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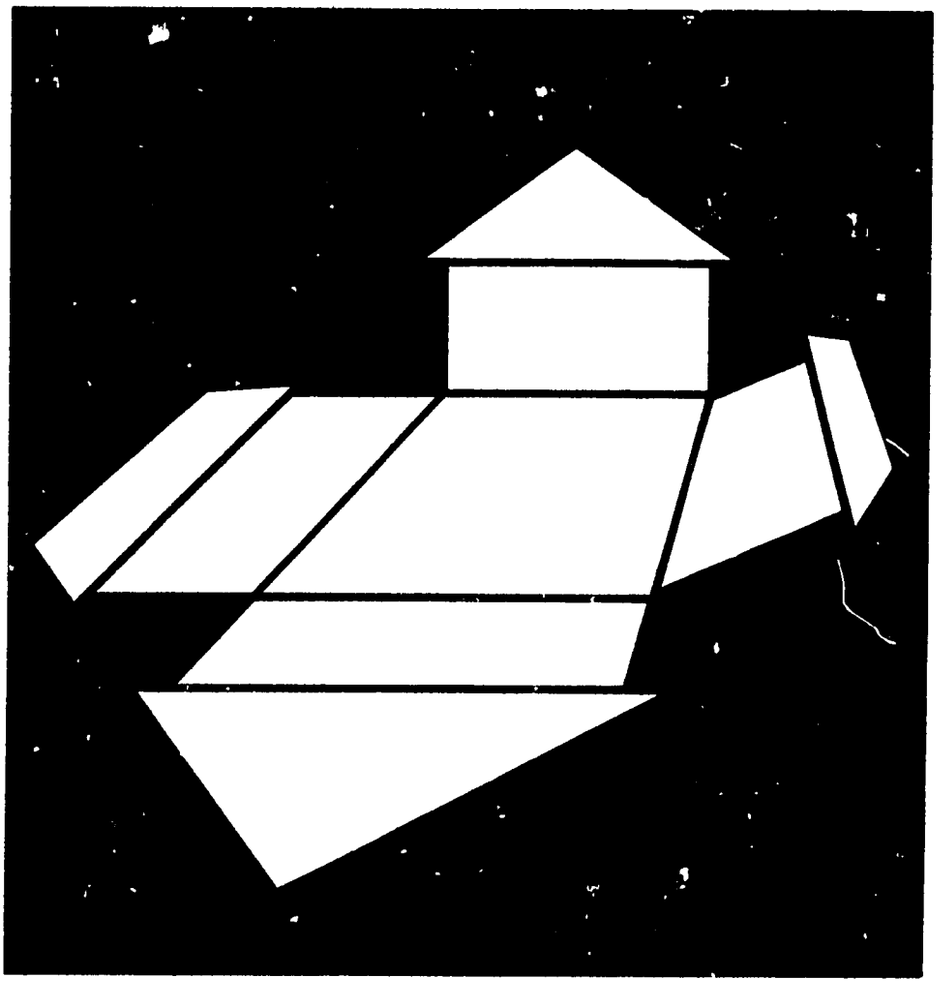
Seminar

New Techniques of Design and Construction of Low Cost Housing



(For Technicians and Officials from Latin America)

Sponsored by the
Agency for International Development, LA/HUD

Conducted by
FCH Services, Inc.

F.C.H

CONTENTS

Note. Because of the length of each presentation and the diversity of information, only the key points and highlights are presented. Due to syntax variations in translation, questions are paraphrased for clarity.

REPORT

SEMINAR ON NEW TECHNIQUES OF DESIGN AND CONSTRUCTION OF LOW COST HOUSING

The seminar held in the early fall of 1972 exchanged ideas on new techniques in the design and construction of low cost housing with 14 housing technicians and officials from Latin America As examples, it used housing solutions developed through industrialized building techniques which were brought into prominence within the building industry in the United States by the research program of the Department of Housing and Urban Development

During the past 10 years the Agency for International Development (AID) and the Foundation for Cooperative Housing (FCH) have worked throughout Latin America assisting in the development of low cost housing programs Although thousands of houses were built with AID loan support, perhaps the most important result of this effort was the creation of new local housing institutes and training of technicians and officials The housing produced in Latin America with AID funds ranges from $300 self-help rural-unit projects to modern apartment buildings for middle income families in the major cities The countries face many common problems, however, the design and construction techniques vary widely from country to country.

FCH has assisted AID in developing housing programs in 14 countries of Latin America and helped in training more than 400 housing and cooperative housing technicians and cooperative housing leaders during the past 10 years. Although it is recognized that there are great differences in the housing technology of the United States and most Latin American countries, experience shows that certain approaches developed in the United States have application in Latin America There are common problems in organizing the design and construction of low cost housing projects The idea for a seminar on new design and construction techniques came from AID/FCH contacts in the field, who felt that certain U S procedures could be adapted to local conditions and reduce costs for housing

With this in mind, AID and FCH developed a seminar as a two-way exchange of information to sort out those techniques which could apply in certain countries It is recognized that "industrialized housing" is not the answer in developing countries where labor is plentiful and inexpensive, and where material costs are high. However, there are new techniques in site planning which can save up to 20 percent in land development and utilities costs which are not yet widely used in Latin America. There are also techniques for setting up small on-site fabrication of housing components which can save time and money even in very simple housing projects. It was hoped that by exposing the participants from Latin America to these new techniques and procedures, they would return home with new ideas and concepts adaptable to their own needs, particularly on organizing and scheduling construction projects to reduce time loss and avoid wasteful procedures. It was not expected that they would duplicate the same type of housing seen in the United States, or set up a factory to produce prefabricated homes However, instruction in the advantages of standardization of basic components, quality certification in the building materials industry, minimum testing facilities performance specifications, and effective management, production and cost controls is useful to each system of local construction.

Based on interviews and discussions with the participants at the end of the seminar the sponsors felt that this objective was achieved, in fact, the participants planned to arrange a follow-up seminar in Caracas under the auspices of the Banco Obrero in 1973 to expand upon the application of material received in this workshop.

The participants were from the following countries*

Costa Rica – Sr Gerardo A. Lara

Dominican Republic – Sr Victor M. Garcia D

Mexico – Arq Andres Bellon

Sr. Carlos M Dias R.

Ing Atanacio Jarero

Panama – Arq Manual Bastista V

Ing Daniel G. Rojas P

Paraguay – Arq. Rudolfo B. Garcia-Vera

Venezuela – Sr Manuel E Chiquito P

Sr Claudio Creamer

Sr Edgard Guinan

Eng Mario de Guinan

Arq Fernando Paparoni

Arq Maria C de Paparoni

The Seminar dealt comprehensively with the subject using as a model the Operation *Breakthrough* program of the U S Department of Housing and Urban Development Recognizing the limited capabilities of less technologically developed countries, the seminar emphasized those aspects of industrialized housing that could be reasonably undertaken This included system management, the use of labor and materials, and financing

An informal classroom technique was used for the prepared lectures with professionals addressing themselves to a given subdivision of the overall subject, accompanied by appropriate visual aid materials Each presentation was followed by a question and answer period and general discussion to allow participants to gain insights into how best to apply the benefits of industrialized housing in their own countries The seminar scheduled two major field trips to study management and technical systems, and to see actual site developments in the construction and finished stages

This report presents digests of presentations of some of the principal speakers providing, together with a synopsis of systems examined on field trips, a summary of information, technologies and viewp imparted to the seminar participants Certain topics and field trip explanations were conducive to ac detail explanation through back and forth questions and answers not readily captive for su rized reporting, such as the methods for joining concrete panels that evolved from the chalk talk des on t the Balency and Neil Mitchell systems by Mr A W Hutchinson in Atlanta

Simultaneous translation was provided throughout the seminar

CHAIRMAN Paul M Campbell, Director of International Training, FCH

CO–CHAIRMAN Craig S Noren, Architect, International Office, FCH

COLLABORATING Dale Barnes, Director, Office of International Affairs, HUD and Staff

Harold Robinson, Housing and Urban Development, Latin American Bureau, AID

L. Albert Wilson, Regional Director, FCH, Atlanta

The appreciation of the participants, AID and FCH is sincerely expressed to all the number of individuals who kindly contributed of their knowledge and time toward the success of this training activity This gratitude includes, among others

Mr. Fred V. Annis, AID and Office of International Affairs, HUD

Mr. Robert Brinkman, Hercules, Descon/Concordia Systems, St Louis Site

Mr. Ervan Bueneman, Regional Director, FCH, Washington

Mr Thomas Callaway, Office of International Affairs, HUD

Mr William F. Clayton, HRW Systems, Inc., Edmondston, Maryland plant

*Agency or company affiliation and address, page

Mr. John Colby, New Communities Development, HUD

Mr. Robert M Dillon, Executive Director, Building Research Advisory Board

Mr. David Evans, Rouse-Wates Limited, Columbia, Maryland

Mr Thomas Faison, National Bureau of Standards, Manager-Operation Breakthrough – Evaluation Team Project

Mr. Robert Freed, Office of International Housing, AID

Mr. Willis Goldbeck, Assistant to the Assistant Secretary for Research and Technology, HUD

Mr. Bert Greenglass, Division of Research and Technology, HUD

Mr. M. O. Gustafson, President, Imperial Homes, Georgia

Mr A. W. Hutchinson, III, Community Building Corporation, Atlanta

Mr Donald Lubes, National Association of Home Builders, Research Foundations Inc.

Mr Walter A. Meisen, Assistant Commissioner for Construction Management, G.S.A

Mr. John Merle, Millstone Construction Company, St Louis, Missouri

Mr Warren Nellis, BRAB, National Research Council

Mr. James Pielert, National Bureau of Standards, Office of Housing and Technology

Mr Dale Rusets, St Louis Planning Commission

Mr. Henry F Shipherd, FCH Services, Inc , Macon, Ga

Mr Edward Spinaio, Rouse-Wates, St Louis, Missouri

Mr William Stacey, National Association of Home Builders, Research Foundation, Inc.

Mr Eric Thomas, LaClede Community Center, St Louis site

Mr Glen Travis, Finkling Walker, Inc , Macon, Georgia

Mr. Allan Trellis, National Association of Home Builders

Mr Jack Warner, President, Warner Consultants

Mr William Werner, Operation BREAKTHROUGH, HUD

Mr. John Henry West, Finkling Walker, Inc., Macon, Georgia

Seminar on New Techniques of Design and Construction for Low Cost Housing

PROGRAM

Monday, 25 September

Welcoming and Introductory Remarks – Mr Harold Robinson – Aid Latin American Bureau

The activities of USAID to promote the construction of more and lower cost housing in Latin America

Mr. Ervan Bueneman – FCH Services, Inc

Cooperative housing in the United States and Latin America, its innovative support for better building methods

Mr. Dale Barnes – HUD Office of International Affairs

Secretary Romney's concern for improved housing production and the subsequent birth of "Operation Breakthrough"

Introduction to Industrialized Housing – Mr. John Colby - HUD New Communities Development

The demand for industrialized housing, its promises and problems. Full, partial and indirect industrialization and some adaptations to Latin America

Organization of "Operation Breakthrough" – Mr. Bert Greenglass - HUD Division of Research and Technology

The concept of "Breakthrough," its organization in HUD and in cooperation with other agencies, the selection of participants and progress monitoring by the control room.

Film – Operation Breakthrough

Lunch

The European Experience - Mr. Thomas Callaway - HUD Office of International Affairs

European leadership in the developing of industrialized housing systems and the adaptations of the European approach in Latin America, Asia, and Africa

Systems Management of Construction – Mr. Walter A Meisen - GSO Asst. Commissioner for Construction Management

Development of integrated construction plans from program preparation, design, contracting, financial planning, scheduling erection and occupancy

Discussion

Tuesday, 26 September

Trip to Bladensburg, Maryland – Inspection of the casting plant for prefabricated concrete panels and slabs

Trip to Columbia, Maryland – Mr. David Evans - Sales Manager, Rouse-Wates Ltd.

Slide presentation - Wates Industrial Housing System - 15 minute inspection of an erection site of pre-fabricated concrete panels and slabs

Trip to Rockville, Maryland – National Bureau of Standards

Lunch

Tour of NBS Testing Facilities – Mr. Thomas Faison - NBS Operation Breakthrough Evaluation Team Project Manager

The testing of large building components for the "Operation Breakthrough" program

Trip to Laboratory of the National Association of Home Builders, Rockville, Maryland – Mr Donald Lubes Assistant Director Building Systems - Mr. William Stacey Director Urban Development Services

The testing of small building components and materials. The testing of sanitary, mechanical, and electrical subassembling

Wednesday, 27 September

Evaluation Procedures for Industrialized Building – Mr. Robert M. Dillon, Building Research Advisory Board, Executive Director

Performance and specifications approach to evaluation. Selection of priority criteria for economy and marketing. Problems of subjective evaluation and the innovative use of materials.

Frame Systems – Mr. Robert Freed, AID Office of International Housing

Use of frame systems in concrete, steel and wood together with local wall materials. Factors of frame systems compared to traditional construction in Latin America.

Panel Systems – Mr. Jack Warner - Warner Consultants Inc., President

Structural and non-structural panel systems in concrete, wood, metal, plastic, others. Benefits of panel systems over frame and box systems

Film–The Dillon Panel System

Lunch

Box and Module Systems – Mr. James Pielert, Structural Engineer, NBS Office of Housing Technology

Fully enclosed prefabricated building units and components - Dwelling size, room size and partial room size units for low density and high density construction

Mr. Allan Trellis, Assistant Director, Technical Services, NAHB – Electrical sanitary and mechanical pre-assembled components for use in traditional construction and industrialized building

Thursday, 28 September

Trip to St. Louis, Missouri – Inspection of St Louis Breakthrough Site No 1, 3331 LaClede Ave.

Friday, 29 September

Inspection of St. Louis Breakthrough Site No. 2 – Trip to Atlanta, Georgia – Trip to Macon, Georgia

Saturday, 30 September

Inspection of Macon Breakthrough Site – Mr Albert Wilson - FCH Southern Atlantic Region, Director

Sunday, 1 October

Trip to Atlanta, Georgia – Inspection of "Seasons Four" Low Cost Cooperative, Thomasville, Georgia – Mr. Albert Wilson

Monday, 2 October

Cooperative Housing Advantages

The advantages to occupants and sponsors of cooperative ownership, management. The function of reserve funds in low cost housing projects.

Future of Industrialized Housing in the United States – Mr Robert Dillon

Some successes and topics for further study, trends of the future, individual versus societal goals and the production and utilizing of housing

Mr. A. W. Hutcheson III, Community Building Industry and formerly Project Manager Building Systems International Inc., Macon project.

Low bearing panel and slab construction for mid- and high-rise up to 16 stories using Balency precast concrete system; Neil Mitchell system used in Florida.

Lunch

Changes in the Building Industry – The Practioners View – Mr. M. O. Gustafson - Imperial Homes, President

Cost control and planning lessons of prefabricated component manufacturers. Pitfalls to be avoided.

Opportunities in Systems Management and Industrialized Building Products in Latin America – Discussion by Participants

Comments on the applicability of construction methods and building systems inspected in "Breakthrough" to conditions in Latin America.

Closing Exercise: Award of Certificates

WELCOMING AND INTRODUCTORY REMARKS

by
Harold Robinson
Chief, Housing and Urban Development
Latin America Bureau, AID

Since this is an AID-sponsored seminar, I was asked to provide some welcoming remarks The Latin America Bureau was most happy to be able to sponsor this seminar on Operation BREAKTHROUGH. We have always considered training as one of the most effective means of development

Training, whether through seminars (I prefer to call them by the more down to earth term, *workshops*), visits of experts, or in-service training is one of the best means for transmitting knowledge. That is, when the training deals with specific, concrete subjects rather than broad generalities Recently, we sponsored very successful seminars on housing management, site planning, and secondary markets for home mortgages. I hope this will be as successful and fruitful

Since 1961, the United States Government has provided loans, grants, or guarantees to Latin America, directly or through agencies such as IDB – over a billion dollars for housing. This has been matched in good part by governments or private entrepreneurs in Latin America With this magnitude of money – small as it is compared to the total need being devoted to home construction, more attention must now be paid to techniques for reducing costs and achieving more efficiency and speed of construction. This seminar is designed to explain some of the techniques being adopted in this country. Their applicability to your countries is for you to determine.

In some ways, the home construction industry in your countries is like it was in the United States during the 1930s. Then the United States housing construction industry operated on a relatively small scale. Large scale housing projects with their concomitant site acquisition, site planning, mass construction, and larger financing needs, were virtually unknown. With the advent of our mortgage insurance, public, low cost housing programs, and Federal support to home banking, large scale planning and construction became a reality. The need for thinking in different and larger terms became essential Site planning took on new dimensions, mass construction, prefabrication, standardization of building components, mechanization, and new financial mechanisms became important for almost the first time Your countries are entering – some have, of course, already entered – that phase. From us you may be able to learn some new methods and systems. Certainly, you should learn from our mistakes what to avoid

The very existence o Operation BREAKTHROUGH indicates that we in the United States feel a continuing need for improvement of our own housing industry and a realization that our systems, too, need an overhauling. This seminar was deliberately located in this building, despite its being an AID-sponsored event, so that you could have closer contact with the people in the Department of Housing and Urban Development who are involved in Operation BREAKTHROUGH. The expertise exists here. I'm sure that I don't have to caution you however, not to take everything you hear as gospel to be transferred directly and fully to your own countries. Nevertheless, I am equally certain that from this seminar you will take away some thoughts, some ideas that will be applicable back in your respective countries. After all, that is the most that can be expected from any seminar.

WELCOME TO PARTICIPANTS OF SEMINAR

Ervan Bueneman, Regional Director,
FCH Services, Inc
Washington, D. C

I am delighted to have the opportunity to greet you on behalf of Mr. Wallace Campbell, President of the Foundation for Cooperative Housing. Mr Campbell is responsible for the Foundation's and FCH Services' international activities. He has asked me to tell you how much he regrets that he cannot be present to greet you and to participate in this seminar.

The concept of a seminar which would enable professionals from other areas of the world to examine Operation *Breakthrough* was suggested by Mr. Campbell sometime ago It is our hope that subsequent seminars open to participants from other regions of the world will follow.

Prior to assuming responsibility for FCH sponsored housing programs in the Middle Atlantic Region of the USA, I was involved in the development of housing, community, and urban development activities in Latin America and other areas of the world I must say that I personally share Mr Campbell's enthusiasm for this seminar. I can see unlimited opportunities for people actively involved in resolving housing and urban development problems and to meet together in this seminar to examine with us efforts in the United States to make a "breakthrough" in what often seems to be the insoluble housing and urban development problem.

FCH is very pleased and proud to be involved with the U. S. Department of Housing and Urban Development and other organizations in Operation *Breakthrough* projects in Macon, Georgia and Detroit, Michigan You will learn in considerable detail more of our experience in these projects.

Recognizing the limited amount of time available to welcome you on behalf of FCH to this seminar, I will not at this time explain FCH's involvement in the field of housing and urban development. We have assembled a series of publications which cover our role and explain the purposes and functions of the Foundation and its subsidiaries. I am certain that Paul Campbell and others will cover this during the course of the seminar

I hope that it will be possible for me to sit in on the seminar from time to time. I have encouraged members of the Mid Atlantic Staff of FCH to participate whenever they have a chance. I am looking forward to meeting you individually and wish you a very pleasant stay in the USA.

THE BIRTH OF OPERATION BREAKTHROUGH

An excerpt of remarks by
Dale Barnes, HUD International Affairs

Housing production in the United States traditionally has been carried out by many individual builders and contractors who use conventional methods. Building has been confined largely to the private sphere, with Government participation in the form of mortgage insurance activities and, in more recent years, various subsidy programs to assist lower income families to obtain needed housing In 1949, Congress established a goal of *a decent home in a suitable living environment for every American* It reaffirmed that goal with the Housing Act of 1968, which called for 26 million housing units to be built in the decade of the 1970s.

To a nation with social vision and enormous technical and productive capacities, this objective seemed easy to attain, and yet it still is largely a dream. Encouraging an accelerated rate of housing production requires removal of many existing constraints in all elements of the housing business, not the least of which is industrialization.

On May 8, 1969, Operation BREAKTHROUGH was announced Its major objective was to markedly increase the total supply of housing by unshackling as many as possible of the bonds that impede industrialization.

In three years, 20 States passed mandatory statewide industrialized housing laws or general purpose building codes – a major impediment to industrialized housing. The goal is to overcome the limitations imposed by thousands of local building codes and to develop greater uniformity that will provide a means for reciprocity in building regulation among the States.

Building trade union actions have led to precedent-setting labor agreements that encourage building of housing in factories on an industrialized basis. These agreements include special factory wage levels instead of higher field wages. Larger proportions of lower skilled workers can be used, and minority training opportunities are provided. The arrangement permits work and jurisdictional rules to facilitate efficient industrial production of housing.

Transportation is a key link to large area markets for factory-built housing BREAKTHROUGH worked with the transport industry, housing producers, other Federal agencies, and State and local agencies, to reduce truck tariffs, highway restraints, and red-tape. BREAKTHROUGH also worked to interest railroads and long-range shippers to handle housing components at reasonable rates, using standard tie-down hardware and flatbeds. Some successes have already been achieved in reducing shipping costs.

A large spectrum of financial institutions have been exposed to industrialized housing. These include: mortgage bankers, insurance companies, commercial banks, savings and loan institutions, and the various governmentally-established organizations involved in the mortgage market.

The management systems used in BREAKTHROUGH are being emulated by industry and other parts of Government. A need for more refined cost controls led BREAKTHROUGH to develop an industrialized housing cost accounting system which brought together the most useful field construction accounting and advanced factory production cost accounting.

All 50 States, and many local communities, have named special representatives to Operation BREAKTHROUGH, which has been a pacesetter in involving State participation in housing and community development.

BREAKTHROUGH design criteria and project surveillance provide high standards for the building industry in effective control of quality during production. New forms of building technology have undergone rigorous evaluation and testing and were found to be feasible. The nine prototype projects provide a model for effective land use in varying urban and geographic settings Two thousand nine hundred thirty eight units were constructed at the sites by the conclusion of the prototype phase of this program.

Initial marketing and occupancy of the prototype sites indicates that economic, social, and racial mixing of families is feasible if community design, living environment, and amenities that indicate good living opportunities, are available. Longer term evaluation of this social consequence of Operation BREAKTHROUGH is necessary for development of community planning policies

INTRODUCTION TO INDUSTRIALIZED HOUSING

An excerpt of remarks by
John Colby–HUD New Communities Development

The Housing Act of 1968 determined that the United States needed 26 million houses over a 10 year span. The need for this enormous amount of housing is shared by Europe and North America, and was especially so in Europe after the end of World War II. The need is also felt by the emerging nations of the world. Both Europe and North America agree that radical methods are required and that only the use of new technology in conjunction with industrialized housing seems to be the answer.

A widespread effort to seek possible application of this technology in the developing countries is being made by European and North American housing manufacturers who are looking for broader markets for their products. Technicians are enthusiastically promoting so-called technology transfer and some housing officials of developing countries have been carried away by the apparent panacea of efficient volume of production of low cost housing.

