They're reaching a decision... 

They'll be seeing their architect tomorrow.

Celotex National Advertising Tells Them

"Now is the time to build."

This is a typical home-loving American couple. For years they have wanted to own a home. They have a little money saved up—enough to build, with today's easy financing and low interest rates. They would like to build for the satisfaction there is in it. And they would like to put their savings in a secure investment. Now they have decided, and they're going to act.

These people live right in your community. What has prompted them to act right now? A combination of circumstances, probably—the circumstances which are being mentioned in every Celotex national advertisement this fall. At any rate, they have been reading those Celotex advertisements with a lot of interest.

Eight out of ten such people know the Celotex name and quality reputation. When you specify Celotex Guaranteed Insulation, they know you're giving them full protection against fuel waste—against cold drafts and excessive summer heat. And it's low-cost protection, too, guaranteed in writing for the life of the building! (When issued, applies only within Continental United States.)

*Now is the time to build! It is a hedge against the future • Financing rates are low • Interest rates are low • Materials cost less than they will later on • Labor is still available.

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INTRODUCTION

... Without Building there can be no National Defense.

BACKDROP: WORLD WAR I

A review of Building's assignments in 1917 ... object lessons for today's defense problems.

A MESSAGE TO AMERICANS

A letter from the president of the Royal Institute of British Architects.

BUILDING'S PART

Building's share in the Defense Dollar ... where Defense building dollars are going.

ORGANIZATION: DEFENSE BUILDING AGENCIES

A chart and table guide to Washington's defense organization ... for architects, engineers, and contractors.

BUILDING'S ROLE

Wherein new opportunities are explored ... and ways and means for individual participation examined.

MILITARY AND NAVAL BUILDINGS

How the Army and Navy will spend a billion 1940-41 building dollars ... recent military and naval building in every category.

INDUSTRIAL BUILDINGS

A look at the demand and legislation which is boosting industrial construction to post-depression highs ... a portfolio of building types it is producing.

DEFENSE PLAN FOR THE CITY

Two studies for an average U. S. community by W. Earle Andrews and Richard M. Bennett.

AIR RAID PROTECTION

Basic data on ARP and camouflage, prepared in collaboration with Eriing F. Iversen.

HOUSING

A National Defense demand for 200,000 dwelling units ... legislation behind Government's 80,000 unit share ... organization and procedure ... an expandable low cost house for National Defense and national standardization ... a portfolio of eighteen other timely housing projects.

BIBLIOGRAPHY

Additional information sources on the Building Industry's part in National Defense. (Follows page 468.)

MONTH IN BUILDING

FORUM OF EVENTS

Government personnel related to the building industry and National Defense.

LETTERS

Design Decade.
THE MONTH IN BUILDING

TRENDS. Slumping sharply from recent record levels, nonresidential construction pulled the September volume of total permits down 11 per cent from August (see tabulation, right). The filing of large permits for defense industrial plants during recent months has made the nonresidential total jumpy. Chances are it will bounce up again for October when several multi-million dollar defense projects were permitted. (The nonresidential category also includes institutional, educational and publicly financed building types, the construction of which has dropped markedly during 1940.)

EFFECT. Besides giving Army, Navy and industrial building one of the biggest forward pushes they have ever received, the national defense program is doing many other things—some good, some bad—to the industry and its vital statistics:

- Residential building activity, after a rather slow summer, is showing new life. The September volume of permits was up 6 per cent from August, raising the nine-month total 10 per cent above the 1939 level (see tabulation, above). Preliminary estimate is that about 525,000 dwelling units will be produced this year, 30,000 more than last year.
- Wholesale building material costs have jogged up steadily from 92.4 per cent of the 1926 average in June to 94.6 per cent in September. Year ago the figure was 90.9. Culprit mainly responsible for the rise: lumber (see p. 4, col. 3).
- Residential rents for October, after climbing slowly but steadily for seventeen months, hit 87.0 per cent of the 1923 average for the first time since May 1938. Year ago rents stood at 86.3 per cent.
- Average price of twelve stocks of building material and equipment manufacturers rose to 74.6 per cent (preliminary) of the 1928 average in October from a three-year low of 58.1 per cent in June. In October 1930 stock prices averaged 82.0 per cent.
- Wage rates for both common and skilled building labor have risen to the highest levels in U. S. history. According to Engineering News-Record, they now average about 71.1 cents and 81.45 per hour respectively. Year ago: 68.2 cents and 81.44.

BIG ONES. Perhaps never before in U. S. history and certainly never before in the past two decades have so many big jobs been given Building in so short a time. Toward the prompt accomplishment of national defense, the War and Navy Departments alone signed 90 construction contracts totaling $480 million between August 1939 and mid-October. Averaging more than $5 million each, many of them are so large that they are divided between two, three, four and even five contractors. And, more projects, more contractors are being added to the list each week.

Defense Builder No. 2 is Merritt-Chapman & Scott Corp. (contractor for the new $6 million Southland Paper Mills and $3 million Champion Paper & Fiber plants in Texas) who, along with Spencer, White and Prentis, Inc., and Foley Bros., Inc., is erecting $17 million worth of shipbuilding drydocks and accessories at the Norfolk (Va.) and Philadelphia Navy Yards; and, with Geo. A. Fuller Co., $24.2 million worth of aviation shore facilities at the Quantock Pt. (R. I.) Naval Air Station.

Design of most of the Army and Navy construction projects is being handled by their own architects and engineers, but much of it is given to private firms. While names have not yet been released in connection with some of the larger projects it is safe to say that Detroit's Albert Kahn, Inc., is the No. 1 National Defense Architect. He is known to be designing many of the buildings included in the $45.5 million Pacific Islands contracts and the $24.5 million Quonset Pt. contracts mentioned above, and he is known to be putting into working drawing form many other projects roughed out by the Navy's architectural staff.

WHY. Less than half the rental dwelling units in the U. S. stay occupied for two or more years at a time. The others see at least one change in tenants within the short two-year period, and their landlords are putting in everything they can to make the unit worth the effort of more than one tenant. And, in the office building, the chief change is in the type of accessories and furnishings—Zone air conditioning, vacuum cleaning installation, simple, yet costly—estimates have been from $10 to $85 per unit.

(Continued on page 4)
MASONITE PRESDWOOD TEMPRTILE

...SPOTLESS LUXURY AT LOW COST

No. 1—THIS PLAN FEATURES a built-in seat for breakfast, behind which are sliding shelves for the electrical equipment, a shelf for cook-books and another for a radio. The counter tops and built-in cabinets are Masonite Tempered Presdwood. The walls are Presdwood Temprtile. Notice the electric clock mounted behind a removable panel of Presdwood Temprtile.

No. 2—HERE'S ANOTHER BRIGHT cheery kitchen with Presdwood Temprtile walls and built-in features of Tempered Presdwood. In the far corner is a sewing nook. Next to the sewing machine is a planning desk with cook-books and radio. Over the sinks and counter top to the right are windows that swing in from the top for ventilation, and also provide plenty of sunlight.

Lots of the "finishing touches" run into lots of money. But you needn't strain the budget to achieve tile-effects these days. Masonite Presdwood Temprtile produces truly beautiful tile-like walls for an exceptionally reasonable price. When you realize what Presdwood Temprtile is, you can see the reason why. Because it is a hard, grainless, wood-fiber board that comes in 4 x 12 ft. pieces—already grooved. It can be installed by an ordinary carpenter with ordinary wood-working tools. It can be painted or enameled to suit the client's taste. And—it's permanent! Once it's properly applied, it will neither warp, chip, split nor crack, and there's no breakage. Illustrated here are schemes for two interesting kitchen arrangements that can be finished for surprisingly little—using Masonite Presdwood Temprtile for the walls and Tempered Presdwood for built-in features.

MASONITE KG. U.S. PAT OFF.
THE WONDER WOOD OF A THOUSAND USES
SOLD BY LUMBER DEALERS EVERYWHERE
COPYRIGHT 1940, MASONITE CORPORATION

If you would like to examine a sample of Masonite Presdwood Temprtile now, just fill in and mail this coupon to:

MASONITE CORPORATION
Dept. AF-11-40
111 W. Washington St., Chicago, Ill.

Name
Address
City
State

THE ARCHITECTURAL FORUM

VOLUME 73
Number 5
NOVEMBER 1940
lords’ profits are correspondingly shaved by the high rate of turnover. In New York City, close to 600,000 families (34 per cent of the total and about the same number as in the whole of Philadelphia) move each year. For each family the annual mass migration means many dollars for moving and redecoration costs, many hours of apartment hunting and then readjustment of new landlords, neighbors, school teachers and tradesmen. For each landlord it also means dollars for redecoration plus costly allowances for vacancies.

To satisfy its own curiosity and to give local and national realtors some pertinent information, the Citizens’ Housing Council of New York City during the winter of 1938-39 analyzed the question: “Why do tenants move?” Last month, the documented but unsurprising answer was announced: most families move in search of lower rents; the second largest group moves for change in family size, to schools, or room arrangement, as the reason of particular interest to architects should be the fact that 20 per cent of the Manhattan and 26 per cent of the Brooklyn tenants gave improved apartment layout, or room arrangement, as the reason for their latest move. Closely allied to the desire for lower rent is the third most frequent reply to the moving question—a desire for better value, presumably a bigger or better apartment at about the same monthly rental. About 20 per cent of the Manhattan tenants and 17 per cent of the Brooklyn tenants gave improved apartment layout, or room arrangement, as the reason for the move. Other reasons, in the order of their importance: change in family size, neighborhood conditions, proximity to employment, improved living standards, better light and more ventilation, proximity to friends, to transportation facilities and, finally, to schools.

Answers to other questions posed by the Citizens’ Housing Council indicate that New York’s tenants are still far from satisfied with their present quarters:

- Biggest complaint is against the landlord’s redecoration policy, with dissatisfaction expressed by 35 per cent of the Manhattan tenants; by 28 per cent of the Brooklynites.
- Almost as important a source of friction is the landlord’s tardiness in handling repairs. About 30 per cent of the tenants in both Boroughs are unhappy on this count, and the ratio increases as rents drop.
- Between 18 and 27 per cent of the tenants still feel that they are not getting full value for their rent money. Most such complaints come from families in the $20-30 rental bracket.

- Between 13 and 19 per cent of those surveyed are convinced that their leases are unfair in that they favor the landlords.
- While all of the above complaints indicate that the landlords’ services and policies are such that tenants appear to hold but small grudges against the landlords themselves, Thus, less than 13 per cent of the respondents registered dissatisfaction as to personal relations with their landlords.

- Reflecting the widespread effect of open site planning in Government housing projects and privately financed garden apartments, more than half the tenants questioned believe that landlords should provide some community recreation facilities. However, many noted that this was impossible in the crowded city.
- Significant is the finding that from 20 to 25 per cent of the families would have remained in their previous apartments “had some positive effort toward readjustment of differences between landlord and tenant been made.”

From it two major findings (high rents and dissatisfaction over landlord policies and services underlie the biggest part of the moving day problem) the Citizens’ Housing Council comes to two major conclusions.

One is a flat, unqualified statement: “Wishful thinking will bring no relief, and the landlord must face the fact that it is futile to shoot wide of the public’s ability or willingness to pay.” The other is a rhetorical question: “Would the average landlord . . . consider his business in a healthy condition if he knew that one-third of his tenants were dissatisfied with the redecoration (and the repair service) in his house? Would a merchant be concerned if he discovered this degree of dissatisfaction among his customers?”

SHOP LIFTING. Considered a plague by many (notably Congressman Patman whose bill to tax them out of existence was killed in Congress this year), chain stores account for one of Building’s biggest modernization markets. Completed or in prospect are studies by Chain Store Age on the habits of the 26 leading chains operating 30,000 stores reveals that they will spend a shade more than $130 million on modernization this year, 3 per cent more than the recordbreaking 1939 total and despite the fact that the number of stores decreased about 7 per cent during the year. In addition, the chains’ landlords will spend some $25 million on modernization, and an undisclosed amount of warehouse and office modernization kicks the total still higher.

Most important chain as far as modernization expenditures are concerned is the department store with $42.4 million in 1940. Other leaders: groceries, $29.3 million; apparel, $11.1 million; restaurants, $8.5 million; drugs, $8.3 million; shoes, $4.5 million. Of the 39,000 stores surveyed, 16 per cent will have been modernized this year. Average expenditure per store: $8,857.

STAPLES. During World War I building costs more than doubled, willfully and unwittingly sabotaging the industrial expansion program and causing innumerable private financed construction activity to evaporate. Logical then is the current fear that another abrupt price rise may sabotage the national defense program by throwing a powerful block against the boomward building trend. Further justifying this fear is the fact that wholesale building material prices havewigged up each month since national defense got under way. During September they were 94.6 per cent of the 1926 average, up 2.1 points from April and at the highest level reached since 1937’s fateful runaway rise. Discouraging but not yet serious, the price trend of Building’s staple goods is no cause for alarm. Cement, at 90.6, while steady for four consecutive months, has risen 0.3 since April, September 1939: 91.3.

Paint and paint materials have rebelled against the general trend. Combined, they stood at 81.4, a surprising 3.6 below April, 0.6 below September 1939.

Steel, while it has remained at the same national average level (107.2) since July 1938, has recently gone up fractionally in a few isolated communities, particularly on the West Coast.

Lumber is the only component of the index whose price rise gives cause for alarm. It stepped steeply up from 97.7 in September 1939 to 96.1 in April 1940 to a post-Depression high of 104.0 in September 1940. Due primarily to orders for Army residential construction (barracks, tent floors and walls, etc.) which have sapped the lumber market in recent months, the August-September advance in wholesale prices amounted to 4.3 points. And, to be reflected in the October index (not yet available), are additional price rises ranging from $1 to 89.50 per 1,000 bd. ft. reported last month from all parts of the country.

Trend-watchers in Washington have not taken this lumber price rise passively. Month ago the Defense Commission warned that it could see nothing in the lumber picture to warrant the upward jog, charged that the Army was being forced to pay higher prices than its civilian competitors. Putting teeth in this warning, the Justice Department’s trust-busters immediately indicted five lumber trade associations, 188 lumber companies and 33 officials.
The picture at the top shows the dispensary at the Baldwin Locomotive Works, Philadelphia. Formica surfaces were specified by Arthur H. Rock. Below: Formica table tops Municipal Hospital, Indianapolis.

Formica combines a smooth, hard, chemically inert surface that is easily cleaned with a wide range of attractive colors. It has a place in the modern hospital where color is appreciated in thoroughly sanitary material.

Walls may be covered with plywood panels covered with Formica veneers, or with Formica wall board where there is no objection to metal moldings over the joints.

For dining room table tops it combines color with great durability, resistance to spotting by ordinary liquids, or by lighted cigarettes.

Literature on request.

The Formica Insulation Co., 4620 Spring Grove Ave. . . . Cincinnati, Ohio

FOR FURNITURE, FIXTURES AND BUILDING PURPOSES
Remember the One About the Darky and His Cats?

It always seemed silly to one member of a famous blackface vaudeville team that the other should cut several holes in the kitchen door just to let a lot of cats out. But as the other pointedly explained: "When I say scat, I mean SCAT!!!"

You, too, may have wished at times that your office had several exits to expedite the departure of electrical equipment salesmen. Well, as far as Westinghouse is concerned, you are going to have no more worries on that score.

We've simplified the whole business of contacting architects and builders so that too frequent calling on the part of our representatives is well-nigh eliminated. What we've done is to assign to your office a man whose job is to keep you fully informed regarding Westinghouse products, services and supplies.

For instance, the Westinghouse man whom you'll see regularly may be a specialist on lighting equipment, elevator equipment, kitchen planning, or what not. During one of his visits it may develop that you need additional data on motors, wiring devices or air conditioning equipment. He relays your requirements to the Westinghouse Clearing House and immediately all the working material you need is rounded up for you.

Though in operation only a few weeks, architects and builders have heartily approved this new arrangement. They find that it saves them a lot of interviewing time when nothing's up. Yet it provides them quickly with all the information they need when things start popping.

If you want to get a true line on this Clearing House Service just phone your nearest local Westinghouse district office.

Westinghouse CLEARING HOUSE SERVICE FOR ARCHITECTS AND BUILDERS
There can be only one reason for any building ever being built... to house something. An office building houses working tools of those who conduct business... those who make and execute decisions upon a multitude of varied subjects. It is the thinking that is done in the office that makes any building or plant pay dividends.

In planning a building, first consideration should be given to what is to be housed in the building. In planning an office building, first consideration should be given to the type, style, design, duties and arrangement of desks, chairs, filing cabinets and all other items of office equipment that it will be called upon to house.

An engineer, trained in all matters pertaining to the use and arrangement of Metal Office Furniture, is available to aid you in this phase of your modernization program.
AND IT WON'T NEED A NEW PRIMING COAT EITHER!

THAT'S WHAT I CALL TRADE-IN VALUE IN PAINT

"Now let's get this straight," you say. "Do you mean that a paint job can have a trade-in value like a car—or an electric refrigerator?"

"Yes sir," answers the Dutch Boy. "You 'turn in' your old paint when you repaint on top of it. Then, whatever it saves you on the cost of the new work is exactly the same as a trade-in allowance."

Generous "trades" are the rule when the previous painting was done with Dutch Boy White-Lead. This fine paint cuts down the cost of the new job in two ways:

1. **No old paint to be removed.** Dutch Boy does not crack and scale. There are no scaly surfaces that have to be burned and scraped off (that's slow, costly work) before they can be repainted.

2. **No new priming coat.** Since the old film is smooth and unbroken, it is not necessary to reprime the surface before applying the new Dutch Boy coats. Make sure that your clients get paint with this high trade-in value. Plus long wear. Plus beauty. Specify Dutch Boy White-Lead.

NATIONAL LEAD COMPANY
121 Broadway, New York; 116 Oak Street, Buffalo; 660 West 15th Street, Chicago; 639 Freeman Avenue, Cincinnati; 1223 West Third Street, Cleveland; 722 Chestnut Street, St. Louis; 279-281 W. Federal Street, San Francisco; National-Boston Lead Co., 860 Albany Street, Boston; National Lead & Oil Co. of Penna., 375 River Avenue, Pittsburgh; John T. Lewis & Bros. Co., Widener Building, Philadelphia.

"You're money ahead when you paint with White Lead."

This is the slogan of the national advertising campaign on white-lead now being conducted by the Lead Industries Association. The purpose of this campaign is to promote a wider understanding of the advantages of white-lead paint.
These Two Government-approved Swartwout Ventilators Solve Most Ventilating Requirements of Defense Program Construction

The Swartwout-Dexter Heat Valve for Industrial and Government Buildings

Continuous ventilators have been specified by the War Department, Bureau of Yards and Docks, and other governmental departments on a large proportion of new construction during the past several years. • Swartwout-Dexter Heat Valve, either galvanized steel or copper, meets the specifications in every way. Many miles of this continuous roof ventilator are in use all over this country and in the Canal Zone. • Your plans are complete when you specify Swartwout-Dexter Heat Valve. Immediate acceptance and approval is assured — quick delivery can be made — full satisfaction with the completed installation — economy in cost — and highest efficiency in operation — all of which makes the Swartwout-Dexter Heat Valve most desirable for this type of construction.

The Swartwout Round Unit Ventilator for Emergency Defense Buildings

Thousands of these ventilators are being installed. They meet standard specifications of government departments for the emergency construction. Made in required sizes, of materials to meet individual needs, the Swartwout Round Unit Ventilator combines low cost with unusual efficiency. And where delivery is a very essential factor, shipment can be had in quantity almost over-night. • It's the ventilator especially designed to meet the current need for fast quantity production. Simplify your work by specifying the Swartwout Round Unit Ventilator—and let us do the rest.

Write, wire or telephone for complete information and detail data. Representatives in all principal cities are at your immediate service.

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VENTILATION SPECIALISTS

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NOVEMBER 1940
The Story of Ric-Wil Insulated Pipe Units Recorded in Pictures

STABILITY
STRENGTH
SIMPLICITY

Real pipe support and guide screw included - removable. Pipe and its covering free from any load on the conduit.

Durable Watertight Engineering

Ric-wil Insulated Pipe Units

Unique
Strong • Dependable!
Made Possible only by Modern Engineering!

Pre-Sealed by Ric-wil

Asphalt of Quality and "Life" Protects a Strong, Pure Iron Shell of Precision Pre-Fabrication by Armco

Welding conduit. With this connection, pipes are welded and fastened in line to slip over pipe insulation and supports.

Newing project, showing typical fittings.

Ric-wil units in production at factory. Fittings for expansion and special shapes furnished at necessity.

Welding steam pipe.

Shaker Square Co. Cleveland wrapping before installing connections.

Welded into a single piece 50 feet long, this pipe was dropped into the arch cover, beside the Ohio Edison service entrance for automatic test in the housing project in Elizabeth Park, Akron, Ohio.

