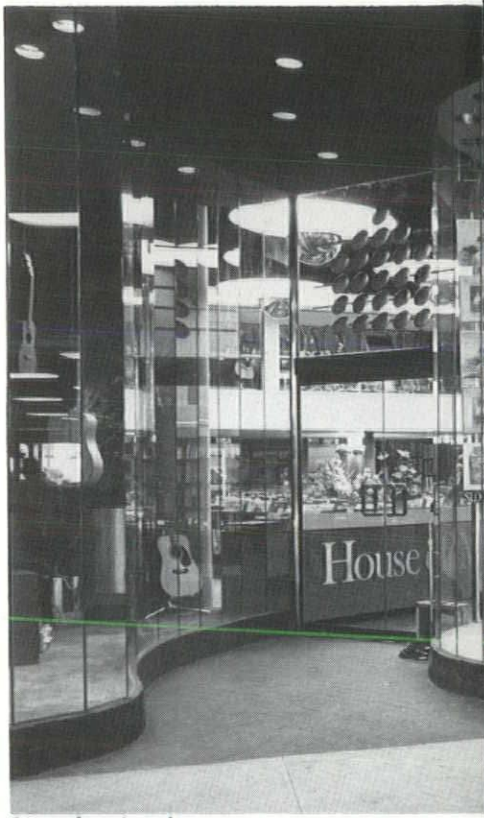
PROJECT SCOPE

The client's original intent was to "freshen up" the storefront to create an image more in keeping with current music trends and clientele. A major requirement was to incorporate visual and audio effects in an easily changeable display area for a variety of items from records to musical instruments.

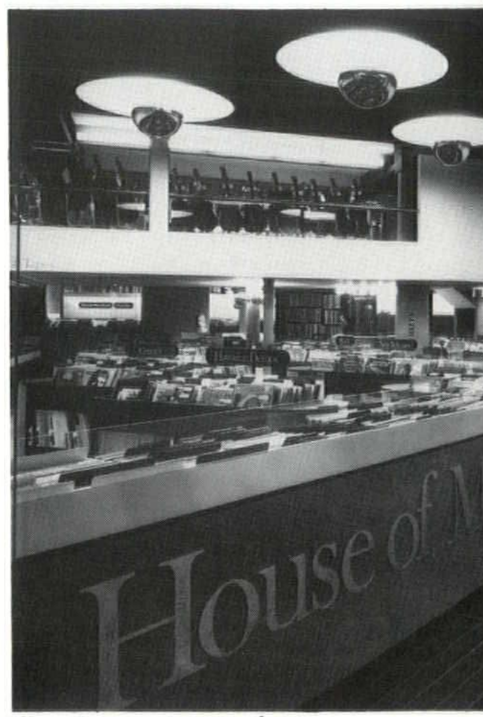
The scope of work expanded upon investigation, because a major problem of the existing store was inefficient and ineffective product display not only in the storefront but throughout the store. Additionally, existing general lighting was subdued and somber and a more dynamic environment was desired.

PHYSICAL LIMITATIONS

The existing space is long, narrow and L-shaped with a low mezzanine. A stair to the mezzanine is hidden from view from the entrance. Steel vertical supports for the mezzanine and octagonal concrete columns over 1' - 6" thick penetrate the space at random. Existing lighting under the mezzanine was surface mounted with less than 7'-0" height clearance. Power was limited to the capacity of the existing supply conduit.



Storefront entrance.



View from entrance door.

JURY COMMENT

A carefully studied successful solution to a multi-functional commercial activity.

The traffic flow throughout the entire project is exceptionally well handled, the entry is inviting, the rounded bin ends reinforce the flow while providing pickets to encourage browsing.

There was an excellent attention to detail. Display well integrated into total problem and its design solution.

A dramatic but consistent use of architecture in an interior space.

et sales booth.

BUDGET AND SCHEDULING

The client's foremost concern was scheduling and budget. Not only was there a definite construction cost ceiling, but the construction had to be done with minimal disruption to store operations during a "slow" time of year. Also because of cost concerns the client requested that as much as possible of the existing record and sheet music bins, shelving, lighting and air conditioning be retained.