The promotion of this technology transfer to developing countries has led to many problems – political, economic, and social The importation of large and sophisticated housing plants into those countries directs attention away from basic housing policy changes that are needed. This expensive technology hides the many productive steps a nation can take on its own, without enormous investments and using its own technology, which may provide equal or better answers to housing The promotion of highly industrialized plants, which may not fit the needs of the country, diverts needed resources away from valuable programs into unproductive areas.

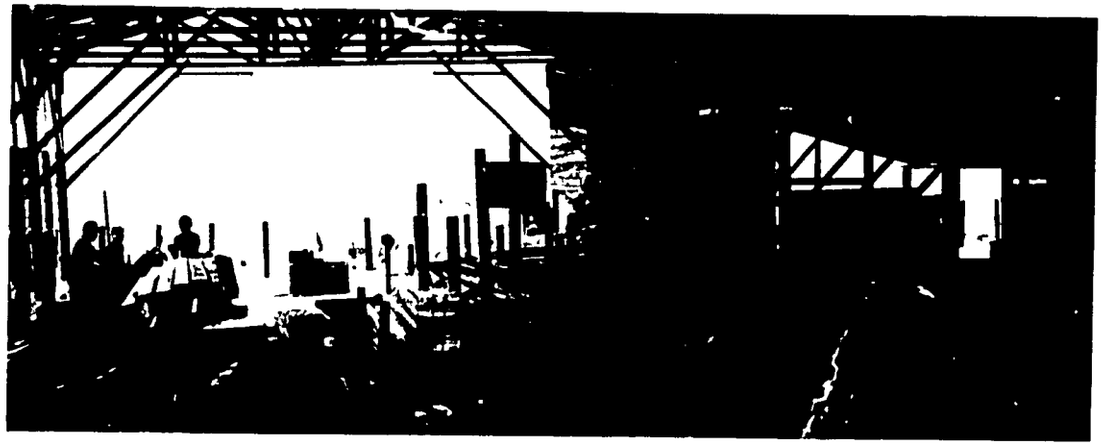
The trend in industrialized economies has been to mass produce, as cheaply as possible, as many of the elements of houses (roofs, floors, walls, ceilings, doors, cabinets, etc) as possible These methods can directly affect the cost of housing, particularly rising construction and labor costs, through mechanization and reduction of construction time. However, in most developing countries the savings of labor are small compared to the large cost of mechanization and automation of housing, and their accompanying high costs of management and coordinating skills The costs and savings of industrialized housing must be balanced against the individual economies of developing countries and their supporting industries. The shortened time of construction of industrialized housing, with the attendant reduction in cost and interim financing, can be an end in itself. But this requires coordinated effort between management, labor, materials, and machines – all of which may be in short supply. Shortcomings in any of these areas can have serious affects in reducing any time savings. This may, in turn, negate interim financing.

Fully industrialized housing systems in the so-called emerging nations are almost bound to be out of face with reality. The degree to which they depend on economic conditions, social goals, supply sources, and technologies (which often do not exist), makes it obvious that efforts in industrialized housing are apt to be difficult, if not outright, failures. However, chances for success improve as the level of industrialization in a country increases.

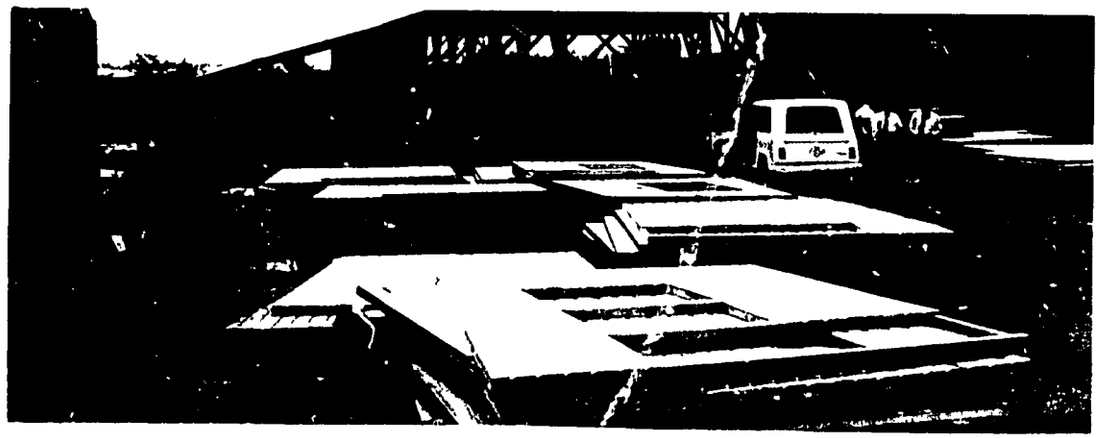
Information on the success or failure of industrialized housing systems in the less technologically developed nations is sparse – particularly information about failures.

INDIRECT INDUSTRIALIZATION — Although these industrially-produced concrete stair units will be installed in conventional houses, this form of indirect industrialization of housing can be useful and productive in developing areas. Furthermore, the producer's investment and risk are much lower than they would be in attempting to industrialize the production of entire houses.

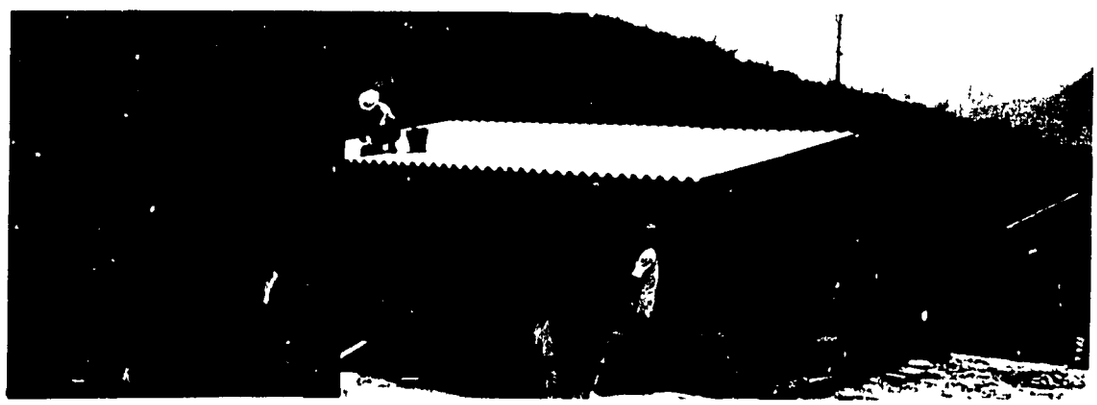
(Photo John G. Colby)



PARTIAL INDUSTRIALIZATION — This small plant in Honduras produces wooden housing components which involve a high degree of standardization and labor specialization. The remaining aspects of industrialization — concentration and mechanization — are present, but in a less developed form.



COMPONENT INVENTORY — Prefabricated components are stored in the yard outside of the plant awaiting assembly at one of several nearby sites. Standardized door and window openings are visible in the panels in the immediate foreground.



ASSEMBLED HOMES — The partially-industrialized, prefabricated panels are assembled on site into simple and relatively inexpensive dwellings with a minimum of fitting and trimming. The materials used in the process respond to local availability.

(Photos by John G Colby)

One Latin American venture was reported and serves as a classic case in point. It all started as the result of a highly optimistic study.

In this illustration, private enterprise, with no government help beyond favorable taxation and import benefits, undertook importation of a highly sophisticated industrialized housing plant The plant, furnished by a European firm, cost $1 million in a dollar-short economy At the outset, a race against time and interest on the loan began and a high production rate was needed to offset the high financial costs. Planning mistakes took plant construction well beyond its original nine-month schedule and costs exceeded 50 percent Delay in constructing the plant caused corresponding problems No time was permitted for trial production to test components and this was to have far-reaching effects at the consumer end where complaints are still heard about building defects and leaking roofs Technical assistance, which should have been provided by the seller of the plant, was not given, even though he was drawing royalties on the system As production went on quality improved, but the initial poor quality of the housing damaged the company's reputation

Further problems beset the company when labor under the impression that production was exceeding sales, undertook a slow-down to preserve their jobs Fire, flood, and other accidents took their toll The lack of critical parts for the company's trucks caused months of delay and bottlenecked production – in some cases for the want of a fanbelt

Certain critical materials were in short supply or not available in the area Eventually, the company had to develop in miniature the many supporting industries normally found in industrialized countries.

These and other problems contributed to high costs and overhead Losses accrued every day – as much as $1,000 per day - and soon all cash reserves were exhausted and the company went bankrupt Private investors bore the brunt of the financial loss The government lost the potential of valuable tax revenues and society suffered the disappointment of not having enough housing But the greatest loss was brought about because valuable resources were diverted and consumed The housing shortage was aggravated rather than alleviated

It can be seen that normal industrialized operating problems are exaggerated by low order industrialization in the surrounding area The high costs of self-sufficiency in the economy are prohibitive to both private and public ventures Industrialization is a composite of parts, some of which are useful in developing economies, some of which are not Systemization of products, specialization of labor, concentration of production and marketing, and mechanization of production are variable aspects of industrialization These and their implementation involve greater risk as each is added on

Industrialization has many stratems running from low to high risk, depending on which and what combination of variables are used These must be modeled after the particular level of development in each country Intermediate product technologies are needed as a step to partial or full industrialization of housing and should proceed in the sequence of economic development

Questions and Answers

Q. Were any other case studies made?

A. *Yes, two others One on Southeast Asia and one on Africa The African report, by Don Turner and John Turner (no relation), was made after a 2½ month survey of Tanzania, Kenya, and Uganda Hopefully, they will make a case study of Latin America to expand on this case material. We searched the United Nation's development program records, along with FCH, HUD, and AID, and added much of our own experience to make this a logical case study*

Q. What type of housing was involved in your case study?

A. *They were prefabricated highrise multi-family units?*

Q Are copies of your study available?

A. *Yes*

ORGANIZATION OF OPERATION BREAKTHROUGH

An excerpt of remarks by
Bert Greenglass, HUD Office of
Research and Technology

There are certain techniques of management in the aerospace and nuclear industries that were brought into the Operation BREAKTHROUGH program because they were transferable to housing However, other unusual forms of management had to be developed In BREAKTHROUGH, the bulk of management systems were not developed to manage in detail, but to give lower management an incentive so that it would not have to be closely supervised Also, it was designed to force the small business man participating in the program to form his own management structure

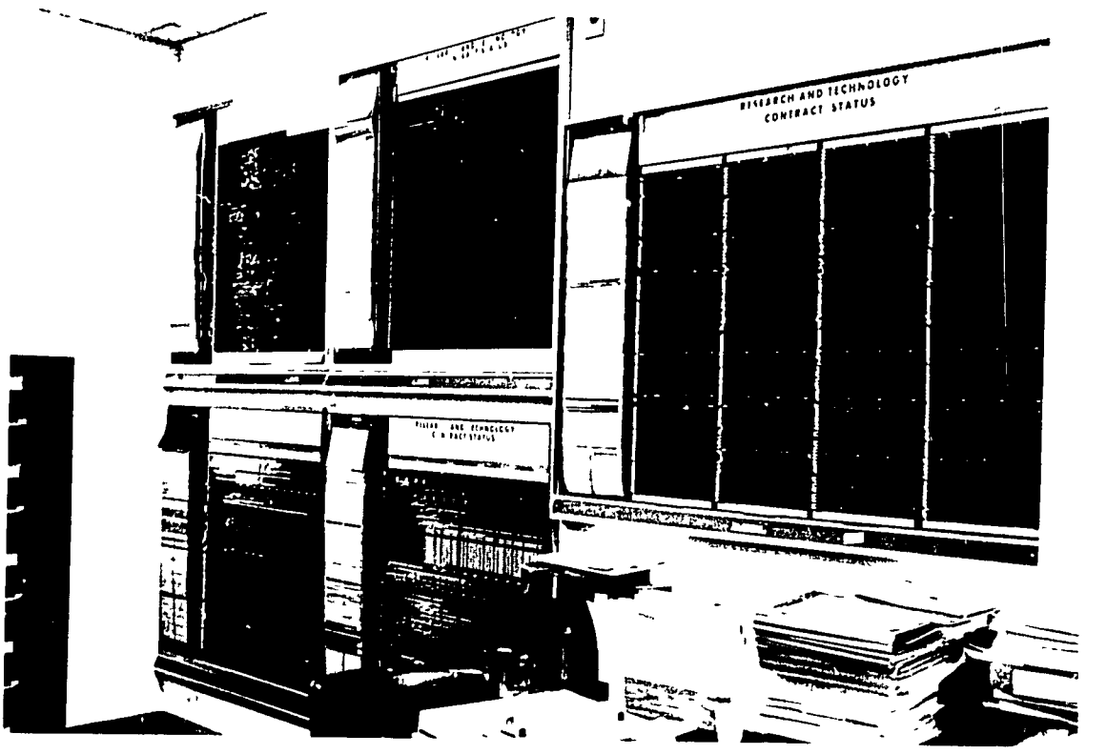
Unusual forms of management were needed to coordinate the many different types and forms of construction at the nine BREAKTHROUGH sites The program operates under constraints of public acceptance, zoning, quality assurance, transportation, fragmented markets, land banking, labor union participation, financing, government subsidy, local codes, geographic temperature barriers, and sub-system alignments. New management techniques had to be devised

A complex contractor/sub-contractor organization was developed with Washington serving as the prime contractor. Staffing limitations made it necessary for Washington to delegate most of the functions to private organizations. For each of the nine BREAKTHROUGH sites, a prototype site planner was selected to help design it, a prototype site developer insured that everything was built. Ninety architect-engineering firms worked with the developers and testing laboratories to develop the systems, and ultimately with the 22 housing systems producers to get them built Involved were 3,000 dwelling units, 227 single family, 830 detached single family, 580 low-rise, 1150 highrise, and 151 mid-rise The building materials used were wood, concrete, steel, and plastic The housing systems involved modular and panel units, constructed in place or as modified conventional housing. In addition to the housing, BREAKTHROUGH produced seven community centers, eight swimming pools, two schools, 20 to 25 stores, including supermarkets; 20,000 square feet of professional office space, parking facilities; and special utility areas

This coordinated effort required a systems approach which retained a flexibility that would permit management to change its mind as the occasion required Remember, the program was experimental The organization formed in Washington is the equivalent of a construction corporation that uses a "control room" approach for program evaluation and analysis It permits the overall job to be broken into tasks small enough to be done by individual organizations With this technique, BREAKTHROUGH moved ahead simultaneously with parallel activities This brought great savings in time for development and construction.

With the control system, budgets could be developed and planned, and management of money could be closely supervised ahead of the actual event Each contractor was required to report on costs, product schedules, man-hours, and other information pertinent to the project Information is funneled into the control room and posted on charts for easy reference The daily performance at each site can be evaluated and trouble areas quickly spotted, continuous program evaluation is possible and it allows for redesign when necessary The overlapping input of reports from each contractor insures the reliability of the information and errors in decision-making are held to the minimum

In writing a contract it is necessary that the product be fully described and defined and that specific delivery dates and costs be identified The control room approach allows easy tracking of contracts because all of the information pertinent to its fulfillment is visually displayed. It is also possible to determine how good a manager is in controlling his program.



Questions and Answers

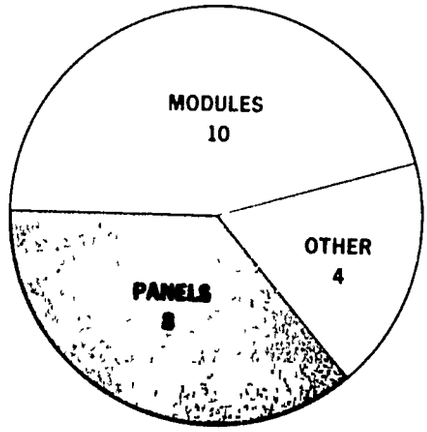
Q. Why were so many areas selected as BREAKTHROUGH sites, rather than one?

A. *If the main purpose of BREAKTHROUGH was to transfer technology, only one site would have been used. The purpose is to demonstrate on a national scale what industrialized housing is all about. This is being done in the major market areas of the country. It was felt that people on the West Coast would not come to the East Coast to see what was being done. So, for market and display purposes, several places were selected. Another reason was the varying kinds of housing. Could a wooden structure be built on the East Coast that would hold up on the West Coast? Could a house be built in Macon, Georgia, which is closer to warmer weather, that could be used in Seattle, Washington? That was part of the problem of market aggregation. If a man builds a house at the factory, his investment in factory production must be offset by volume production. If he can sell only in one locale, he can't get his investment back. This was one of the fallacies of industrialized housing in the U. S. The point was to identify as large a market area as possible.*

BREAKTHROUGH IN PRACTICE

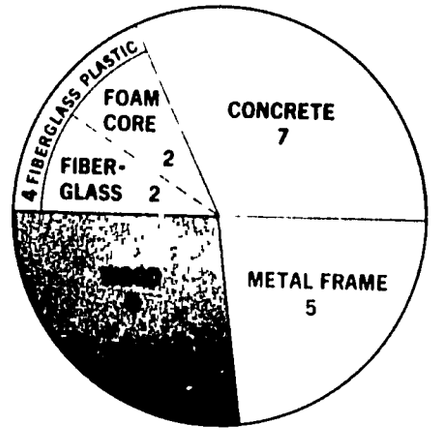
An Excerpt of a Presentation
made by William Werner, HUD
Operation BREAKTHROUGH

STRUCTURAL FORM
(22 SYSTEMS)



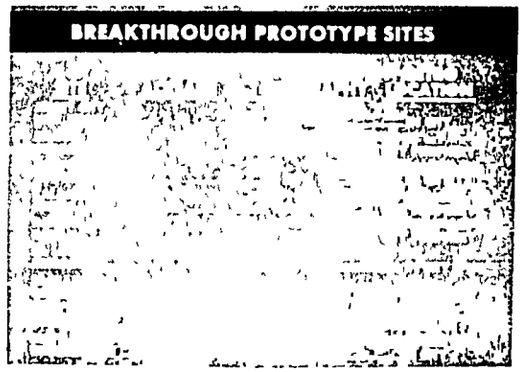
After an extensive technical evaluation, Operation BREAKTHROUGH selected 22 systems for demonstration. There are 10 modular systems, eight panel systems, and four that were considered "other" types because they either had a predominance of on-site construction or were combination of modular units and panels.

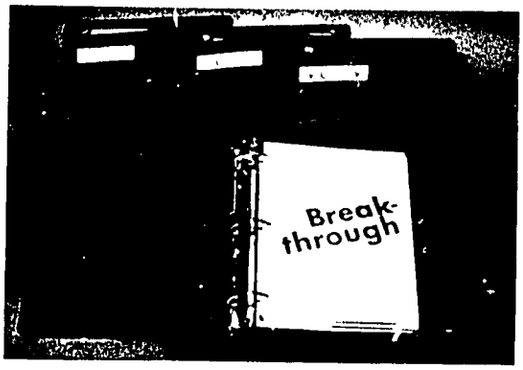
STRUCTURAL MATERIALS
(22 SYSTEMS)



As to construction materials, seven systems employ concrete, five use metal frames, and six are of wood and a category of glass fiber and foam core. The later are the more innovative systems in the program, and generally, are constructed as single-family housing and low-rise buildings of up to three stories.

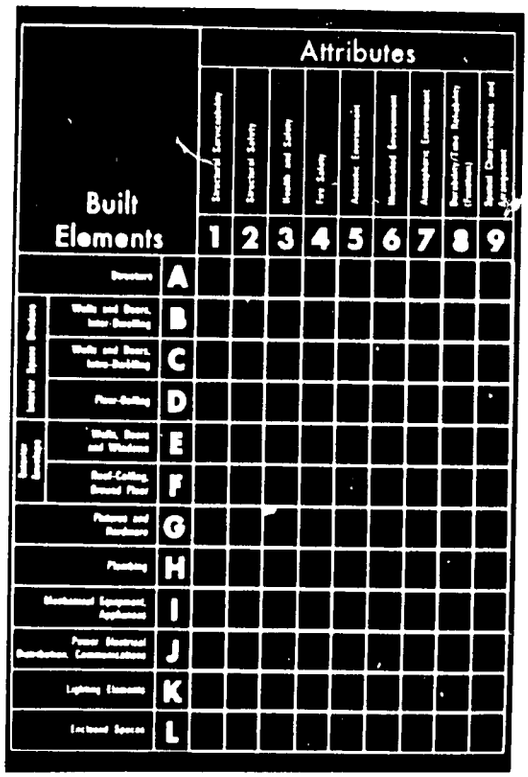
BREAKTHROUGH demonstrations are located on nine sites through the country. Several are on in-city urban renewal sites, others are in suburban areas

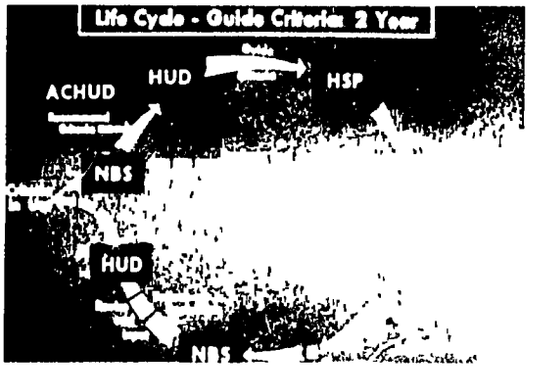




When evaluation of the systems began, it was found that the code structure in this country, which is essentially based on a prescriptive type of acceptance procedure, would not be fully responsive to innovative technology and BREAK-THROUGH. Within the concept of a research program HUD and the National Bureau of Standards took this opportunity to develop a performance-base document that could be used for evaluating innovative systems. This is the guide criteria for Operation BREAKTHROUGH

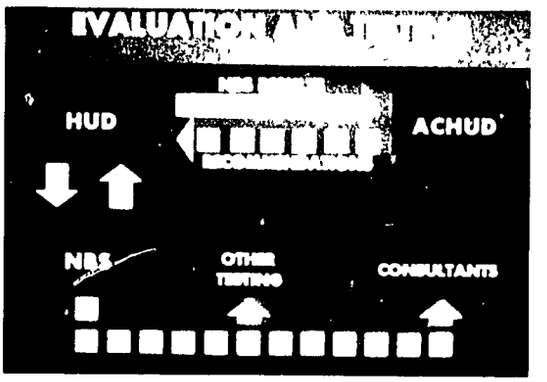
In developing the document, the housing unit was subdivided into what is referred to as the "built elements" the hardware parts of the housing system. The total of these constitute a complete housing unit. Also provide performance attributes, the things that are sought after. The attributes range from structural safety to fire and environmental considerations. Present codes in the U.S. are generally concerned with public health and safety. BREAKTHROUGH was concerned about that, too, but it added another aspect which has to do with the environment, habitability, and architectural use of the spaces. This is not normally found in a building code





In addition to the criteria document developed with the National Bureau of Standards, an advisory group was drawn from the National Academies of Science and Engineering to review the BREAKTHROUGH program, and, in particular, the things that were being done in technology. The criteria was developed by the National Bureau of Standards, reviewed by the advisory committee and HUD, and transmitted to the housing systems producers. During this process, BREAKTHROUGH got technical feedback, and desirable changes that were identified were used to refine the documents Ultimately, after evaluation of the units on the sites, the document will be rewritten so that other organizations within HUD can evaluate new housing systems that are developed.