Detailed Bulletins sent on request

Asphalt of Quality and "Life" Protects a Strong, Pure Iron Shell of Precision Pre-Fabrication by Armco

THE RIC-WIL CO.
CLEVELAND, OHIO

Agents in Principal Cities

FOR UNDERGROUND OR OVERHEAD STEAM LINES
NATIONAL DEFENSE BIGWIGS... their faces and functions

Charged with guiding and coordinating Industry's part of the $13 billion U. S. rearmament program, the Advisory Commission of the Council of National Defense was formed last June when President Roosevelt tapped the shoulders of these private enterprisers (standing, left to right, above): Chicago, Burlington & Quincy R. R. Chairman Ralph Budd, transportation; ex-U. S. Steel Chairman Edward R. Stettinius, raw materials; ex-General Motors President William S. Knudsen, production; University of North Carolina Dean Harriet Elliott, consumer protection; SEC member Leon Henderson, price stabilization; Federal Reserve Board Member, Chester C. Davis, agriculture; William C. McReynolds, secretary. Seated: Franklin D. Roosevelt, acting chairman. Absent when picture was taken: Amalgamated Clothing Workers President Sidney Hillman, labor.

Below and right are the men most interested in what the Advisory Commission accomplishes, and originators of the Army and Navy construction projects.

Secretary of the Navy Col. Frank Knox

Chairman, new Navy board, Rear Adm. J. W. Greenslade

Assistant Secretary of War Robert P. Patterson

Secretary of War Henry L. Stimson
WAR DEPARTMENT

By the middle of last month, the Army had under contract almost $500 million worth of defense building construction. The men on this page are those who are chiefly responsible—the Construction Division of the Office of the Quartermaster General for handling general construction, the Corps of Engineers for building fortifications and other structures of strategic importance. Also shown on this page are the heads of the Bureau of Reclamation, which is responsible for Federal power developments that are now assuming special importance due to the need for new power sources.

Quartermaster General
Maj. Gen. E. B. Gregory

Chief of Construction Division
Brig. Gen. Chas. D. Hartman

Supervising Architect, L. M. Leisenring; Assistant (left) F. F. Drischler; Chief Draftsman J. Stimson (right)

Chief of Engineering Branch, F. E. Lamphere; Assistant, Maj. E. J. Walters; and clerical force

Chief, Lump Sum Branch
Maj. Andre L. Violante

Contractors examining plans

CORPS OF ENGINEERS

Construction Advisory Section
F. J. C. Dresser, Maj. F. S. Harvey, chairman, Francis Blossom


BUREAU OF RECLAMATION

Commissioner
John C. Page

Chief Engineer
S. O. Harper

THE ARCHITECTURAL FORUM
Prime news to the building industry is the fact that the Navy is contracting for even more construction than the Army, by mid-October well over $400 million worth. Recent Navy building, shown in this issue, is surprisingly well designed, and it is the personnel of the Bureau of Yards and Docks, shown on this page, which is responsible for this new high in Government architecture. Also shown are the heads of two peace-time departments which are feeling the effects of the defense program: the U. S. Coast Guard and the Civil Aeronautics Authority. The latter advises municipalities on bringing civilian airports into line with defense needs.
In a double-barreled effort to provide immediate housing for the families of national defenders, Congress has given the Army and Navy $100 million, the Federal Works Agency, $150 million more (see p. 437 et. seq.). The Navy will spend its own share of the former appropriation, the Army has already added its cash to the FWA fund, the expenditure of which will be guided by the men pictured below. All but one are kingpins in FWA and its operating sub-agencies. The exception: Administrator Will W. Alexander of the Agriculture Department’s Farm Security Administration (lower right) which may be called into the program to provide rural or prefabricated defense housing.
How the architectural style of a century ago is preserved in line and decoration at Turf and Field Club, Belmont Park, L. I.

More than a century ago residential Tudor-Gothic was in vogue in and around New York. The famous Belmont Turf and Field Club on Long Island is a classic example. Originally of frame, the building was resurfaced recently with Artstone Stucco, made with Atlas White cement. This steel and concrete overcoating now preserves the original lines, decoration and color from foundation to highest pinnacle.

Architects are consistently proving the versatility and adaptability of Portland cement stucco as a medium of expression in designing new buildings or modernizing old ones. They find that it blends well with wood, stone and brick, and gives permanence to design and durable protection. Fire- and weather-resistant, its first cost is moderate, and upkeep is practically nil.


Factories at: New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.

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A Universal Atlas Product
THE CENTER STRINGER
MAKES A STAIRWAY SOUND...

The stairway with a center stringer is firm under your step...The treads don't sag or warp...squeaks are out.

THE CENTER BUTT
Keeps The Door Hanging Straight And True

Where's there a wood door that's not prone to warp? You can correct this situation, if you put the third butt on every door in the house. It holds the door in line, keeps the latch and lock clicking to a perfect fit. Remember, thin doors are more apt to warp than thick doors! And it may cost more to repair a single warped door than to put the third butt on every door in the house. Your clients will thank you later if you figure every job "three butts to a door."
The Stanley Works, New Britain, Connecticut.
Light oil refining plants like this, and many other plants built by Koppers, are producing materials essential to the national defense.

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KOPPERS CONSTRUCTION
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KOPPERS ROAD TARS
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KOPPERS COAL
KOPPERS COKE
KOPPERS GAS
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KOPPERS PISTON RINGS
KOPPERS COUPLINGS
ETC.
American's ability to build and produce... quickly, efficiently and in vast volume... has suddenly become a matter of life or death in the minds of most Americans, and with it has come a new and mounting appreciation of the importance of the industries that design and construct.

To these industries... as to most industries in America... Koppers is a skilled and trusted aid, a dependable supplier of materials, a prolific source of new ideas and technical improvements.

Koppers is in perhaps a better position than any other company to act as a consultant on the highly-technical plant construction so vital to America's safety. It maintains an engineering staff... experienced in the invention and development of new processes and machinery.

Koppers has contributed much of the current experience on protecting concrete and masonry with waterproofing and dampproofing treatments. Its engineers are glad to work with architects and engineers on this specialized problem.

Koppers has a department which acts as consultant on industrial power plants, boiler systems, industrial electrical engineering installations, power surveys, and valuations. Koppers may be retained to prepare complete estimates on boilers and electrical installations or to carry out actual installations.

Koppers is an important factor in the roof business. It produces coal tar pitch, the type of roof which has made the long-time record for leak-free life. It pioneered the water-cooled roof which is an important factor in air conditioning and in the control of humidity.

Koppers operates a nation-wide group of treating plants in which timber products are pressure treated with creosote and other preservatives to prevent destruction by termite decay or other wood destroyers which annually cause millions of dollars of loss.

Koppers has extensive foundry, forge and machine shops... it manufactures specialized machinery and equipment, including Fast's Self-aligning Couplings; D-H-S Bronze, a remarkable non-ferrous alloy; American Hammered Piston Rings. It produces Tarmac for paving roads, walks, parking areas, etc.
FOR A VITAL JOB IN U. S. DEFENSE!


Today, when planned expansion is the keynote of national defense, National Gypsum's 14 year program is of particular interest. Back in 1926, National had one plant, three salesmen. Today, it operates 16 modern mills from Canada to the Gulf—sells 149 related wall and ceiling products through over 10,000 dealer outlets!

This background has prepared National Gypsum ideally for an important role in national defense—without sacrifice of service to private contractors, dealers, home-owners! Plants are strategically located to give Uncle Sam vital building materials on short notice. To date over 10,000,000 feet of Gold Bond wallboard, for example, has been purchased or is on order for army encampments.

Whether you are building an army cantonment, a private dwelling or an office building, it will pay you to consult the National Gypsum Company, America's foremost wall and ceiling specialists. National's famed research helps solve your problems. National Gypsum Company, Buffalo, New York.

Gold Bond WALL & CEILING PRODUCTS

GYPSUM PRODUCTS
A complete line including famous Gold Bond wallboard, gypsum sheathing board, gypsum lath, gypsum plaster, special finishes and patented systems of erection.

PAINT PRODUCTS
For economy, speed—texture Finishes and Sun-flex Casein paints.

INSULATION PRODUCTS
A product to meet every insulation problem! Fibre insulation board, insulation lath, Foil board, Rock Wool, Dry Fill. Decorative plank and insulation tile.

LIME PRODUCTS
Including top-quality Mason's lime, Agricultural lime.

METAL LATH
Fine metal products manufactured in America's most modern metal lath plant. Including metal studs, new ideas in corner bead, patented base and partition systems.

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Tile, plaster, board and accessories to meet every sound control need.
WHEN YOU BUILD FOR
INVESTIGATE THE PROGRESS AND CHANGES
HAS MADE IN FACTORY

Interior Kenmore, N. Y., plant of the Curtiss Aeroplane Division, Curtiss-Wright Corporation, Albert Kahn, Inc., architects. A. D. Palmer, Jr., Curtiss plant official says—"Aklo Glass has been helpful to working conditions, in that it is truly a non-glare glass. This has been found especially true in the assembly building, where airplanes with shiny Alclad surfaces are being constructed. With normal glass and a bright sun condition, work on certain parts of the plane, where reflection was especially pronounced, would be impossible."

Times have changed since America last manufactured armaments on a vast scale. Tremendous progress, changes and improvements have been made in factory layout and construction. Not the least of these has been the introduction of improved types of glass and glass usage in industrial design.

It is now possible to control the distribution of light to meet all sorts of conditions. A wide range of glass is available from which to make selections for all factory building purposes. Because most defense work is a precision job where solar heat often affects accuracy of machining, Aklo Heat Excluding Glass is used effectively. Again, this same glass greatly reduces glare from highly reflective machined surfaces. And in so doing, Aklo increases worker efficiency—speeds production.

Because of this better understanding of glass usage and the availability of improved and specialized glass products, defense construction need not evolve into cavernous, expensive types of construction where both air and light are supplied artificially. Then too, every kilowatt of power that is saved by natural lighting in daytime is a kilowatt available to turn defense manufacturing machinery.

We want you to know all about this specialized use of glass as it applies to industrial buildings. The facts can be explained and demonstrated in your office. We would like to explain them to you at your convenience. Call your nearest L-O-F Distributor or Branch Office or write us direct. Libbey-Owens-Ford Glass Company, Toledo, Ohio.

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THERMOPANE . . . AKLO PLATE GLASS . . . THERMOUX . . . SAFETY GLASS . . . TUFX-FLEX TEMPERED PLATE GLASS . . . Distributors of BLUE RIDGE FIGURED AND WIRE GLASS . . . BLUE RIDGE AKLO HEAT-ABSORBING AND GLARE-REDUCING GLASS
DEFENSE

THAT GLASS CONSTRUCTION

PROPER GLASS USAGE MAKES POSSIBLE EFFICIENT CONTROL OF LIGHT DISTRIBUTION—EXCLUSION OF SOLAR HEAT—REDUCTION OF GLARE—INCREASES EFFICIENCY—SPEEDS PRODUCTION.

A section of the plant of the General Machinery Corporation at Hamilton, Ohio. AKLO frosted finish. Heat-Absorbing and Glare-Reducing Glass is used here to reduce specular reflection from surfaces of machine parts and to make working conditions more comfortable by lowering the amount of solar heat transmitted into the building. In air-conditioned plants this effect worth-while savings in the cost of operating refrigeration equipment.

AKLO Hammered Glass is used in both the office and factory windows of the Druggist Cooperative Ice Cream Co., Inc., Atlanta, Ga.; J. Wood Jones & Co., General Contractor. In the office windows, only the upper half is glazed with AKLO Frosted Finish, permitting an unobstructed view through the lower half which is glazed with L-O-F Quality Glass. The factory windows are glazed throughout with AKLO.

AKLO Frosted Glass is used in both the office and factory windows of the Druggist Cooperative Ice Cream Co., Inc., Atlanta, Ga.; J. Wood Jones & Co., General Contractor. In the office windows, only the upper half is glazed with AKLO Frosted Finish, permitting an unobstructed view through the lower half which is glazed with L-O-F Quality Glass. The factory windows are glazed throughout with AKLO.

GLASS PRODUCTS

The plant of the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. Windows and mimic areas are glazed with AKLO Hammered. Where large areas are exposed to the sun, AKLO greatly reduces heat infiltration.

The unusual heat absorption qualities of AKLO are acutely and dramatically demonstrated with this highly sensitive Radiometer. We would like you to see this demonstration in your office. No obligation.

NOVEMBER 1940
Modernistic Service Station. Note the slender vertical lines with horizontal lines emphasized to conform to architect's requirements.

Modern Residence with attached Garage, equipped with Ro-Way "Two-Car" Overhead Type Door.

U. S. Government Inspection Station. Note all Ro-Way Doors have arch segment tops, to conform to architect's design.

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—are ultra-modern and available in designs that harmonize with any style of architecture. If you do not yet have in your files a copy of the 72-page Ro-Way "Time-saving Specification Book", may we suggest that you mail a request for your Free copy today.

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The Architectural Forum
Skyward

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Straight up for more than 1000 feet, the slim spire of the Chrysler Building pierces the sky like the point of a huge bright needle. People the world over know this building for its height, its graceful design, and the engineering that made it possible.

We feel, therefore, that the use of Bethlehem Elevator Cable in the Chrysler Building speaks, in itself, for the quality of the product.

The new Bethlehem Elevator Cable is a quality product in every detail: designed by wire rope experts, made of selected steel on new machines, scientifically lubricated and fitted together as accurately as a fine watch. It can be specified with complete confidence for any type of elevator system.

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CAREY Elastite Asphalt Tile has a smoother and more attractive surface—highly resistant to compressive loads—quiet and dustless under traffic. While relatively hard, it is resilient—comfortable under foot.

Available in black and red, in ½” thickness, and in sizes 12” x 12” and 12” x 24”. Many attractive patterns are obtained by combinations of the color and sizes.

CAREY Elastite Asphalt Tile is another important development of CAREY research . . . backed by more than a half century’s manufacturing experience. Write for complete details. Address Dept. 20.

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Isn't it significant that so many of the early colonial buildings that still stand staunch and sound today have been painted through the years with pure white lead paint? Isn't that the best proof that white lead paint forms an enduring weatherproof seal that better safeguards construction?

White lead of course is made from lead, one of the most enduring of metals. And like the metal, white lead also has high weather-resisting qualities. That's why white lead paint lasts longer — why it looks better. Moreover this time-proven paint does not crack and scale but wears away slowly and evenly.

Yet white lead paint costs no more than others when you consider its economical, high spreading-rate, ease of application and longer life. And its velvet-smooth finish sets off your work to best advantage.

That's why most architects say it's a good idea in specifying paint to make sure how much white lead it contains. And it's pretty safe to say: the higher the lead content, the better the paint. You can't, for example, get a more durable paint than one containing a hundred per cent white lead. This is the kind good painters mix from lead-in-oil. It can also be bought in many places today in prepared, ready-to-use form — in white and colors.

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Rigid frames and arch bents, particularly adapted to welded construction because of their rigidity, require little additional steel for wind and crane loads and to resist explosion forces.

Additions and alterations to existing plant buildings can be made by welding at low cost and with minimum interruption to operations and less moving of machinery or equipment to provide construction clearances.

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Airco offers complete service, supplies and equipment for all gas welding and cutting and arc welding needs. In addition, the specialized knowledge of Airco Engineers is freely offered in helping to plan, fabricate or erect by welding.

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In any system of Pneumatic Control, there are many accessories vital to the successful operation of such a system. The choice of which accessories to incorporate naturally depends upon the problem presented by the installation. We ask you to compare Gradutrol Accessories, point by point, with others offered. We are certain their superiorities will weigh heavily with you in the choice of the right Pneumatic System to control your heating installation. Minneapolis-Honeywell Regulator Co., 2740 Fourth Avenue South, Minneapolis, Minnesota, Canadian Plant: Toronto, Ontario, European Plant, London, England. Company owned branches in 48 other cities.
HOW Fenestra CAN HELP YOU

Above, two great storehouses of the U. S. Navy Base, Brooklyn, N. Y., equipped with 243,370 square feet of Fenestra Windows during the World War; Turner Construction Co., contractors. In this period, Fenestra windows, literally ACRES in area, were installed in many buildings for the Army, at New Orleans, Charleston, Norfolk, Philadelphia, Boston, etc.; and for the Navy, at Pearl Harbor, Hawaii; San Francisco, Norfolk, Portsmouth, Bremerton, Boston, etc. The Army and Navy Office Buildings, Washington, D. C., used 396,000 square feet of Fenestra Steel Windows.

WILL AMERICA BE NEXT?

Above, the huge new plant addition of Pratt & Whitney Aircraft, East Hartford, Conn., equipped with Fenestra Windows; Albert Kahn, Inc., architects; Turner Construction Co., contractors. Besides numerous orders from private manufacturers, recent Fenestra orders from the U.S. Navy include: Windows and Doors for hangers, storehouses, garages, overhaul shops, officers' quarters, barracks, mess halls, etc., in Alameda, Jacksonville, Squantum, Quonset Point, Melbourne, Key West, Green Cove Springs, Norfolk; Cuba, Porto Rico, Hawaiian Islands, etc.
AGAIN Fenestra is in action for a national emergency—this time to help you make America strongest, quickly: all ready to speed the construction of many kinds of defense buildings. For quick shipment, Fenestra has available many styles of Standard Prefabricated Steel Windows and Doors, in wide ranges of types and sizes, for use in military and naval buildings, in industrial, transportation and utility buildings, and in housing... Where desired, entire walls of ready-built windows may be substituted for masonry walls, effecting large savings in erection time, labor and materials, and in over-all cost... Observe how Fenestra can serve you faster and better—

1. You get rush delivery of Standard Fenestra Prefabricated Steel Windows and Doors from factories in Detroit, Michigan, and Oakland, California, and from factory warehouses strategically located to make overnight deliveries.

2. You save installation time, labor, materials: Prefabricated Fenestra products are delivered to your jobs already fitted, assembled, even Bonderized and prime-painted—COMPLETE.

3. You get top quality—quality that for years has met the exacting specifications of the U. S. Army and Navy; materials fabricated by craftsmen using specialized machinery.

4. Protected from rust by Parker Rust-Proof Company's Bonderizing process, Fenestra materials are durable. They cannot rot, warp, shrink, swell or splinter; they are proof against termites and other vermin.

5. Fenestra products afford practically 100% salvageability: easy and quick transfer from temporary to permanent construction, for example. Sizes are standard; identical sizes are perfectly interchangeable, even to the smaller hardware parts. Frames are integral, and an entire window or door assembly may be removed and reinstalled as a unit, intact.

6. Standard Prefabricated Fenestra Steel Windows and Doors afford maximum savings in first cost, the result of maximum manufacturing economies in the shops of America's oldest and largest manufacturer of solid section steel windows.

... For the latest complete catalog information, mail the coupon below. For quick catalog information, see the Fenestra Blue Book in SWEET'S (31st consecutive year)... Fenestra offices are located in 200 principal cities—for immediate, personal service, call a local Fenestra engineer; or telephone Detroit—Madison 7680.
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STOP HIM WITH MODINES

It's a hold-up! Simon Degree holds up your clients' production—all along the line. He is the undercover agent who sabotages plant operations... destroys employee morale and efficiency... stalls shipments... runs up useless costs... steals profits. He is inadequate in person!

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Modines warm up faster; keep temperatures even; prevent cold weather shutdowns; insure employee comfort and efficiency. Fuel savings are larger; maintenance is lower. Modines mean precision heating—proved by years of satisfactory performance in thousands of installations; backed by Modine—the greatest name in unit heater heating.

Time is all-important in your building expansion program. Modine is prepared to make prompt deliveries. And the Modine-patented direct-from-branch-supply-pipe suspension means speedier, easier installation at less cost to you.

WRITE FOR LITERATURE

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MASTERPLATE
METALLIC-CONCRETE
FLOORS!

GOVERNMENT FINDINGS ON THIS TYPE OF FLOOR

FLOORS DEMAND AND GET HEAVIER ARMAMENT!

YEARS ago wooden ships with no metal armament sailed the seas to fight the battles of nations. Today, armor-plate grows increasingly thicker and tougher as modern day methods create severer demands.

Years ago plain concrete floors were considered "good enough" for industrial buildings. Today the speed and severity of industry demand the most durable metallic-concrete floor, Masterplate.

Heavier armament applies to floors as well as to battleships. Floors are designed and built with the same care as machine tools are built because the floor is an essential part of "the machine".

Since 1935 leading industries and railroads have been incorporating in floors up to 120 pounds of metal per 100 square feet by the Master Builders' exclusive Masterplate method to provide the durability needed.

Masterplate is Master Builders' pure water-absorbent, graded Metallic Hardener combined with Master Builders' exclusive water reducing agent ... By the Master Builders' method 2 to 4 times more metal is incorporated in the concrete and up to 500% longer life is created in the floor. This thick "built-in" armored surface outwears plain concrete floors 4 to 6 times.

Earlier practice of installing 30 to 40 pounds of metal while good "as far as it goes" is inadequate for today's needs, heavy duty industrial traffic.

Full information on Masterplate will be sent to you at your request. Write for "Masterplate Method" No. 3386. Refer also to Sweet's.

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THESE OUTSTANDING INDUSTRIALS have found the Masterbuilt Metallic-Concrete Floor the economical, efficient floor for today's needs.

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INSULUX Gives "FULL SPEED AHEAD" to Jobs Marked "Rush!"

With defense orders piling up, industry needs new plant facilities—needs them quick! You can help your clients build quicker, build better by planning with Insulux Glass Block. Here's why:

1. **You can get immediate delivery on Insulux Glass Block, in any quantity, from distributors anywhere in the country!**

2. Insulux speeds up new construction and remodeling of old buildings. Insulux panels can be installed by any bricklayer on your job.

3. Insulux gives ample quantities of well distributed light that ups production efficiency.

4. Insulux gives better insulation . . . better control of temperature levels . . . more usable floor space.

Insulux Glass Block will help you hit your construction schedule squarely on the nose! Owens-Illinois Glass Company, Insulux Division, Toledo, Ohio.