DESIGN CONCEPT

Design of the House of Music was based on sight and sound to impart a musical encounter. A curvilinear theme was developed as a visual representation of the fluidity implied by music and a total sound system was engineered throughout the interior and exterior of the store to complete the experience.

SPECIAL EFFECTS/FLEXIBILITY

The storefront was considered the foremost special design effect. Lighting and sound are incorporated into a vortex-like entry to draw people into the store. The curved storefront features television monitors which transmit video tapes of best-selling artist's performances available for sale in the store. An existing structural column was transformed into a mirrored stainless steel "listening post" with the audio system for the television monitors hidden within and engineered to be heard only by people standing directly in front of each monitor. (The covenants of the client's lease forbid any advertising sound spillover from the store into the mall area.)

Flexibility was required at the display platform at the end of the register counter which doubles as a platform for live guest artists' promotions. The platform is wired for sound and video transmission back to the monitors. Additionally, a multitude of creative displays are possible with the curved track above and mirrored and textured walls. Lighting on additional curved track was designed for flexibility and existing eyeballs were reused in some areas for economy.

To obtain optimum visibility throughout the store for maximum sales and minimal shoplifting, and to minimize costs, the existing low bins were reused. Transformation of the low bins to fit the curvilinear theme was accomplished by adding rounded display platforms at the ends and linking them into a pattern which encourages traffic flow throughout the store. New backs with clear plexiglas standards for graphic identification of products enhances sales without sacrificing desired visibility.

The bins were designed to be modular and movable which required nondirectional general lighting. Also, a new curvilinear staircase to the mezzanine was precluded by limited space and budget. To meet lighting and visibility requirements, the existing ceiling was removed to expose the structural slab creating a greater volume which was then accented by five illuminated custom designed metal halide domed fixtures with polished stainless steel shields. The entire wall of the mezzanine floor was removed and replaced with a chrome and glass railing. The dramatic lighting and openness of the mezzanine created the desired effect of maximizing visibility and awareness of the instrument sales area and the general display in the bins. Graphic signage completed the job by pointing the way to the existing stairway which was economically repainted and carpeted.

OTHER CONSIDERATIONS

Lighting was kept simple except where dramatic effects were desired and even then costs were considered. At the ticket sales counter, listening booths, and piano room, for example, economical dime store sockets were recessed and covered with plexi mirrors and theatrical light bulbs. A simple fluorescent grid light soffit lights the cassette tape display which required accommodation of all types and sizes of tapes in both horizontal and vertical display.

To control acoustics, an acoustics expert was consulted to engineer the intricacies of the total sound system including the listening booth system and the video monitors. Also hard plaster walls were alternated with walls covered with corded wall covering or acoustical fabric and cabinets and bins were made up of various combinations of corded wall covering, laminated plastic, wood and glass. The floor was

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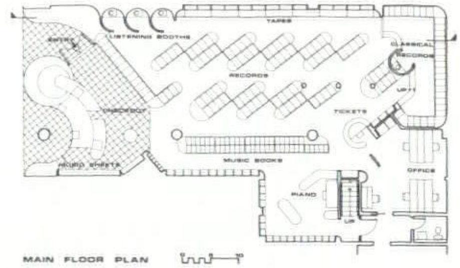
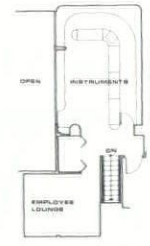
House of Music