During the program, the National Bureau of Standards accomplished evaluation and testing for HUD NBS coordinated with other testing laboratories and consultants to evaluate and test housing systems HUD, in turn, worked with the panel from the National Academy of Sciences in reviewing and evaluating the final housing systems.



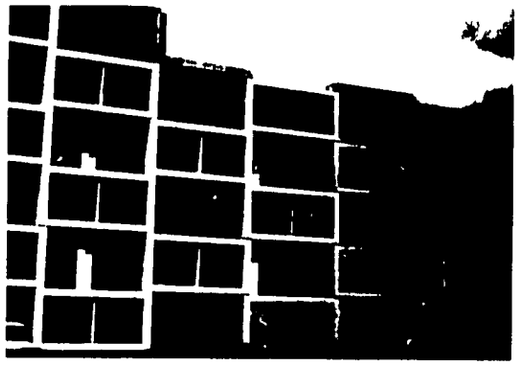
There are several types of housing demonstrated in BREAKTHROUGH. The Levitt system uses woodframe construction in a concept that exemplifies the industrialized process Levitt builds a complete housing module in the factory and transports it to the site completely finished, ready for erection and occupancy

The Alcoa system employs a modular core which contains the mechanical, electrical, plumbing, and all other intricate and expensive parts of the housing system The core is delivered to the construction site where the remainder of the housing unit is fabricated of panels, erected in place, and inside finishing completed. The advantage of this process is that shipping costs are reduced because less complicated interior spaces can be finished in the field almost as economically as in the plant.

The Scholz system uses different approaches that vary the facade and architectural treatment of its houses This is a multi-family housing unit

This steel-framed townhouse system by Boise-Cascade is a departure from current practice. It is an attached housing unit in which the builder uses light gauge steel wall studs and floor framing in lieu of wood.

Pante has one of the more innovative systems. It employs panels that are four feet wide and eight feet high The interior surface is plywood on which traditional gypsum board can be attached The exterior surface is a cement asbestos board the surface of which can be finished in any type of architectural treatment desired Here, Pante applied on epoxy grout and stone aggregate finish The panel is foamed in place in the factory with about two pounds per cubic foot density of uretahane foam The foam provides thermal insulation for heating, ventilating, air conditioning, and acoustical properties The panel is built with an aluminum frame which goes all around the unit, with a spline driven down between adjacent panels as a connector

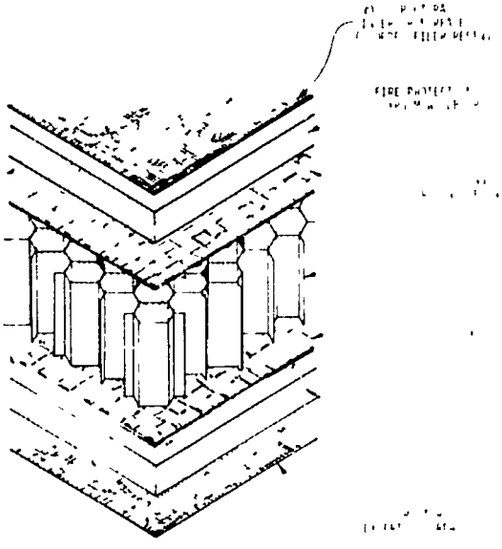


Generally speaking, when concrete modules are erected they are placed one on top of the other and side by side so that double floors, ceilings, and walls result at the junctions The Shelley system, which was developed in Puerto Rico, erects the modules in a checkerboard pattern. The module, containing the kitchen, bathroom, plumbing, mechanical, electrical, and heating elements, is built in the factory. In the field, the space that is created in the living, dining, and bedroom areas which are finished on-site.

BREAKTHROUGH established a performance level for certain aspects of some systems This is a test of the column used in the Shelley system If this system were designed according to the ACI code, since there is no transfer of reinforcing steel at the joint, it would be a straight bearing connection and the column would be appreciably greater in size In designing this system, Shelley used a particular configuration of ties at the column to confine the concrete, as well as a neophrene/steel bearing plate They presented a very good scientific case that this column is acceptable, the ACI code notwithstanding The column was subjected to BREAKTHROUGH performance loading tests and it was determined that the ultimate strength of this column could be developed in the joint The system was acceptable even though it violated a prescriptive requirement in the ACI building code

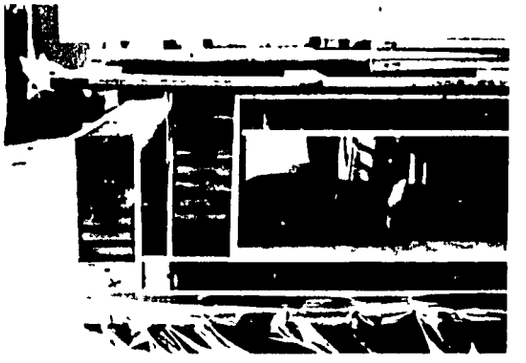
The MSC system employs a glass fiber reinforced polyester structural material. The skins are about 08 inches thick The stiffeners are of the same material, about 05 inches thick, and bonded with polyester or epoxy adhesives This type of housing system was difficult to evaluate because it is not generally covered in building codes BREAKTHROUGH was looking for performance (structure, fire, acoustic, habitability), and the system was subjected to testing at the National Bureau of Standards It was learned that fire performance of this system was at a level not considered appropriate for single-family housing in BREAKTHROUGH, which recommended a performance level of 20 minutes for fire endurance MSC was able to develop a process of insulation and polyester binder which is packed into the corrugations at a predetermined density. On that basis, the walls tested out to the performance recommendations

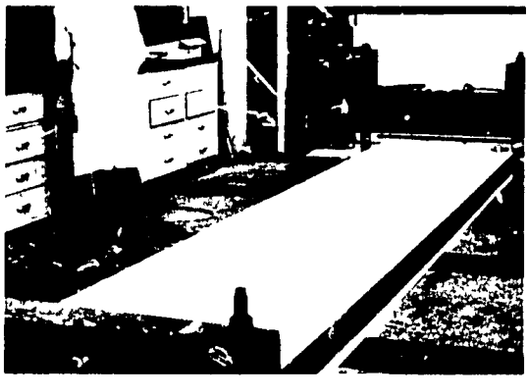
This townhouse construction system by Boise-Cascade uses traditional construction materials It shows some of the things that can be done to relieve the front elevation to get a more pleasing appearance, by the use of balconies and sidewalls



The TRW system employs aerospace technology and materials in ways which engineers may not be quite familiar. This sandwich panel system employs a paper honeycomb and fiberglass roving on which epoxy resin is sprayed The honeycomb core is imbedded in the roving, with the process repeated on the other side, then oven-cured Gypsum board is familiar in this country as an interior surface, but it has to be adequately protected from the weather and hard usage The floor construction employs the same sandwich concept, but with a plywood subfloor, giving a very stiff floor in relation to the conventional wood joist plywood system This system has good fire resistant properties

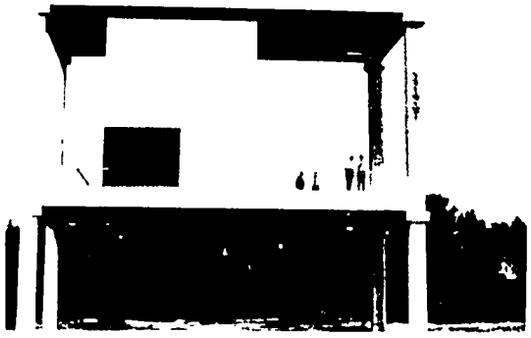
Shown here are samples under structural test at the National Bureau of Standards. Connections and corner details where the gypsum board is subjected to compression and tensile stresses were evaluated

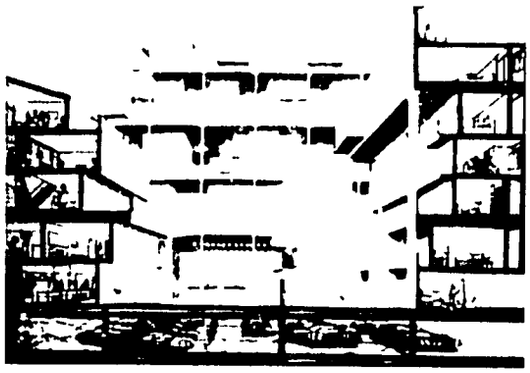




This is a bending test performed on the floor construction. This panel under ultimate loading deflected 18 inches and was still able to carry load.

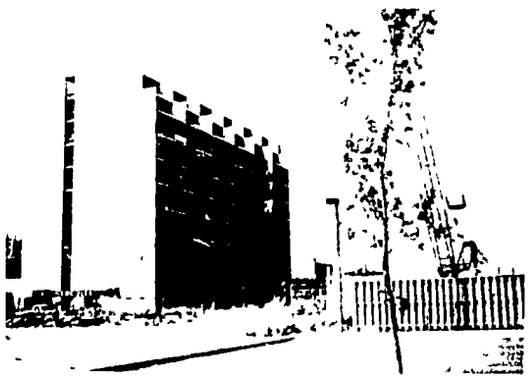
The Towland concept shown here combines an innovative engineering concept with a new approach to living and land use. The concrete frames create land in inner city areas. The platforms provide a structural frame on which modular units can be inserted - one-family, townhouse, or three-story housing. The approach is to get away from highrise and make the occupants feel that they are more a part of their individual housing unit. This system is being demonstrated in Seattle, Washington.



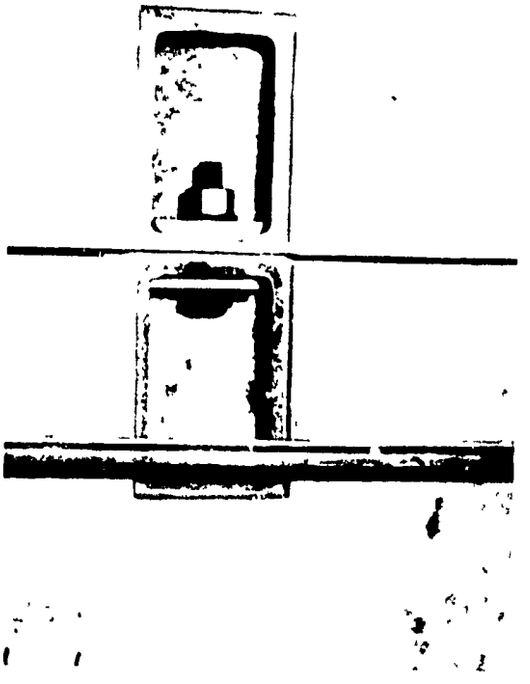


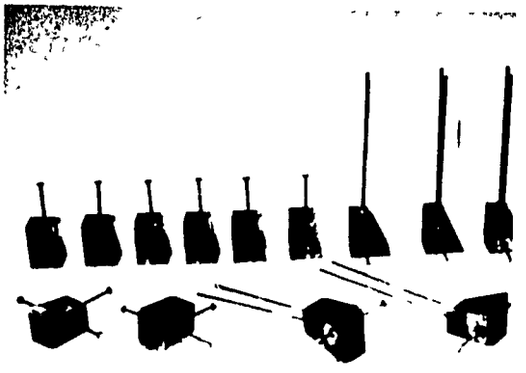
This overall view of the concept envisions its use as an inner city site with parking beneath

A different approach to panel use is the system developed by Descon-Concordia. This system is not too different from the European systems such as Camci and Tacoba, except that all joints are mechanically-connected dry joints. No grout is used to connect the panels together.



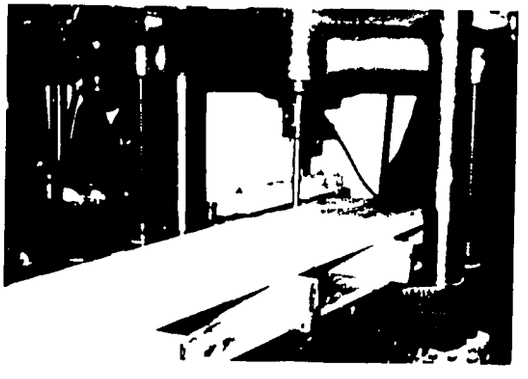
This is a connection between two floor panels. It is a bolted connection that attempts to get away from pouring concrete in the field. Theoretically, it can be worked in extremely cold weather or in the rain.

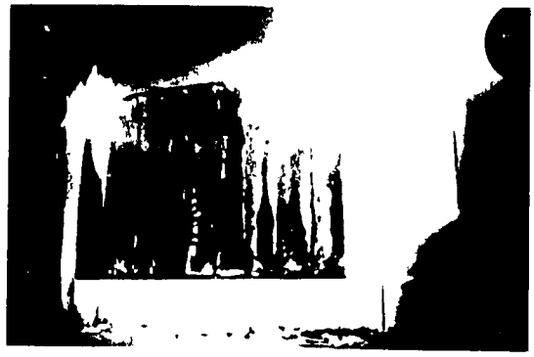




There are different types of connections used to connect the wall and floor panels together. These are samples tested at the National Bureau of Standards to verify that they could develop the loads that were assumed in the designs.

It is known that conventional floor materials behave well under furniture leg punching, high heels, etc. Little is known about innovative system behavior. It was necessary to backtrack to establish the level of performance of conventional construction to use as a basis for accepting a new type of construction under the same test conditions.

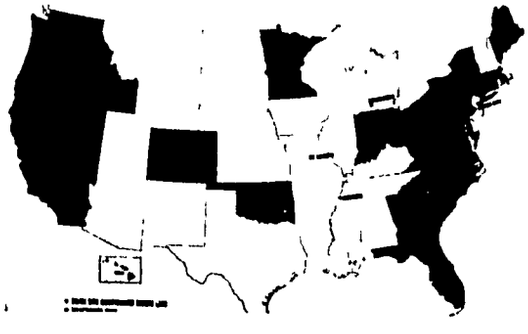




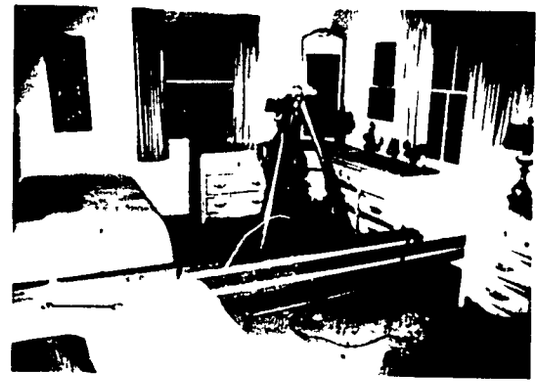
This is a test to determine the vibration characteristics of a conventional floor The results were used as a benchmark The testing was performed on a housing unit which was completed and furnished at one of the prototype sites

Transportation is a critical item where modular and industrialized housing is concerned This shipment went from the Levitt plant in Kalamazoo, Michigan, to Seattle, Washington Several of the modules were instrumented to determine what types of loads and stress they were subjected to The purpose was to check a module in this configuration to see if it would stand up under the anticipated loads when moved by railroad or truck

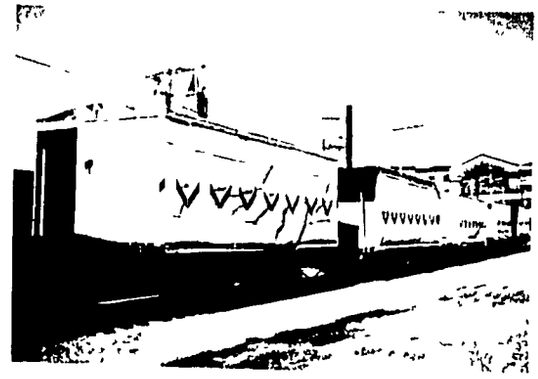
STATES WITH INDUSTRIALIZED HOUSING LAWS AND BREAKTHROUGH SITES



Fire testing was done on conventional single-family construction to establish performance loads for innovative systems



Field testing of acoustics was done to establish certain levels and to verify laboratory tests. This insured that the units were capable of performing at the levels recommended.



With the impetus of the BREAKTHROUGH program, approximately 20 States now have their own statewide industrialized housing law This type of regulation creates a building code that is acceptable throughout the entire State If the housing producer gets an approval from the State, each of the localities must accept the housing system

Questions and Answers

Q. What is the price range or average cost of these systems?

A. *The cost of the prototype unit is more in varying degrees than the volume production unit. The concept of the program was to assist the producer in developing a new system which initially might not be competitive. The intent is that after prototype production, the producers must be competitive in the marketplace. By and large, the housing systems developed will keep the level of rise in housing costs at a lower rate than we are currently experiencing.*

Q. Are there any efforts to make one-family units?

A. *Yes. We have detached housing units. Generally, constructed up to two or more modules.*

Q. How long do you anticipate it will take for this program to be applied nationwide?

A. *In view of the innovative technology, the ability to deliver these units has been demonstrated. There is a definite trend in this country towards the acceptance of industrialized housing. The time frame involved is going to be dependent on primarily two things. First, the type of architectural approach that the builder takes. It must be marketable. Secondly, the producer is going to have to be competitive.*

OPERATION BREAKTHROUGH

A Program of the U S Department
of Housing and Urban Development

What is BREAKTHROUGH?

Taking advantage of modern technology and the management, financing, and marketing capabilities of private enterprise, Operation BREAKTHROUGH encourages a partnership of industry, labor, consumers, and all levels of government The initial objective is to break through the constraints that now prevent housing needs Among the major constraints are

- Inadequate assemblage of land for housing sites
- Protective and restrictive zoning codes
- Building codes variations and obsolete requirements
- Inadequate financing sources
- Small-volume building
- Inefficient use of the labor force
- Delays in processing documents

To overcome these and other constraints, one of BREAKTHROUGH's major efforts is to develop an "aggregated market" to determine the numbers and kinds of housing needed, the likely sites, and the possible sponsors

What will BREAKTHROUGH do?

BREAKTHROUGH will encourage large-volume housing production and reduce fragmentation by helping to create substantial local, regional, and perhaps national markets BREAKTHROUGH will demonstrate the magnitude of the potential market to those capable of and interested in producing both housing and sites for housing

With the kind of large, continuous market enjoyed by manufacturers of other consumer products, housing producers can realize economies of scale They can recover their investment in research and development, in improvements in their methods and concepts, and in plant and equipment necessary for engagement in large-volume production operations

BREAKTHROUGH will encourage the active participation of political jurisdictions, local organizations, and potential developers in an effort to break down the constraints of codes, restrictions, and requirements that now limit volume production of housing

BREAKTHROUGH will help to develop volume-production housing systems by applying improved technologies and improved management methods BREAKTHROUGH would expand the available manpower and encourage new financing methods In addition, BREAKTHROUGH will test and evaluate housing components and systems as a basis for developing performance standards for housing.

Impact of BREAKTHROUGH

- Reduce the real cost of housing
- Produce quality homes in volume for persons of all incomes.
- Reduce the cost of subsidizing low and moderate-income family housing
- Create a housing industry with year-round employment.
- Increase the job opportunities for minority groups
- Encourage continuing innovation in housing.
- Help to reduce one cause of urban tension – inadequate housing
- Help to combat inflation in the housing market
- Make it easier for all of our people to have the housing they need.

Elements of BREAKTHROUGH

- Systems development HUD will support the development of housing-systems concepts proposed by firms and teams of firms capable of high volume production and delivery of high-quality homes at prices lower than now prevail.
- Innovative approaches New designs, materials, and techniques as well as improved management, financing, and processing are encouraged Some of these innovations may already have been proved workable, but they may have been barred from wide use by local codes, regulations, or other constraints
- Prototype construction The housing systems and designs selected will be built as prototypes on sites chosen by HUD They will serve as models to test design, construction, and land use and to determine consumer acceptance Prototypes are expected to include all kinds of housing -- single-family, multifamily, high-rise, and low-rise dwellings
- Testing and evaluation The completed prototypes the housing components, and the subsystems will be tested and validated by both private and Federal organizations, such as the National Bureau of Standards and the Forest Products Laboratory The test results will be validated by the National Academies of Science and Engineering Local governments, possible sponsors, and consumer groups will be involved in the process of matching suitable prototypes to the needs of particular market areas
- HUD approval Successful completion of the testing program and validation by the National Academies will provide the basis for HUD to certify the housing systems for all of its programs Participating localities are being requested to accept HUD approval in lieu of existing codes
- Housing construction HUD does not build BREAKTHROUGH housing The public or private local sponsors will contract with the selected systems producers for full-volume production of the prototypes they choose The contracts may include management and maintenance of the completed housing units

Continuing HUD commitment

HUD has a continuing commitment to BREAKTHROUGH A full-time staff is assigned to provide assistance and advice to

- Fund the design, development, and construction of prototypes
- Support a test program
- Help States and cities with site identification and market aggregation
- Assist the sponsors and developers package housing programs

HUD supports local, State, and national efforts to improve the standards, codes, and regulations that affect the production of housing Regular HUD program funds are earmarked to support BREAKTHROUGH construction, and assistance is provided in developing additional sources of permanent financing

A program of research and development to test and demonstrate technological advances in housing construction Twenty-two housing systems producers were selected to demonstrate BREAKTHROUGH techniques at nine prototypes sites throughout the United States

OPERATION BREAKTHROUGH

A program of research and development to test and demonstrate technological advances in housing construction Twenty two housing systems producers were selected to demonstrate BREAK THROUGH techniques at nine prototype sites throughout the United States

JERSEY CITY, NEW JERSEY

Site Description Inner city site located in the heart of downtown Jersey City in the St John s urban renewal area

Land Use 486 housing units school pre school enclosed swimming pool park open space covered parking and auto access, shops, and professional offices

Significant Points Planning includes development of 80 residential units per acre of multifamily high rise and medium rise structures along with a variety of buildings for nonresidential uses The first floors of the taller structures will be used for retail and office space

Developer Volt Information Sciences, Inc 640 W 49th Street New York N Y 10018 Telephone (212) 536 6700

Housing Systems Producers Townland Marketing and Development Corp Descon Concordia, Camci Inc Shelley Systems

MACON, GEORGIA

Site Description A pine wooded estate with a six acre lake, located four miles from the center city in a rapidly developing area of Macon

Land Use 287 housing units streets, park open space, and community building

Significant Points A cluster plan with a variety of housing types including multifamily high rise multifamily low rise townhouses and single family detached units Minimizes the amount of streets and length of utility lines and is responsive to the ecology Many of the units are oriented to the open space and the existing lake

Developer Macon BREAKTHROUGH Housing Venture, P O Box 2523, Macon Georgia 31203- Telephone (912) 781 8700

Housing Systems Producers Building Systems International Inc , Boise Cascade Corp , Christiana Western ALCOA, Hercules Inc , Material Systems

MEMPHIS, TENNESSEE

Site Description Located in the Court Avenue urban renewal area in downtown Memphis It is bounded on three sides by major traffic arteries