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Prying or peeping when Insulux Glass Block protect the privacy of industrial plants. Solid Insulux panels guard against entry and theft.

**NO HOLD-UPS**

On Insulux jobs, blocks are immediately available—construction is rapid—panels are laid up easily by any good bricklayer.

**WE'RE AT YOUR SERVICE!**

If you need technical advice of any kind on Insulux installations, write or wire us. Our staff will give you quick assistance.

**OWENS-ILLINOIS INSULUX Glass Block**

**THERE ARE PLACES IN EVERY BUILDING THAT NEED INSULUX**
READY to speed up production of many vital elements of the Defense Program

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42 UNIT SIZES . . . 150 to 650 tons

Production of many of the tools and equipment items for the military and naval services calls for working conditions made possible only by air conditioning . . . uniform temperature to eliminate variations from the expansion and contraction of metals in precision parts . . . humidity control to guard against tarnishing of polished surfaces . . . a comfortable healthful atmosphere to keep workers at top effectiveness.

Worthington builds air conditioning and refrigeration equipment of all types, to meet any condition. Newest and highest in efficiency, for large tonnage requirements, are the systems incorporating centrifugal refrigeration compressors.

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WORTHINGTON

NOVEMBER 1940
Design Decade

Forum: Your Design Decade number of The Architectural Forum is a joy to my blurring eyesight. It is a very inspirational job from cover to cover, and must have been a gigantic task to gather, assemble, and organize this material for presentation to your readers. You should be congratulated for your earnest effort to present such a wide range of endeavor so comprehensively.

I was especially proud that you picked my Cameo Dictaphone and placed it among such distinguished company, and the fact that you omitted my name as designer means that I am not meant for posterity. If I am any judge of reader interest, the October, 1940 number is going to be around for a long time, which means that I'll have a lot of explaining to do for a longer time.

As a subscriber who applauds loudly, many thanks for your October number—it is worth many years’ subscriptions.

William O'Neil
New York, N. Y.

For omission, an apology; for Cameo Dictaphone, renewed cheers; for posterity, subscriber William O'Neil.—Eo.

Forum: ...I read with fascination your splendid review of a Design Decade. I was somewhat disturbed, however, by the inference to be gained from the pages about houses that the developments pictured were as typical as those dealing with electric fans, automobiles, factories, and airplanes.

Sunday, still brooding on the subject, I went through the real estate pages of the New York and Washington papers to see how well Forum's review squared with current offerings of operative builders. I found a complete lack of correspondence. In neither city (this was October 20, 1940) was one house of an identifiably modern character advertised. There was not even a modernistic one. All that were exhibited were Colonialistic, Normanistic, or some other reflection of a traditional concept of design. In other words, those builders whose survival supposedly depends upon their accurate interpretation of public demand saw no such acceptance of modernism in houses as is granted in industrial products generally.

I am not rising in defense of traditionalism; but I wonder if the evidence is such as to warrant an interpretation of design trends in terms of the unalloyed modernism which exists in other fields. Where are the modern houses? How many of them are there? In what price classes do they fall? Are they built on order or on speculation? What is the increase in volume from year to year? I know how hard it is to provide accurate answers to such questions, but I would like to get this kind of information if it exists.

My own impression is that while there is widespread evidence of improved taste and an increase in simplicity of treatment, any real breaking away from tradition is still too rare to be illustrative of the main trend. You have, I hope, proof to the contrary. I seek enlightenment.

Miles L. Collean
Washington, D. C.

Subscriber Collean should read before he looks—or at least, after. In introducing its Home Section in October, emphasized The Forum: "With modern clearly entrenched wherever building has to pay a return, domestic architecture still shows stout resistance. But today every city and many towns can point to their modern houses, and many of the new "traditional" houses show greater openness and flexibility, some use of new materials and always the new equipment. An uninhibited generation of home buyers is beginning to question the resale value of the old cupboard designs ten years from now. The modern house, which opened the decade as a completely intellectualized importation in the International manner, now shifts to indigenous forms and materials with under appeal. More and more of these houses will be built, eventually acquiring the same sentimental aura now attached to the houses modern will replace."

As to breaking away from tradition, Forum offers in evidence not the Sunday real estate section but its own pages every month.—Eo.

Forum: On reviewing your October issue I noticed an error on page 246.

The Pix Theater in White Plains, N. Y., was designed not by B. Schlanger, but by Biancualli & Ghiani, Architects. Mr. Schlanger was consultant only for the floor construction. ...

Piero Ghiani
New York, N. Y.

To TVA Architect Biancualli, and Architect Ghiani, apologies for a stupid error.—Eo.

Forum: This last number of The Architectural Forum—Design Decade—I think is about the best number you have ever published in that it illustrates the uniform tendency of design in the shapes of everything from bridges to ladies. It is a little encouraging, too, in that it shows that we have all of us been made to think by some force outside of ourselves which may be called, I suppose, the spirit of the age. Perhaps we are getting somewhere. I wouldn't be surprised.

Aymar Embury, II
New York, N. Y.

Forum: Looking through Design Decade, one thinks of the opportunity missed to tell of the fine accomplishments of designers during the past decade.

There must have been some lack of understanding in presenting material selected with a photographic reproduction value, rather than the laborsious and complicated efforts of designs which are sold to millions.

If it was the intention to show only the finest examples of the respective groups such as furniture, rugs and machines, then this issue is an incompetent picture of what was accomplished. If on the other hand, items were picked at random to illustrate the groups, then it was terribly unfair to designers by not showing a complete picture for the layman to understand.

I must protest in the name of the American Designers Institute. As Chairman of the Executive Committee of the New York Chapter, I feel that the material presented does not do justice to the efforts of the many designers who have been included, and it presents a wrong picture of the efforts which were not shown, probably due to lack of space.

There is a danger in an issue heralded as a "Design Decade" and sponsored by stores and Museums that due to the fact of some designers having been omitted or their work not well presented that these designers will feel damaged as their work may have been an important contribution.

I am quite sure that all this happened accidentally as design efforts of over ten years cannot be concentrated in just a few pages and I believe the greatest mistake lies in the fact that it is not clearly stated that The Architectural Forum did not try to be a jury or edit the objects according to their design excellence.

No doubt an explanation of this type would have been a great help to understand that this was not a summary of talent or design.

(Continued on page 68)
Outstanding Quality

PENBERTHY AUTOMATIC ELECTRIC SUMP PUMPS
MADE IN 6 SIZES
Constructed of Copper and Bronze Throughout

PENBERTHY INJECTOR COMPANY

Manufacturers of Quality Products Since 1886

Canadian Plant: WINDSOR, ONTARIO

DETOIT, MICHIGAN

NOVEMBER 1940
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PIERCE BOILERS

Embracing 101 Years of Experience in Boiler Design and Construction

In 1846 . . . again in 1861, in 1898 and in 1917, Pierce Boilers kept the home fires burning. Four times in 101 years, they have helped to heat the barracks, recreation halls and hospitals of American soldiers, taking the field in a national emergency. They have warmed the public buildings and workers' projects used for war. And they have brought cozy comfort to the homes, apartments and schools of the wives and children left behind.

There's a Pierce Boiler for Every Need—
- Cast Iron and Steel Boilers for Home Heating
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From the new, high-efficiency Pierce "Gold Seal"—especially designed for modern homes—on up to large-size Pierce "Americans" and steel boilers for large installations, there's a Pierce boiler for every need. You can choose from boilers that were engineered especially for oil or gas fuels, boilers that were engineered for hand-fired or stoker-fired coal, and boilers that were engineered for water, steam or vapor systems.

For efficiency, for economy, for prompt delivery and the assurance of a proved product and trusted name, investigate Pierce before you specify.

Pierce Radiators

Here's the crowning touch to boiler efficiency—a series of radiators that concentrate the heating effect in the "living zone" of the rooms you want to heat. And behind each unit stands the thorough scientific research and long engineering experience of the Pierce organization—factors that will underwrite the economy, safety and satisfaction of your installations. Ask for detailed information.
Just published! Beautiful brochure pictures the unlimited opportunities of J-M Asphalt Tile for durable, decorative floors. Contains many full-color reproductions of interesting, attractive pre-designed floor patterns. Mail coupon for your FREE copy today!

ARCHITECTS agree that flooring can make or break any decorative scheme. Here's a booklet that will help you give clients everything they want in floors.

It's the new J-M Asphalt Tile brochure...crammed with fresh ideas for floors for every service. It pictures smart designs for stores and display rooms...dignified floors for banks...cheerful patterns for clubs and restaurants. Dozens of photographs, many in full color, illustrate how finished floors actually appear. A chart reproduces all colors of J-M Asphalt Tile...shows how this better flooring gives you free scope in decoration.

What's more, you'll see why J-M Asphalt Tile provides quiet and comfort...is easily cleaned...needs little upkeep. For your copy of this stimulating idea book, mail the coupon today.

Mail Coupon for FREE Brochure
Johns-Manville, Dept. AF-11, 22 East 40th St., New York, N.Y. Send me a copy of the new J-M Asphalt Tile Flooring Brochure.

Name: ____________________________
Address: ___________________________
City ___________________ State ________

JOHNS-MANVILLE Asphalt Tile Flooring

NOVEMBER 1940
U.S. NAVY SAVES WEIGHT, SPACE, MONEY
by using new heavy-gauge FERRO-THERM METAL INSULATION

COVERED LIGHTERS TO HAVE FERRO-THERM INSULATION
WELDED ON ROOF—SAVES TON IN WEIGHT, INCREASES EFFICIENCY

The Navy's new all-steel Covered Lighters, which will be used for transportation of men and supplies, will have a permanent roof insulation of Ferro-Therm. As shown at the left, sheets of Ferro-Therm will be tack-welded under the roof channels. This provides a moisture-proof, fire-proof insulation that can be 95% of all heat, but will last as long as the ship itself. The sheets of Ferro-Therm are equivalent in efficiency to about 1/2-inches of ordinary board insulation—but very much lighter. The saving in weight—3/4 lbs. per square foot, about one ton in each lighter—effects a corresponding increase in carrying capacity.

PORTABLE COLD STORAGE ROOMS DESIGNED WITH
WEIGHT-SAVING, VERMIN-PROOF, FIRE-PROOF FERRO-THERM PANELS

The illustration at the left shows a section of one of the new Portable Cold Storage Rooms designed for U. S. Naval Bases. These rooms are assembled from pre-fabricated panels composed of two sheets of heavy-gauge Ferro-Therm enclosed by three sheets of light-gauge Ferro-Therm. The panels, 35-inches wide and 8-feet high, are only 2-inches thick, yet are equivalent in insulating value to 5-inch standard cold storage insulation, and save 40% in weight. The panels can be quickly bolted together into permanent cold storage rooms of any size, which are 100% salvageable, and completely moisture-proof, vermin-proof and fire-proof.

FERRO-THERM SAVES 800 LBS., INCREASES CAPACITY, IN
FABRICATION OF PORTABLE SELF-CONTAINED REFRIGERATION UNITS

At the left is shown the type of Portable Self-Contained Refrigerator Units which will play a vital part in the transportation of food to Naval Bases. These units can be fabricated from heavy-gauge Ferro-Therm sheets combined with light-gauge Ferro-Therm sheets in a structure similar to that used in the Portable Cold Storage Rooms described above. With standard insulation and construction, these units would have 4-inch walls and would weigh about 3000 lbs. With Ferro-Therm panels, they are 2-inches thick and weigh about 2200 lbs. As a result, the capacity for additional supplies is increased 800 lbs., and the units possess the great strength and lightness required for handling by overhead cranes.

Has the STRUCTURAL ADVANTAGES of any heavy-gauge coated steel sheet
plus the added advantage of EFFICIENT INSULATION

Heavy-gauge Ferro-Therm has all the advantages of light-gauge Ferro-Therm—recognized by architects, builders and industrial engineers all over the country as the most effective metal insulation. It has the same high insulating value, with a reflectivity of 95% of all radiated heat. Yet, for gauge, it has all the structural advantages of any coated steel sheet, and the same high resistance to corrosion. For army barracks, warehouses, cold storage rooms, refrigerators—wherever it is planned to install corrosion-resisting steel sheets, and where insulation is an advantage—it pays to install Ferro-Therm. Ferro-Therm can be welded, bolted or fabricated to conform to any specifications, and is available in corrugated sheets. Plan now to obtain the plus value of Ferro-Therm.

Write for complete information and prices.

AMERICAN FLANGE & MANUFACTURING CO., INC., 30 ROCKEFELLER PLAZA, NEW YORK
Hogan & Company, National Distributors, 383 Madison Avenue, New York

NEW HEAVY-GAUGE Ferro-Therm METAL INSULATION
BUILD THE
LIFE LINE
TO LAST LONG

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Put "Wolmanized Lumber" in the specification. It is the only material of its kind which is always pressure treated according to one standard set of specifications, and sold under one brand, from coast to coast. The name means dependability. AMERICAN LUMBER & TREATING COMPANY, 1647 McCormick Building, Chicago.

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WOLMANIZED LUMBER
LUMBER FOR ENDURING, ECONOMICAL CONSTRUCTION

NOVEMBER 1940
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Many architects use Curtis Woodwork on all their work, even in their own homes. Its true architectural beauty, its high quality of construction, its wide selection of designs help it fit jobs of all sizes and styles.

Some of the biggest names in architecture have helped design Curtis entrances, mantels, stairways, china cases, doors and cabinet work. These men have been glad to help make correct architectural woodwork available to all. And today even low-cost homes can have the advantage of authentic woodwork of good design. For Curtis quantity production lowers the cost.

Your Curtis dealer will furnish you with the Curtis Catalog and architect's details of Curtis Woodwork. He'll also tell you about the famous Silentite "Insulated" Window family. Mail the coupon for literature and full information. If you live in Canada, write to W. C. Edwards & Co., Limited, 991 Somerset Street West, Ottawa, Canada.

Curtis Architectural Woodwork is sold by reliable dealers everywhere.
Baffling new product looks like plate glass but sells at window glass prices

WHAT IS IT?

Who ever saw a window glass without an obvious distorting waviness? Who ever heard of a plate-like product selling at window glass prices? Well, now it's happened. This amazing new Lustraglass just defies ordinary classification. The uniformity of its perfection has definitely set a new and infinitely higher standard of quality. The ultra-violet rays of sunlight it transmits and the great tensile strength it displays make it the world's most efficient glass for windows. Lustraglass is lighter in color (freer from that greenish cast characteristic of both window and plate glass) than any other glass used for regular glazing.

Add to these advantages its jewel-like luster and you have a product that architects and builders agree is really a new species . . . That's today's Lustraglass and if it isn't window glass and it isn't plate glass—what is it?

THE SHADOWGRAPH TELLS THE STORY
by amplifying distortion and defects 20 times

(1) This is high quality cylinder drawn window glass. The bent and twisted lines shown by the shadowgraph testing device indicate the presence of considerable distortion. This glass became obsolete in 1928.

(2) Here is what most manufacturers offer today as top quality window glass . . . Made by the sheet drawn process, it shows a characteristic distortion in the waviness of the black lines.

(3) Now look at this “shadowgraphed” sample of the new Lustraglass. Obviously an important improvement. The lines are straight, showing relatively perfect vision—relative freedom from distortion.

* Write for the new Windowgraph Slide Rule Chart and a sample of the new Lustraglass. Examine both—then tell us what you think.

AMERICAN WINDOW GLASS CO., PITTSBURGH, PA.
Manufacturers of Flexite, the safer safety glass; Lustralite and Lustragold for ornamental uses;
Crystal Sheet, Chipped and Special Glass for industrial purposes.

THIS NEW TYPE OF
LUSTRAGLASS
The Ultra-Violet Ray Sheet Glass
LOOKS LIKE PLATE GLASS—SELLS AT WINDOW GLASS PRICES

NOVEMBER 1940
FOR LIFETIME BEAUTY AND CLEANLINESS

What does a housewife demand you give her in a modern kitchen?

Beauty, of course, distinctive design, and convenience. She wants a clean, sanitary workshop—that will stay that way with a minimum of effort. A room that will be a pleasure to work in, that will serve her every purpose most efficiently—not make her a slave to its care.

And you can give her all that by using steel—a material she knows and trusts.

The attractiveness and durability of porcelain enameled steel stoves, table tops and refrigerators are well known. Now you can supply the same material for walls at moderate cost. Easily applied porcelain enameled tiles make permanent, colorful walls that can be wiped clean with a damp cloth. Porcelain or stainless steel sinks, splashboards and work surfaces are impervious to ordinary abuse, assure lifetime cleanliness, retain their sparkling beauty indefinitely.

Steel cabinets can be made to fit any arrangement or design. They are insulated to assure quiet operation, they won’t warp or sag, and their baked enamel finish is enduring and color-fast. Steel casements let in more light, require less care. And to complete the picture, steel venetian blinds last longer and are easier to keep clean. Even the valence boards may be had in steel.

To assure permanent client satisfaction, specify an all-steel kitchen. And to make certain of quality require that products be marked with the U-S-S label. It is your assurance that the manufacturer has used the best steel for its purpose.

Write today for your copy of the new booklet, “Steel for Modern Living.” You’ll find its colorful pages an excellent help in selling the advantages of steel.

CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago
COLUMBIA STEEL COMPANY, San Francisco
TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham
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UNITED STATES STEEL

40 THE ARCHITECTURAL FORUM
ADDS YEARS TO PAINT LIFE
ADDS NOTHING TO COST!

An Aluminum First Coater
makes topcoats last longer

At the U. S. Forest Products Laboratory, Madison, Wis., these two sections of Douglas Fir siding were painted exactly the same except for the first coat. On the left, the ordinary type of oil paint priming was used. On the right, an Aluminum first coat. Both sides then got the same two white topcoats. After 6 years exposure to sun and moisture, the Aluminum primed section was in far better condition as you can plainly see.

There are two reasons why a first coat of Aluminum House Paint lengthens the life of topcoats:

First, the Aluminum undercoat allows very little oil from the topcoats to soak through into the wood; that keeps the topcoats more elastic and durable. Second, it allows less moisture to penetrate into the wood to cause rapid swelling; thus there is less strain on the paint. It weathers evenly, chalks slowly, does not check or crack so soon.

Aluminum House Paint isn’t needed when it’s time to repaint; just two topcoats of regular oil paint. The benefits of the original Aluminum first coater extend through many repaintings.

The small extra cost of Aluminum House Paint is more than offset by greater coverage per gallon of topcoat. As a result, the job runs no higher with Aluminum priming than it does on customary 3-coat painting.

For complete technical data on Aluminum House Paint, write PAINT SERVICE BUREAU, ALUMINUM COMPANY OF AMERICA, 1947 Gulf Building, Pittsburgh, Pennsylvania.

ALUMINUM HOUSE PAINT
FIRST COATER FOR WOOD

SPECIFY... "Aluminum House Paint", made specially for priming wood. Sold by many well known paint companies and labeled with this Aluminum disc and wood background. Names on request.

ALBRON Pigments for
Republic produces the most complete line of steels and steel building products made by a single manufacturer

- In round numbers, 55,000 typical American men who know steel are daily doing their share—working in Republic plants, mines, offices and warehouses in 35 states—to turn out huge quantities of steel products that the building industry in this crisis may have the sturdy materials with which to fashion homes, stores, schools and hospitals for the country's workers, and buildings of every type in which industry may increase its tempo of production with steel—first line of national defense.

For your convenience, many pages of Sweet's Catalog are devoted to information on Republic's diversified line of building products—some under the name of Republic—others under the names of the divisions and subsidiaries shown below. Refer to these pages or write for a copy of Booklet No. 196.

REPUBLIC STEEL CORPORATION
CLEVELAND, OHIO

Berger Manufacturing Division • Niles Steel Products Division • Steel and Tubes Division
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Enduro® Stainless Steel
Toncan® Iron Sheets
Steel and Copper-Bearing Steel Sheets
Toncan Iron Roofing Products
Steel and Copper-Bearing Steel Roofing Products
Taylor Roofing Ternes
Toncan Iron Enameling Sheets
Toncan Iron Pipe
Steel and Copper-Bearing Steel Pipe
Wire Nails, Spikes and Staples
Electric Weld Pipe for Foundation Piling
Concrete Reinforcing Bars and Welded Steel Fabric
Bolts, Nuts and Rivets
Corrugated Pipe, Sectional Plate Pipe and Arches
Electrical Conduit
OF NATIONAL DEFENSE

- Steel Windows and Doors
- Steel Joists
- Steeldeck Roofs
- Gutters, Eaves Trough, Conductor Pipe and Other Sheet Metal Products
- Metal Ceiling
- Metal Lath
- Steel Lockers, Bins and Shelving
- Steel Kitchen Cabinets
- Mechanical and Structural Tubing
- Pressure Tubes
For Economical, Firesafe
HOLLOW PLASTERED PARTITIONS


Rigid, firesafe, non-bearing hollow partitions can be quickly and economically erected with the Steelcrete Bar-Z-System. This consists of Bar-Z-Studs and Bar-X-Lath—the popular Steelcrete diamond mesh expanded metal lath which has twin reinforcing rods for extra stiffness. Bar-Z floor and ceiling tracks are supplied for use with Bar-Z-Studs. The open design simplifies installation of plumbing and conduits as shown in illustration at the left. Bar-X-Lath is tied into position. It provides a perfect keying base for plaster and offers long-lasting protection against cracks. Write for the latest catalog containing complete details.