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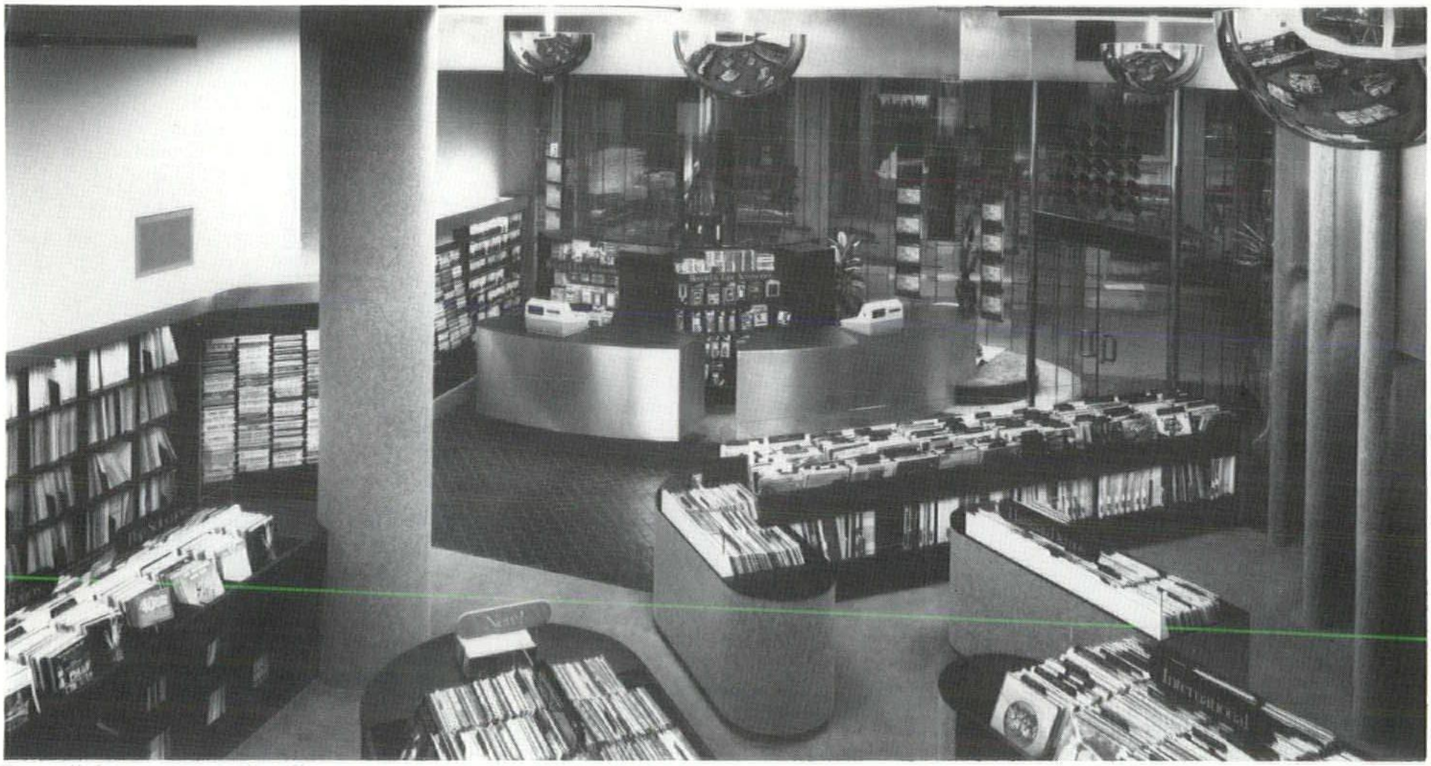

Overall from mezzanine floor.

redone with clay paver tiles at the entry, carpeting throughout the sales area and for economy, the existing teak parquet floor was retained in the office area.

The existing air conditioning system was partially retained and supplemented with a new unit and the system was rezoned for more efficiency. Linear diffusers were used wherever possible to integrate with the total design.

Ala Moana Center lease covenants limited construction time to after store hours. Also, because scheduling and budget were of such concern to the client, construction, including demolition was limited to one month and many long lead items such as the air conditioning unit, storefront glazing and custom lighting and fixtures such as the stainless steel listening post were designed and ordered before construction documents were complete. Modular furniture was selected rather than partitioned spaces at the office for fast, simple installation, space economy, and long term savings.