Land Use 374 housing units, parking structure, community building, park, open space, and possible shops

Significant Points A mixture of building types multifamily high rise, low rise, and townhouses The concept includes low rise apartment and townhouse clusters Associated with high rise apartments and townhouses is deck covered parking structure which can be used for open space, recreation, and a community building The elevated deck will provide extension of pedestrian bridges across adjoining busy streets Major traffic arteries present challenge in anti noise pollution design

Developer Neeley BREAKTHROUGH, Inc , 425 Madison Avenue, Memphis, Tennessee 38130, —Telephone (901) 523 0650

Housing Systems Producers Boise Cascade Corp , Stirling Homex Corp , General Electric Co ,

INDIANAPOLIS, INDIANA

Site Description Located on the edge of the city near the famous Indianapolis Speedway, the tract is part of the former State Mental Health Farm

Land Use 295 housing units, schools, parks, open space, street, parking and a community building with swimming pool

Significant Points A site with medium and low density building types with one medium rise apartment for the elderly to accommodate a variety of lifestyles A cluster planning approach separates pedestrian from vehicular traffic, aggregates open space for common use and provides green ways between cluster or housing units Creative mass grading is used for environmental interest and separation between pedestrian and moving or parked automobiles

Developer Urban Systems Development Corp , 2302 North Tibbs Avenue, Indianapolis, Indiana 46222,—Telephone (317) 639 4109

Housing Systems Producers FCE Dillon, Home Building, Inc , Material Systems Corp National Homes, Pantek, Pemtom Inc , Scholz Homes Inc , General Electric Corp

KALAMAZOO, MICHIGAN

Site Description located on a plateau overlooking a lake in Spring Valley Regional Park within the Kalamazoo city limits The rolling wooded site is two miles northeast of the Kalamazoo business district

Land Use 245 housing units, park, open space, streets, parking, community building, and swimming pool

Significant Points Each cluster, some with mixtures of town houses garden apartments and medium rise apartments, includes a play area for small children which is easily supervised by mothers from surrounding units Clusters are linked by green ways to the neighborhood playfield for older children and the adjacent city park The network of pedestrian ways is separate from streets and parking areas A portion of the site is used for single family detached units on cul de sacs

Developer Kalamazoo BREAKTHROUGH Housing Venture, 2307 Gull Road Kalamazoo, Michigan 49001,—Telephone (616) 382 5050

Housing Systems Producers Hercules Inc , Republic Steel Corp , National Homes, Scholz Homes Inc , Levitt Building Systems Inc , Material Systems Corp , FCE Dillon

ST. LOUIS, MISSOURI

Site Description This site occupies two neighboring parcels of land in the Mill Creek urban renewal area in downtown St Louis The sites are separated by LaClede town, a new housing development that has been successful in revitalizing this neighborhood near the downtown area

Land Use 464 housing units, recreation areas, open space, swimming pool, parking, and shops


WASHINGTON
SEATTLE
KINGS COUNTY
OREGON
CALIFORNIA
SACRAMENTO
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICH
MICHIGAN
KALAMAZOO
INDIANA
INDIANAPOLIS
OHIO
KENTUCKY
TENNESSEE
ST LOUIS
MEMPHIS
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MD
DEL
N J
SEY CITY
CONN
R I
MASS
VT
N H
MAINE
MACON

Significant Points A mixture of low and high rise apartments and townhouses The units are organized around a pedestrian street which is modulated into small courts with small convenience shops recreation areas for small children and promenades for adults Automobiles are parked on the perimeter of the development in a well landscaped area

Developer Midtown Associates Inc 18 North Compton St Louis Missouri 63103 Telephone (314) 534 7070

Housing Systems Producers Rouse Wates Inc Descon Concordia Home Building Corp Material Systems Inc

SACRAMENTO, CALIFORNIA

Site Description Occupies the eastern portion of the old California State Fairgrounds four miles southwest of downtown Sacramento

Land Use 407 housing units park open space street community building and parking

Significant Points A cluster planning concept with high and low density buildings is used to separate pedestrian and automobile traffic The clusters surround small semi private recreation areas and are arranged on the perimeter of a large recreation area for use by all residents

Developer Sacramento BREAKTHROUGH Housing Venture P O Box 271 Sacramento California 95802 Telephone (916) 452 5371

Housing Systems Producers Boise Cascade Corp Christiana Western Structures ALCOA FCE Dillon Material Systems Inc Pantek Corp TRW Systems Group

SEATTLE, WASHINGTON

Site Description Approximately two acres in the Yesler Atlantic Neighborhood Improvement project in downtown Seattle

Land Use 58 housing units

Significant Points Low and mid rise housing for larger families Apartments overlook an adjacent city park are arranged around a court and provide direct access to court and park

Developer The Boeing Company P O Box 3999 Seattle Washington 98124 Telephone (206) 773 3866

Housing Systems Producers Townland Marketing and Development Corp

KING COUNTY, WASHINGTON

Site Description This 30 acre suburban site is located approximately 40 minutes from Seattle

Land Use 162 housing units open space streets swimming pool and community building

Significant Points The cluster principle is used on this heavily wooded site to minimize space needs for access and circulation and to assure some area of common open space A loop road provides main access to the cluster of detached houses townhouses, and garden apartment Active and passive recreation areas are accessible from the housing clusters This open space links the community to a large community park and schools

Developer The Boeing Company P O Box 3999 Seattle Washington 98124 Telephone (206) 773 3866

Housing Systems Producers ALCOA Christiana Western, Levit Building Systems Inc Material Systems Inc

SUMMARY DESCRIPTION OF THE BREAKTHROUGH HOUSING SYSTEMS

ALCOA CONSTRUCTION SYSTEMS, Inc.

Housing Types townhouses, walk up apartments

System Type combination steel framed service modules and panels

Service core modules, including mechanical, kitchen and bathroom elements, produced in factory and transported to the building site Joined with factory produced panels which define the living and sleeping spaces Aluminum or wood framed panel walls can be employed

BOISE-CASCADE HOUSING DEVELOPMENT

Housing Types single family detached, single family attached, multi family low rise apartments

System Type lightgage steel framed and wood framed modules

Modules are factory assembled utilizing plywood floors, steel or wood framed wall and ceiling panels with gypsum skins, electrical harnesses, and prefabricated plumbing trees Finished modules shipped by truck or rail to building sites, placed on the foundation and connected to form housing clusters of all kinds

BUILDING SYSTEMS INTERNATIONAL, INC

Housing Types single family detached, single family attached, low, medium, and high rise apartments

System Type precast concrete load bearing panels

The Balency precast concrete system of factory produced panels is utilized Load bearing interior and exterior walls and floor slabs provide flexibility in design arrangements

CAMCI, INC

Housing Types single family attached garden apartments, medium rise apartments (4 10 stories)

System Type precast reinforced concrete panels

The Tracoba system of precast concrete loadbearing crosswalls, floor panels and facade panels is employed Joints between walls and slabs and between adjoining slabs are cast in place, insuring continuity between elemen s and a rigid structure

CHRISTIANA WESTERN STRUCTURES, INC

Housing Types single family detached, townhouses two story garden apartments

System Type wood framed panels

Shop fabricated wood frame panels are used for walls, partitions and roof construction, with the wall panels produced without joints for the required lengths A polyester resin finish, reinforced with glass fibers, is furnished as an interior and exterior wall finish in lieu of paint

DESCON/CONCORDIA SYSTEMS, LTD

Housing Types single family attached, multifamily low rise and high rise

System Type reinforced concrete panels

Structural components consist of precast concrete walls, floors and beams, which can be produced in existing pre casting facilities All weather assembly of panels at the site is accomplished by using dry mechanical joints

FCE DILLON, INC.

Housing Types single family attached, multi family low, medium and high rise

System Type combination of pre cast and site cast concrete structural and exterior elements with wood framed interior panels

The concrete structural system consists of precast wall and floor panels and cast in place concrete elements using steel "tunnel" and other reusable forms Interior partitions and non load bearing facade panels can be of prefabricated wood frame construction, with a wide variety of possible finishes

GENERAL ELECTRIC COMPANY

Housing Types townhouses, garden apartments (up to 3 stories)

System Type closed modules

Floor, ceiling and roof assemblies are of wood members All wall framing is steel The major portion of the interior wall surfacing is by cast plaster The closed module contains all mechanical elements and is finished to a major degree before leaving the factory

HERCULES INC

Housing Types townhouses, garden apartments

System Type wood framed modules

Wood-framed modules bolted together to form the basic structural system The modules are trucked to the site, completely finished and equipped with appliances and utility systems, and erected by crane on conventional foundation

HOME BUILDING CORPORATION

Housing Types single family detached, single family attached, low rise apartments

System Type wood framed modules

Wood frame modular units are fabricated in factory An extra modular hall can be installed on site to join two modules into a dwelling unit

LEVITT TECHNOLOGY CORPORATION

Housing Types single family attached, multifamily low rise

System Type wood framed modules

Factory constructed modules use conventional wood framing and finishes with efficient assembly line production

MATERIAL SYSTEMS CORPORATION

Housing Types single family detached, townhouses, two story garden apartments

System Type fiber reinforced resin with fillers moulded into panels

The structure uses composite materials consisting of organic and inorganic reinforcing fibers for strength, integrated with a polymer matrix Factory produced panels of these composite materials are filled with insulating materials and assembled into modules for shipment to the building site Many interior and exterior textures and appearances are possible

NATIONAL HOMES CORPORATION

Housing Types single family detached, single family attached, multifamily low rise

System Type steel framed modules

Units assembled on site from factory produced three dimensional modules The only on site work is joining the units, foundations, and utility hookups

PANTEK CORP

Housing Types single family detached, single family attached, multifamily low rise

System Type combination of mechanical core modules and foamed plastic core panels

Structural panels with aluminum frames, stressed skins, and foamed plastic cores are used for floors, walls, and roof components These are joined to prefabricated mechanical core modular units capable of stacked multi floor applications

PEMTOM, INC

Housing Types single family detached, single family attached, multifamily low rise (up to 3 stories), multifamily high rise (with separate structural frame)

System Type stressed skin plywood modules

Panels, comprised of plywood interior and exterior facings separated by a polyurethane foam core, are joined by a polymer bond to form modular units There is considerable flexibility in the arrangement of the modules to create various housing types

REPUBLIC STEEL CORPORATION

Housing Types single family detached

System Type steel framed panels

Structural wall, floor and roof panels are steel faced on both sides of a foam and insulated paper honeycomb core Interior surfaces may be added Foundation consists of concrete piers to which are attached steel rectangular box beams The wall and floor panels are attached to the steel box beams, and the roof panels added to form complete structure Bathrooms and kitchens are preassembled modular components

ROUSE WATES, INC

Housing Types multifamily low, medium and high rise

System Type precast reinforced concrete panels

The Wates Building System of England employs precast reinforced concrete panels as the basic structural elements, produced at or near the site in movable facilities

SCHOLZ HOMES, INC

Housing Types single family detached, single family attached, multifamily low rise

System Type basically wood frame modules

Wood framed modular units produced in factory, completely wired and plumbed and exterior and interior finishes applied Modules are transported to site and erected on prepared foundations

SHELLEY SYSTEMS, INC

Housing Types single family attached, multifamily low rise and high rise

System Type reinforced concrete modules

The structural system employs factory cast and finished reinforced lightweight concrete modular units Load bearing columns are an integral part of the modules so that, when the modules are stacked, the columns match vertically to carry all gravity loads The modules are stacked in an alternating checkerboard manner, and the resulting open spaces are then closed in

STIRLING HOMEX CORPORATION

Housing Types multifamily high rise

System Type steel framed modules

The structural system utilizes steel columns and steel floor beams which form an integral part of the factory produced modules Interior finishing applied at factory, including vinyl covered gypsum board for walls and ceiling Modules erected by means of a hydraulic jacking system Top floor modules are placed on the first floor level, bolted together, and raised to the second level The next story of modules are then inserted underneath, bolted and jacked up, moving the top floor modules to a third story level, and so on until the structure is completed

TOWNLAND MARKETING AND DEVELOPMENT CORP

Housing Types multifamily high rise

System Type reinforced concrete "megastructure," with lightgage steel framed in fill modular cores and panels

The structural system employs pre cast, prestressed concrete columns, spandel beams, and deck slabs to create a frame with the deck slabs running across between the spandrel beams at two or three story intervals, up to a maximum of 15 stories The result is concrete grids enclosing multi story spaces Two and three storied housing units are constructed on the separate deck slabs, utilizing lightgage steel framed panels and mechanical core modules

TRW SYSTEMS GROUP

Housing Types single family detached, single family attached, multifamily low rise

System Type glass fiber reinforced plastic and paper honeycomb modules

Load bearing walls, ceiling and floor are made with a sandwich structure, consisting of glass fiber reinforced polyester resin plastic on both sides of a Kraft paper honeycomb core The sandwich is manufactured in on site factory by wrapping various layers on a rotable mandrel Panels for end walls and interior partitions made in flat molds Completed modules can be arranged in various architectural arrangements

THE EUROPEAN EXPERIENCE

An excerpt of remarks made by
Thomas Callaway, HUD Office of
International Affairs

Prefabricated housing goes well back into history, as much as 30,000 years. The ultimate in this type of housing was reached by the Hottentots who used prefabricated systems in their migrations southward through Central Africa. Their structural elements were made of wood, grasses, and straw and used for homes, meeting houses, and religious structures that were transported on the backs of their cattle. The structures were standardized to a high degree, demonstrably airconditioned, and useful beyond the bounds of housing. If the cattle became hungry enroute, the houses could be fed to them, while the Hottentots in turn fed off the beef.

The European entry into prefabricated housing became apparent during the colonial eras of Latin America, Africa, and the Near and Far East, when corrugated galvanized iron sheets came into use. Fairly sophisticated timber-prefabricated structures were shipped all over the world for cheap housing Prefabricated timber structures go back to the 18th and 19th centuries

Industrialized housing in the United States did not reach its level until just prior to World War II. During the war, shortages of material, labor, and transportation placed emphasis on prefabricated structures By the end of the war the U S had a fairly high order of industrialized housing that used many technicians

The reconstruction needs of Europe at this time caused the U. S to ship the technology, technicians, components, and completely prefabricated units by the thousands to France and the United Kingdom. In the U. S , interest was confined to conventional housing and what had become the basis for an industrialized housing industry declined.

In the Far East, the use of large panels and box systems of concrete dominated the industrial housing market In Scandinavia, wood was the preferred material In Western Europe, smaller panels, post and panel methods, and wooden construction were the choices. The rising costs of labor made industrialized housing attractive, even though in some aspects it was more costly than conventional housing Its main advantage was that a smaller manpower could be used more effectively.

Successful industrialized housing is based on an optimum balance between the use of labor and mechanization Because of the varied needs in Latin America, this would be especially so The types of construction must be studied to determine what is best to use. Russia turned to large mass dwellings, mostly of concrete, while Japan retained the detached modular concept with the use of wood as the basic material.

Consumer acceptability is a problem, particularly in the United States In Europe, industrialized housing is acceptable because of the great need. Acceptability is a question of scale and height. It was found that higher income groups will more readily accept this type of housing than low income people. Socially, also, lower income groups are less adaptable to such mass units as highrises It takes as much as three generations to overcome urban shock and move low-income families successfully into the higher units There is reluctance to be separated from the ground and there is greater interest in gardens and closeness to the soil The general lack of acceptability of industrialized housing by Americans is paradoxical While they consider themselves advanced in most areas, they are conservative in housing and consider industrialized housing as second rate.

Form plays a large role in acceptability Certain materials are considered inferior for dwelling use, such as concrete New architectural forms to fit new materials are slow to come about At present, industrialized building limits esthetic sensibilities

Acceptance of industrialized housing by government must come about. Is it worth grants and other incentives? Also, there is the economic limit on how many units must be produced to have a system which is economically viable There are industrialized systems in the United States which are going out of business because they failed to fully investigate economic, social, and technical problems An optimum balance must be struck between labor and industrialization Prefabricated housing need not deal out low income people because of cost. The low skill requirements of industrialized housing can keep costs down. Prefabricated housing need not be large-scale, large component operations to be successful

Questions and Answers

Q After World War II there was a great deal of promotion in the U. S of the Lustron System, an all-steel house What ever happened to it?

A. *Lustron was one of several systems that began after the war. It showed promise, a lot of good engineering, and there was much enthusiasm But there were a lot of things wrong It was badly timed because we got back to normal quickly after the war, especially to conventional building Prefabrication still meant something not particularly acceptable – second rate It also used a material which was not normal to American construction Another problem was good, old-fashioned salesmanship The system was badly handled in terms of public relations, in terms of sales, and in terms of promotion, generally This is not the sole example, there are many, and some of them are still suffering from the same problems*

Q. Perhaps you remember the Airfoam Construction Company. It built a number of inflated houses in Hobes Sound, Florida, and also built in the Congo. Are we going to see any inflated structures?

A. *You might There are some still standing – a little cluster of hemispheric concrete structures – in Virginia, just outside Washington, D. C They were not highly successful, as I remember.*

Q I'm curious whether in the European experience the question of rental units, versus condominium units has an influence on the success or failure of industrialized housing?

A. *It is an oversimplication to say that the method of ownership is the deciding factor, unless taken in terms of income groups Lower income families normally prefer a rental situation, an ownership situation similar to the cooperative, or some variation. In many European countries, right after the war rentals were controlled where construction of homeownership units were not controlled, in terms of price It may be hard to believe, but there are still places in Europe where the same rentals are being charged as 30 years ago New York is an example that can be used. It has not been economic in terms of return for building owners. The need for reconstruction and maintenance for some buildings has caused owners to turn their backs and walk away because they cannot afford to lose money. I think that the form of homeownership has less influence on the rate of construction than the question of what was available and the basic decision of whether or not to industrialize This is the case for countries with high components of private industry and finance – where private industry builds most of the housing France, through a central bank, its subsidies, and central ministries is able to allocate ahead of time areas where industrialized building will be used They are able to predict where and how much housing is going to be built and in what form*

Q. In your Latin American experience did you encounter the same attitude toward industrialized housing?

A. *My experience is limited, and to the very low income Attitudes are just as they are in Europe The lower the income the greater the resistance to change The desire is for middle income housing. The really imaginative approaches to housing come from people who have all the choices in the world. For instance, the only people in the United States who, to any extent, build adobe structures are those in California and New Mexico These may run from $70,000 to $80,000 on the market today. They use adobe because they like the material, not because they are forced to Whereas in most areas of Latin America, adobe is a less desirable material*

A Residence of Stabilized Adobe Brick in North America.

SYSTEMS MANAGEMENT OF CONSTRUCTION

An excerpt of remarks made by
Walter A. Meisen, Assistant Commissioner
for Construction Management,
General Services Administration

Some of the most important requirements in systems building are the performance standards Performance standards are not concerned with how a job is done, but rather, what the end results may be For example, in specifying requirements for a bedroom in a house the performance standards would call for a certain amount of space, heat, cooling, light, and other convenience factors. How these are achieved would be up to the builder The idea is to allow him to innovate and improve

A better analogy is one of the first performance standards on record in the United States it was for an airplane The government wanted a machine that would fly and perform specific functions The performance standards were simple – they covered only two pages They required that the airplane be able to carry two people in the air for one hour at a speed of 40 miles per hour, and that the machine could be disassembled by two men in one hour and loaded on a wagon The Wright brothers – Orville and Wilbur accepted the challenge and delivered a machine that met the performance requirement. The rest is history

The point is that no one in government knew how to design and build an airplane, however, it was known what was needed. The Wright brothers delivered their version of the machine and the government certified its performance

The use of performance standards, requirements, and certification are applicable to industrialized housing Uniformity and monotony are a great challenge in overcoming the social prejudice towards prefabricated housing. To encourage the use of new forms and ideas in housing, a system different from the old prescriptive practices must be used. When building for people, the act of building the cheapest unit possible may not always be the best.

In the development phase of systems building it is necessary to inform all interested parties of your requirements and that you will evaluate what they think they can do for you When proposals meet performance requirements it is necessary to learn their cost and evaluate their esthetic qualities When the proposal reaches the prototype stage testing is imperative to guarantee that performance requirements have been met

The application of performance requirements to prefabricated housing should be suited to the people who will live in the houses Proper management in the use of performance specifications can achieve the highest amount of flexibility to achieve this goal The rejection of preconceived ideas in favor of inventiveness and originality may bring a higher order of performance than usually can be expected.

Questions and Answers

Q We are both architects and have been educated in the traditional relationships of architects to construction companies and to clients. We have been told that the industrialization of housing is going to produce larger construction companies. Do you think architects and engineers will merge into the building companies under the design function to conform to the overall requirements of a performance specification?

A. *I think it is imperative to the construction industry as a whole that it become a team effort. The system of architects and contractors as adversaries cannot continue We must look at the construction design process as a whole I think that in 10 years there will no longer be professionals just on the design side and contractors in construction on the other. Organizations will do both design and construction - especially construction management – for the building owner The present system is wasteful and does not serve the owner. The only way that economy can be achieved is for the architect and the engineer to work more closely It is good for the designer because he can live closer to the realities of construction innovations and cost It is good for the engineer because he can share in the design stage and contribute an expertise that is valuable to the designer What I am saying is that if there is a constructor on the design team he can work with the designer from the beginning in helping to make choices that pay off in the construction stage I think our industry needs that kind of teamwork, and on a regular basis. I think that is the way we are going.*

Q There are those of us who live in countries where there is a severe lack of housing and many limitations. Wouldn't it be more expensive to require a multiplicity of housing styles than to produce one style?

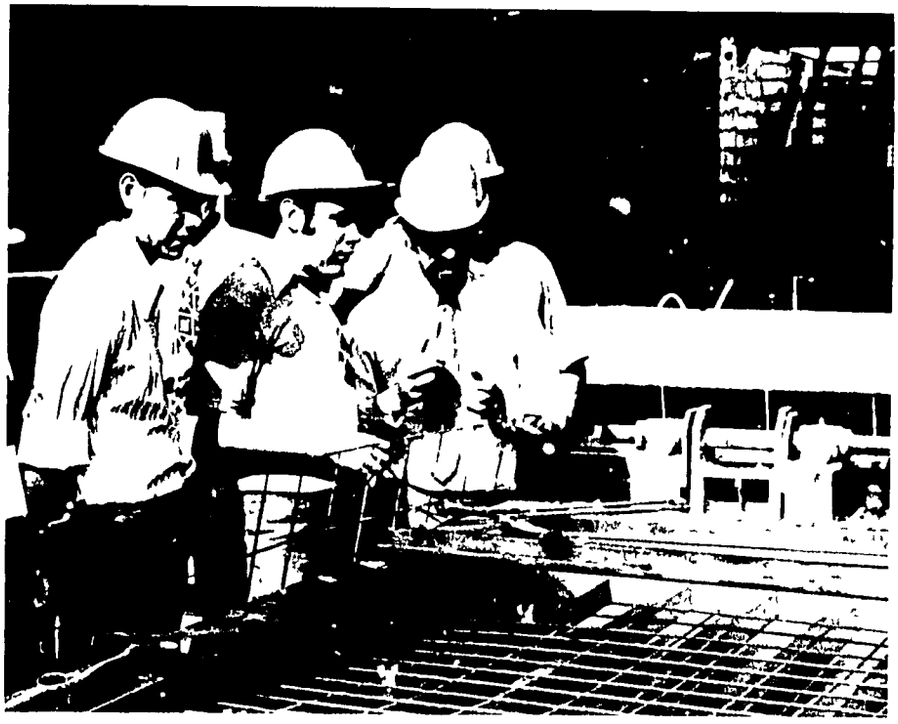
A. *I would say that it is imperative to use whatever means you can to get shelter for the people There is nothing that says the performance requirement cannot be to produce housing as quickly and as cheaply as possible It is important for you to decide what your performance criteria is If you are talking about the absolute necessity to provide basic shelter to protect people so they can survive, then I think you must keep the performance criteria as simple and as direct as possible But I don't think that will solve a housing problem that involves the normal lifestyle of people Housing is more than just shelter Obviously, it is easy to say that when you have the shelter needs satisfied When a man is in desperate need of shelter, any kind of housing will do But, when he satisfies the immediate need, he usually looks to improving his situation The recent earthquakes in Latin America demonstrate the immediate needs for housing If we were to write performance standards for replacing the destroyed housing, we would take into consideration that earthquakes can happen again, and we would build accordingly If not, we are back where we started. The beauty of performance standards is that you can determine needs and try to achieve the goal by allowing the broadest possible latitude*

Q How far do these latitudes extend, insofar as performance requirements are concerned?