"IT'S WHEELING STEEL"
Listen to the Mill Whistle: Every Sunday 5 PM—EST—The Musical Steelmakers—Coast to coast Mutual Broadcasting System.

THE CONSOLIDATED EXPANDED METAL COMPANIES
WHEELING, WEST VIRGINIA
Branch Offices and Warehouses:
New York • Chicago • Detroit • Cleveland • Pittsburgh • Philadelphia • Boston • Buffalo • Houston • Atlanta • St. Louis
Export Office: 330 West 42nd Street, New York, N.Y.
There's a Square D Multi-Breaker for homes of every size

For Cottages

Left - Type MO—Two single pole circuits, 15, 20 or 25 amperes; no main switch or breaker required. List price $2.15 to $2.80.

Right - Type M1—Similar to Type MO but with capacity up to 50 amperes. List price $5.00 to $6.30.

For Average Homes

Type MB—Up to eight single pole circuits or the equivalent in single and double pole circuits; 15 to 50 amperes capacity. No main switch or breaker required when there are six or less circuits. List price, $6.00 to $13.80.

For Large Homes

Type MB Load Center—Up to sixteen single pole circuits or the equivalent in single and double pole circuits. 15 to 50 amperes capacity. List price $27 to $37. Often used with Type M2, 100 ampere main breaker (at right). List price, $15 to $18.50.

Circuit Breaker Protection and Convenience at Low Cost!

Compared with the total cost of even the smallest home, the price of a Square D Multi-breaker is infinitesimal. In fact, the Multi-breaker seldom costs more than the switch and fuses it replaces... often actually less. But clients are quick to appreciate the added protection and convenience it affords. They appreciate the elimination of fuses and the annoyance and expense of replacing them... the satisfaction of knowing that they have a truly modern home.

Your electrical contractor has the complete story of the Multi-breaker. Or write for Bulletin CA-4000. Learn why it pays to specify Square D Multi-breakers.

Square D Company
Detroit-Milwaukee-Los Angeles
In Canada: Square D Company Canada Limited, Toronto, Ontario
A smart, modern tiled kitchen...easy to clean, and to keep clean...a truly charming workshop.

commands attention...but requires little!

Homes are permanently attractive...house-cleaning far less tedious...when entrance-halls and sun-porches, as well as kitchens and bathrooms are tiled. Colors never fade and expensive re-finishing and decorating are eliminated. Tile is particularly appealing to builders and buyers with modest budgets because of (1) its demonstrated economy; (2) because it raises the tone of a house, and (3) increases its saleability. The preference shown for Tile by architects and builders, as well as by the general public, is based on sound reasoning. Smart tiled rooms insure life-time satisfaction...and the cost is only pennies more per month.

THE TILE MANUFACTURERS' ASS'N., INC.
50 East 42nd St. New York, N. Y.
Janitrol's Space Heating Experience

OF 34 YEARS...ON LARGE PLANTS...WAREHOUSES AND PUBLIC AUDITORIUMS IS AVAILABLE TO YOU IN EVERY TYPE OF NATIONAL DEFENSE BUILDING PROJECT

1. Propeller Type Unit Heater ... 2. 1,250,000 Btu Unit Heater ... 3. Blower Type Unit ... 4. Floor Type Unit ... 5. Winter Air Conditioner

Every phase of the National Defense Program calls for quick action by experienced men... men backed by organizations with proven reputations for reliability and ample manufacturing facilities.

Trends indicate that the outstanding demand for heating equipment in the National Defense Program will be for gas-fired unit heaters. Janitrol unit heaters are self-contained heating plants — no central heating plant is needed — no water or steam is used. The line comprises the widely used propeller fan type in capacities from 50,000 to 225,000 Btu's... the blower type with centrifugal fan in capacities from 75,000 to 450,000 Btu's... the floor type 60,000 to 1,250,000 Btu's... duct type 65,000 to 225,000 Btu's. Units may be controlled by separate thermostats or operated in parallel, thus permitting flexible applications of unlimited heating capacities to meet your requirements.

For 34 years, Surface Combustion Corporation has devoted its entire efforts to developing and manufacturing gas-fired heating equipment... the world's oldest and largest exclusive manufacturer of gas-fired equipment for industrial, commercial and residential purposes... the largest research laboratories in the gas industry. Factories are located at Toledo, Columbus and Tulsa.

We have experienced heating engineers in principal cities. They will make heating layouts, size equipment, and give you general cooperation on heating work. Their services are gratis and will be furnished promptly upon telegraphic request addressed to our main office.

Write for Specification Booklet... gas-fired unit heaters, winter air conditioners, gravity furnaces and conversion burners.
Kawneer RESILIENCY holds show window glass safely!

FULLY RESILIENT Kawneer Store Front Sash, based on principles established by Kawneer in 1905, practically eliminates chances of glass breakage. Patented Kawneer construction holds glass securely, with an almost human grip that cushions shocks and vibration, prevents localized pressure or rigidity. The complete Kawneer line includes rustless metal sash, bars, awning bars, mouldings, entrance doors, sign letters. Facing panels are available in aluminum or porcelain enamel (27 colors).

Store front designers will find a wide range of possibilities in Kawneer construction. Write for latest data. THE KAWNEER COMPANY, NILES, MICHIGAN.

Left, Albert C. Martin, Arch.—Samuel A. Marx, Assoc. Above, I. M. Cohen, Arch.
Were Building a tightly knit, completely industrialized business there would be less need for this issue of The Forum. But Building, with its complex and almost wholly local mechanism does not move as a unit on a national front. Defense means above all, speed, and speed means above all, coordination. Whatever coordination Defense brings to Building will be vastly aided if Building can at least think as a unit. So that Building may be informed as a unit, and so in greater degree plan and work as a unit, this issue of The Forum appears as the Defense program begins to take form. It has been designed to state in broad outline and in specific detail Building’s part in solving the problem of National Defense.

—The Editors

Forum readers will be kept informed regularly of major defense developments in a new department which opens next month.
Without Building there can be no National Defense
AFTER TWENTY YEARS of uneasy peace, of small wars, invasions and rebellions, World War has again broken out, and for the second time in a generation the U.S. faces a national emergency. Already the first measures have been taken: the Army is being expanded from an ill-equipped handful to a mechanized million; the Navy is increasing its tonnage by 70 per cent, preparing to extend its domination to two oceans; planes are rolling off the assembly lines and new factories are building. World War II is a total war, in defense as in aggression. If armies formerly traveled on their bellies, they now also move on refineries, blast furnaces, rubber plantations, power plants, strip mills. National Defense includes, to an unprecedented degree, all the resources of Building.

Military needs mean expansion of old plants and the building of new. Air defense demands protected locations, often in formerly undeveloped areas. Mass population shifts will unquestionably occur, and preceding them there must be industrial construction, housing construction, commercial construction. There can be a planned building program, unparalleled for its speed and effectiveness—or there can be the destructive expansion and costly waste of 1917.

Responsibility for the general plan of National Defense belongs in Washington, since nowhere else can the varying potentialities and conflicting desires of the States and regions be brought into order. But the plan cannot work solely from above: all down the line is required the closest collaboration between Government and private enterprise. The basic requirement is a clear and widespread understanding of objectives.

Out of the nation’s rich resources, we can create the essentials of defense. Our economic potentials were well tested in World War I, when we trained and armed 4,000,000 men, and each month filled $500,000,000 worth of orders for the Allies. But the techniques of war have changed radically since 1918. Preparing America for defense is a vastly more complex task in 1940.

Basically, planning for national defense can have no fixed time limits. It is impossible to say how long the present emergency will last. Attacking armies can set a precise timetable of specific areas to be seized, simplify their military preparations accordingly. Defending forces cannot: they must be ready to meet any contingency which may arise at any time or at any place.

In modern warfare exact needs are not known until they arise—and, as shown by England’s experience, the ravages may be unexpectedly severe and widespread. Evacu-
ation of whole populations and the demands born of large scale property destruction must be anticipated and planned for. Industrial facilities must be developed to a point sufficient to meet unforeseen needs on short notice. Thus, wrapped round the immediate problem of enlarging U. S. armed forces, there is the larger problem of planning for America’s permanent defense.

As a pattern for Building’s own development, what does this mean?

Broadly, it signifies accelerated Building and preparation for the all-out tactics of total war. More specifically it implies:

**Greater protection of the physical plant.** Steadily extending their cruising radius and power of destruction, bombers have demonstrated that even the remotest hamlets are not immune to air attack, challenge the ingenuity of American designers to devise new safeguards for local workshops and homes. Fire resistant materials, blackout mechanisms, camouflage, structural forms affording reduced visibility from the air, bombproof shelters—all these should be given special study. Firetraps, abandoned structures, and other potential hazards to the nation’s defenders should be cleared away wherever feasible.

**Greater flexibility in use.** New construction should be designed with an eye alert for possible military advantages and easy conversion to wartime use. Conversely, there is the possibility of turning strictly military structures to practical peacetime use: some English underground shelters, for example, have been designed to serve ultimately as basements for flats, as first-aid stations, as public garages.

**Greater decentralization of services and utilities.** Blessing in disguise for Londoners is fact that the metropolis’ various communities have developed independently their own systems of water pipes and reservoirs. Result: German bombs damaging one section do not affect the water supply for other districts. Similarly advantageous in war time are buildings designed for self-sufficiency, with independent power sources, capable of being operated even when breakdowns occur in surrounding areas.

**Greater mobility of structural units.** Whole cities may have to be evacuated, but unless the populations can be quickly housed elsewhere, disastrous confusion will ensue. Large scale rebuilding of damaged areas may become urgent. In such emergencies the conventional construction methods would consume too much precious time. Here, clearly, is an opportunity for inventive design abilities to produce new structural forms—units capable of quick fabrication in quantity, quick transportation, quick assembly for use.

This issue is primarily a detailed survey of the scope of the immediate U. S. defense program in all fields which demand the cooperation of Building. But before launching into this examination of the roles of Government and Building there are two indispensable preliminaries: The history of what happened during World War I, and a glimpse of what is now happening in England. If ever there was a time when object lessons, past and present, were important, that time is the present.
BACKDROP: WORLD WAR I. Tucked away in the archives for two full decades, dusty, almost forgotten—but more sharply significant than ever in light of current happenings—Government reports picture vividly the enormous tasks suddenly tossed on Building’s shoulders in the early summer of 1917. Overnight the U.S. became one of the world’s greatest builders. Military cantonments—each a small city in itself—had to be erected before an army could be trained. Immediate expansion of industry was demanded. And, as behind-the-lines production stepped up, so too did the cry for housing for the workers who swarmed to ship-building and munitions centers.

Even by ordinary peacetime standards, Building’s war assignment would have seemed vast. Confronted with shortages in labor and materials, a breakdown in transportation, plus an ever-increasing demand for speed, the emergency tasks appeared wellnigh insurmountable. Traditional policies and procedures had to be scrapped. Under stress it mattered little how much the projects cost. As the official reports point out repeatedly, one question was everywhere paramount: Could the specified work be done—and done within the specified time? Much hinged on Building’s answer.

ARMY HOUSING

First, largest and perhaps most important single performance of the 1917 construction program was the provision of shelter for the new troops. With the first contingent of draftees scheduled to arrive in camp early in September, less than 90 days were available for surveying sites, drawing plans, preparing specifications, selecting contractors, mobilizing field forces, building and equipping barracks. The demand ran up to a prodigious total: sixteen National Army cantonments, each housing some 40,000 men and 10,000 livestock; sixteen National Guard camps to house 400,000 more men; two embarkation camps to take care of another 45,000 men; a quartermasters’ training camp for 18,000 men; also, additions to Regular Army barracks for another 100,000 men—all told, accommodations for 1,250,000 men (subsequently boosted to more than 1,600,000).

The magnitude of this job, next to the Panama Canal the largest ever undertaken by U.S. engineers, appears still greater when it is recalled that the cantonments and camps had to be built on raw tracts of land. Each site presented its own problems: roads, water supply, sewage disposal, the various utilities all had to be supplied. In some instances inadequate railroad facilities had to be extended. Where sites were remote from labor markets, workmen had first to be imported, housed and fed before construction on the Army housing could proceed.

Normandy planning alone would have taken as many weeks as could be allowed for completing an entire project. But there was no time to sit and plan. Construction work began even before contracts were legally executed or sites officially approved.

Undeniably the emphasis on speed was the cause of much waste and inefficiency. Proper supervision was lacking. To take full advantage of favorable weather and deliveries, it was necessary to keep large forces always on hand. If men were laid off when materials were not at hand, they could not be gotten later when supplies arrived. To catch up with unavoidable delays, overtime at extra cost was authorized. With rising prices and a surplus of labor on the payrolls, it is small wonder that unit costs soared as the output per man hour dropped.

Lagging construction was accelerated by taking on more workers. It is reported that the contractor on one cantonment stated he could increase his production 25 per cent but only by doubling his working force—he was ordered to do so. In less than a month construction forces on each cantonment expanded from a few men up to 8,000 or more. During August and September of 1917 they frequently numbered 10,000 on a project, reached 14,000 in several instances. Had the supply been available, more would have been hired. There was no attempt to select men for their skill. Hurriedly assembled, large numbers worked as carpenters who had not been trained in the trade, but it is questionable whether the work would have progressed any faster if they had been. Many foremen were strangers to each other, to their crews, even to the contractors for whom they worked.

High costs were the price paid for speed. Compared to similar prewar construction, the sixteen National Army cantonments were expensive undertakings, kiting to more than double the original estimates of $5 million each. Wages shot up as Government departments competed for labor, material prices skyrocketed. Principally

For additional references on World War I see Bibliography pages 2, 3, 4.
would have been delayed, the war's issue seriously influenced. The average daily cost of the war to the U. S. was about $380 million. "If," continues the Board, "the completion of these cantonments and camps in time to receive the Army in September 1917 and to hold it during the extreme winter of 1917-18 shortened the war by only one week, their total cost was saved. If it shortened the war by one or two days, the total excess costs paid for speed were saved."

Organization. It would have been impossible to build the cantonments and camps within the specified time if the Government had purchased its own materials and hired its own labor. Officials had all they could do in expanding staff bureaus to meet war demands without simultaneously trying to collect and operate a large number of construction units of the Continental Guard camps, located in southern states. Many wood buildings and structures would have to be hou.set to house 150-men companies had to be revoked at the last minute to accommodate units of 250 men. More time for planning undoubtedly would have obviated such waste.

Less expensive were the sixteen National Guard camps, located in southern States where construction would be for the most part mobilized under canvas. Nevertheless, many small buildings and structures had to be built, and the important problems of water supply, sewage, and hospital facilities required substantial the same consideration as that given the National Army.

By war's end the total cost of cantonments and camps stood at almost $273 million. In evaluating this figure, however, the time factor must also be taken into account. Considered as a single undertak­ing, the 92 projects cost about 53 per cent of the amount paid for the Panama Canal—but they were built in about 5 per cent of the time. As observed by the War Department's Construction Review Board, a civilian committee appointed after the Armistice to postmortem war building, an unprecedented amount of construction was performed in a minimum of time: "It is a fact that, by the methods adopted, the cantonments were completed in time for the troops, and no other method is known by which this result could have been accomplished."

Whitewashing the high costs, the Review Board adds that if construction had not been pushed at maximum speed, cold weather would have interfered with the housing work, the training of soldiers to deal independently with departments and play them against each other in an effort to get the largest fees or to take the easiest or most profitable work instead of that for which they were best fitted. Such full consolidation of construction authority would also have provided effective means for conscripting and efficiently utilizing all the construction materials, ability and labor of the nation."

Procedures. Declaration of war caught the War Department unprepared. Plans for many barracks had been partly developed, but many special structures, such as hospitals and depots, had not been designed nor their requirements even determined. Planning had to proceed without much knowledge of the sites being selected for the cantonments and camps. Complicating the problem still further was the fact that any plans developed would almost certainly have to be changed to comply with the Army's changing needs.

Under these circumstances, the Government's venerable procedure of advertising for lump-sum bids and then awarding contracts to lowest bidders was impractical. A more flexible type of contract which would permit construction and design to proceed concurrently was needed. There emerged a standard form, labeled the Contract for Emergency Work, based on cost plus stipulated payments. Criticized for encouraging excessive overtime and reducing efficiency on the job, the standard contract nevertheless left the Government in full control of operations, free to order changes or to expedite work as it deemed best. Most important, construction could start immediately, while drawings and specifications were still being prepared. Nor does its sliding schedule of fees seem exorbitant: average for cantonment contractors was less than 3 per cent. Unlike the cost-plus contracts used in other Government departments, the Army's standard form set a maximum fee limit, a feature estimated to have saved the Government about $5 million in fees otherwise payable on the sixteen cantonments alone.

While the standard contract was still under discussion, a committee on emergency construction began compiling a list of qualified contractors. Questionnaires dispatched to leading architects, engineers and large corporations brought in 1,400 names, to whom other questionnaires were sent in quest of facts on individual work experience. Information thus obtained was cross-indexed geographically so that suitable contractors would be spotted quickly in any part of the country.

Each project built by the Construction Division was handled by a resident contracting quartermaster, usually recruited from civilian building work. Armed with wide discretionary powers, he was actually in general charge, cooperating with the contractor in thinking up production methods, designing structures, selecting equipment, developing time schedules, making cost estimates, all in addition to...
writing the usual inspection reports. Primary task was to get the job pushed to completion as rapidly as possible. With authority thus vested in a single competent individual directly on the site, red tape was slashed and many bogdowns averted.

Vigilance against graft was notable; the Construction Review Board found surprisingly little evidence of dishonesty. Chief losses to the Government came rather from inadequate production methods and the employment of men not qualified for the construction tasks thrust on them. U. S. Building may be guilty of waste and inefficiency, but it did its war assignment speedily and honestly—a fact in which it can take great pride.

Labor Shortage. Highly unsatisfactory was the original method of allowing each contractor to assemble his own forces by any possible means. Some contractors began to entice men away from other cantonments, offering concessions such as excessive overtime, free transport home, free food and lodging. This led to competitive bidding for labor. Wage scales shot up; where they did not, there was unrest.

An agreement between the Secretary of War and the AFL President Samuel Gompers, establishing union-wage-hour scales and calling for arbitration of labor disputes, served to minimize the threat of strikes. Nevertheless, labor inefficiency and a dearth of competent foremen combined to decrease daily output. Overtime beyond the basic 8-hour day was unavoidable; was the greatest single cause of high unit labor costs. A vicious cycle could be observed: workmen, wearied with overtime efforts, slackened their pace, created a need for still more overtime or for more men. By Armistice, according to opinions garnered by the Construction Review Board, labor inefficiency and calling for arbitration of labor disputes were needed. The Employment Service reported that the country's common labor boards with jurisdiction over the recruiting and distribution of unskilled labor in each locality. By this time approximately 300,000 unskilled laborers were needed. The Employment Service reported that the country's common labor supply was exhausted, began importing workers from Puerto Rico and the West Indies. About 18,000 men were obtained in this manner. If the war had continued, probably 100,000 more would have been imported.

Various schemes were used to whop up workers' morale and increase efficiency. In localities where Italians predominated patriotic parades and public entertainments were given; for Negro laborers in the South, camp meetings and religious songs were used. Different communities, it was discovered, required uplift at varying intervals: 14 or 15 days in Virginia; 22 days in Boston.

The U. S. Employment Service did not operate long enough under war conditions to prove its worth. One mistake worth noting, however, was the Government's failure to utilize more fully the private employment agencies with which workers were accustomed to deal.

Materials needed in building the cantonments fortunately could be obtained in ample quantities at the start. Most items were purchased direct from competitive bidders; one bill served to place orders for all cantonments. An exception was lumber, the largest single construction item. Alert to the new needs, the lumber manufacturers formed an organization with offices in Washington, cooperated with Government representatives in fixing prices (lower than the prevailing market), allotted orders to local dealers able to make deliveries. Plumbing equipment manufacturers likewise established a Washington office, nominated one of their number to handle and allot orders.

A time-saver, this system set a pattern followed later by the War Industries Board when it took over the allotment and price-fixing of essential materials. Conflicts between requisitions were minimized. Priorities could be established. Thus, not only the Army's Construction Division but also U. S. Shipping Board and U. S. Housing Corp. were able to procure needed items as shortages developed. About three-quarters of the principal construction materials were bought in this manner, averaging nearly 81 million daily during the summer of 1918. Remainder was secured locally by contractors at prices approved by the Construction Division.

Design. The Army cantonments could hardly be called photogenic. However, as the Construction Review Board concludes: "All facilities that were important and reasonably warranted were furnished. The general health, comfort, and convenience, and the physical, mental and social welfare of the troops were provided for as fully as was practicable." Moreover, and most significant, "they were built with remarkable speed."

HOSPITALS

Bottlenecked for time, World War I building operations could not always follow a logical sequence. Roads and rail extensions were often constructed last instead of first. Signal boner, however, was the failure to build hospitals until after troops arrived in camp. Lack of medical facilities caused much hardship and needless suffering. Concludes the Army's Construction Review Board: "Hospitals should always be constructed in advance of or along with the troop quarters."

Base hospitals were designed by the Surgeon General's office, became part of the construction work of each cantonment and camp. Typical layouts show a symmetrical arrangement of one-story frame buildings —56 units for a 1,000-bed hospital, including single wards, double wards, quarters for officers and nurses, lavatories, operating pavilion, mortuary, chapel, laundry, garage, and such. Principal units were usually connected by enclosed passageways for protection against weather. Total capacities provided: approximately 32,000 beds.