SUMMARY

The concern for sensitive design tempered by limited budget and tight scheduling demanded that everyone involved in the design process contribute talents in a timely and cooperative manner. We were very fortunate to be a part of a unique team in which the client recognized the value of design to enhance sales and agreed to adjust the scope and budget, the graphics designer was persistent and innovative in his approach to design of the total image of the store beyond graphics, the client's wife's desire to participate and contribution of her talent in interior finish selections, the mechanical engineer who was also the electrical engineer and therefore could efficiently coordinate both disciplines within the bounds of the new energy savings requirements and who also was enthusiastic about exploring the domed lighting, the acoustical consultant whose expertise made possible the use of video and sound in the storefront design and the contractor with whom negotiations began early and who managed to complete construction in a month despite the restrictions of the shopping center's construction rules and regulations.

The fruits of the team's efforts are evident in the comments from staff as well as shoppers which indicate that product awareness, efficiency and shopping pleasure have increased, while current electric company readings show no apparent increase in power consumption. The success of the design is most evident in the growth of sales which has met desired projections for the House of Music. HA

t McInerny, Royal Hawaiian Center . . .

RAND NEW EXCITING STYLE S 131-YEAR-OLD'S LATEST STORE LITTERS WITH GENUINE CERAMIC TILE

s, shining brightly even in utiful new Royal Hawaiian nter now sparkling kaua Avenue in the heart aikiki is multi-department, i-story McInerny, retail hor for the area.

u see here the expanse of 6 popcorn white Ceramic that lends cheer to the r for department after artment, accenting quality McInerny merchandise. e tile fronts escalator to ond floor.

housands and thousands quare feet of Ceramic Tile McInerny added to the erous use of Ceramic Tile ughout the Center help ke the Royal Hawaiian ter a shopping pleasure visitors and home folks e.

oyal Hawaiian Center in kiki is one more achieve- t in continuing the trend in aii for greater and greater ding beauty, expanding of Ceramic Tile in all its active and practical vari-

Architect & Interior Designer: **Tosh Yamashita.**

ractor: **Hawaiian Dredging & Construction Co.**

Hawaii Ceramic Tile, Marble & Terrazzo Promotion Program
615 Piikoi, Suite 804, Honolulu, Hi. 96814, ATTN: John P. Brack
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Atlas Tile Inc. 839-7403
Leo Cecchetto, Inc. 848-2428
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Concrete Forming Methods

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more labor than slipform since the forms must be stripped loose of the concrete by hand before the form can be jacked to the next position.

Improvements in forming systems will occur with the development of new innovations in concrete, such as fiber-reinforced concrete, super plasticizers and high-strength concrete. Fiber reinforced concrete is being developed that will eliminate the need of reinforcing steel in some concrete applications. One of these applications will be in architectural precast cladding.

In recent years, an alkaline-resistant glass fiber has been developed that reacts favorably in hydrated cement. This method will allow the production of architectural cladding in very thin shapes as compared to a conventional reinforced product.

Superplasticizers are a new group of admixtures used to modify the properties of fresh concrete. Their principal feature is the ability to greatly increase concrete slump without an increase in water content. The development of these admixtures will improve the characteristics of concrete making the pumping and placement of concrete much easier. These admixtures are now being used successfully in projects in Europe and are currently being tested in the U.S.

High strength concrete is now being produced under laboratory conditions up to 20,000 psi, and buildings are being designed with 3,000 to 6,000 psi concrete. An increase in the strength of concrete should reduce the concrete and reinforcing steel now required.

These improvements, however, are still inadequate to curb the rising cost of construction. New ideas and techniques must be encouraged by the entire building community. We need a team effort between owners, developers, architects, engineers, contractors, and suppliers to develop new innovations and to design and utilize these ideas in upcoming projects. HA

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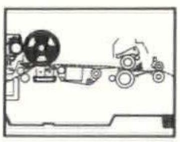
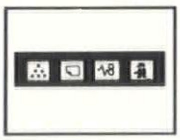
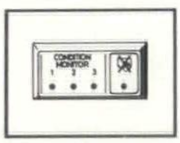


2. Toner recycling system. Keeps the machine cleaner by reusing excess toner. Also saves money by making toner go further.