A. *You can produce housing which will serve immediate needs, and which, in the long run will satisfy many people Latin America is experiencing a growing white-collar population and it is reasonable to assume that for the present they would find minimum housing standards acceptable However, with growing families and growing incomes, the situation will change The tide of upward mobility is rising throughout the world Experience in the United States shows that people express this mobility by striving for better housing They are satisfied to live in standard, even substandard housing, but only as long as they have to In Latin America the same is true But if the opportunities for upward mobility are limited by cost or availability, the Latin American may be forced to stay where he is An effective performance requirement would provide the ultimate means for improving and expanding his present living situation until such time as he can find something better elsewhere*

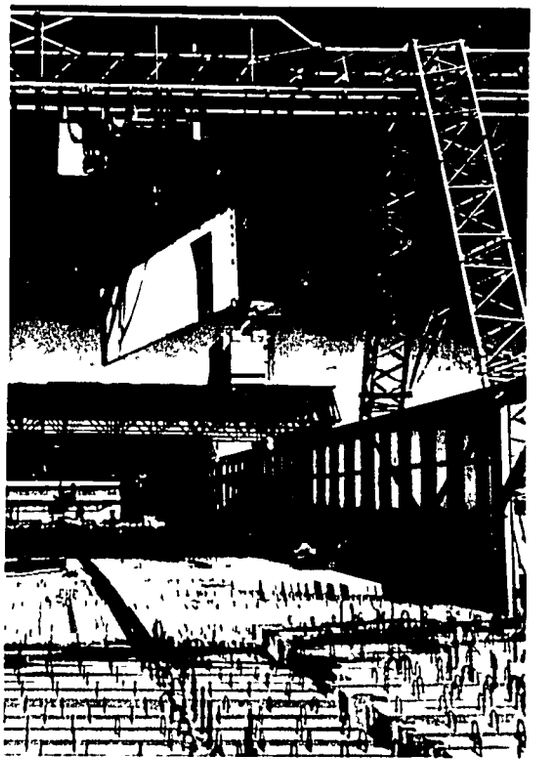
THE FIRST TOUR

On Tuesday, September 26, the participants were conducted on a tour around the Washington Metropolitan Area to see prefabrication and testing facilities for components of industrialized housing



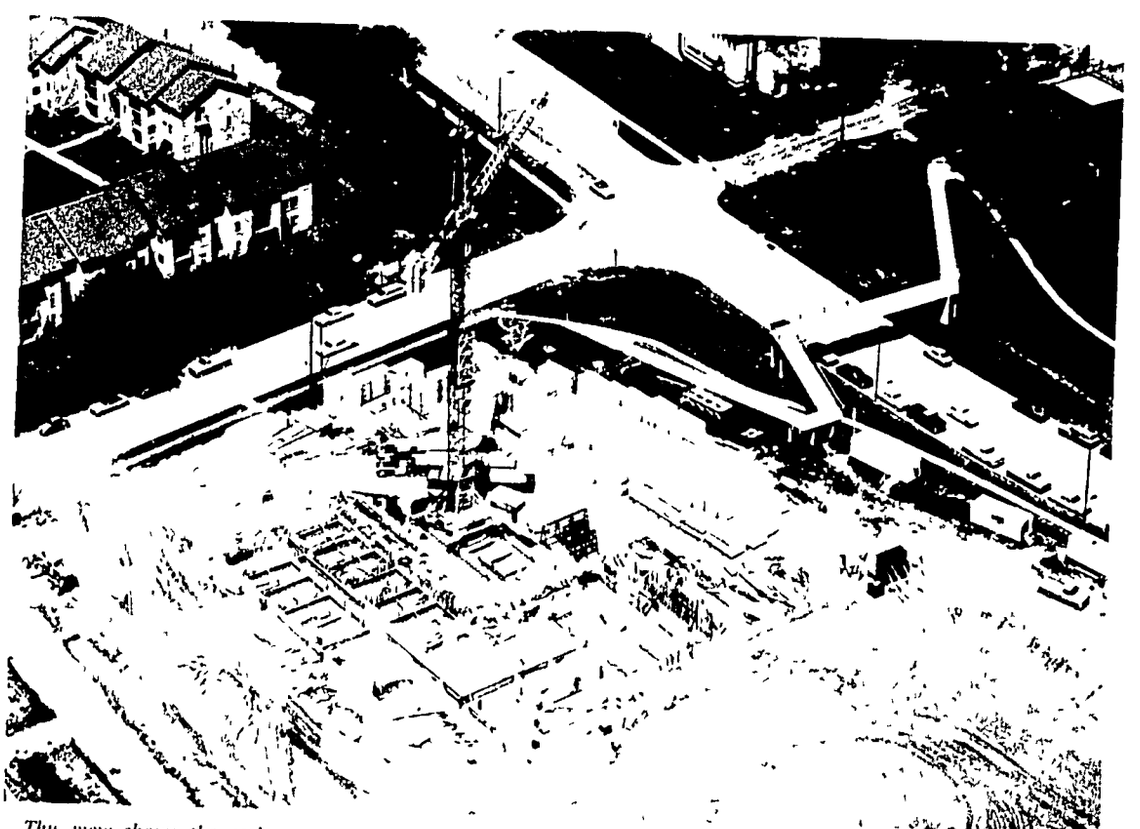
At the HRW Systems, Inc , plant, Bladensburg, Maryland, participants inspect prefabricated concrete panels and slabs while in production HRW uses the Rouse-Wates system

The HRW Systems plant at Bladensburg is capable of producing 750 dwelling units per year

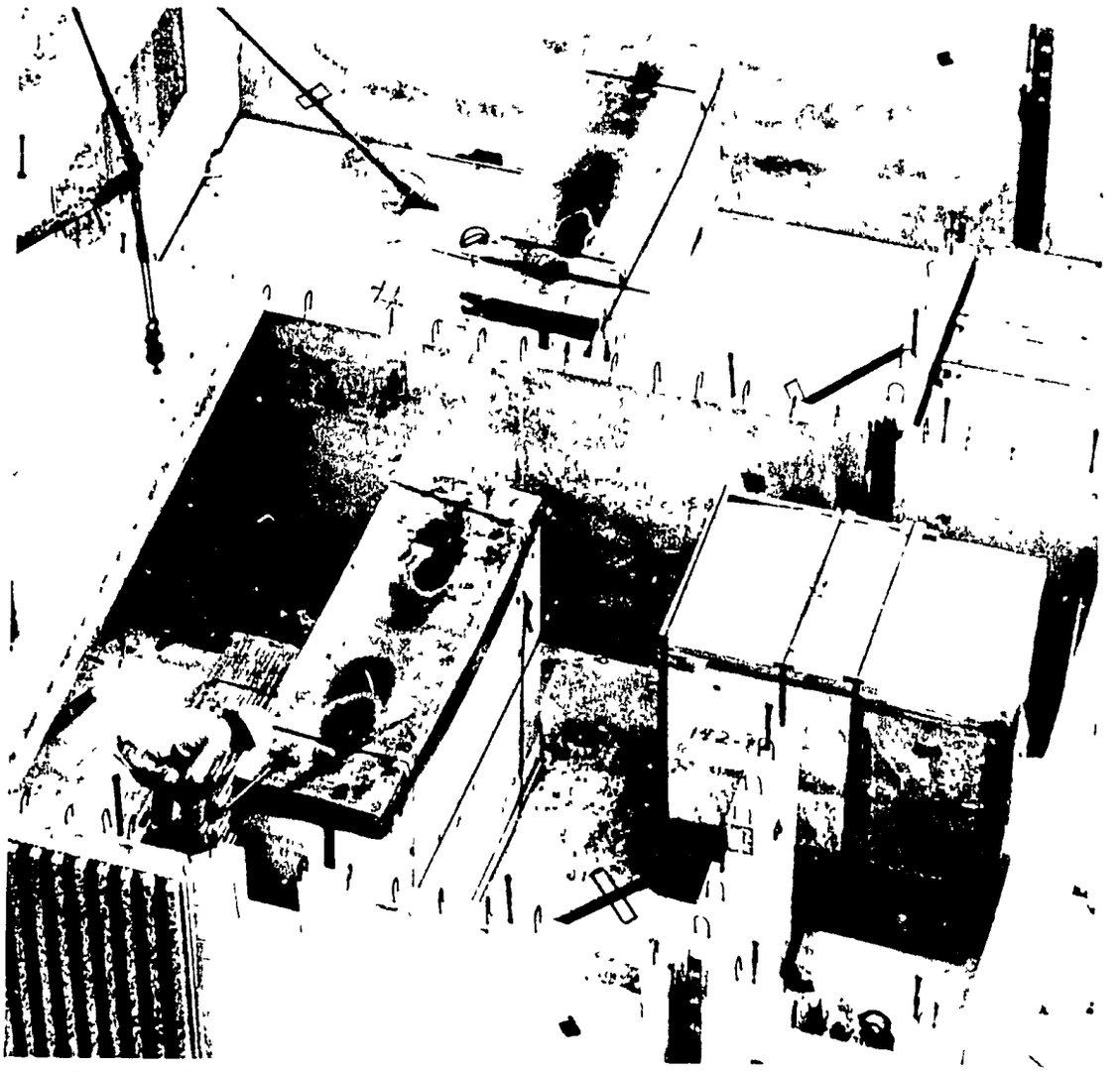


The precast panels are moved to a storage area for curing and ultimate transportation to the building sites.

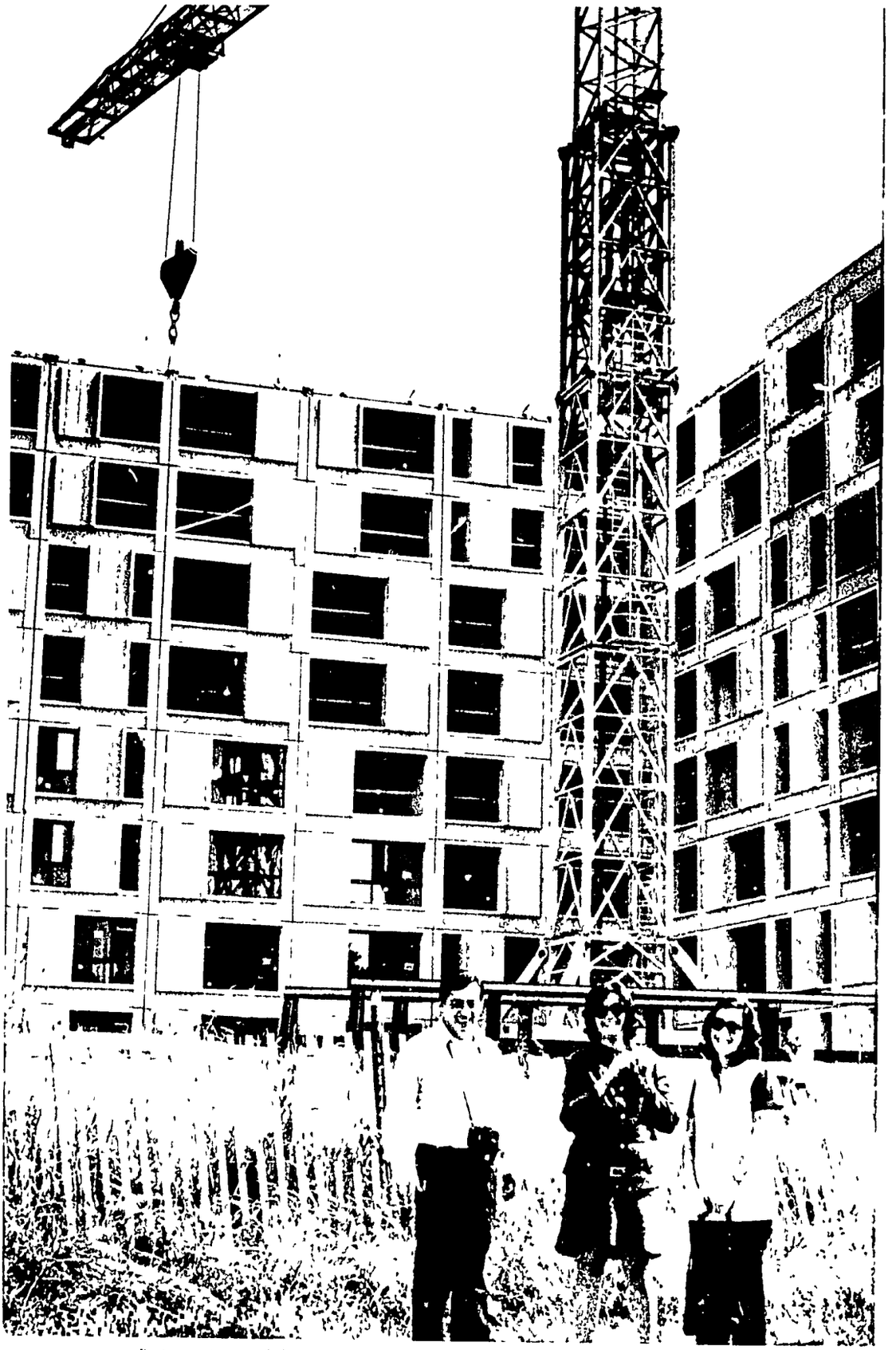
Officials at Columbia, Maryland, described the Rouse Wates system used in the construction of this new community, and gave a slide presentation showing all phases of construction (4)



This view shows the early construction of the 9 story, 100 unit Abbott House apartment building at Columbia



Prepackaged bathroom and kitchen modules are shown being installed in the Rouse Watts structural system



Participants visited the construction site of a highrise apartment building at Columbia

EVALUATION PROCEDURES FOR INDUSTRIALIZED HOUSING

An excerpt of remarks made by
Robert M Dillon, Executive Director,
Building Research Advisory Board

Our function is twofold to advise the Federal government, and to promote the orderly growth of science and technology

The United States is anything but a good example of how to put together an industrialized housing program system The use of prefabrication has been tried for 150 years, but none of these have caught on Part of the difficulty is our free economy with the inherent difficulties in trying to control anything

As businessmen, your primary concern is what you can and cannot control in the area of industrialized housing What factors will change the rules by which you will operate? What is the availability of capitol land, and markets?

Volume of consumption is one of your biggest controlling factors What volume can you except? What is the cost to you, and how fast can you make up this cost with your product to make a profit? How flexible is your system? Can it change as your consumer market or minimum requirements change? Will it meet the social requirements of the consumer?

What is the life of your product and what maintenance will you provide to extend its life? Lack of maintenance will dry up your market as people reject your system as undesirable

All of these factors must be controlled to bring about a successful system

How will you go about setting your requirements and meeting those your government is likely to set?

Will your housing meet the public's standards for what they want and what are those requirements? Will it meet the safety requirements the public needs such as fire, earthquake, and other natural disasters? What will be your level of environmental control?

How will you go about protecting those you house from urban shock such as that experienced in high rises?

If these requirements are changing too fast, and too often, your investment will be lost as the system fails to respond quickly enough to these changes A greater flexibility for the producer is the only way to keep up with these changing requirements by using the system of performance specifications This coupled with judgment based on past experience can help you say when a system is good or bad Look at each system in relation to your country's needs, not at the salesmanship of each manufacturer

In covering a large geographical area, the United States has different social and economic needs and this affects what is considered good housing in each area Because of large supplies, much of our construction is based on woods, and its related products Wood is preferred over concrete, and in many cases it is cheaper Housing requirements are high and usually are centered on the middle class As a result, the housing we put up for lower income families is correspondingly more expensive Industrialized housing comprises very little of our actual volume of construction in the U S

Questions and Answers

Q Do you think industrialized housing is feasible in Latin America?

A *I am not as well informed as I should be on your problems and availabilities or the strength of your central government. I don't know the amount of decisions in your hands and the amount in your governments, but I think that where it is not possible to control the total process yourself, you must insist that somebody else control it for you. There must be a guarantee on the availability of land, and for how long. I think also there must be a guarantee that requirements will be held relatively stable. When I say the total process, take a standard private builder in this country. He will acquire land on the open market for his own purposes, he will then begin to produce housing onsite and sell it. When he moves into the industrialized field, what he must do is set up a plant, sell its production to whoever wishes to buy, until the market begins to drop. Then he can shift to his own construction to absorb his plant capacity. Now he may also go on further to make arrangements with basic suppliers over long periods of time at wholesale rates. In other words, to cut out the middle man he will try to set up some sort of financing system so that he can help the consumers purchase this item. He may set up his own credit corporation. This gives him the ability to influence the market to make sure he has a market. Also, you'll find many of these people doing different kinds of home building operations at the same time. Some people may be reasonably successful and have been successful selling just the production of a plant. But almost all of these are not really industrialized plants, they tend to be prefabrication-type activities. Another problem is flexibility. For example, the total housing production of the Washington, D. C. metropolitan area takes around 40,000 units a year. This sounds like a lot of consumption. But, broken down in terms of geographic area, about 40 miles in diameter, and by highrise, medium-rise, low-rise, single family attached, detached, and town houses the picture changes. Further divide by different income levels and styles that people like and you find that the mass market just disappears. Now in your countries, it may be possible to have a greater influence on the control of that market. I know that many of you are from relatively small countries and it may be that you may not be able to amass a really large scale market. I would simply add a conclusion that I'd like to be as honest as I can with you people and particularly, when you are being taken around to see things. Therefore, I want to be sure you understood what you will be seeing and whether these things can be transferred to your own sector. If you want to walk off the beaten track, you'll find that there is some fine housing being built by all kinds of methods around the country and some not so fine.*

EDITORS NOTE: Mr. Dillon's comments were made as an oral presentation with visual materials. The printed text of his presentation is presented here as a paraphrase.

FRAME SYSTEMS

An excerpt of remarks made by
Robert Freed, AID Office of International Housing

Prefabricated posts, beams, and columns assembled to create a structural frame, form what is probably the most ancient of all of the building systems. It is the most widely utilized of all systems and permits the greatest of all architectural flexibility. Certainly, it is the most versatile insofar as materials are concerned.

Unfortunately, it is also the most overlooked, because we all too often think that a system must be new if it is to offer any advantages over our customer construction.

Throughout Latin America one can find shelters consisting of four wooden posts stuck into the ground and to which four wooden beams are fastened to make a structural frame. Four large woven mats are tied to these to form the exterior walls and a fifth mat or some corrugated galvanized iron sheets make a roof. This is a prefabricated post and beam frame utilizing prefabricated wall and roof panels.

In many areas the poles may be bamboo and the house is elevated above the ground or water. But, in all instances these houses use a post and beam structural frame.

The steel framework of high rise buildings consists of prefabricated columns and beams.

The traditional Japanese house with "shoji" and "fusuma" walls and partitions consisting of a light lattice work supporting only paper or glass uses a post and beam structural frame.

All prefabricated systems of posts, columns and beams demonstrate that the walls and partitions of a building need not provide the structural support but, it is perhaps the traditional Japanese house that most demonstrates the spacial and architectural flexibility of such systems. The interior partitions and exterior walls are nearly all movable or removable. In the summer all of these partitions and walls are often totally removed to open the entire house to the air and sun. The partitions are put back in place as needed.

What may well be the most unique prefabricated wood frame building has recently been completed in Dassiar, British Columbia, Canada. This is a seven story building with a laminated wood framework designed to withstand earthquake tremors and support six feet of snow. There are 899 laminated wood beams, columns, and struts with steel plate and bolt connections.

Wood was used because of lowered freight and foundation costs because it weighed less than steel. It was easier to erect with the totally prefabricated components. Concrete was ruled out because it was not readily available in this remote area of Canada. The floors were designed for 200 lbs per square foot total load.

There have also been several designs of precast concrete beams and column systems for houses. These are relatively few and it is hard to judge whether they will gain wide acceptance.

In July 1970, in a publication entitled *Manufactured Housing Technically Suitable for HUD Housing Programs*, 193 systems were shown. Of these, only two wood framing systems employed post and beam construction.