General hospitals to receive sick and wounded soldiers returning from abroad were needed almost immediately after completion of the cantonments and camps. First to go up was a group of knockdown frame buildings on a site near Williamsbridge in New York. Originally constructed by Columbia University for reassembly in France, those buildings (capacity: 500 patients) were taken over by the War Department and frame structures of a more permanent character added.

By November 1917 the Surgeon General's office had developed plans for a complete group of standardized buildings. These were then turned over to the fast-stepping Construction Division's hospital section (headed by Architect L. H. Lewis), served as a general pattern for all subsequent work. Early buildings were one-story wood with compo-board lining, but experience gradually led to two-story units

GENERAL HOSPITAL at Illinois' Fort Sheridan, where existing barracks were remodelled in 1918 to accommodate about 2,000 patients and new buildings erected to provide 2,500 more beds. 1940
and the use of plasterboard lining, metal lath and cement stucco exteriors. Some were built with hollow tile exterior walls. Finally there evolved a standard design consisting of a principal utility building, oriented east-west and connected by service corridors with parallel ward pavilions extending south. One side of each pavilion had an open porch for patients. To the north of this group were placed the administration, surgical, laboratory and recreation buildings; beyond these, quarters for nurses, officers, and enlisted men. This type of hospital provided a total of over 19,000 beds.

Heavy casualty lists indicated by September 1918 that existing hospital accommodations would be inadequate if the war should continue. Growing shortages of labor and materials also indicated the necessity of buying or leasing buildings which could be converted into hospitals with a minimum of alterations. To place wounded men as near their homes as possible, the country was divided into districts approximating the draft districts. Two commissions then traveled about, selecting suitable buildings and converting them into general hospitals without delay. Plans called for a total of 38,500 beds to be provided within six months at a total cost not exceeding $15.4 million. When the Armistice was signed, hospitals of this type totaling approximately 27,000 beds were under construction.

Significant were the average costs per hospital bed—$8961 for new buildings, $89 for leased buildings.

INDUSTRIAL

Although the Army's 32 cantonments and camps take top billing as the biggest and most spectacular single performance in the War Department's building repertoire, they were hardly more important in a military sense than the production and transportation structures needed to supply men overseas with food and munitions. At war's break the country was short on these. Faced with the task of making up the deficiency, both Industry and Government began immediately to construct new factories, terminals, storage depots and warehouses so urgently demanded all over the country.

Factories. Most Government spending for new manufacturing facilities consisted of advances to producers who had to expand their plants if they were to turn out munitions and war stuffs in sufficient quantity. Included in the contracts as plant facilities, such expenditures were added to the cost of war materials. Usually the manufacturer let the job to a building contractor for cost plus 10 percent, then received payments from the Government on presenting vouchers covering labor and material, an upset price being fixed on the work's estimated cost.

On this basis a large amount of construction had already been undertaken by the Ordnance Department before the order was issued in October 1917 that all Army building should be handled by the Construction Division. Of the $819 million spent by the Ordnance Department—covering barracks, arsenals, proving grounds, storage depots, as well as plants for manufacturing acids, nitrates, explosives, gas, shells, guns—only $87 million were for contracts supervised by the Construction Division. Altogether, some 230 factories were developed as expanded plant facilities for manufacturers.

For unknown reasons the Ordnance Department did not use the standard contract for emergency work. Fees were much higher than those paid by the Construction Division. "It is evident from reading these contracts," summarizes the Construction Review Board, "that the attention of the Ordnance Department was so focused upon the one object of obtaining war materials at the earliest possible time that the matter of cost of increased facilities was treated as an incident, and the fact that the Government would have a large investment in such increased facilities was not considered of great importance."

Real Estate. Less easily explained is fact that many plant expansions paid for by the Ordnance Department were on sites which the Government did not own or control. At war's close this left the Government with three highly embarrassing alternatives: 1) to buy the site at the owner's price; 2) to sell the buildings, also at the site owner's price; 3) to remove the buildings—an impractical procedure since costs of demolition and restoring the site would probably exceed any salvage.

As the Construction Review Board postmortems: "It is difficult to understand why the officials drawing the contracts under which these plants or extensions were built did not protect the Government's interests by agreement, option, or purchase of sites." Net conclusion: construction work and purchase of real estate should be handled by a single organization.

Record. Lumped together—National Army cantonments, National Guard camps, special training camps, embarkation camps, hospitals, armories, factories, airfields, quarantine stations, temporary office buildings and such—the nearly 600 projects handled by the Construction Division make an impressive volume of work. Erected in hundreds of communities throughout the country, they touched every State except Nevada, rang up a grand total of over $1 billion on Building's cash register.
CIVILIAN HOUSING

Most disturbing feature of Building's role in World War I is fact that all the while Government was spending millions on cantonments and plants to house the machinery of war, not one red cent went into housing for the industrial workers who were expected to keep the machinery running full blast. More than a year went by after America's entry into the European conflict before effective action was taken on this problem—turbulent months in which the task of obtaining labor for the shipyards and munitions factories, concentrated in a relatively small number of communities, became increasingly difficult as the shortage of suitable living quarters grew more and more acute. Action finally came, but too late to prevent the congestion which proper planning could have anticipated and forestalled. The war was over—won, fortunately—before many dwellings had been built.

Building's war housing record is clouded even beyond a tardy start: operations were too slow, too inefficient, too costly. But, without past experience to serve as a guide, the Government agencies saddled with this problem had to grope their way toward a solution. Their pioneering blazed a trail which has since pointed the way for slum clearance and USHA's low rental housing.

Private enterprise. Much scattered private building took place in the early war days, but the residential volume declined continuously as the war stretched on. New dwellings were no longer being added at a rate sufficient to offset losses through fire and obsolescence or to meet the normal increase in families. Reasons: 1) skyrocketing costs (up about 68 per cent between 1913 and 1918) discouraged investors who feared deflation of values with war's end; 2) demand for labor and materials for cantonments and other urgent war construction became overwhelming; 3) private capital was more interested in nursing war babies.

At the same time population shifts caused by the armaments program magnified the nation's growing shortage of houses into intolerable proportions in war industry centers spotted along the Atlantic seaboard and in the North Central States. In cities like Bridgeport, New London and Erie, where huge war orders had been placed, the influx of labor quickly absorbed all available housing. Still more serious were conditions in smaller, more remote communities where proving grounds, bag-loading plants and other dangerous undertakings had to be located. Here there was no housing at all to spare. Even though paid high wages, workers had to live in slums, share rooms with two to ten others, in already overcrowded private dwellings, or snatch space in flimsy bunkhouses. Rents rose rapidly. So too did the ill health, discontent and inefficiency of workers. Labor turnover became enormous: unable to find satisfactory living quarters, men worked a few days, then left town. Married workers, usually the most skilled and most needed, had to live apart from their families, became also the most difficult to retain on the job.

With private enterprise unable alone to cope with this situation, steadily growing worse, the Government at last was forced to take long-postponed action.

Government policies. Forewarned by England's experience with production-hampering housing shortages, the National Defense Council's Committee on Labor had set up a section on housing as soon as America entered war. Little was done, however, until questionnaires and a tour through the country revealed acute congestion in many centers although expansion of war industries had only just begun. The committee concluded private capital could not meet the growing demands, stated the Government would be forced to make housing funds available, argued the desirability of building brick houses before snowfall. (Labor note: in spite of the abnormal demand for carpenters, there was serious unemployment among bricklayers.) More hearings were held, more recommendations advanced. Then finally the National Defense Council appointed a "Ten Day Committee" headed by Builder Otto M. Eidlitz to examine the housing problem, determine its extent and relation to the war program, suggest remedies. Late in October 1917 this committee submitted its report: earlier findings by the Housing Section were confirmed.

Ten localities—Bethlehem, Chester, Bristol and Hog Island in Pennsylvania; Bridgeport; Quincy and Squantum in Massachusetts; Wilmington; Newport News in Virginia; Rock Island in Illinois—were already restricting output because of inadequate housing facilities, faced the critical task of accommodating 75,000 more workers before June 1918. Typical of the lack of coordination in war planning were conditions in Bridgeport. In the preceding seven years the town's families had increased at a pace double that of new house construction, but despite the lack of living quarters the Government was now financing a new plant. By the first of the year nearly 10,000 more men would have to be housed if plants with war orders were to run at full capacity.

In the meantime Congress had adjourned. Another precious three months slipped by before a bill requesting $80 million for workers' housing could be introduced in line with the committee's recommendations.

Quite independently of the National Defense Council's investigations, U. S. Shipping Board had also become aware of a growing housing shortage. Located in small communities or in suburbs of such cities as Baltimore and Philadelphia, shipyards were hamstrung for lack of labor because of bad housing conditions. An annual turnover of 800 to 1000 per cent was reported.

Through its Emergency Fleet Corporation, the Shipping Board was helping to build new shipyards. Ship builders, however, were too busy to do much about housing.

(Continued on page 70)
A MESSAGE TO AMERICANS
from the President
of the Royal Institute of British Architects

It is perhaps unusual for a letter of fraternal greeting from the President of the Royal Institute of British Architects to the Architectural Profession in the U. S. of America to be written in an Air Raid Shelter, but such is actually the case. As I write I hear the familiar drone of the heavy German Bombers overhead and the continuous barking of the anti-aircraft guns. From time to time as these hull there is the welcome rising note of anger as the Spitfires swoop to the kill. This is but a tiny village set in cherry orchards and hop gardens, but on my lawn is a jagged hole and at my gates police notices saying “Unexploded bomb. Keep clear.” There are no military objectives here—only the peaceful tile-hung cottages, and the gray church where simple folk have worshipped for 600 years in freedom and dignity. These however, second perhaps to the hospitals and the thickly clustered homes of the workers, are the new objectives of the German command. We are not dismayed, but our anger, too, is on a rising note and the end is not yet.

In the years before the war the architectural profession in Great Britain was changing owing to the increase of Architects Departments of Ministries, City Corporations, Municipal, County and Education Authorities. Although these Official Architects, as they are called, do not compare in numbers with the private practitioners, they were ever increasing in skill and importance.

Such buildings as Schools, Post Offices, State Hospitals and Housing schemes which formerly were mainly designed by private architects, are now largely carried out by official staffs. The opportunities thus created of continued sequences of planning have resulted in many excellent buildings of modern character, particularly the schools.

The vast amount of private buildings, universities, hospital centers and the greater civic and commercial buildings remained in the hands of the private architect.

When war appeared to be a possible happening, the R.I.B.A. at once formed a strong Committee to investigate problems of defense against air raids and conferences were held. The conclusions were of great value in the later compilation of the Building Code of the Civil Defense Act.

At the outbreak of war there was a sudden and almost complete stoppage of building which was felt most of all by those in private practice.

This Institute at once offered its services to the Government in the task of carrying out the huge national program of temporary camps, hospitals, munition factories and defense works, which was then inaugurated.

Our profession, trained in planning and design, in judgment of sites and supervision of work, has a vitally important part to play and a very definite helpful contribution to make to the national effort.

There was in the first instance some reluctance to employ architects by many Government Departments owing to the old wrong idea that they, the architects, were only concerned with the addition of architectural trimmings to otherwise plain buildings. Had it but been realized, the modern architect is far more likely to be the man to omit the trimmings.

The modern education of architectural students is more scientific than was once the case and in its earlier stages is akin to that of engineers but combines also in the subjects of planning and design two all important matters in which engineers as such appear not unduly to concern themselves.

Recently there has been far more cooperation between the authorities and the architects. In the formation of air raid shelters in certain towns the qualified architects formed themselves into panels and were responsible for the design and the carrying out of the whole shelter program. The work was shared, fees were pooled, cooperation was loyal and the result was beneficial alike to the town and the architects.

Our young architects are in the fighting forces and our brilliant students are winning fresh laurels for themselves. For many, alas, the victor's crown has also become the bury leaves of the heroic dead. The older men, most of whom fought in the last war, are enrolled in A.R.P. and fire fighting services and in the Home Guard.

The insensate shattering of London buildings now proceeding will need much technical skill for its present control, while the future reconstruction will demand all the powers of town planners and architects alike. Out of this evil good may eventually come.

You will, I am sure, forgive my returning to the subject of the war because this is clamant and insistent. Nothing else matters in England now. We are fighting for the freedom of men's souls against a monstrous tyranny that would enslave both body and soul, and I assure you that the knowledge of your sympathy is of immense help to us.

The art of architecture may be clouded but it cannot die. The spirit of the free laic masons of the mediaeval years who, refusing to be dominated either by King or Abbot, produced some of the finest of the world's buildings, still lives in the architects of today whether British or American, and for that freedom we shall fight to the end. It is difficult to believe that America can ever be subjected to the strain we are undergoing now. For one thing that would assume that some queer things had happened to the British Empire and its fighting forces. Those things are not going to happen, but if I may presume to advise I would recommend action that will be useful to you in both war and peace.

Make your government and your nation architect-conscious at the earliest possible date. Prove to them that the national development in all directions, particularly in those affecting the planning of the environment of your people, will be all the better if at the very beginning it is realized that the architectural profession is by training and experience the rightful one to be consulted early, not to remedy mistakes, but to prevent them, and that the same thing applies to all the vast program of air raid shelter, industrial and defense works which war entails.

In conclusion I give to the architectural profession in America the warmest greetings of the Royal Institute of British Architects. God speed the right.

W. A. Audell
President, R.I.B.A
BUILDING'S SHARE

Since the President's first declaration of the national emergency, Congress has appropriated a total of $12,249,500,000 for defense. By mid-September, six-and-a-half billions of these appropriations had reached the stage of actual contracts or definite allocations—enough to afford a rudimentary idea of the pattern of defense spending, enough to establish the approximate relative magnitude of Building's share in the defense job.

As of September 15, five of the six-and-a-half billions had been assigned to shipbuilding, one to aircraft and supplies, and a half-billion to building (chart, right). And, in addition to this half-billion for direct Federal construction, Army and Navy grants and RFC loans to private manufacturers for plant expansion totaled another quarter-billion, at least a third of which is being used for new industrial buildings.

Thus, by rough calculation, 11½ per cent of the defense money allocated by September 15 went into building construction. As time goes on, this percentage of building dollars to defense dollars will undoubtedly tend to increase. Contracts let by mid-September included but 30 millions for defense housing, although a quarter-billion has been appropriated for this purpose—but encompassed almost the whole of the naval expansion program, which will take until 1946 to complete. While Army and Navy building was well under way, the necessity to prepare detailed plans and specifications for each building project naturally meant that this part of the program did not get started as rapidly as some of the others, reducing still further its proportion to the total figure. Despite the start which has been made in this respect, it is certain that Building will figure more importantly in future defense contracts than it has in the past.

Current plans for defense building total more than a billion dollars for fiscal 1940-41 in the military and naval classification alone. To this must be added another quarter-billion for defense housing and an undetermined, but probably large amount in government grants for industrial plant expansion, as well as an allowance for the impetus which the program will give to private housing, other industrial construction, and the miscellaneous building types.

The significance of these figures to the building industry can be evaluated only in relation to pre-defense building volume. Last year's expenditure for buildings of all types—public and private—totaled barely four billion. Next year's will certainly total six. Biggest increase, of course, will be in the military and naval classification, where 1939-40's 125 million leaps to '40-41's billion plus—an increase of almost ten times which has no precedent in past building statistics except the experience of World War I. The increase in industrial construction to a 1941 forecast of 725 million, while not nearly so great proportionately, is equally unprecedented—topping all previous peacetime years, including even the 1929-29 average of 640 million. The 1941 housing demand, forecast at two-and-a-half billion, while tremendous in absolute volume, should be compared to the 1939 depression-high of two billions and the '26-'29 average of four billions.

All of the figures quoted above (and shown in the charts at the right) are necessarily rough but reasonable approximations. They are sufficient to indicate, however, that Building's number one job is military and naval construction, followed by industrial expansion and defense housing. In the major sections which follow (arranged in this order of importance) the nature of these tasks is indicated in greater detail. Foremost fact to be gleaned therefrom is that the defense building job includes every conceivable building type, small and large, temporary and permanent, simple and complex. And, for those who like mouth-filling figures, they also show a 1940-41 defense construction program which adds up to at least two billion building dollars.

For additional references see pertinent sections of the Bibliography.
WHERE defense building dollars are going.

KEY

Each symbol represents $5,000,000 of building construction contracted and/or allocated

- USHA and Army - Navy Defense Housing
- Grants and Loans for Industrial Buildings (1/2 of Actual Expansion Allocations)
- Army Building Construction
- Navy Building Construction

CHARTS BY HENRY ADAMS GRANT
the picture on October 1.
EXECUTIVE

The President

NATIONAL DEFENSE

ARMY & NAVY

ADVISORY COMMISSION

MDJ. GEORGE J. SCHLEY

WILLIAM HARRISON - LESTER

PRESIDENT

Lt. Col. Simon Jacobson

C.E. COHEN, CHIEF

OFFICE OF THE ADJUTANT GENERAL

J. COLLATZI, JR., DEPUTY

CONSTRUCTION ADVISORY CO.

Chief

District Engineers

LOCAL CONSTRUCTING QUARTERMASTER

LUMP SUM

Maj. A.L. Viola,

CORPS OF ENGINEERS

PROFESSIONALS', CONTRACTORS' PROCEDURE

Major F. S. Harvey

Chairman

Francis Blossom

F. J. C. Dresser

Civilian

John P. Hogan, A.S. Hammond,

E. P. Palmer, Malcolm Pirnie

Ernest J. Russell

PROJECT PROCEDURE

1. Construction projects which are part of a general program originate in the office of the Secretary of War in conjunction with the Chief of Staff after advisements from Chiefs of the various branches. Construction projects arising from apparent need originate in the office of the Post Commander, go through the Corps Area Commander to the War Department.

2. Project is turned over to the office of the Quartermaster General for execution.

3. Method by which work is to be let is determined by the Chief of Construction Division who then assigns it to proper section in Engineering Branch.

4. Drawings and specifications are prepared by the Engineering Branch. The Office of the Quartermaster General, when it finds it expedient, designates private organization to prepare drawings and specifications.

5a. If contract is to be let by cost-plus-fixed fee method, Advisory Committee selects names to be gone over by a special committee. Three or four firms are then sent questionnaires and asked to come to Washington for interview by the Chief of Construction Division and his assistants, who make the award, subject to approval of (6).

5b. If contract is by competitive bid, Lump Sum Division advertises bids, and awards to lowest bidder, subject to approval of:

6. National Defense Advisory Commission; The Assistant Secretary of War; and in some cases, the Joint Army and Navy Munitions Boards (see note opposite page).

7. Supervision of the contractor's work is by the local Constructing Quartermaster, and/or the private architect-engineer engaged for the job.

8. If materials specified are not readily available, the Procurement Division is consulted.

PROJECT PROCEDURE

2. Office of Corps of Engineers executes fortification projects.

3. Its Fortifications & Construction Section designs the work, often aided by consulting architects and engineers. The District Engineer lets contract, selecting firm on recommendation of Fortifications & Construction Section.

CORPS OF ENGINEERS

Fortifications & Construction Section

Provisions Bases, Contractors' Procedure

A. Contractors may leave names with District Engineer or with Fortifications & Construction Section, Corps of Engineers.

B. After receiving questionnaire regarding specific fixed-fee project, architect, engineer, contractor appears before Chief of Construction Division and his assistants. Contract awarded by Chief of Construction Division on basis of questionnaire and above interview. Contractor's work is supervised on job by local constructing quartermaster and/or the private architect-engineer employed on the job.

C. For fixed-fee work, architect, engineer, and contractor may also leave names and qualifications with local constructing quartermaster. This is only additional to (A) but a recommendation from the local officer is a factor in selection of firms. Landscape architect should leave his name and qualifications with local constructing quartermaster who hires him directly.

ADVISORY SECTION

Major F. S. Harvey

Chairman

Francis Blossom

F. J. C. Dresser

LUMP SUM

Maj. A.L. Viola,

LUMPSUM

Mc Donald

Army, Navy & Munitions Board

PROFESSIONALS', CONTRACTORS' PROCEDURE

For work on cost-plus-fixed fee basis, architect, engineer, contractor leave names and qualifications with Advisory Committee in Washington. A personal interview is best; and the more illustrative data on his work, the better.

For competitive-bid work, contractor prepares bid in reply to advertisement. Consults plans in Lump Sum Office in Washington, at local Army post, or obtains plans from Washington under bond. Bids are sealed, opened on appointed day and at public hearing, contracts awarded to lowest bidder.

For fixed-fee work, architect, engineer, and contractor may also leave names and qualifications with local constructing quartermaster. This is only additional to (A) but a recommendation from the local officer is a factor in selection of firms. Landscape architect should leave his name and qualifications with local constructing quartermaster who hires him directly.

After receiving questionnaire regarding specific fixed-fee project, architect, engineer, contractor appears before Chief of Construction Division and his assistants. Contract awarded by Chief of Construction Division on basis of questionnaire and above interview. Contractor's work is supervised on job by local constructing quartermaster and/or the private architect-engineer engaged on the job.

PROJECT PROCEDURE

1. Construction projects which are part of a general program originate in the office of the Secretary of War in conjunction with the Chief of Staff after advisements from Chiefs of the various branches. Construction projects arising from apparent need originate in the office of the Post Commander, go through the Corps Area Commander to the War Department.