3. Self-diagnostic system Number One. When things go wrong, it tells you the right thing to do: add toner, add paper, clear the paper path or call the serviceman.

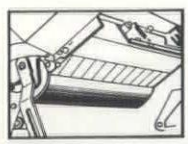


4. Self-diagnostic system Number Two. Signals that let you tell the serviceman over the phone where the problem is located. "Clam-shell" construction and snap-out modules mean fast service when it's needed.



5. Copy interrupt mode. A computerized copy control panel allows interruptions of long copy runs. The original count is stored in the memory while the interrupt copies are made. A touch of a button allows the longer copy run to be restarted, without losing count.

6. Long-life photoconductor drum. The photoconductor drum is longer lasting, thanks to state-of-the-art chemistry and greater resistance to damage.



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Precast Prestressed Concrete Can Save Time

Index

by RICHARD L. HEGLE
Chief Product Engineer
Ameron HC&D

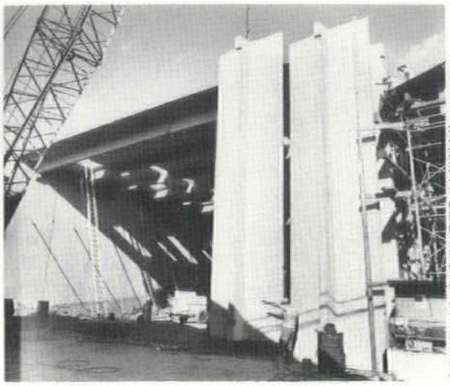
Architects, engineers, and contractors in Hawaii have been using precast prestressed concrete in their structures for about 25 years since the first manufacturing plant was established here. The steady growth in the use of concrete products has resulted in the building of production facilities on the islands of Maui and Hawaii as well as additional plants on Oahu.

The variety of products used and the diversity of structures incorporating them is a tribute to the innovative abilities of the construction professionals to hold down costs by using the latest techniques.

Some of the standard products now available are piles, columns, solid slabs, hollow core slabs, tri-tee, tri-slab, single tee, double tee, beams, beam soffits, joists, spandrels, and bridge girders. In addition, many special sections are provided for individual projects requiring unique structural framing such as stadium seats, folded plate roots, and other.

This development has occurred during a time when the cost of construction has increased tremendously, due in large part to much higher labor and financing costs. Material costs also have risen, but their proportion of the total construction dollar has steadily become less in recent years. Material costs are to a large extent out of the control of the people and firms engaged in construction activity, whereas jobsite labor and the construction schedule can be reduced by increased productivity—fewer men to build a structure in less time. This is where the use of plant-produced precast prestressed concrete can result in great savings.

Many of a project's structural framing members can be produced



GRAPHIC PICTURES HAWAII

in a plant more efficiently than at the job side through the repetitive use of forms, specialized labor-saving equipment, and high strength materials. Simultaneously, site work can proceed, such as placing foundations, grade slabs, and walls or columns, in preparation for the precast floor, roof, or wall framing system.

The availability of mobile and tower cranes, and large capacity trucks enables the contractor to place hundreds of square feet of precast members per day into the structure. Forming labor and material costs are drastically reduced, it not eliminated. Composite concrete topping is placed by pumps or buckets over the precast to create thin, long-span but stiff floor and roof systems. This process is repeated floor after floor with a minimum of site labor and construction time between initial grading and topping out.

Other characteristics of precast prestressed structural framing which can result in less site labor and shorter construction time are:

- Long spans with load carrying capability resulting in fewer columns, walls, and footings to construct.
- Locally produced products resulting in shorter delivery schedules, thereby minimizing lead time and reducing carrying costs.
- Familiarity with the product by local building trades.
- Concrete's natural corrosion and fire resistance without

Continued on Page 22

Precast Prestressed Concrete

Continued from Page 21

additional treatment.

One of the major material, labor, and time-saving features of precast prestressed structural framing is its use as a "leave in place" structural form. The precast deck provides an immediate working platform for plumbers, electricians, and other trades to expedite their work.