The magazine *Building Design & Construction* devoted its September 1970 issue to Industrialized Building Systems Three systems of precast beams and columns which might be used in high-rise apartment were included Quite obviously prefabricated systems of posts, beams, and columns are in the minority

I would like to state that in my opinion post, beam, and column systems offer the greatest future for the less developed countries of the world, despite their rather neglected position in Europe and the United States

The May-June 1969 publication of the *Dominican College of Engineers, Architects and Surveyors* presented the results of a contest of "Anteproyectos" for rural housing It showed houses using precast concrete and wood columns. The house with precast concrete columns and beams used thin precast slabs in its walls One wood house used woven sticks to create the finished walls The other, which utilized square wooden posts, offered several wall variations, including pieces of bamboo which were stuccoed on the outside

Various self-help projects in Africa, as well as Latin America, have utilized prefabricated concrete columns and wood beams or trusses

Recently, five Japanese manufacturers started making houses with steel or wood prefabricated frames. In addition to the traditional Japanese wall panels they added panels of styrofoam with factory finished aluminum skins

These various systems of prefabricated posts, beams, and columns all offer great advantages to Latin America The members are light and do not require heavy trucks and equipment for handling Very often they can be carried by only one man and rarely require more than two men The exterior walls are not load bearing and may be of any available materials This usually reduces footings to only post footings under each post or column The roofing can be made of locally available materials Interior partitions need not be erected with the initial structure and may be removable Following the Japanese custom, one large room might be converted into several sleeping areas by the use of movable or removable sections

Large projects can use on-site prefabrication of the post beams and columns and offer a variety of houses from completely finished units down to shell houses or even "piso-techo" units The same model house can use various interior layouts and exterior wall treatments

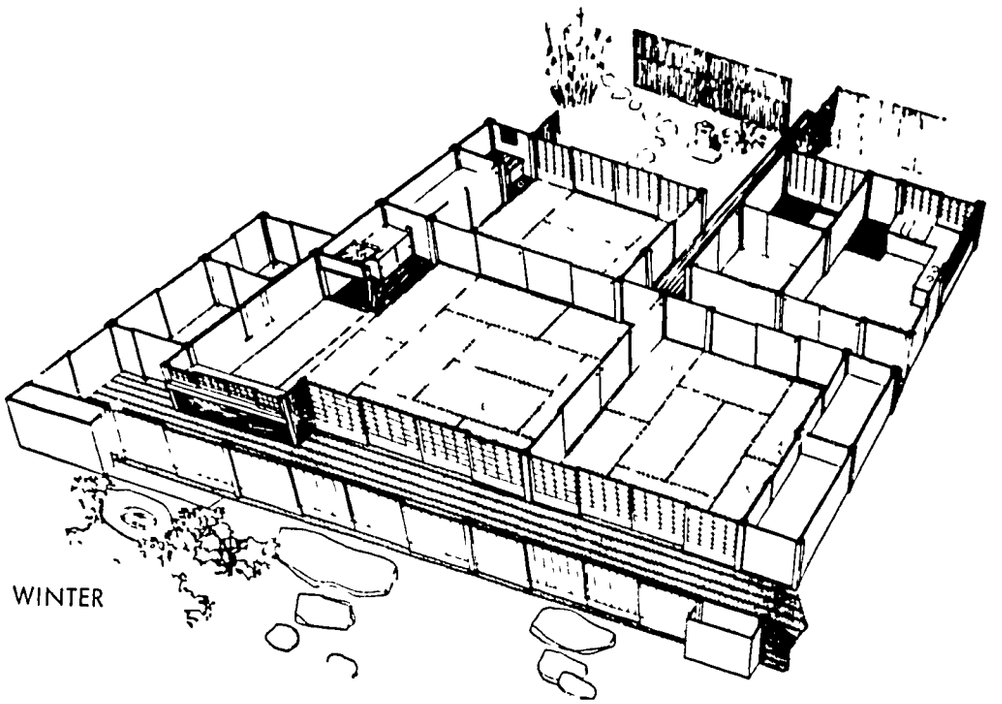
Aluminum is an ideal material for prefabricated post and beam houses The Aluminum Company of America makes members which replace wood as studs and joists Perhaps the lightest structural framing material, it is not subject to rot and corrosion, and it can be worked with simple tools

Post, beam, and column framing systems offer advantages on poor soil Since they reduce the weight of the structure, the footings need not be extensive On severe slopes the house can be raised on posts and prefabricated beams can be used at the floor level to support the floor and house above

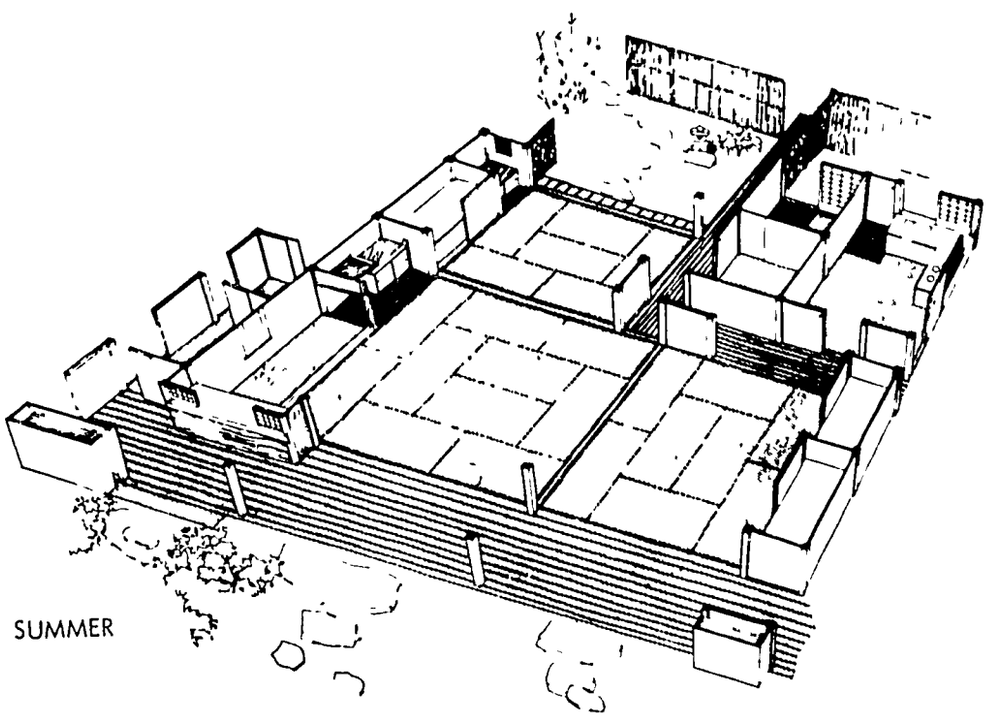
If one intends to build a complete house, utilizing conventional materials for walls and partitions there is no monetary savings by using a prefabricated framing system, it may even cost more money If one builds with non structural walls and partitions, using old or new materials, then the prefabricated structural frame is the way

In self help programs using unskilled future homeowners, a properly designed prefabricated structural frame can be erected faster than conventional walls This permits the homeowner to move into his house substantially sooner

Prefabricated systems using wood, steel or aluminum framing members require minimum warehousing or stockpiling facilities Members can be turned out quickly after they are ordered In contrast, precast concrete members require forming and curing, and are limited to the number of forms available for each day's production The units must be stored until they are cured and until there is an adequate supply



TATAMI HOUSE – The traditional Japanese house used the double square tatami mat (approximately three feet by six feet) both as a basic planning module and building component. The use of the mats epitomize a coordinated and standardized approach toward the design of highly responsive and flexible construction systems Wall partitions from the house are removed for a summer configuration, below.



Any lumber supplier of steel shop can produce prefabricated members without additional investments in machinery or space Prefabricated concrete units require equipment, forms and space

Anyone can design a prefabricated system of posts, beams, and columns using locally available materials With this economy of flexibility, prefabrication can be a valuable tool in helping to solve housing problems

Questions and Answers

Q Of the systems used in Operation BREAKTHROUGH, which do you prefer?

A *I don't like any of them I think that we must understand Operation BREAKTHROUGH was not designed to create systems in building The original process was to create a program of building moderate cost housing economically for integrated communities and the proposals happened to come in with systems building I have not seen any of the systems which show me that they are reducing the cost below conventional housing This does not mean that they do not put out a nice product Its hard to judge the initial cost of the plants and the design, and a lot of other things are not taken into full consideration in Operation BREAKTHROUGH I think because of rising costs in labor, we had no choice*

Q Do these systems reduce the skilled labor?

A *They do That's another problem in less developed countries In countries where you're trying to employ more people, not less, it could have a big consideration on how you are going to build You don't want to overindustrialize anything A big problem when you want to industrialize is to get people to move where you want to employ them I don't know the answer to the conflict between the employment of labor and the wish for reduced costs I don't know if anybody does But within the last year AID and the other agencies interested in assisting the economic and social development of Latin America have been paying more and more attention to the question of employment and in a number of countries to the question of increasing employment through increasing the pace of construction of houses*

PANEL SYSTEMS

An excerpt of remarks made by
Jack Warner, President, Warner Consultants

The pitfalls of industrialized housing are very apparent in the United States Application of this principle to the developing countries more than doubles the danger In essence, as the degree of technological competence rises so do the requirements for capitalization An important question Is industrialized housing practical for Latin America? The answer A qualified *maybe*

You have seen, and will see, representative samples of industrialized housing produced in the United States These involve volumetric modules, built entirely in the factory ad transported to the erection site or factory-built combinations of core modules and panels In terms of capital investment, technological capability, materials availability, and transportation, all of which you may have seen, probably is far more than you want to undertake However, portions of the industrialized housing concept in modified form are worthy of consideration I refer to panel systems which come in varying degrees of sophistication and types of materials The use of post and beam construction in BREAKTHROUGH housing is not applied However a combination of post and beam and prefabricated panels may be applicable in Latin America within the framework of limited industrialization Panels are easy to fabricate, easy to transport and easy to erect Management and skill requirements, both in factory and on-site, are not demanding Materials requirements are flexible and may be tailored to those available locally

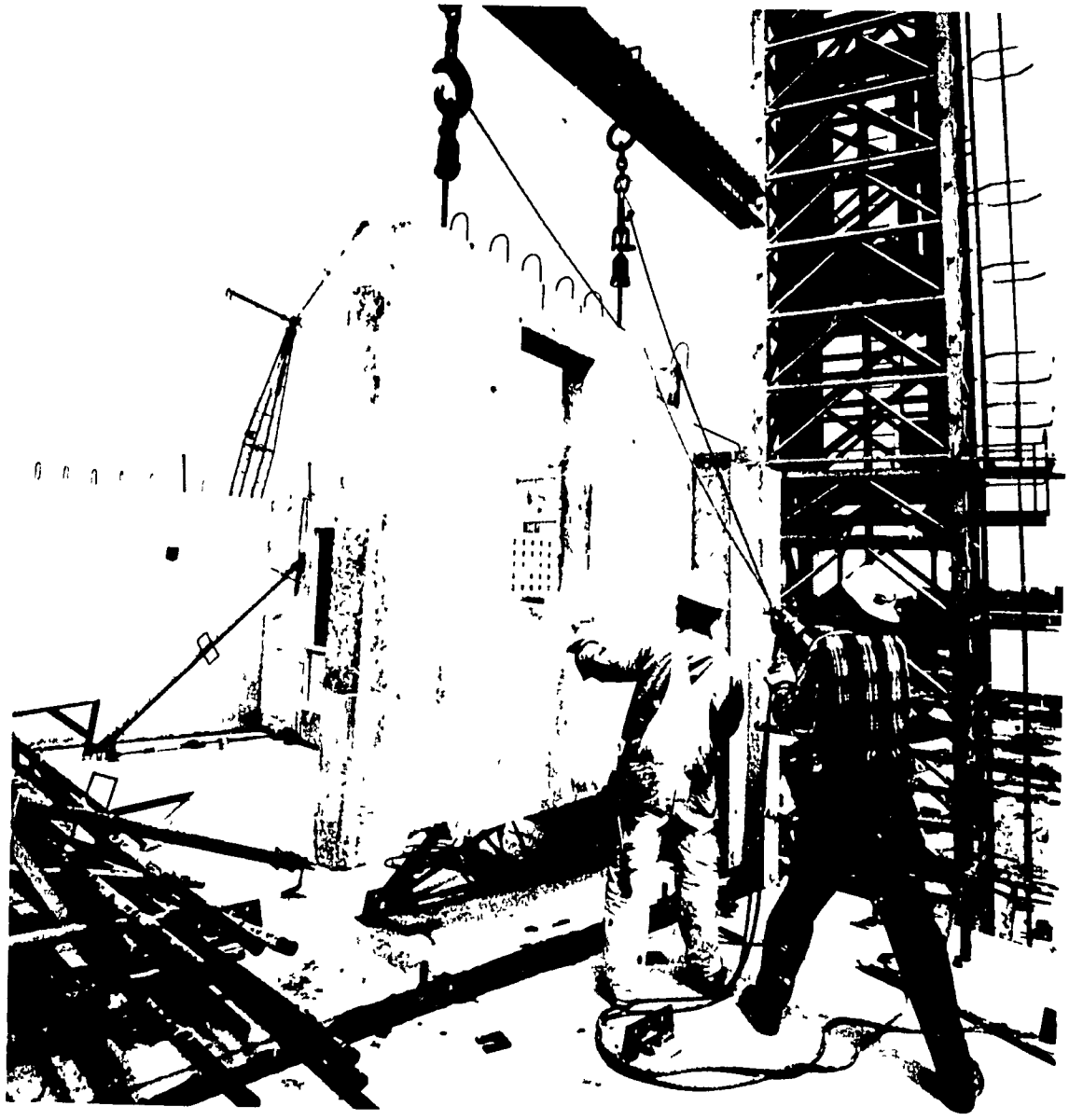
The panel systems used in Operation BREAKTHROUGH vary from precast concrete, wood, or combinations of metal and plastics Some panels are load-bearing, others contain highly sophisticated electrical, plumbing, and comfort facilities Practically all of them contain built-in doors and windows

On your tour of BREAKTHROUGH housing sites at St Louis, Missouri and Macon, Georgia, you will see four building systems which use various forms of panel construction

By now you are familiar with the Rouse-Wates system which you saw at Bladensburg and Columbia, Maryland This concept, along with the Descon/Concordia system will be seen in St Louis

The *Rouse-Wates System* is intended entirely for multi-family low- and high-rise structures, and is based on precast panels which are bedded one atop the other This forms a series of monolithic, rigid wall tables The weight of the panels and the joint connections assure structural integrity for buildings up to 24 stories Foundations and ground floor slabs are built by conventional methods with specially designed leveling devices cast in to provide connections for the precast walls At structural joints, the appropriate edges of wall and floor panels have projecting loops of reinforcing steel which are laced together by steel rods and concreted to provide monolithic connections The vertical joints are made by concreting into purpose-formed grooves Exterior appearance of the concrete panels can be varied considerably with the use of exposed aggregate and sculptured or brush-hammered finishes Floor panels of dense concrete, weighing 150 pounds per cubic foot allow for spans up to 22 feet Panels are smooth-finished to receive flooring of tile, wood blocks, or carpeting Similar material may be used for the walls

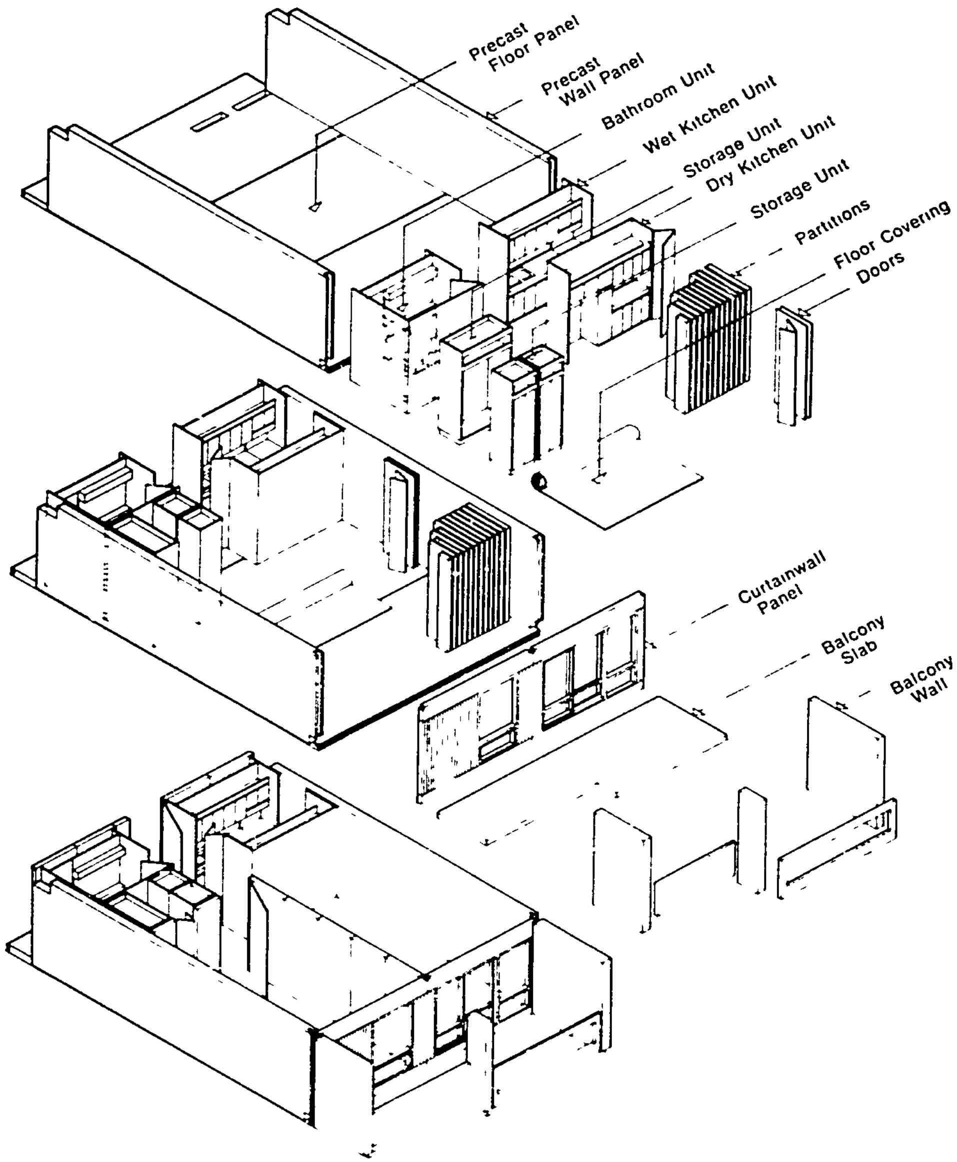
Descon/Concordia has a flexible building system which uses readily available off-the-shelf components, or components fabricated or manufactured through existing processes. It produces housing ranging from

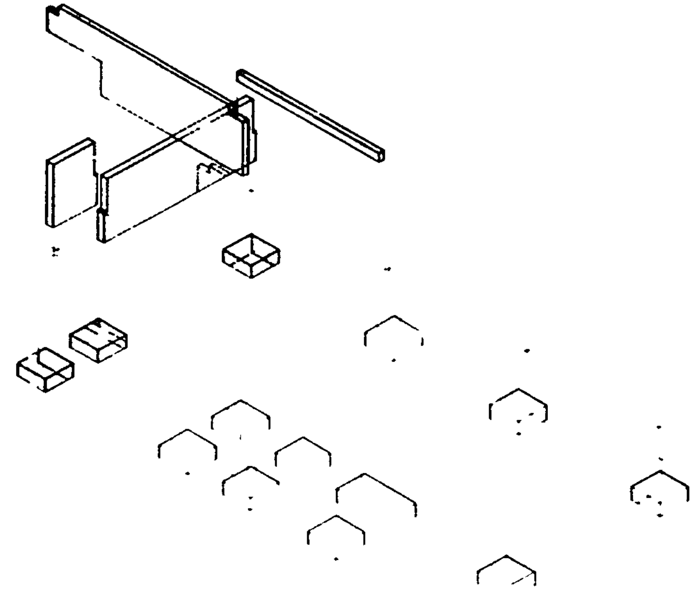


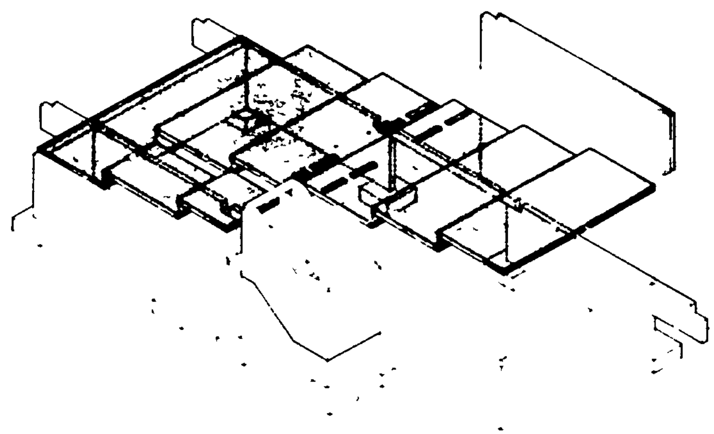
Rouse-Wates precast load bearing panel, with dining room service counter cutout.

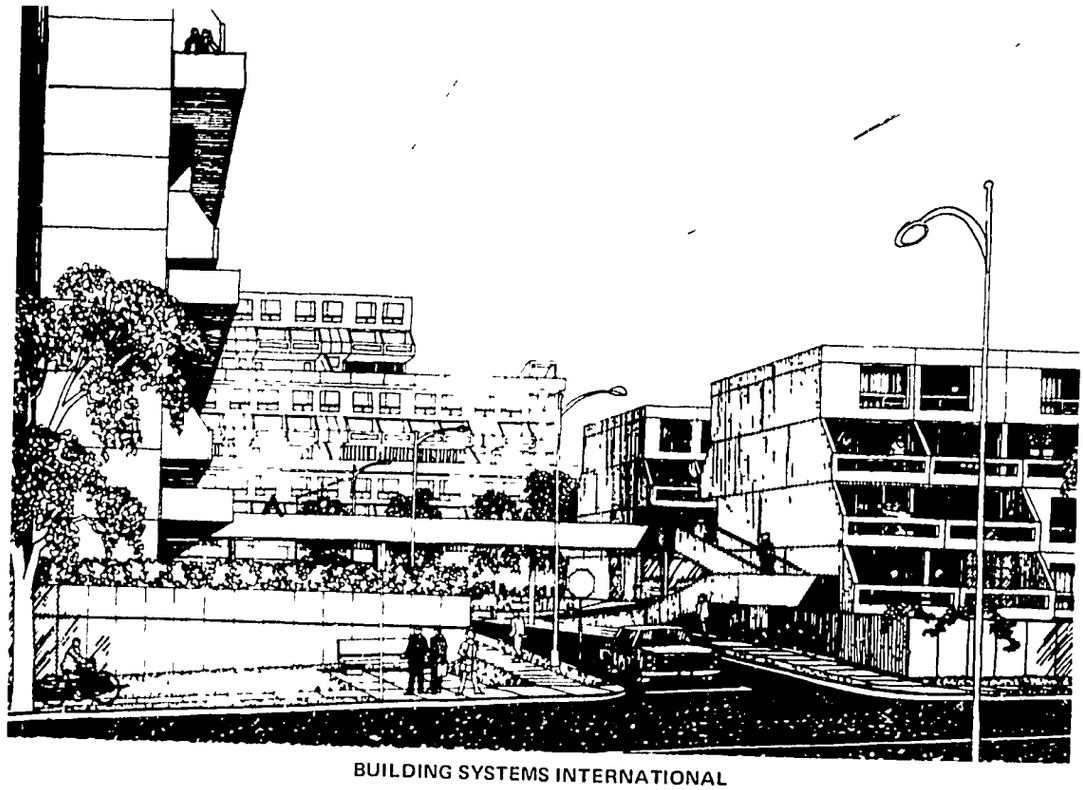
two story townhouses to 22-story high-rise structures Basic to the system is the use of factory-produced precast reinforced concrete floor and wall panels which are crane-hoisted and rapidly assembled on the site into a self-supporting structure These panels may be prestressed or post-tensioned in existing pre-casting plant facilities, or may be cast on-site Supplementing these panels are nonstructural composite panels with exterior finishes or metal or plastic, integral window, and modular interior partitions of metal-stud, gypsum board construction