2. Project is turned over to the office of the Quartermaster General for execution.

3. Method by which work is to be let is determined by the Chief of Construction Division who then assigns it to proper section in Engineering Branch.

4. Drawings and specifications are prepared by the Engineering Branch. The Office of the Quartermaster General, when it finds it expedient, designates private organization to prepare drawings and specifications.

5a. If contract is to be let by cost-plus-fixed fee method, Advisory Committee selects names to be gone over by a special committee. Three or four firms are then sent questionnaires and asked to come to Washington for interview by the Chief of Construction Division and his assistants, who make the award, subject to approval of (6).

5b. If contract is by competitive bid, Lump Sum Division advertises bids, and awards to lowest bidder, subject to approval of:

6. National Defense Advisory Commission; The Assistant Secretary of War; and in some cases, the Joint Army and Navy Munitions Boards (see note opposite page).

7. Supervision of the contractor's work is by the local Constructing Quartermaster, and/or the private architect-engineer engaged for the job.

8. If materials specified are not readily available, the Procurement Division is consulted.

The Architectural Forum
NAVY BUILDING ORGANIZATION
BUREAU OF YARDS & DOCKS

PROJECTS' CONTRACTORS' PROCEDURE

A1. For work on cost-plus-fixed-fee basis architect, engineer, contractor leave names and qualifications with the Contact & Liaison Section in Washington. List of projects open for consideration may be obtained in this Section. A personal interview is best; and the more illustrative data presented, the better. Photographs of work constructed in past, recommendations by clients, etc., are helpful.

A2. Architect, engineer, and contractor may also leave names and qualifications with District Public Works Officer.

A3. For competitive contracts, contractor prepares bid in reply to advertisement. Consults plans in Lump Sum Office in Washington, at office of District Public Works Officer as specified in advertisement, or obtains plans from Washington under bond. Bids are sealed, opened on appointed day, and at public hearing, contracts are awarded to the lowest bidder.

B1. For fixed-fee contracts, after receiving questionnaire regarding specific project, architect, engineer, or contractor appears before the special Negotiating Section for names of all local professionals. Architect, engineer, contractor leave names and qualifications with District Public Works Officer as specified in advertisement and are then sent to the Secretary. Photographs of work constructed in past, recommendations by clients, etc., are helpful.

B2. On smaller contracts, the contractor appears before the District Public Works Officer who negotiates with him direct, and awards contract.

C. Work supervised by District Public Works Officer.

NOTE
All construction contracts to be let or negotiated must have the approval of the National Defense Advisory Commission which studies their relation to and effect on the rest of the defense program.

The Army and Navy Munitions Board passes on all those jobs which overlap both Army and Navy. A Construction Advisory Committee has been appointed by the Army and Navy Munitions Board to advise on construction planning.

PROJECT PROCEDURE

1. Construction projects which are part of a general program originate in the Office of the Secretary of the Navy. The special Navy Board also advises on new construction work. Construction projects arising out of evident need originate from the Commandant of Naval District and the Commandant of the local yard and are then sent to the Secretary.

2. Project is turned over to Bureau of Yards & Docks for execution.

3. It is then assigned to the appropriate project manager. He is responsible for seeing that plans and specifications are prepared, and the contract let.

4. Drawings and specifications are prepared by Design Division. Architect and engineering firms are also being employed to draw up working drawings and supervise construction to relieve pressure on Design Division.

5. If by cost-plus-fixed-fee, the project manager turns to the District Public Works Officer (Civil Engineering Corps) in charge of construction at naval station or base. He selects three or more concerns who appear best qualified for work under consideration and awards contract.

6. The names selected by Contract & Liaison Section are then reviewed by a Negotiation Board of Officers. At least three who appear best qualified for the project are designated. A special questionnaire is forwarded to them for detailed information covering this specific project, and the contractors are directed to appear before the Board.

7. All recommendations by the Negotiation Board of Officers are forwarded to Chief of Bureau who awards contract, subject to approval of:

8. National Advisory Defense Commission; Secretary of the Navy; and in some cases, joint Army & Navy Munitions Board (see note to left).

9. Supervision of contractor's work is by District Public Works Officer.
(For officers of Washington's Defense Building Agencies)

<table>
<thead>
<tr>
<th>ARCHITECTS AND ENGINEERS</th>
<th>CONTRACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To what extent are professional services used?</strong></td>
<td><strong>How are payments made?</strong></td>
</tr>
<tr>
<td>Architects and engineers are employed on salary basis in the Engineering Branch of the Construction Division. These must be on the Civil Service register or have a Civil Service status. Architects and engineers are also occasionally employed on fixed fee basis to prepare drawings and specifications for special projects when Office of Quartermaster General finds it most expeditious.</td>
<td>Contractors are classified by the type of work they do, and by the size of job they are able to handle. This is determined on basis of work done in past, firm's own estimate, and board's judgment based on his equipment and staff. The names are also classified by States. It is the general policy to make awards to qualified firms in the geographical area in which the work is to be performed, but on jobs running to more than $5,000,000, this may be ignored.</td>
</tr>
<tr>
<td>The majority of professional architects and engineers, however, are employed on fixed fee basis for supervision of Army-designed construction. On almost every Army job, a private architect-engineer is employed to lay out utilities and supervise construction according to plans prepared by Engineering Branch in conjunction with local constructing quartermaster.</td>
<td>Usually all three firms are called in to discuss the project, before one is selected. An award of more than one contract to any one firm is not contemplated unless the interests of the Government dictate such action.</td>
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<tr>
<td><strong>Whom to contact and what to submit—</strong></td>
<td><strong>What is nature of work? How are payments made?</strong></td>
</tr>
<tr>
<td>For contracts on fee basis, architects and consulting engineers should apply to The Quartermaster General, Washington, D. C. Applications are filed with the Construction Advisory Section. Personal interviews with this Section (F. S. Harvey, F. Blossom, F. J. C. Dresser) are advisable. No one is summoned for personal interview, but the Advisory Section interviews each one who applies and will help in making sure his qualifications are properly set forth. Submit by letter or interview (1) full experience record indicating clients by name, location and type of project, and money value; (2) organization available with view to rapid completion of plans and specifications; (3) list of projects designed for Federal agencies. Photographic illustrations of completed work are helpful.</td>
<td>Applications for contracts on fee basis should be filed with the Fortifications &amp; Construction Section (Gen. Thomas M. Robins, Chief). This may be by letter or personal interview.</td>
</tr>
<tr>
<td>Architects and engineers are classified by the type of work they do, and by the size of job they are able to handle. This is determined on basis of work done in past, firm's own estimate, and board's judgment based on his equipment and staff. The names are also classified by States. It is the general policy to make awards to qualified firms in the geographical area in which the work is to be performed, but on jobs running to more than $5,000,000, this may be ignored.</td>
<td>For large contracts on fee basis, contractors should apply to The Quartermaster General, Washington, D. C. Applications are filed with the Construction Advisory Section. Personal interviews with this section (Gen. Robins, Chief) are advisable. No one is summoned for personal interview, but the Advisory Section interviews each one who applies and will help in making sure his qualifications are properly set forth. Submit by letter or interview (1) experience on fee construction; (2) experience in competitive bid construction; (3) organization available—including architectural and engineering; (4) equipment available; (5) financial resources. Under Items 1 and 2 list types of projects, place and cost. It is also well to apply to the local Constructing Quartermaster. On small jobs, he may negotiate contract direct. His recommendation is also of considerable importance in connection with contracts negotiated in Washington.</td>
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</table>

**What is nature of work? How are payments made?**

- (a) Furnish all necessary labor, material, etc., and construct project in the shortest possible time; (b) take all discounts, etc., (c) keep records on an approved basis; (d) keep a qualified representative at site of work; (e) conform to prescribed wage scales. Government to (a) Pay contractor: (1) a fixed fee which is sole pay for profit and interest; (2) all costs for labor, material, etc., (b) rent of contractor's plant at scheduled rates, (c) all transportation, including contractor's plant, (d) salaries of superintendent and other key employees, (e) band, insurance, and Social Security costs, (f) travel and hotel expenses of officers and employees; (g) reimburse contractor weekly or oftener, rentals paid monthly; (h) pay fixed fee 90 per cent as accrued, balance on completion; (d) adjust fee to any material increase or decrease in cost of project. | Applications for contracts on fixed fee basis should be filed with Fortifications & Construction Section (Gen. Thomas M. Robins, Chief). This may be by letter or by personal interview. Submit descriptive information similar to that submitted to Quartermaster General's office. Competitive bid work is handled through regular channels—advertising either through District Engineers or Fortifications Section. Awards to lowest bidder. |
| Architects and engineers are classified by the type of work they do, and by the size of job they are able to handle. This is determined on basis of work done in past, firm's own estimate, and board's judgment based on his equipment and staff. The names are also classified by States. It is the general policy to make awards to qualified firms in the geographical area in which the work is to be performed, but on jobs running to more than $5,000,000, this may be ignored. | Selection is on same basis as in office of Q. M. G. |
Architects and engineers employed in Design Division must be on the Civil Service register or have a Civil Service status. Consultant engineers and architects are also engaged to supplement work of Design Division when need for such services is deemed necessary to expedite the work.

Work in the field, including supervision of construction, carried out under the direction of officers of the Civil Engineer Corps, U. S. Navy.

For contracts on fee basis, architects and engineers apply to Chief of the Bureau of Yards & Docks, Navy Department. Applications are filed under the direction of officers of the Civil Engineer Corps, U. S. Navy.

In selecting three or four from the names in the file, the Board carefully studies responsibility of the firm based on its past record, office personnel and equipment suitable for type of work under consideration, and other pertinent information. Usually all three firms are called in to discuss the project before one is selected.

Architects and engineers are classified as to the type of work they do; also as to locality, although on large contracts the geographical distinction is not necessarily made.

In the case of contracts negotiated by the District Public Works Officer, for final selection is turned over to Office of Supervising Engineer (W. J. Rackley, in charge of emergency construction fixed fee contracts). Contractors are asked to fill out qualification questionnaires on special printed form for their files. On all other work, contracts are let by competitive bid.

A sample contract and a complete description of the nature of cost-plus-fixed fee contracts, prepared by William M. Smith (published May 20, 1940) may be obtained by writing the Bureau of Yards & Docks.

For fixed fee contracts, address letter to Quartermaster General. This request is turned over to Contact & Liaison Section (Lt. Comm. E. J. Spaulding). Application can also be in person, in which case interview is with the above Section, and in the case of ordnance plants, with Rear Adm. R. R. Waesche.

All contractual work on structures for U. S. Coast Guard is done by the engineering division. The Supervising Engineer, together with his assistants, the project manager and others, selects the contractor, who is asked to come to Washington for interview. Final selection is made by Chief of Bureau. In the case of contracts negotiated by the District Public Works Officer, additional names of firms may be forwarded to him from Washington files. He considers the list, issues questionnaires and carries on negotiations and hearings. Complete records of these are forwarded to Negotiating Board who pass on their recommendation to Chief of Bureau, for final selection.

For fixed fee contracts, contracts are listed geographically. Names are selected for specific jobs according to the type of work, financial condition, type of equipment, size of office force, and location. No special requirements. Partial payments made on delivery of ordered material. Regular payments are usually on monthly basis. Quarterly reports of progress reports from supervisor.

*Builds departmental and service buildings for the Government. Under the Lend-Lease Act FWA is authorized to build housing for Army and Navy personnel and civilian workers.
### GUIDE TO WASHINGTON'S DEFENSE BUILDING AGENCIES (cont'd)

<table>
<thead>
<tr>
<th>AGENCIES</th>
<th>F.W.A., U. S. HOUSING AUTHORITY</th>
<th>FARM SECURITY ADMINISTRATION</th>
<th>BUREAU OF RECLAMATION</th>
<th>CIVIL AERONAUTICS AUTHORITY</th>
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<tbody>
<tr>
<td>Administrator</td>
<td>Nathan Straus, Administrator</td>
<td>Department of Agriculture Will W. Alexander, Administrator</td>
<td>Department of the Interior John C. Page, Commissioner</td>
<td>Department of Commerce D. H. Connolly, Administrator</td>
</tr>
<tr>
<td>Provides construction loans and annual grants for low-rent slum clearance projects developed and operated by local housing authorities.</td>
<td>Provides construction loans and annual grants for low-rent slum clearance projects developed and operated by local housing authorities.</td>
<td>Builds housing for rural resettlement. May be used as agency for defense housing.</td>
<td>Architects and engineers employed on salary basis as part of design and engineering staff. From Civil Service. Architects and engineers employed as consultants to the regular design force. Supervision is through Bureau's own office.</td>
<td>Architects are employed in the Airport Division on salary basis. No consulting architects or engineers are employed by this Department, as all actual construction work and its initiation lies with the local municipalities.</td>
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</table>

### To what extent are professional services used?

- Architects and engineers employed on a fee basis by the local authorities. USHA has the power to develop and build defense projects directly. This has not been done to date and the probability is that where local authorities exist, this power will not be used.
- USHA has the power to develop and build defense projects directly. This has not been done to date and the probability is that where local authorities exist, this power will not be used.
- Architects and engineers employed on salary basis in nine district offices. No Civil Service registration necessary for this job. Consultant architects and engineers are also employed on fee basis direct from district office.
- Architects and engineers employed on salary basis by the local authorities. USHA has the power to develop and build defense projects directly. This has not been done to date and the probability is that where local authorities exist, this power will not be used.

### Whom to contact and what to submit—

- Apply to District Office.
- Address all applications to Department of the Interior, Personnel Division. When need for consultant arises, the Bureau calls on the Personnel Division for names. Applications may also be made to the Field Office, Customs House, Denver, Colorado—S. O. Harper, Chief Engineer.
- Apply to District Office.
- All work for Bureau of Reclamation is done by competitive bid. Advertising for bids is done through bureau of Reclamation at Washington, or through Field Office, Customs house, Denver, Colorado—S. O. Harper, Chief Engineer.

### How is selection made?

- Selection at present is by the local authority through appointment or competition.
- Consultant to Bureau's design division or engineering division where plans and specifications are made by Bureau's own office.
- Brokerage to Bureau's design division or engineering division where plans and specifications are made by Bureau's own office.
- Consultant to Bureau's design division or engineering division where plans and specifications are made by Bureau's own office.

### What is nature of work? How are payments made?

- The same procedure as in regular private practice. Rate of fee varies in accordance with the value of the project.
- Determined by District Office.
- Determined by District Office.
- Consultant to Bureau's design division or engineering division where plans and specifications are made by Bureau's own office. Payments are on a day-by-day basis.

### Whom to contact and what to submit—

- Award to the lowest bidder.
- All contracts are let by competitive bid from the District Office.
- All contracts are let by competitive bid from the District Office.
- Lowest bidder.

### How is the firm selected?

- Award to the lowest bidder.
- Awards are made in Washington office to lowest bidder.
- Lowest bidder.
- Lowest bidder.

### What is nature of work? How are payments made?

- Regular procedure under competitive bid.
- Determined by contract drawn by District Office
- Determined by contract drawn by District Office
- Similar to other Government contracts.
BUILDING'S ROLE Wherein new opportunities are explored . . . and ways and means for individual participation examined

Once again, as in World War I, the cry for speed commands all of Building's sources. Defense construction must proceed at the pace of roughly $2 billion a year if the Government's plans for national preparedness are to be realized. Materials and skilled labor are needed immediately. So too are the talents and knowledge of the industry's chief operating men—architects, engineers, contractors, builders, dealers, realtors, bankers. Each has a part to play, for Building's new assignment signifies more than a flood of orders for structures to be erected within a specified time. The problem is how to do the best possible job: not only must work proceed quickly, but quality must be held high and costs kept down. To do this, Building must call on its most progressive men.

In a system of individual enterprise such as ours, Government can set national objectives and appropriate needed funds, but cannot blueprint in detail what each person should do. Building's job has been outlined: it now remains for those who make up the industry to tackle the problem.

What can you do as an individual? Three possibilities are open: 1) appointment as a civilian specialist in a Government agency; 2) private contract work on Government-financed project; or by no means the least significant, 3) contract work on (or sponsorship of) a privately financed project serving the interests of National Defense. No matter what your specialized activity—finance, management, marketing, construction, design or research—each line of attack offers opportunities for individual or group initiative.

Not only is there the immediate task of building for the immediate enlargement of the nation's armed forces. Also to be considered are the long range objectives implied in the task of planning and building for America's permanent defense against outside attack.

Overshadowing all individual activity, however, is the question of what the industry can do as a whole. Clearly, if Building is to be ready to meet any defense demands at any time or any place, it should be known exactly what resources—professional skills, labor, materials—are available not only in each locality but also over the entire country. Shortages in any branch of materials or labor will affect directly the design and construction of all types of buildings.

INDUSTRY'S CAPACITY. Sad fact is nobody really knows Building's dimensions. In other industries the productive capacities are measurable: steel, for instance, is now operating at 95 per cent. But for Building such a gauge is lacking. Construction statistics cover only what is currently produced each month, do not indicate production potentials. There are no precise data even on how many people Building employs. Best guess: about 2 million. Typical of statistical findings is the Labor Department's latest study which reveals that in 1938 some 14,000 builders operating in 72 cities produced approximately 47,000 one-family houses. Eighty-six per cent of these builders were subcontractors and craftsmen who put up one to four houses and accounted for less than 37 per cent of the total production.

All-time high in private construction was reached in 1925 when the industry produced 594,000 dwelling units in addition to handling almost $2.2 billions worth of non-residential projects. Against this achievement now stands the two-edged fact that while construction techniques have improved the supply of qualified workers and technicians has dwindled. New houses are urgently needed, and the 1941 output should exceed by 10 per cent the 525,000 total being rolled up this year. Furthermore, industrial construction, already up 85 to 90 per cent over last year, should go on to break all previous records next year.

LOCAL LIMITATIONS. Hovering specterlike in the background is the experience of 1917-18 when Building's resources were strained to the breaking point. Will confusion, inefficiency, growing shortages of labor and materials be reflected again in waste and skyrocketing costs? Since those hectic days Building has made notable strides in its own organization. New marketing and construction techniques have been developed. Standardization—time saving, labor-saving—has simplified building design and pointed the way to prefabrication of building parts.

Nevertheless Building still remains largely localized in its operations. The nation's construction plant is split up in order to be near the sites on which new structures are to be manufactured. Unlike other industries which are distinguished by production centers—Detroit for autos, Pittsburgh for steel, and so on—Building is spread out over the whole country. Each locality is in effect a separate production center. And,
significantly, in this decentralized self-sufficiency of the industry there lies a potential threat to its ability to produce sufficiently fast to meet defense needs.

Already bulking larger than in World War I, demands for defense construction are again concentrated in certain areas for strategic reasons, will doubtless again prove too great for the construction plant in these localities to handle alone. Work must spill over into other localities. Building's entire resources must be drawn on if prospective local bottlenecks are to be kept open.

LABOR. Tapping of the industry's resources on a national scale is already well underway, reports indicate. Significant is the exodus of steamfitters and plumbers from New York's Westchester County to work overtime in Boston, Baltimore, Memphis and Pensacola, thereby creating a local labor shortage in a community not directly concerned with defense construction. Similar shortages elsewhere can be anticipated as skilled trades and drafts are piped off to defense project areas. Cabinet makers possess a skill well suited to aircraft manufacture. West Coast plants have discovered. Welders likewise find ready employment and draftsmen are in demand in many places.

No national labor shortage in any line has yet been reported, but Government officials are keeping an eye cocked on the supply of carpenters—a bottleneck in 1917 and a weak spot again today. Late last month advertisements in New York papers were calling for an extra 900 carpenters to work with 2,000 others on New Jersey's Camp Dix. As in most trades, few apprentices have been trained during depression years, and the qualified supply, already low, may possibly be exhausted under the heavy demand of cantonment construction.

MATERIALS. Biggest question mark is lumber. Although stocks are currently ample and no immediate shortage is seen, much wood will be required in building barracks and other emergency structures. The strain may be reflected later on in a tight squeeze for supplies in non-defense construction.

According to National Defense Advisory Commission estimates, between four and five billion feet of lumber will be required for troop housing and other defense installations in the next twelve months. As a safeguard against possible shortages, some 425,000,000 feet of rough lumber salvaged from New England's 1938 hurricane have already been sold by the Government to be repurchased after being sawed and finished. Valued at approximately $10 million, it is reputedly the largest deal in rough lumber in U. S. history.

Similar is the case of steel: output has been stepped up to facilitate the building of tanks and battleships. This primary defense demand can be met easily enough, say Government economists, but they are scratching their heads over what will happen with the secondary demand certain to develop as workers get fatter pay envelopes and begin to think about buying new automobiles and building new houses. As a hedge against rising costs, "open" contracts are being prepared by defense officials for use on construction projects: prices are agreed on in advance for materials to be delivered to unspecified points on call. In this way each contractor obtains a list of controlled supply sources to which he can turn whenever necessary.

INDIVIDUAL OPPORTUNITIES. So large is the demand for defense construction, primary and secondary, immediate and long range, that almost everyone should be able to fit into the industry's changing pattern. For instance:

1. If your work is in a locality already booming with defense orders.

First Government contracts have gone to organizations qualified to turn out working drawings on the double quick and to get construction forces going in the field without delay. But these organizations also have limits of capacity—new contracts must be either farmed out to newly formed subsidiaries or turned over to other specialists who can demonstrate their ability to do the work just as speedily.