Whether it consists only of beams with a cast-in-place slab between, or a complete precast soffit system such as solid plank, tri-tee, or hollow core planks, the precast section generally contains a major portion of the total reinforcing required and much of the total final concrete cross section.

It can almost be considered as a "cost free" forming system when compared to the cost of conventional wood forming requiring many carpenters to repetitively set up and strip plywood forms with their multitude of supports to the floors below.

Another advantage of precast prestressed concrete is that it can be designed to minimize or eliminate formwork requirements. A high ceiling, unfavorable ground conditions, or required access to the space below may make it infeasible to provide shoring. Low-rise structures of non-typical bay layouts also lend themselves to precast systems as economies resulting from repetitive (flying, jump, slip, and such) form utilization cannot be realized.

Alternative structural framing systems are generally evaluated by the architect and engineer during preliminary design of a proposed structure. The most economical solution for a particular site and structure is often not readily determined. This article has attempted to summarize some of the features of one particular construction material and provide the design professional with information to use in this decision making process. HA

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To illustrate this latter point, a recent design change has just been completed wherein a second floor column supporting the roof will be removed to provide a column-free space for a theater. It was possible through a process of strengthening of the wide flange beams and columns to accomplish this. With concrete or wood framing, this would have been an almost insurmountable problem.

First Methodist Church Classroom & Administrative Facilities

As part of the Admiral Thomas Condominium project, a two-story classroom and administrative facility of about 20,000 square feet was constructed for the First Methodist Church. In consultation with Warner Boone, architect, and Swinerton & Walberg, precast, pre-stressed concrete floor members supported by cast-in-place post-tensioned girders were initially chosen as the structural material. Designs were completed and Swinerton & Walberg prepared a complete estimate.

Because of the location of the building outside of the radius of the climbing crane, significant costs were anticipated for crane service, resulting in a higher than anticipated cost. The usage of structural steel with open web steel joists was investigated with the assistance of Carlton Nichol of ICSW. A preliminary design was completed and Industrial Welding, the steel fabricator, provided estimates. The final design resulted in savings of about $2 per square foot, and with the use of structural steel, the cantilever conditions at the corners were easily accommodated.

The team chose nominal joist spacing of approximately five feet to fit the air-conditioning units between the joists, and a three-inch composite metal and concrete deck floor system. The structural steel beams and joists of the roof were sloped to provide the necessary roof drainage. Thus, an efficient, rapidly constructable building was obtained, meeting the architectural requirements.

As with this project and others,

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Structural Steel

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we have found that two-story office and commercial structures of structural steel construction can in many instances be more economically provided than comparable concrete structures when the architectural requirements are unique.

As many of you have noted in architectural magazines, both articles and advertisements indicate a wide usage of structures of this nature on the Mainland. When possible, an extension of our local experience in the future will be the usage of truss girders coupled with open web floor joists such as currently are being promoted by Vulcraft, a Mainland fabricator of open web joists.

Arizona Memorial Shoreside Facility

The Arizona Memorial Shoreside Facility utilizes exposed aggregate architectural concrete for the exposed members in keeping with the design concept of Don Chapman of Chapman, Cobeen, Desai, and Sakata, Inc., project architects. The site, however, rests on filled land where Halawa Stream enters Pearl Harbor. Long term settlements are anticipated and a re-leveling capability was designed into the foundation system.

To provide minimum weight coupled with some degree of flexibility and diaphragm restraint, a structural steel roof system was chosen. One-half-inch in twelve roof slopes were easily provided to facilitate drainage in accordance with Navy standards. A rigid insulation and built-up roofing system was applied over the one and one-half-inch metal deck.

In summary, the adaptability of structural steel together with the capability of Hawaii fabricators and material suppliers has created a wide range of projects wherein structural steel can be economically utilized providing both functional and pleasing architecture. The capabilities of the fabricators and suppliers can be very helpful. The formulation of the design in a team effort with the architect, fabricator, material supplier, and structural engineer can be challenging and yield satisfying results. HA

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