Building Systems International, at the Macon, Georgia site, uses a series of precast, prefabricated concrete panels and slabs that can be produced at a central plant, trucked to the site, and assembled Essentially, this system is predicated on large, load-bearing, interior and exterior concrete panels, supplemented by floor and roof panels to create an integral structure The only on-site work that is contemplated other than normal foundation preparation, is the possible casting of the floor slabs if local conditions make this economical Standardized, prefabricated metal forms, reinforcing steel assemblies, and assemblies of any required mechanical services to be incorporated in the slabs are supplied The wall panels contain necessary electrical, plumbing and heating-ventilating subsystems, and need only be connected to adjoining units on-site More complete subassemblies, such as bathroom and kitchen walls, complete with fixtures and accessories, and closets and stairways, are also made in concrete at the central factory and shipped to the site for erection. Design of the exterior panels as four-layered units that include architectural, structural, and finish concrete




FOOTINGS +
FOUNDATION WALLS


FLOOR SLABS



BUILDING SYSTEMS INTERNATIONAL

as well as insulation and the method of construction at the central plant are unusual The panels are carefully cast one layer at a time in horizontal forms The first (bottom) layer is the exterior veneer, which may be anything from exposed aggregate to brick and tile the second layer is a dense mass of concrete, the third layer is expanded polystyrene insulation and the fourth layer is concrete which serves as the structural portion of the panel smooth-finished to become the face of the interior wall Panels are allowed to set sufficiently to be stripped then stacked vertically in racks to await shipment to the site for immediate erection by crane On-site, the alignment of panels is accomplished with adjustable temporary brackets The wall panels are erected with a 1/2-in horizontal and vertical spacing between each panel, to allow for movement and provide erection tolerance The inner side of these joints is grouted, with reinforced steel where necessary and the outer side is caulked This forms the needed connection allowing an air space between the grout and the caulking to permit balancing air pressures and drainage of any condensation

Christiana Western, also at Macon uses plywood panels with long-wearing factory-applied polyester resin finish coat, allowing complete wall construction in the shop This finish coat, reinforced with fibrous glass, leads to significant life-cycle cost savings because it does not require repeated painting It is applied to both interior and exterior panel surfaces and gives the appearance of conventional construction Approximately half the work required for production of the system is in manufacture of the panels and half for on-site work, including erection and mechanical hookups The system includes the fully insulated, non-modular, studwall panel component made with 3/8-in plywood sheathing covered with a 1/32-in layer of blown fiberglass on both the interior and exterior surfaces Factory-installed rigid plumbing subsystems and wiring conduits in the walls and flexible horizontal runs in the ceiling require only simple hookup of outside service, appliances and equipment at the site Units are shipped as panels from the factory and field assembled The production method provides panels of any length without joints and is suitable for all types of housing up to and including three-story heights This system employs a conventional foundation and floor construction, slab-on-ground or wood-frame floor with plywood subfloors and vinyl asbestos tile This factory-fabricated wall panel framing consists of 2-in x 4-in studs 16 in on center, with top and bottom plates doubled Joints which exist at wall intersections only, are covered with caulking-compound coated wood battens Fiberglass insulation is factory applied in outside walls Interior walls are framed in the same manner, without insulation Windows and doors are completely trimmed with hardware installed when the panels leave the shop A roof-ceiling component consists of 8-ft wide panels produced in any

length. A truss frame is jig-built from 2-in. x 10-in joists and is covered with 3/8-in plywood sheathing Interior ceiling finish is acoustical plaster The fiberglass-film finish applied to interior walls is precolored offwhite and requires no refinishing for the life of the structure

Again, let me emphasize that the panel systems I have described are the best the United States has to offer Certainly, they are within reach if money and materials are available However, there are ideas represented here that can be modified to meet local needs and resources and serve as the base upon which a truly industrialized system can be developed

THE SECOND TOUR

Participants visited Operation BREAKTHROUGH sites at St Louis, Missouri and Macon, Georgia, September 28 - 30, 1972.

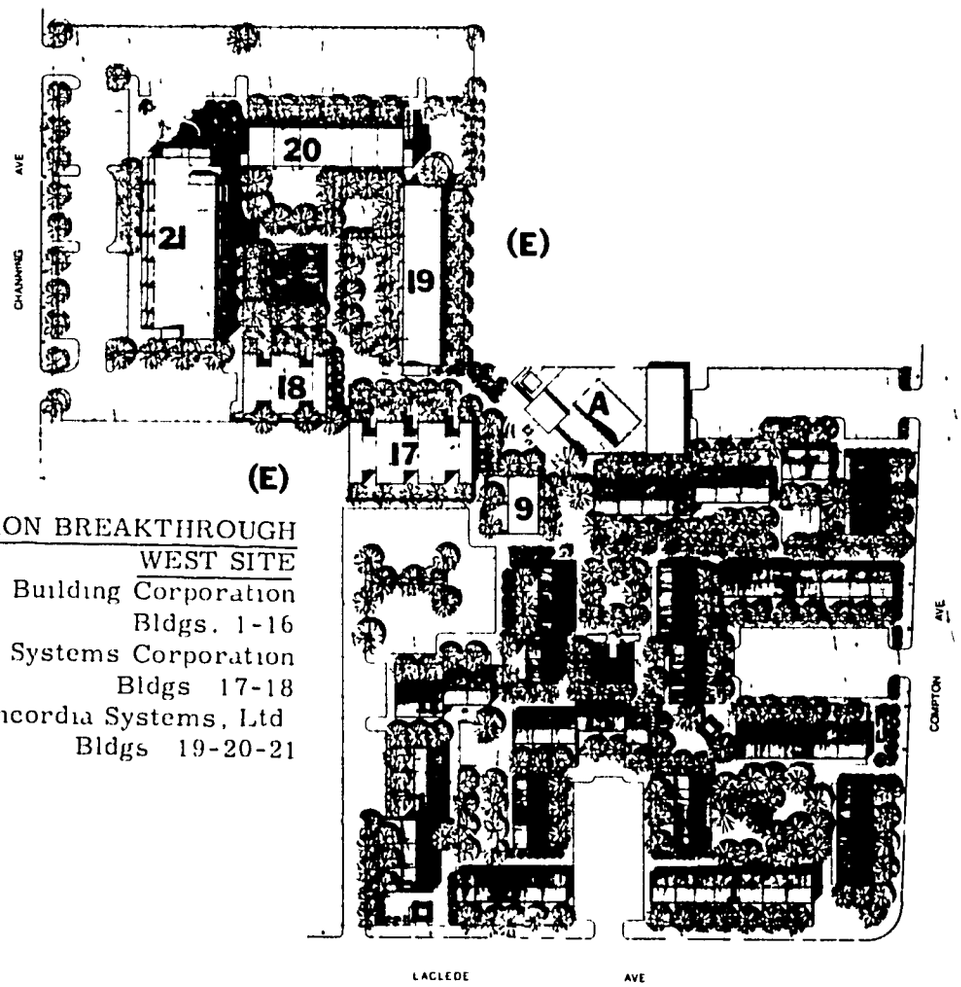
The Saint Louis Site

The St Louis site is divided into two parts, one to the east and one to the west of LaClede Town in Mill Creek Valley The area of these two sites totals approximately 15 acres One site, LaClede/West, is located on the west side of Compton Avenue between LaClede Avenue and Olive Street, and consists of 7 9 acres The other site, LaClede/East, is located on the east side of I wing, between Heritage House apartments and Market Street, and consists of 7 6 acres

Two hundred and twenty-three units are being built in LaClede/West and two hundred and forty-one in LaClede/East

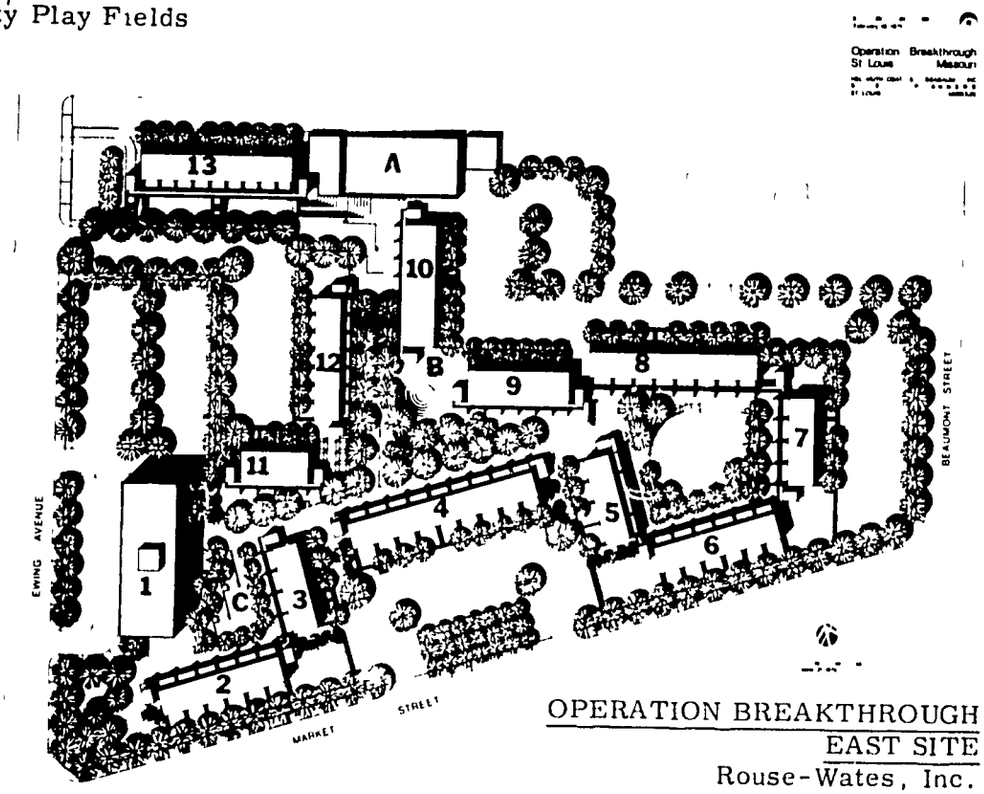
The sites, being limited in acreage and urban in character, were chosen by HUD to demonstrate medium density configurations The density is approximately the same as that developed in the adjacent LaClede Town Complex

The site planners arranged the buildings to face inward toward a pedestrian street which is developed with a series of connected courtyards Vehicular traffic and parking is on the periphery of each site with no vehicular traffic entering the pedestrian street Thus, automobile traffic is completely separated from interior pedestrian movements



OPERATION BREAKTHROUGH
WEST SITE
Home Building Corporation
Bldgs. 1-16
Material Systems Corporation
Bldgs 17-18
Descon-Concordia Systems, Ltd
Bldgs 19-20-21

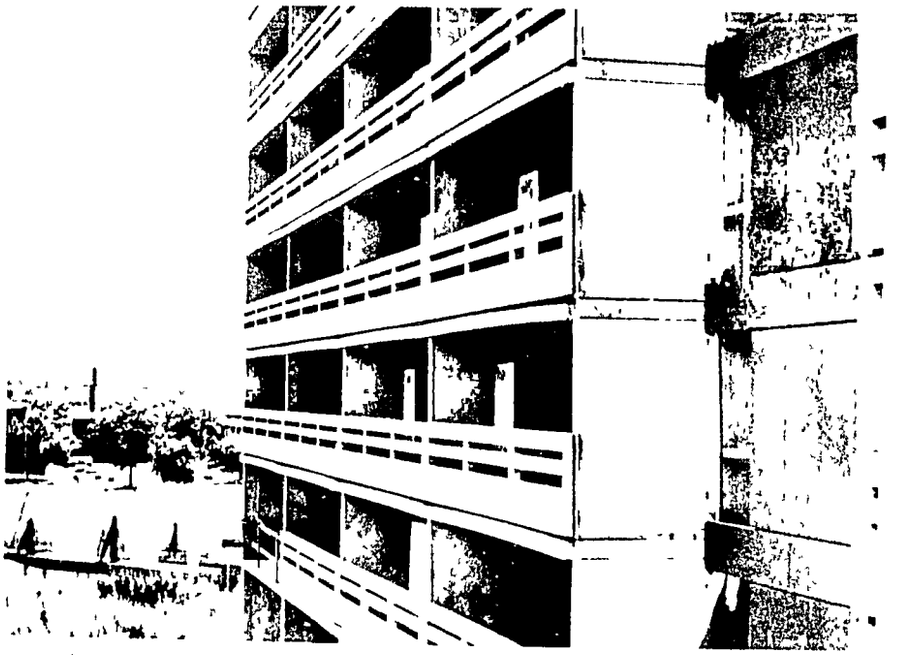
A. Swimming Pool
B. Amphitheatre
C. Fountain
D. Large Play Area
E. City Play Fields



OPERATION BREAKTHROUGH
EAST SITE
Rouse-Wates, Inc.

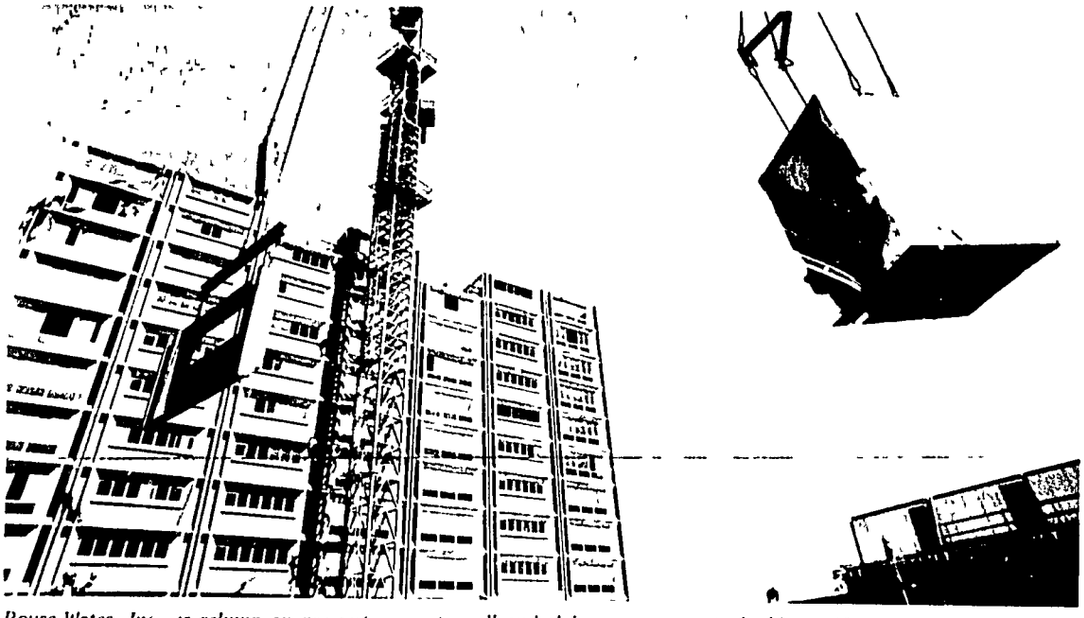
Within the pedestrian street a wide variety of community facilities are located play areas for children of all ages, sitting areas, water fountains, paved areas for cycling, small amphitheaters for special events, wisteria covered arbors, and numerous large shade trees Each of the sites has a swimming pool, wading pool, and bath house facilities

A wide range of dwelling types are being developed on the site, including attached townhouses, two story garden apartments, stacked townhouses three and four stories in height, and two medium-rise apartment buildings containing apartments for adults These building types are arranged into a harmonious and attractive total composition Both views and privacy for every unit have been taken into account



Descon/Concordia System, Ltd of Montreal, Quebec, is building one 90 unit 10 story building, one five story 24 unit building and one three story building containing 14 units The three buildings are interconnected with pedestrian galleries Descon/Concordia has contracted with local and nearby sources to manufacture and assemble the primarily pre cast concrete structures Seventeen efficiency units, 45 one bedroom units and 66 two bedroom units are being built

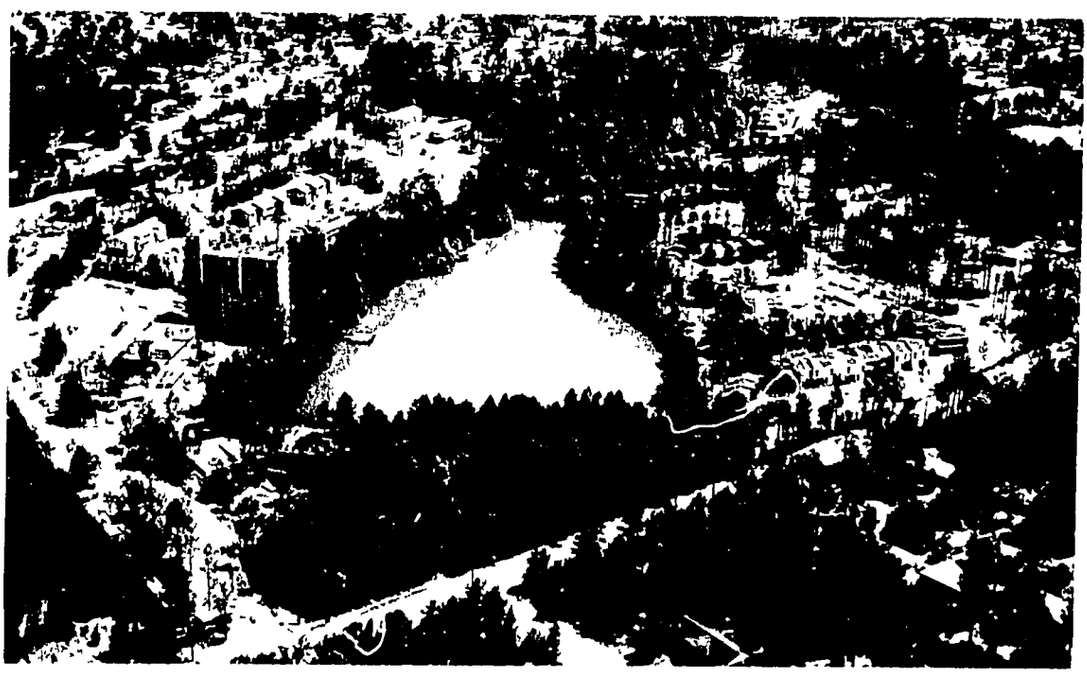
Material Systems, Inc, uses prefabricated molded panels made of fiber-reinforced resins to be assembled as garden apartments Of these 20 units, 10 will be one bedroom units and 10 two bedroom units



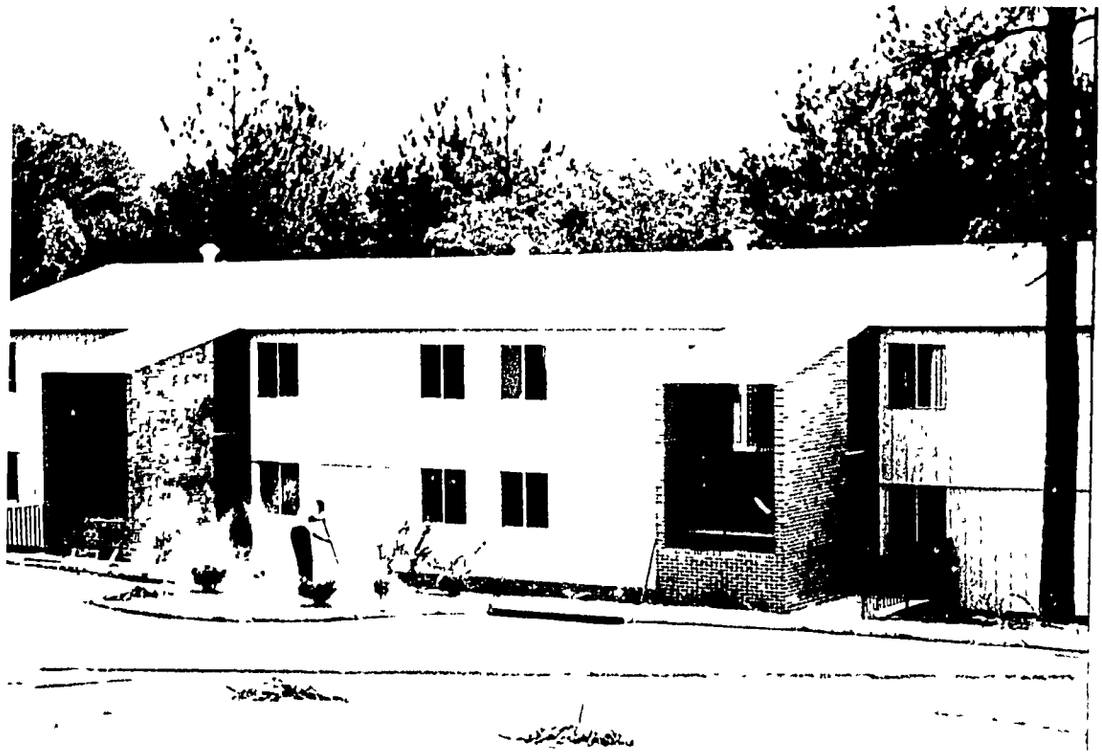
Rouse-Wates, Inc , is relying on pre cast concrete wall and slab construction to build one 12 story residential building containing 84 units, eleven 3 and 4 story building with a total of 130 units, and one 6 story building with 27 units– a total of 241 units Of these 241 units, 46 will be efficiencies, 27 one bedroom units, 123 two bedroom units and 45 three bedroom units (4)

The Macon Site

Strategically located in southwest Macon on Chambers Road, the site is easily accessible to downtown Macon, regional shopping facilities, and the interstate highway system Neighborhood shopping and school facilities are within walking distance A six-acre spring-fed lake surrounded by densely wooded rolling terrain provides the setting for approximately 300 housing units The Macon Project was organized as a housing cooperative by FCH Services, Inc , under contract with HUD

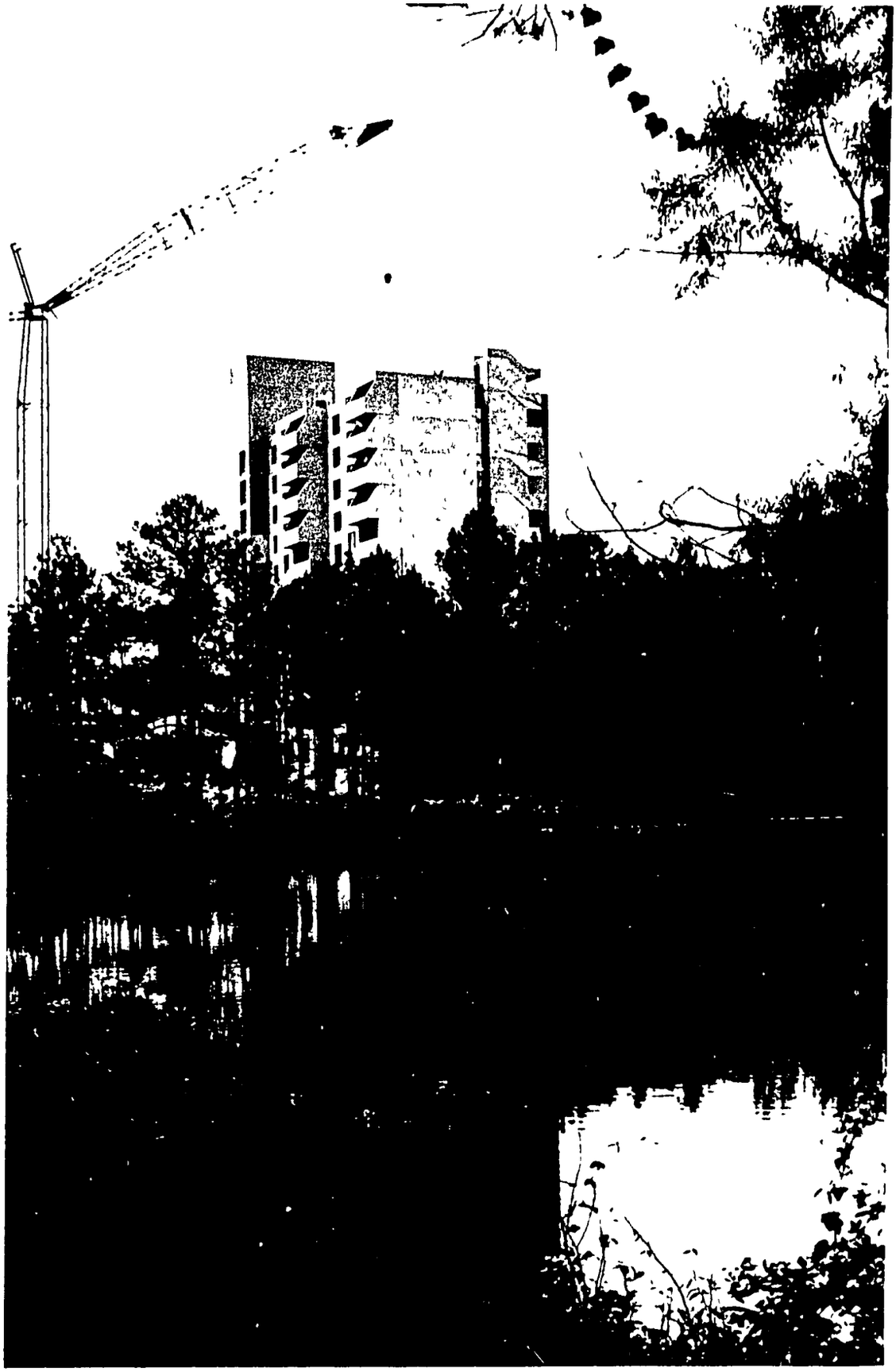


The Macon site, under construction by six different housing systems producers, creates an optimum living environment, with a variety of housing types and densities clustered within a unifying open space system.