Alert to the interests of their members, the three big professional organizations—American Institute of Architects, American Society of Civil Engineers, American Society of Landscape Architects—have petitioned FW Administrator John M. Carmody, urging that competent private practitioners in the vicinity of a project be employed to do the work by direct contract with the Government and not as employees of other organizations. Awards should be distributed widely to as many practitioners as possible, states the petition. Obviously, if there are no private firms within the vicinity qualified to do the project's design or construction with sufficient speed, the work must then be performed by organizations in other localities or by the Government's own building agencies enlarged for the purpose.

Aside from direct construction with Federal funds, there is the possibility of revamping idle or unprofitable local buildings for military or industrial use. Example: at New York's Fort Slocum, where recruits come for five weeks' training before embarking for service in the Canal Zone, Puerto Rico or Hawaii, Army officers have found quarters for the overflow of men by utilizing a converted garage in nearby Larchmont. Discovered by local Real Estate Man Harry E. Codwell, Jr., and refurbished inexpensively with partitions and plumbing, the building, long a white elephant, now nets the owners a tidy rental while the Army benefits by acquiring shelter at a cost of less than $2 per man per month.

In pointing out local possibilities to local investors, local architects, builders and real estate men can do yeoman service. Indicative of possibilities in this direction is San Francisco, where a thousand houses are being erected in the Mare Island Navy Yard district by Builder Henry Dolger who heretofore has specialized only in large commercial and industrial construction. Dolger's earlier experience is viewed by local lending institutions as eminently suited to the quantity production of low cost dwellings.

Opportunities do not stop with the provision of privately financed housing. Other types of buildings and community services will be required to meet the increase in business activity treading close on the heels of industrial expansion—stores, shops, theaters, and such. Recreational projects are worth investigating. Although the Government intends to take exclusive charge of recreational programs for all men in uniform, the National Recreation Association points out that facilities for workers are lagging in defense factory areas. Particularly desirable are off-time diversions—adult forums and the like—which will foster high morale.

For specific suggestions on how to develop new building possibilities, see case study of a defense plan for The City, pages 498-498. For Government contract procedure, see pages 334-338, and section on Military and Naval Buildings, pages 342-352; on Industrial Buildings, pages 573-576; on Housing, pages 437-468. Additional reference sources are cited in an indexed bibliography, section following page 468.
2. If your work is in a locality not directly involved in production for National Defense.

Other towns nearby may be congested and without adequate means for relieving immediately their housing shortages. This suggests the possibility of improving and extending transportation lines so that workers may commute to better living accommodations locally. Full advantage should be taken of the widest possible commuting range.

By compiling facts showing local advantages in avoiding production bottlenecks, communities can assist Government officials materially in spreading project contracts according to the principle of selective location. Such community promotion should be reinforced by local preparations to accommodate an increased population and business activity. "Ghost" factories, abandoned by obsolete industries, could be quickly put in shape at relatively small cost. Economies are also latent in vacant office buildings that require little expenditure for conversion into new uses. Many big country estates, held under foreclosure by banks, may provide the Government with inexpensive and suitable sites for airfields.

Before trying to get in new defense industries, a town should make sure it can handle them. Unless housing and school facilities are adequate, police and fire departments are strong, the municipal health service is operating smoothly, and local water supply and sewage systems can take the increased loads, new industries may be more of a liability than an asset. City government experts are pushing the National Defense Advisory Commission to insist on checking such items before commitments are made in spotting new plants. Fundamentally, the job is one for the town itself, aided by Building's local representatives.

Where a community sees no possibility of participating in defense production, and may even face the loss of some of its population to other localities, there is still the opportunity to promote slum clearance and rehabilitation of blighted areas. Doing so now, rather than after the emergency passes, will make easier the task of attracting back again the workers who have gone elsewhere. Removal of derelict or unsafe structures is also desirable from a military standpoint.

Defense production, it should be remembered, will create increased purchasing power which will be reflected in an increased demand for commodities and services. Preparation for a higher standard of living for the entire country goes hand in hand with the task of maintaining high civilian morale.

GROUP PROGRAMS. In many communities a local architectural firm, a contractor, a realtor, possibly others, can advantageously combine their services in a joint effort to promote and develop a local defense project. Such an integrated organization would undoubtedly speed output, could cooperate closely with Washington officials. See section on Government Organization, pages 334-338.

LOCAL PLANNING. In virtually every community there should be a local defense council of the sort suggested by the National Defense Council. A few have been organized already. Advisory rather than administrative, such committees are expected to formulate and recommend directives, leaving executive work to the regularly constituted city fathers. Preferably, to be wieldy, they should be kept small. As nuclei in the system of state councils and the broad national plan, their main task is to serve as spearheads in guiding the activities of other local agencies.

Defense planning must take place simultaneously at all levels of government—national, state, local—if the entire program is to move forward harmoniously. At many points the various interests are likely to clash. For instance, sound municipal planning may suggest the building of a new plant adjacent to the central area where it would be relatively easy to provide water and other services, but military strategy demands that it be placed in a suburban area to which utility extensions would be prohibitively costly. Essentially such problems are a matter of adjustment between what is desirable locally and what is imperative nationally.

Where comprehensive land use, social and economic surveys have been made of local areas, the task of the central planning agencies is simplified and local points of conflict can be avoided. But in many instances such data do not exist. Here then is an opportunity for all factors in the Building industry (architects, engineers, builders, labor unions, materials dealers, manufacturers, real estate boards, lending institutions, housing authorities) to assist municipal planning boards and local defense councils by undertaking to:

- Inventory available space in various types of buildings. Where housing shortages are already pressing, a definite plan such as that suggested by the 20th Century Fund's research staff should be followed: 1) set up a room registry service, listing quarters suitable for lodgers; 2) start a rent-a-room campaign; 3) bring additional dwellings into the market through a community repair and modernization program; 4) consider improving or extending transportation facilities to less congested areas within commuting distance; 5) promote new residential construction. See Section on Housing, pages 487-486.
- Inventory existing municipal utilities and services to determine their limits of expansion. As the American Society of Planning Officials observes, it is important to know, particularly where large defense housing programs are being considered, whether sewers, water lines and power systems can carry the new loads, what transportation can be obtained, how the proposed urban extensions will affect the community's schools and shopping centers. Although most cities have excess capacities in their reservoirs and storage dams, in the average city a population growth of 12 per cent is almost certain to require extra pumpage equipment as well as extensions to the distribution system. Expansion of industry, however, will probably tax city water supply and sewage systems more than will any increase in population.
- Inventory available building materials and construction plant resources. Where there is a local shortage of skilled labor, training of apprentices should be encouraged.
- Provide advice on the design and construction of emergency structures. Each town should have a "disaster plan" as a blueprint for action in a local emergency. Some forward looking cities have had them for many years. Now is a good time to devise others. Surprising as it may appear, in many cities the officials themselves do not know the exact location of their own utility and service lines—a matter of no small importance in case of sabotage.

INDUSTRIAL RESEARCH. Looking farther ahead, the industry as a whole can advantageously sponsor studies which will lead to the design of entirely new types of defense structures and to the development of even more efficient construction and marketing techniques than prevail today. Prefabrication promises much for the quantity production of building units in meeting unexpected emergency needs. Such studies merit special attention. And, finally, there is the question of Building's function when peace is restored to a war-torn world—long-range studies should also be in progress along this line.
MILITARY AND NAVAL BUILDING

RECEPTION
AIR CORPS
TENT CAMPS, CANTONMENTS
IMPROVEMENTS TO EXISTING POSTS
WAREHOUSES, STORAGE, ETC.
HEAVY ENGINEERING
MARINE CORPS BARRACKS
HOUSING
AMMUNITION DEPOTS
NAVAL AIR BASES
HOSPITALS, RADIO AND RESEARCH
ELECTRICAL FACILITIES
SHIPBUILDING FACILITIES

AVY

1937-38
1938-39
1939-40
1940-1941

$115,000,000
$93,000,000
$45,500,000
$137,000,000

EACH DOLLAR = 25 MILLION DOLLARS

11,272,000
4,000

V

V
DEMAND
Since last July, the Army and Navy have contracted for more building construction per month than the total for any previous peacetime year. By next July, they expect to have completed more than a billion dollars worth of military and naval buildings. Not all, or even most of this construction will take the form of light, barrack-type structures, nor will the greatest effect of the increase in military and naval construction be felt in those branches of the building industry usually concerned primarily with frame construction. Temporary cantonments for the enlarged army account for only about a third of this year's bill for military and naval building, and this part of the program—even allowing for the fact that it must be largely completed within six months—represents an increase in the normal rate of light construction of not more than 30 per cent. The influence of permanent military building, to which two-thirds of the money will be devoted, will be of longer duration and greater intensity. Relative to the normal volume of construction of corresponding building types—which last year totaled one-and-three-quarters billions—the 750 million dollars which the army and navy will spend on permanent buildings during fiscal 1940-41 will have an effect on building more drastic than any other part of the defense program: an increase of more than 40 per cent in the class of construction which requires elaborate working drawings, detailed specifications, and exacting supervision; and which uses the greater part of the brick, steel, cement, and glass which building normally consumes. The cantonment program is scheduled for completion December 15, but the need for permanent hangars, tank parks, shop buildings, etc., will go on increasing as long as the essential equipment which they are to house is being made available—by the most optimistic estimates, for some years to come.

PROCEDURE
Viewed in this perspective, it is evident that the military and naval building program presents a design task and construction problem which will tax the resources of the entire building industry. Present procedure (detailed on pages 34 and 53) puts the job of getting the buildings built up to private contractors, leaves the job of getting them designed mostly in the hands of the Army's and Navy's construction bureaus. To date, private architects and engineers have been employed only to layout and supervise the construction of cantonments (Army), using standardized buildings designed in advance as part of the M-day plan; and to help out the Navy's overloaded Design Division in the preparation of working drawings.*

Prime justification of this arrangement is speed. The Army and Navy design divisions, due to their long experience with military and naval types, are obviously able to produce plans for these specialized structures with a minimum of time-consuming preliminary study, and to fit most readily into the regular military routine. As time goes on, however, this justification will carry less and less weight. With the immediate emergency out of the way, it will be increasingly evident that it is the total amount of building in process of construction—rather than the time required to complete an individual project—which controls the progress of the entire program. The private architect, as he acquires experience with military requirements and methods, has a more significant part to play in the furtherance of this program than that presently assigned to him. Besides increased speed, a change in policy which recognizes this fact should pay dividends, in the form of better designed buildings, better adapted to local conditions both as to use and manner of construction.

*Exceptions: New York Architects Harrison & Fouilhoux, and Delano & Aldrich who are handling design and construction of two different jobs in the Canal Zone. For additional references on Military and Naval building types see Bibliography, pages 4, 5, 7, 9, 10, 14.
TEMPORARY BARRACKS CAMP DIX, N. J.

Characteristic feature of the Army's standard half-company barracks in most climates is a continuous hood over the first floor windows to permit adequate ventilation in bad weather. Platform and ladder at the end of each building is an emergency exit only, inside stairs being provided for inter-floor communication. The single-story building at the right is for the induction of raw troops; here the draftee surrenders his civilian clothing, goes through various stages of inspection, and receives his military equipment.

"WINTERIZED TENTS" have proved necessary at some of the camps where regular barracks have not been completed rapidly enough to keep up with the need. Tents have canvas roofs and a small, conical stove, accommodate four men each.
TEMPORARY BARRACKS

MARCH FIELD, CALIF. Here Escherich Bros., contractors, frame one-half of a two-story, 80 ft. barracks sidewall in a horizontal position, using the rough first floor as a platform, then apply insulating sheathing and an exterior plywood facing with one set of nails before tilting the wall into its final vertical position. Second floor joists are filled in afterward between the braced sidewalls, and end walls.

SCOTT FIELD, ILL., showing barracks spacing

Housing an army of more than a million trainees in the space of a few months is a colossal undertaking—particularly for an industry reputedly tied to horse-and-buggy methods. Prime aids to speed: standardized units (right), pre-designed as part of the War Department's “M-plan,” and advanced building techniques, including the use of labor-saving sheet materials, worked out by enterprising contractors on the job (above). The typical barracks is of two-story wood frame construction, with details varied to suit three temperature zones, and accommodates half a company (53 private soldiers in open dormitories, 8 non-commissioned officers in 2- and 4-bed rooms). It contains its own toilet and wash facilities and is heated by forced warm air distributed through an overhead duct. Units are arranged in company and regimental groups with necessary mess halls, storehouses, recreation buildings, and headquarters of similar construction.
ceiling and roof framing put in place in the conventional fashion. In mild climates, barracks require no inside finish, the inside surface of the insulating sheathing board acting as the finished wall.
Coincident with the Army’s training program, with its demand for temporary cantonments, there is naturally growth of what the War Department calls the “Authentic Army”—permanent standing forces. For such troops, and for the Navy’s permanent shore personnel (which increases at about the same rate as new ships and aircraft are commissioned) fire-resistant barracks of the type shown on these two pages are going up. Huge, and with open interiors (below) which belie their outward similarity to summer hotels, many of these units are capable of housing several thousand men. Construction is generally of reinforced concrete with brick curtain walls.
Architecturally uninspired, the permanent army barracks (right) are still being built from standardized plans which have changed but little in the last decade. Some effort is made to adopt the design to climatic requirements and local tradition, but the tendency has been to freeze design into two styles, designated (somewhat inaccurately) as "Colonial" and "Spanish." The example at the bottom of the page is one of the better buildings for a Naval Operating Base, and includes, in addition to quarters for the men, a mess hall, and galley.


NOVEMBER 1940
Not all of the Army's permanent barracks are as unimaginative as those on the preceding page. This tremendous territorial unit employs bold horizontals expressive of the open character of the interior and the structural frame, as well as up-to-the-minute awning-type metal sash and bent steel structural members. Projecting hoods over window heads are to keep out excessive sunshine.
Military and Naval recreation buildings range all the way from the temporary wooden building for a single Company shown at the right to the large, permanent auditorium for an entire Marine Post shown under construction at the top of the page. Also included are gymnasiums like the one below, while every Army and Navy unit has its chapel, large or small, permanent or temporary.

1. Auditorium, Marine Post, Quantico, Va.
2. Assembly hall, Fort Du Pont, Delaware City, Del.

RECREATION BUILDINGS
One of the basic considerations underlying all military architecture is the carefully maintained distinction between the commissioned officer and the ordinary soldier. Besides separate housing, this means that dual recreational facilities and mess halls must always be provided, and the niceties of rank maintained even in such matters as table linen and interior decoration. Only rarely, however, do either officers or men enjoy surroundings as pleasant as the excellent new midshipmen's mess on the facing page.
OFFICERS' MESS HALL, U.S. NAVAL ACADEMY, ANNAPOLIS, MD.

NON-COMMISSIONED OFFICERS' CLUB, FORT KNOX, KY.

COMMISSIONED OFFICERS' CLUB, FORT KNOX, KY.

NOVEMBER 1940
ADMINISTRATION AND OFFICE BUILDINGS

The paper work of the Army and Navy, as in every large organization, is considerable, and each permanent Army post and Naval station must have its share of modern, well-equipped office space. As will be seen from the examples on this page, the tendency to make such structures into overgrown replicas of the headquarters buildings once commandeered by the Revolutionary Army is giving way, if to nothing else, to sheer bulk. In its place there is gradually appearing the simple and dignified type of design exemplified by the Brigade Office Bldg. at the top of the page—certainly a more fitting expression of modern military science than its nostalgic prototype.

Supply, always the critical factor in military organization, in this day of mass, mechanized warfare takes on the proportions of a large scale industry. The supply divisions must grow in direct proportion to the growth of the army and navy, and require a tremendous amount of building construction, ranging from huge, centrally located freight terminals and warehouses to the individual Company storehouses which dot each army post. Added to this are storage facilities for equipment, which must be ready before the huge numbers of guns, tanks, and trucks now on order can actually be used by the armed forces. Traditionally, such buildings are utilitarian in character—a fact which probably accounts for their better-than-average design.

About one-half of the Navy building program for 1940-41—a quarter of a billion dollars—is for naval air stations, many of which, like the one shown on this page, will be entirely new. Permanent bases for both land and water planes, the typical station includes in addition to landing fields and basins, a score of hangars, industrial shops for the maintenance of the planes and engines, headquarters buildings, storage buildings, mess and recreation halls, and barracks and quarters for the men and officers. Designed by the Navy's Bureau of Yards and Docks, this station is typical of the forward-looking trend in naval building, and is a model of compact planning and orderly organization.
NE TEST BUILDING

JASSEMBLY AND REPAIR BUILDING

BARRACKS, rear

GALLEY AND MESS HALL

ASSEMBLY AND REPAIR BUILDING

All photos Robert & Robert
OFFICERS' QUARTERS

Where private enterprise rental units are not convenient or available, both Army and Navy provide for the housing of their officer personnel in bachelor dormitories, and in apartments and single-family houses for married officers and their families. As most of the examples on this page indicate, designs tend to follow, but lag slightly behind private housing practice. Notable exception to this rule is the recent work by the Navy's Bureau of Yards and Docks, shown in the renderings above. These are standard designs which will be reproduced—with suitable modifications for climatic variation—in all parts of the country, and incidentally illustrate the extremes of the whole range of this type of work, from the house of the Petty Officer or married enlisted man to the Commandant in charge of a Naval Station or Air Base.
CHIEF PETTY OFFICERS' QUARTERS
Canal Zone

OFFICERS' DOUBLE HOUSE
Fort Meyer, Va.

SENIOR OFFICERS' SINGLE HOUSES
Naval Air Station, Seattle, Wash.

FIELD OFFICERS' SINGLE HOUSE
Fort Belvoir, Va.

U.S. Navy

W.P.A.

U.S. Navy

NOVEMBER 1940
Current designs for bachelor officers’ housing being produced by the Navy’s Bureau of Yards and Docks show a distinct improvement over previous work of this type. Characterized by orderly, open planning in which orientation with respect to sun and prevailing breezes plays a determining part, each of these new “schematics” will furnish the design-basis for a score of naval air stations throughout a general geographic area, thus speed the production of working drawings without sacrifice of architectural quality. Illustrations show the general plan of a typical officers’ group, with bachelors’ quarters and mess, recreation building, and houses for senior married officers; details of typical bachelor quarters for two different orientations; and perspective of a typical unit. The paired rooms with common bath shown in both detail plans have proved highly successful, since they may be used with equal facility in a variety of ways by officers of varying ranks: for two junior officers, who share the bath; as a bed-sitting-room suite for the next grade; or—using two of the units—as a single bedroom and bath, joint sitting room, and two bedrooms with common bath.
An integral part of the national defense program is the improvement of non-military airports for possible emergency use by the armed forces. The U. S. Coast Guard, in wartime a part of the regular navy, is naturally no exception to this rule. The excellent, orderly Coast Guard air stations, built for long-range safety patrol, are readily adaptable to military use, and thus will figure importantly in our second line of aerial defense. It is to be hoped that the architectural excellence of this example—extraordinarily high for government work—will be maintained and extended to other branches of the service.
The peacetime functions of the Coast Guard include life saving, property protection, navigation safety regulations, border patrol, and sea hazard patrol. The Cleveland Station, first to be designed from scratch as an architectural entity, consists of three units—a boat house, quarters building, and garage. Arranged in the shape of an L, the buildings are organized both for efficiency and architectural effect into what seems to be a single, homogeneous unit; worked out—in the words of the architect—"to give the impression of wind and wave resistance, and to express the impelling humanitarian activities of the Coast Guard in appropriate architectural terms having a nautical meaning." The boat house is arranged for rapid transfer of boats from truck to water, and vice versa, as the occasion demands, and includes an overhead trolley hoist and a power winch for drawing boats up the inclined launchway. The quarters building houses the officer in command, his mate, and a crew of 22 seamen. Offices, living rooms, mess, and officers' quarters are on the first floor, with dormitory for the mate and crew above. A lookout tower, reached by a spiral stairway, commands a view of the entire horizon.
NAVAL SHOP BUILDINGS

Construction, maintenance, and repair of a modern navy is an industrial job of the first magnitude. At its various bases and operating stations scattered up and down the Atlantic and Pacific coast lines the Navy has scores of huge industrial buildings, shops, and foundries capable of reproducing or reconstructing any and all of the parts which may be required on short notice by any of the units of the fleet. As the size of the fleet increases, so, too, must the size of its industrial base. Naval expansion plans for the current year include more than 125 million dollars for the construction of such facilities.
NAVY YARD, EAST COAST

NOVEMBER 1940
Two trends in the design of industrial shop buildings are illustrated by the two buildings on this page, both the work of the Navy's Bureau of Yards and Docks. Essentially similar in cross section, their exterior treatment has been approached from diametrically opposed points of view.