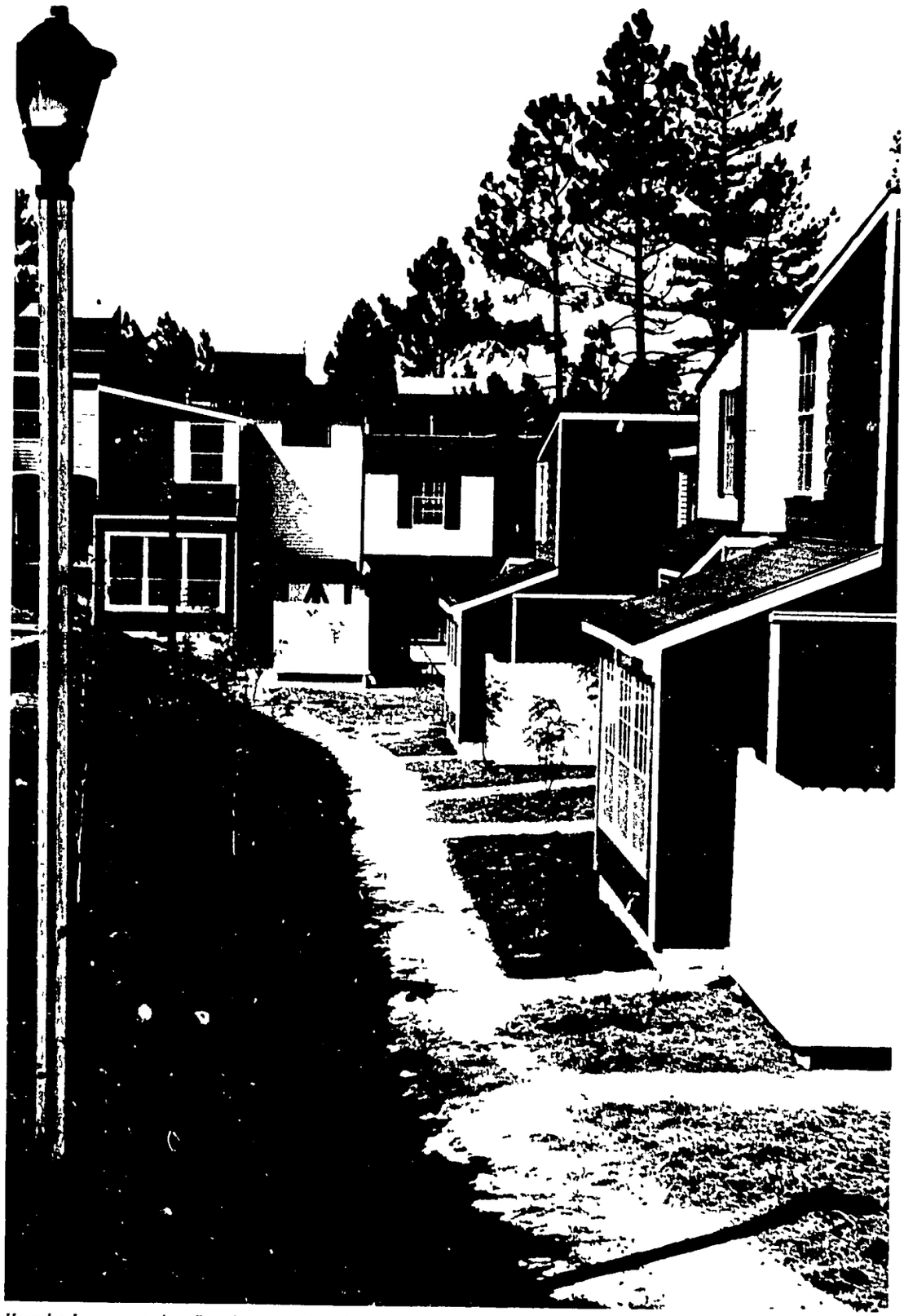


Alcoa Construction Systems — Townhouses and walk up apartments. Mechanical cores are volumetric modules and the remainder of the dwelling is panelized. There are three basic exterior walls: load bearing, ribbed walls, using formed aluminum sheets; conventional wood framed walls with aluminum siding; and aluminum framed walls with aluminum siding.

Boise-Cascade Corporation – Single-family, attached and detached, multi-family low rise. Light gauge steel framed volumetric modules. The system uses light steel members and non-combustible plywood decking, with the basic structure a ballon frame modules.



Building Systems International, Inc., – Single-family de.ached and attached, multi-family low, medium, and high rise apartments Uses precast load-bearing panels for floor sla.s, interior and exterior walls Site erection is accomplished by tower or other cranes



Hercules Incorporated – Townhouses and garden apartments. Uses wooden frame volumetric modules bolted together to form a rigid structure capable of withstanding all residential design loads Exterior walls, extruded aluminum window frames, and sliding doors are factory installed

Christiana Western Structures – Single-family detached, townhouses, and multi-family low rise or garden apartments Uses wood frame and factory-built panels for walls, partitions, and roof construction A special polyester resin finish coat, reinforced with fiberglass, is furnished as an interior and exterior wall covering in lieu of paint

Material Systems Corporation – Single-family attached and detached houses, garden apartments, and townhouses. Uses fiber reinforced resin with earth fillers, molded into panels

COOPERATIVE HOUSING

The Advantages to Occupants and Sponsors of Cooperative Ownership and Management, and the Function of Reserve Funds in Low Cost Housing Projects

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The less technologically developed countries take a pessimistic view of industrialized housing – and rightly so However, the use of partial industrialization through intermediate or transitional technologies may be of value in helping less developed countries solve their housing problems. Certainly, transitional technology lends itself to cooperative self-help groups who are receiving outside technical and financial assistance.

For example, concrete block, although not part of an overall housing system, is a traditional component that initially can be manufactured by hand Ultimately, without any change in configuration, it can be mechanized and mass produced, in the factory or at the building site. The same applies to prefabrication of roof trusses, door and window assemblies, plumbing and electrical hookups, and movable room partitions

In most developing countries, low income families substantially outnumber those in the low-middle and middle income brackets These are families who live in rural huts on their own land or on the land of others, or who invade vacant land in urban areas and build shacks by the thousands around the world. They often occupy sites, publicly or privately owned, which are unsuited to human habitation, or which are needed for other purposes Whether these sites are called *villas miseria, favellas,* or *barriadas,* they usually lack the basic services of potable water, sanitary facilities, proper street access, electricity, schools, or other community facilities

It is apparent that few, if any, developing countries are prepared to house large numbers of poor families in "standard" housing for which they cannot pay. The alternative is to use the self help potential of the people and to employ the limited government resources for those essentials which the families themselves cannot normally obtain – secure land tenure, essential utilities, and low cost financing

Families can and do build their own shelter. They can do it well if assisted with organization, technical help, and small loans for at least some materials such as permanent roofing, and cement for foundations and floors. Cooperatives can play an important role in a program of this sort, because families working in groups, with assistance, can usually accomplish more than individuals working alone and unaided

Cooperatives involve the members in the decision making process. They provide the organizational structure which makes for a well ordered, aided self-help construction program. The skills possessed by individuals n the group are employed for the good of all. Furthermore, the provision of training and other forms of assistance, such as materials, tools and equipment, is simplied.

Cooperatives also provide a useful device for curbing speculation on land provided by the government. This is particularly true when title to the sites is vested in a cooperative rather than the individual family. The cooperative can assure the members of secure tenure through an "occupancy agreement," and yet control the use, transfer, or disposition of individual sites.

Cooperatives also tend to encourage groups to initiate and carry on other worthwhile community undertakings and develop a sense of group responsibility rarely felt in communities planned and regulated by the government. The repayment records of occupants of conventional housing projects in many developing countries leaves much to be desired In a well run single mortgage cooperative there is generally a feeling of collective responsibility for meeting the cooperative's obligations on time The collection of carrying charges and repayments on small loans can also be handled by the cooperative which can put pressure on the delinquents more readily than the government. Also cooperatives have reserves for delinquencies and vacancies. It is possible to carry a member who is in temporary financial difficulties without jeopardizing his financial position or that of the cooperative. This helps to assure prompt repayment of the cooperative's obligations.

In cooperative self-help programs, technical services organizations can play an important role. In addition to serving as sponsors and organizing the cooperatives, they can relieve the government of carrying on educational programs and providing training and technical assistance They also can administer loan funds and serve as both a bridge and buffer between the individual families and the government

Two of the nine prototype sites of the Operation BREAKTHROUGH program, Kalamazoo, Michigan, and Macon, Georgia, were organized as housing cooperatives by FCH Services, Inc , thus adding strong social and community awareness implications to the technical experimental systems of industrial producers

Each member-owner of the community has his voice in the life of his community This democratic attribute has its foundation in a series of member education sessions designed to qualify residents as active participating citizens, living and working together toward common goals maintaining and enhancing the attractiveness of a planned community and fostering a sense of community conducive to individual and group achievements through a well structured democratic organization The cooperative members themselves through fully understanding their rights and privileges as well as duties and responsibilities shoulder the responsibility for achieving long-range high standards of liveability for themselves and their children.

The cooperative technique finds its role in both self-help construction and in permanent community control.

CHANGES IN THE BUILDING INDUSTRY – THE PRACTITIONER'S VIEW

An excerpt of remarks
made by M. O. Gustafson,
President, Imperial Homes

The success or failure of housing production rests in cost control There are three main areas of control manufacturing, overhead, and sales

Manufacturing includes labor and systems costs Labor costs in each of these is variable, as is loading and shipping. A tabulation of man hours is kept on each house every day. This allows a determination of average labor costs per month, per job, per department

A labor budget is set up for each job This, combined with actual costs, tells us whether we are over or under budget in relation to productivity.

Using these methods every day we can see exactly what our costs were for the day before and for any combination of time before In this way we can see whether we are making or losing money on each job.

We figure a labor budget of 9 percent of final sales, or price to the customer Overhead costs are divided by 4 1/3 (average weeks in a month) to get weekly overhead costs. We can check this against our sales to see if we are within our budget This is general overhead.

Our indirect overhead from manufacturing must also be included in these figures. This includes tooling costs, power and related items Material makes up 63-68 percent of the sales price We try to keep it no higher than 63. Hard to do with today's escalating costs.

Our sales budget is 8-½ percent of total sales, including commissions to salesmen, and indirect costs, such as sales management and advertising.

These figures are kept in our computer, which compiles the results we use. Every week our staff meets with all of the figures at hand. This is our basic costs management

We manufacture for two groups private contractors and our own construction company.

Questions and Answers

Q. What was your total production for last year?

A. *500 houses.*

Q. How many workers do you employ?

A. *In our plant, 34-40 people.*

Q. In what area are your sales and production directed?

A. *Our area of production covers 4 states.*

Q. How are the units shipped, by truck or rail?

A. *Our shipping is by truck.*

Q. What is the cost per foot of the unit?

A. *When our package is shipped to the constructor it costs about $6 a square foot. It sells anywhere from $11-14 a square foot.*

Q. How many different types of housing do you build?

A. *About 40.*

PARTICIPANT COMMENTS

At the close of the seminar, participants from the Latin American countries were invited to comment on what they had seen and heard and to relate to home country situations

Carlos Diaz, MEXICO

I think the seminar confirmed the housing criteria we have established in Mexico In short, we are conscious of the housing problems to be solved through a national plan, and those which can be attacked with help from multi-national groups The mistakes we have made, and those we have seen other countries make, are generally in the technical areas. However, we cannot develop basic construction systems, or implement projects, that will simplify and adequately resolve problems from the architect's point of view Obviously, that type of effort, when not involved with social, financial, and urban development plans, will have limited results The approach we intend to take is to adopt all the construction systems that we know are successful Also, we should place equal importance on financing, management, coordination of central problems, home maintenance, urban development, and the problem of educating people so that they will want to live in a better way

In Mexico, the majority of important projects have been sponsored by the government to provide 100 percent subsidy for persons without means to purchase housing. This well-intended gift has failed because people do not appreciate its value The problem centers on educating the people to help them increase their incomes, and by offering more working opportunities This attitude exists in Mexico, and all over Latin America, and efforts are being directed to that end.

Gerardo Lara, COSTA RICA

A seminar of this type tends to bring our countries closer together, particularly with the United States; to learn from each other's mistakes, and to share our mutual problems. We hope that the proposal to have another industrialized housing seminar at the Pan-American level will materialize. If we had not had the opportunity to be here, decades would pass before this idea could flourish

Fernando Paparoni, VENEZUELA

In studying a booklet I received in the Seminar I discovered that the Descon/Concordia System is being used in petrochemical plants in Zuria, Maracaibo, in my country. This is one of several advanced systems of construction which are in use there. There is one company utilizing advanced systems, Vivienda Venezolana, which is more attune with our national housing institutions, such as the Banco Obrero This company demonstrates more interest in housing of social interest.

I would like to point out another Venezuelan experience which has produced very good results in the encouragement of applying the most modern construction techniques. We call this "mixed development" which is the participation of private industry supported by the guaranty of the government for the execution of the specific development

We have a base upon which to build with what we have learned in this seminar

We think we should propose a seminar on this subject in our country to further the Latin American effort in its goals for eliminating the housing problem. It is through the continuing exchange of ideas that we think the most productive part of seminars lie. Perhaps we soon will be able to interchange positive technical solutions, leading toward resolution of the housing problems common to all Latin American countries I am very grateful for the invitation to attend the seminar the contents of which I think have been very very good.

Atanasio Jarero, MEXICO

(Explanation–Mr Jarero was requested to elaborate upon his organization's factory of cement blocks and the production and application of sub-components in Latin American usage, which might be an appropriate theme for a subregional seminar)

Our system is not actually cement block production but rather blocks of light material which can be used as subcomponents. We now also produce complete panels and the material is being used between floors in combination with steel beams and certain pre-fabricated elements. The manner of production and use of the material enables us to continue the use of our labor supply which is very great. It is a beginning in modern housing systems in relation to quality of construction and savings in actual construction time which is a pronounced need in meeting our vast housing shortage With respect to interior finishing work we utilize conventional building systems and conventional elements

Andres Bellon, MEXICO

We were more or less familiar with the advances in the United States, and had some ideas of what is being done in neighboring countries. But it has been especially useful for us at this moment to broaden some of the information we already had. What has convinced me more personally is the idea that we have in front of us more than a technical problem – the problem of improving our resources and optimization and modernization of our systems. I think that as a first step, for countries which do not have much experience in large elements of construction, emphasis must be placed on administrative structure, preplanning, and systems control. I was very much interested in the apparently simple, but complete and effective control room we saw in Washington. It really confirmed our ideas and we are planning to broaden them.

The opportunity for contact and interchange at this seminar has been fortuitous. We should alert those agencies we are in contact with to be on the lookout for this program. We know there is great interest in HUD to continue giving out this information and it would be a sin to pass up the opportunity.

Claudio Creamer, VENEZUELA

This seminar has reaffirmed some of the ideas on methods and systems we are already using We have seen some new details and they show us that we are on the right road. In 1966 we started an experimental program at Valencia, sort of a small-scale Operation BREAKTHROUGH. We selected 50 companies to develop an industrialized housing system in the first year and moved into construction in the following years. With the installation of a prefabricated plant, we construct 2,500 houses a year and we are planning

to grow. The experimental program is leading to wider use of modern methods It forces the government to provide more financing, and has made the public more aware of this new type housing

Unfortunately, prefabricated housing is not produced at the same level for low income people as it is for middle income. What we have seen and heard at this seminar is of great interest to our country. We from the Banco Obrero will try to implement some of these ideas.

Manuel Batista, PANAMA

In my personal opinion, and perhaps all others here, the invitation to this seminar by the American authorities has been a useful effort Although I do not have much experience in the field of housing, I have grasped the contents and intention of the seminar and the housing problem Such a problem cannot be solved without the participation of different agencies and help of different groups The housing problem in Panama is smaller in scale than in the United States But the problems I saw, and the systems developed to solve them, can be applied to our own resources in a highly useful way We have a low income housing problem in Panama and are undertaking rehabilitation There is a large project in Panama City, in the Marañon area – a very poor section Right now it has little value because it has so many useless old houses We are trying to rehabilitate the land and provide new housing for the people.

The experience we have gained at this seminar, and the possible application of certain systems used in conjunction with our own resources, will be of great help

Manuel Chiquito, VENEZUELA

The ideas we have gained at this seminar will be useful to us in many ways The Venezuelan government is helping private industry by participating in mixed programs and they have been very well accepted My specialty is in problems of conservation and maintenance and I have used this visit to observe your use of equipment and mechanical systems for the collection of trash. In cities like Caracas, with great populations, we have sanitary problems in the collection and disposal of trash I have noted with interest your compacting and truck winch systems We hope that we will be able to mechanize our trash collection system very soon, and improve sanitary conditions in our cities

Victor Duval, DOMINICAN REPUBLIC

I work for the Banco de la Vivienda which is mostly interested in housing developed through savings and loans We are experimenting with condominiums, but they only provide apartments for middle income families

Labor is cheap in my country and the workers are very efficient The types of houses we build are of the more conventional construction There are some groups that deal with my bank that prefabricate houses, but it is a modular system made at the site It is a very practical system and economical It cannot be industrialized as it is here in the United States Unemployment is the major factor The Instituto Nacional de la Vivienda is planning to build 5,000 houses at the entrance of Santiago These houses will be grouped together in duplex, multifamily buildings, or single family units Fifty percent of the cost will come from the government and the workers will pay for their houses under a cooperative sort of system

I am very impressed with this seminar, especially the field trips It has been a good experience and very stimulating. When I return to my country I will pass on the information to professional groups I have contact with.

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Section One of this list may be requested from:

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SECTION ONE

I. International Publications – General

WHY THE HOUSING INVESTMENT GUARANTY PROGRAM? — No Cost.
Available in English, Spanish and French.

HOUSING THE CAMPESINO — N.C.
A study of a housing co-op in Los Pocitos, Panama. Available in English and Spanish.

FCH INTERNATIONAL PROGRAM — N.C.
Available in English and Spanish.

WHAT IS ICHDA? — N.C.
Description of the International Cooperative Housing Development Association and its initial member organization. English only

UN/ICHDA — N.C.
Text of the UN/ICHDA Memorandum of Understanding English only

MANAGEMENT GUIDELINES — N.C.
A breakdown of the responsibilities of the Board of Directors of a housing cooperative and policy guidelines English and Spanish versions

COMMUNITY ACTION FOR BETTER NEIGHBORHOODS — N.C.
A study of homeowners associations in three communities in Lima, Peru, with recommendations for the establishment or improvement of similar associations elsewhere English only

THE TECHNICAL SERVICE ORGANIZATION — N.C.
The role of a technical service organization in cooperative housing English only

BUILDING BETTER COMMUNITIES — N C.
Explanation of how institutional lenders for housing can incorporate homeowners associations into their housing programs English only.

II REPORTS

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A progress report on the work of the Foundation for Cooperative Housing. English and Spanish versions

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Report on the Investment Guaranty Program over 10 years. English only

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MESA REDONA SOBRE EL PROBLEMA DE LA VIVIENDA EN LAS URBANIZACIONES MARGINALES
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#2 The Technical Service Organization Key to Successful Cooperative Housing. N.C.

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"U.S Cooperatives and International Development" N.C.

"FCH Assists in Development of $25 Million in L.A. Housing" (Newsbriefs, September, 1971) N.C.

"This Week in Real Estate Co-op Housing Nears $100 Million" (The San Juan Star, May 27, 1972) N.C.

"The Alliance for Progress in Sardinilla" (Congressional Record Reprint, May 14, 1971) N.C.

"Lending Opportunities for Mortgage Bankers" N.C.

"Builder tells timing and procedures for profitable FHA low-income work" N.C.

"Co-op Housing May Fill Your Shelter Needs" N.C.

"Co-op Housing Units Offer Residents New Lease on Life" N.C.

V. COOPERATIVE TRAINING SERIES

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A guide for the Board of Directors, covering their powers and responsibilities, membership relations, co-op committees and relations with the attorney, the auditor, the government, and the managing agent. $1.00 each 5/$2.50

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7 By-laws and Out-laws

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Cooperative Housing Ideas & Methods Exchange No 52	N.C.
The Development of Rural Cooperative Housing in the United States	N.C.
Two Decades of Cooperative Housing Foundation for Cooperative Housing	N.C.
Building for the Mass Market	.30
Building Better Communities	N.C.

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HUD/International Special Supplement Series
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Housing and Market Analysis in Latin America

Housing and Market Analysis in Latin America–Worksheet

V. STANDARDS

Proposed Minimum Standards for Permanent Low-Cost Housing[2]

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[1]BRIEF is designed to promote the exchange of housing and urban development information between the United States and foreign countries. Its purpose is to put into convenient form the highlights of subjects to current interest to domestic and foreign readers.

[2]From Ideas and Methods Exchange Series.

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Housing and Urban Development in Panama

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[2]From Ideas and Methods Exchange Series.