The Machine Shop (right) shows the effect of a conscious effort at symmetry and continuity entirely absent in the Foundry (below), which is evidently a purely functional expression of the physical and structural requirements. Question is: Is the Machine Shop architecturally attractive because of its bow to the established "rules of design," or the Foundry inspiring because it ignores them?
MACHINE SHOP, NAVY YARD, EAST COAST

Nowhere is Design's dependence upon the development of improved building products so evident as in the huge, utilitarian structure. Thus whatever difference there is between the visual appeal of this building and the foundry on the opposite page arises out of the different glazing and sheathing methods employed, factors which are only partially within the designer's control.
Specialized buildings for handling heavy equipment must be available for emergency repairs to the fleet in time of war. For this reason, the Navy owns and operates shops for much of the final fabrication and assembly of its ships. In the interesting building below, huge gun turrets, together with their below-decks powder storage bins and conveyors, are assembled for transfer to the ship as a single unit.
HOSPITALS

One of the great shortcomings of the Army construction program in World War I was the failure to provide base hospitals adequate for the needs of the inducted troops. If this is to be avoided in the present emergency it is essential that new hospitals be built as rapidly as cantonments are made ready for occupancy, and that they be sufficiently well constructed and equipped to care for the sick load which invariably results when large numbers of men are housed in confined quarters.
Alfred Cook Photos

NATIONAL GUARD ARMORY, MORRISTOWN, N. J. HUGH A. KELLY, ARCHITECT

ARMORIES

Armories are customarily built by the States for the use of their National Guard units. During the past few years a great number of these structures have been put up with WPA funds and labor, although still under State supervision. Illustrated on these pages are

LOUNGE

STALLS
three recent examples. The Morristown armory is Colonial in design with a very handsome interior of rigid frame construction. Other views show the equipment racks, stalls, and the lounge.

In planning armories at the present time, flexibility of arrangement is an important requirement, since there is no doubt that armories now set up for cavalry or infantry training will in many cases be used for new types of units, such as mechanized cavalry, chemical defense, anti-aircraft regiments, etc. Obviously, with the organization of the army and its reserves undergoing swift changes, the structures built to serve them should be equally capable of adaptation to new uses.
SCHOOLS AND RESEARCH

Intensified training and research naturally form a part of the growth of the Army, Navy, and Air Corps. Each of the technical branches of the service will have to expand its training program to keep pace with the increasing need, and many buildings such as these will be required to house this activity.

Due mainly to a defense-inspired third-quarter surge, privately financed industrial construction at September’s end was about 90 per cent ahead of 1939’s first nine months. And, indication is that the gain will be at least 80 per cent for the full year, raising the 1940 total to some $360 million. Next year will probably see this percentage increase repeated for a total of about $650 million—a shade above the average annual volume of the 1926-29 heydays.

An upturn in factory construction normally follows close on the heels of improved consumers goods business. The short-lived boomlet of 1937 jacked up private industrial construction expenditures by about 75 per cent—to $391 million. But, with business recession, the total dropped sharply to $192 million in 1938. Last year, the consumers goods business peaked and flopped before industrial construction had time to get started, and expenditures for new factories toted up to an unimpressive $200. This year, national defense has turned the tables; private industrial building has responded more quickly than usual to the acceleration of consumers goods business, has in recent months equalled the booming 1929 pace.

In addition to private factory building dollars, national defense means millions more during 1940-41 for new factory sites and machinery, for ships and shipbuilding facilities, for public utilities and transportation facilities and for all kinds of publicly financed industrial construction. It also means reopening, reconditioning and, in many cases, conversion of existing factories. The reason is obvious: most of the $13 billion job of preparing the U. S. for defense naturally falls on the nation’s industrial plant.

**DEMAND.** Today this industrial plant (at least that part of it necessary to defense) is jam-packed with orders—so much so that there is already indication that the Army and Navy, Industry’s biggest consumers, may soon exercise priorities over their non-defense competitors. Big U. S. Steel Corp. is trying to put the last 4
per cent of its theoretical capacity to work, while smaller Bethlehem Steel Corp, has already been forced to turn down some orders. Meanwhile, every private and public shipyard in the country, which is equipped to build warships, is laying keels in every ship way and is building new ways. Construction of the two-ocean fleet (more than 500 new warships) will take a lot of steel. Existing airplane plants, while recently expanded to handle British orders, are far from adequate to fill U. S. needs in the specified time. The same is true for airplane engine production, one of the defense program's tightest bottlenecks.

Along with orders for airplanes and airplane equipment, munitions orders are presently the hardest to fill. Result is that factories for their production are now in bigger demand than most any other type of industrial building. But, the demand embraces countless other types from tank plants to textile mills, from optical instrument laboratories to warehouses. As good an indication as any of the breakdown of this demand is a summary of the $220 million already loaned by the Reconstruction Finance Corp. to private industry for defense purposes (plant construction, equipment and machinery). Biggest chunk ($892 million) went to the airplane industry; 877 million has been loaned to aircraft manufacturers; 819 million to airplane parts makers, 816 million to metal makers, 810 million to machine tool makers and 86 million to a host of other industries. (Since expansion of munitions plants will be financed largely with Government grants, not loans, manufacturers in this field are near the bottom of the RFC list.)

**LEGISLATION**

Much plant expansion during the first part of 1940 resulted from British (and for a while, French) orders. Some new plants were even financed with British money. Then came U. S. national defense. Between the planning and contract-letting stages of the program, the War and Navy Departments issued "letters of intent" to manufacturers, guaranteeing protection against any losses they might incur in building and tooling-up their plants for anticipated contracts. Then came the contracts—month ago more than three-fifths of the Army's had been let. Up to that time orders had been accepted and new plants had been launched on the assurance that, while Congress would eventually enact a law limiting their profits via taxes, it would also permit them quickly to amortize their new plants. However, they had only a vague idea as to how the law would read, and some of them preferred to hold up their plans pending its enactment.

On October 8, after it had stewed in Congress for two full months, the President put his signature to this law. But manufacturers were and still are befuddled. (Some 500 pages long and weighing a pound and a half without its binding, the Second Revenue Act of 1940 was branded "a complicated hodge-podge" by one Senator, "an imponderable mess" by another.) From the confusing legal verbiage three important facts stood out:

1. Every corporation, for tax reduction purposes, is entitled to amortize any "emergency facility" during a five-year period (previous period: flexible, about 20 years). By "emergency facility" the Act means any "... land, building, machinery or equipment, or part thereof, the construction, reconstruction, erection or installation of which was completed after June 10, 1940, or which was acquired after such date. . . ."

2. Repealed is the Vinson Act which limited the profits of contractors and subcontractors supplying naval vessels and Army and Navy aircraft.

3. In its place goes an excess profits tax designed to limit profits on all contracts—defense and non-defense, public and private. A direct answer to the President's declaration that U. S. rearmament must make no new "war millionaires," this section of the Act raises from 20.9 to 24 per cent the "normal" income tax on normal corporate earnings in excess of $25,000 and adds a graduated "excess profits" tax of from 25 per cent (under $200,000) to 50 per cent (over $8,000,000). "Excess profit" for any year is defined roughly as either 1) any profit exceeding 8 per cent on average invested capital or 2) any profit exceeding 65 per cent of the average annual profit for 1936-39. Apparently, Congress felt that most of the increase in corporations' profits during 1940 over the previous four-year average can safely be attributed to the current defense-inspired business boom. Corporations may take their choice of the two alternative methods of computing their tax, and in either case the first 85,000 of their excess profits will be tax-exempt.

Detailed analysis of the Act reveals several inequities and other shortcomings. Thus, chances are that much of the 1940 tax bill will be paid under protest, that the legislation will be redrafted in the next session of Congress.

**PROCEDURE**

With the long-awaited law finally on the books, manufacturers now have concrete facts with which to work and may take their postponed plant expansion programs off the shelf. But, the building of factories with existing working capital, bank loans and bond proceeds, to which this legislation primarily applies, is only one of several ways in which industrial plant expansion is taking place:

RFC loans. Known as the shrewdest, most tightly closed corporation in the Federal family the Reconstruction Finance Corp. has already done yeoman service for national defense. On September 30 it had loaned $220 million to private manufacturers to finance defense production. Biggest loans: $92 million to Wright Aeronautical Corp., $31 million to Curtiss-Wright Corp., $18 million to Bendix Aviation Corp, and $16 million to Reynolds Metals Co. Probability is that about two-thirds of the $220 million total will go for plant machinery and equipment, one-third for actual building construction.

Federal installment grant. Where plant expansion is undertaken by private manufacturers solely for military purposes, Government may foot the cost of construction by what is known as a "bankable contract" which protects the manufacturers against loss and safeguards the Government's residual interest in the plants upon termination or completion of the contracts. Thus, money for the new facilities would come originally from a manufacturer's own funds or from the granting of credit by private bankers. The Government would give the manufacturer, in five equal annual installments, enough cash to cover the entire capital investment as audited by approved accountants. The manufacturer, in turn, would reimburse the original source. Under this contract the manufacturer would provide management and operation and assume all the ordinary risks of the business.

At the end of the five-year period if the manufacturer has no further Government contracts to fill, the plant would be evaluated by three appraisers, one appointed by the Government, one by the manufacturer, the other by the local Circuit Court of Appeals. If he wanted it, the manufacturer could then buy the plant at its appraised value, otherwise, the Gov-
Four separate buildings, and additions to several others were incorporated in this $2,500,000 expansion program. Besides a 281,000 sq. ft. final assembly building, the program called for an experimental building, office building and final finish building. Because of its size, heating of the assembly building offered the chief problem of technical interest. It called for keeping the heating units above the 30 ft. clearance and providing for additional loads due to the habit of leaving the large hangar doors open. It was solved by high velocity, high output unit heaters located above the bottom chords of the trusses. As in all line production plane plants, the assembly building makes maximum use of overhead cranes for handling parts after they have left the sub-assembly areas. The final finish building is used for final adjustments and painting after planes have completed experimental tests. All buildings make use of high intensity incandescent lighting for night shifts.
AIRCRAFT

EXPANSION
NOW PLANNED

FURTHER EXPANSION NOW PLANNED.

NEW AREA JUST COMPLETED.

376

THE ARCHITECTURAL FORUM
Increased to six times the original size in four months at a cost of approximately $3,000,000 and with further expansion planned to double the area to turn out large bombers, this plant has multiple-windowed steel walls and a saw-tooth roof providing overhead light throughout. Adjacent to the plant is a warehouse from which raw materials and parts are issued directly to the shops requiring them. Work progresses toward the forward end of the three-sectioned building. In the first section, material is prepared and parts formed. In the two-storied second section operations are executed on the first floor, and completed parts are routed by elevator to the sub-assembly area above. Overhead cranes carry sub-assemblies direct from loading stations to the various points in the assembly line in the third section shown above which is one-story high with an overhead clearance of 35 ft. throughout. Completed planes move through wide gates, across a highway to the field. An overhead pass is contemplated. Service lines, electricity, compressed air, etc., are carried through underground tunnels to distribution points. Entrances to all plant areas are through a system of underground corridors.
This new plant is located about a mile from the parent organization, with ample rail and air transportation facilities nearby. When completed it will contain over one million square feet of floor space and will have a capacity of more than 2,000 planes a year. There are eight separate structures in the plant. The administration building is a three-story unit housing all offices not connected directly with production. The engineering building is a virtually windowless structure with designing studios, a drafting room and space for the construction of experimental models. Storage vaults for blueprints are also contained in this building. Immediately adjacent is a third building in which tools, jigs, templates and patterns are produced; space for the offices of factory executives and their staffs is also provided here. Other separate units take care of storage of combustibles, warehouse facilities, shipping, utilities, etc. The main structure is the fabrication and assembly building, which contains the sub-assembly areas on a mezzanine, and the two main assembly lines which run the full length of the building.

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**DIAGRAM**

- **EMPENNAGE**
- **MOTOR**
- **TRIM**
- **EQUIPMENT & METHODS**
- **EQUIPMENT & METHODS**
- **STORAGE VAlUES FOR BLUEPRINTS**
- **SECOND FLOOR**
- **CONVEYOR**
- **FIRST FLOOR**
The photographs above show a record of continuous growth over a period of several years. The plant is predominantly a two-story structure, with the ground floor devoted largely to storage and shipping, while the second floor is taken up with bench work on parts and sub-assemblies. Basic production facilities include a foundry and press shop. Wide-span areas covered with sawtooth roofs are provided for plane assembly.
In ten months and nine erection stages this plant has expanded 700 per cent. Fortunately speedy additions were anticipated in the original layout, which was conditioned further by the irregular-shaped lot and the existing runway. Several small buildings were moved to new locations but two major buildings, the original office and factory, remained as part of the enlarged plant. Most notable feature of the steel construction is the clear span of 196 ft. in the high buildings. This span, accomplished by a parallel chord truss, is one of the longest in the country. In the low buildings the weight to area ratio is 11 lbs. of steel per square foot floor area and in the high buildings 17 lbs. A monitor sash in the sawtooth roof supplies ventilation. Artificial lighting is fluorescent under the mezzanines, and incandescent in the rest of the plant. Toilets are located on the mezzanines.
Clear manufacturing space, uniform daylighting and flexibility of layout were the main problems requiring an integrated solution in this new aircraft plant.

Storage departments for incoming material are placed to permit direct access to the three straight line production and sub-assembly departments. Balconies provide additional sub-assembly and storage facilities. Lighting is of the fluorescent type, and the heating system is a direct-fired warm air duct system supplying air through floor outlets. Pivot sash ventilators in the glass-and-steel walls and roof monitors provide controlled ventilation. The sash in the east and west walls are glazed with a non-glare, heat-resistant glass.

The sketch below indicates the manner in which its present facilities will be incorporated into a greatly enlarged plant. In addition to increased manufacturing space there will also be new offices and a cafeteria.
Tripling present capacity, without interfering with the existing plant (above), the new building (at the right) will cost $2,100,000 to build. Its windowless walls handicap visibility from the air at night, and its non-reflecting wall surfaces are adaptable to camouflage technique. The clear span in the 25 ft. high assembly aisles varies from 140 to 280 ft. Primary production and sub-assembly work is carried on in several bays flanking the assembly aisle. On the second floor are plant offices, engineering quarters and a cafeteria. Exterior walls are brick faced with acoustic block on the inside. The plant is completely air conditioned, and illuminated with fluorescent tubing except in the assembly aisles where high intensity incandescent lamps are used.
This addition to an existing plant went into production 77 days after the order to design the building was given to the architect. The basement lower level of this two-story structure has headroom of 14 ft. and is employed for sub-assembly, feeding to the upper assembly level where ceiling heights range from 18 to 28 ft., permitting the assembly of the large bombers in which the company specializes. As in all such structures, the doors extend the full length of the building, and are motor-operated to open or close in less than a minute. Cost of the addition: $1,850,000.
This new plant of moderate size for the manufacture of sport and training planes is located between a highway and the municipal airport, with the manufacturing unit facing the airport. Materials enter from a receiving and storage wing (see diagram) located at one corner, and after passing through successive stages of assembly emerge at the far end as finished planes ready for flight. All departments are keyed into the main assembly and manufacturing unit so that materials travel a minimum distance to the proper point on the production line. The plant also includes a storage hangar, a recreation room, an experimental unit and offices.

**AIRCRAFT PARTS** ALBERT KAHN, INC., ARCHITECTS & ENGINEERS

MAHONEY TROAST CO., CONTRACTORS

The rapidly increasing production of airplane motors has made necessary a substantial increase in the number of testing blocks. Typical procedure in engine manufacture is to test each unit for five to ten hours after assembly, tear it down, inspect each part and reassemble it, after which it is again tested for three to six hours. In addition to this routine procedure, the test building is important for research on new designs. The illustrations show two views of the new blocks at an aircraft engine plant. The cells open off each side of a corridor, and each cell has a door of the cork and steel "ice box" type. Controls and measuring instruments are located in a separate room, soundproofed to prevent transmission of engine noise from the testing cells.
This new plant has been built to house the manufacture of the only American V-type liquid-cooled airplane engine of high power. The selection of site was dictated by availability of skilled labor, water supply, electric power, railroad facilities, and provision for inevitable plant expansion. Due to the absolute precision character of the work, control of temperature, humidity, cleanliness and illumination were set down as primary considerations. As in all such precision work, when the external conditions are under complete control, the output is more uniform. Consequently, a fully air conditioned windowless plant was early decided upon. Before determining the type and intensity of the illumination, several experimental bays were built approximating working conditions. This led to the adoption of fluorescent tubes throughout, thus insuring good color correction and general illumination in addition to reducing the heat load to be carried by the air conditioning plant. The relative economies of (1) increasing the insulating qualities of the construction, and (2) increasing the capacity of the air conditioning system led to the adoption of concrete block walls with brick exteriors and a metal roof deck with 2 in. insulation. To avoid complete breakdown of the air conditioning, eight identical systems were laid out, housed in pairs in penthouses on the roof. They are of the evaporative rather than the refrigerating type, and the same coils are used for both summer cooling and winter heating. The only manually operated valve is used for the change over from a heating cycle to the cooling cycle. Prevention of possible shutdown through power deficiency has been accomplished by joining the local utility company’s lines with the plant’s own Diesel unit.
This welded rigid steel frame plant and office building, costing $200,000, is the first factory in the Far West to employ "tree-form" design to maintain unobstructed headroom in structures of saw-tooth design. The plant has aisles 40 ft. wide, and a clearance of 27 ft. to the peak of the sawtooth, with no intermediate members to obstruct operations or the even distribution of light. A mezzanine area 40 x 100 ft. houses locker rooms, toilets and lunchroom facilities. Artificial lighting produces a 30 to 35 ft. candle intensity at working levels, and is of the fluorescent type. More than twice the capacity of the old plant, which though comparatively modern, did not permit future expansion, the layout is designed for expansion in three directions and permits line production of three basic types of castings in parallel lines. A one-story and mezzanine office building housing executive and engineering departments extends across the front of the plant.
In addition to the normal problems of a light manufacturing plant, this manufacturer of sea floats and pontoons was faced with the following problems which confront any industrial plant in wartime.

CAMOUFLAGE. The roof has been so designed that it may readily be covered with a material to break the straight line contour of the building. The continuous steel sash that encircles the building is slanted so that glass will deflect the sun's rays downward.

BOMB RESISTANCE. European experience indicates that the buildings which have best withstood the effects of bombings are those with a sturdy frame and the most flexible possible exterior shells. In this plant there are no brick parapet walls, no sharp corners at the roof line to offer resistance to bomb concussion. Masonry at the upper floors and at the corners has also been eliminated. The building has a strong skeleton steel frame and a light exterior wall, which if blown out, would result in a minimum amount of damage to the structure. Employees are further protected from flying fragments by a thick blackout curtain and a strong wire mesh screen extending from the roof to the first floor.

BLACKOUT. Despite an understandable tendency to build windowless buildings as the best security from night attack, the type of blackout selected for this plant was a result of European experience plus the economy factor. The cost of a windowless structure with air conditioning and fluorescent lighting was estimated to be more than double the cost of a windowed factory. Further, European experience has indicated that there is no protection against a direct hit, regardless of the type of blackout. But an even more important lesson to be learned from Europe is that although a plant might be some distance from the point of explosion, gas, water and electric lines might be destroyed by the hit which would leave the windowless plant inoperative. A plant not dependent on artificial light and ventilation could operate on a 10 or 12 hour production basis because a large portion of aircraft manufacturing can be done manually in an emergency so long as there is light and fresh air.

Furthermore, there was the problem of coordinating the new additions with the existing plant in which the company's operations had been conducted prior to the increase of defense orders. The problems arising from possible invasion and the solutions as conceived by the architects and engineers were as follows: The new building incorporates all the principles applicable to light manufacturing plants. Since the company makes no units of immense size, there was no unusual problem of wide spans. Besides the continuous sash, skylights help to provide adequate daylighting, and high intensity incandescent lights supply ample foot-candles at the work levels for night shifts.
The integration of operations now carried on in five different buildings resulted in this $300,000 plant for plane parts and accessories. The plant is steel and glass of the monitor type. The high aisles are 80 ft. wide, low aisles 40 ft. Continuous sash in side walls and monitor provide continuous daylight. Because of the comparatively small units of manufacture, no unusual layout or structural problems were involved, simply the provision of ample free areas for the different types of assembly. Heating units are disposed overhead. As in all aviation plants being hurried to completion as part of the defense program, provision for economical expansion is as much a part of the problem as the character of the immediate space. Future additions, already planned, will be simply repetition of the existing elements, added on as needed without interference with current operations.
With its patented product widely used in the airplane industry, this firm abandoned its old plant to build an "elastic" one. Starting with a one-story plant, work has already begun on an addition that doubles capacity. Straight-line production, impossible in the old plant, is attained by incorporating heat treating and pickling—heretofore isolated—right into the production line. Bar stock stored on one side of the plant is completely fabricated ready for inspection when it reaches the other side. Present expansion contemplates a cafeteria, 35 x 100 ft.; and the second floor, originally unfinished, is being finished to accommodate the engineering departments. The steel structure employs self-locking elastic nuts.
Plans for adding to an old plant were scrapped to build this new unit to produce, assemble and test hydraulic press. High continuous runs of sash on all sides and alternating mercury vapor and incandescent lighting guarantee "daylighting" both night and day. Two 50-ton cranes operate in the central 55 ft. wide craneway, which has a 45 ft. clearance. Heavily reinforced 10 and 12 in. concrete slabs are used for flooring where the heaviest machinery is assembled, and 6 and 8 in. reinforced slabs are used elsewhere. Two tracks, one for receiving and one for shipping, extend into the building at each end of the craneway.

Hydraulic controls for the aviation and machine tool industries are manufactured in this $500,000 addition. Originally planned for 80,000 sq. ft., it has already been greatly increased. Primary requirement was a space served by cranes, well lighted without direct sunlight. Of welded rigid frame saw-tooth design, its principal construction feature is the welded tree-form columns which eliminate shadow-producing web members. Elimination of shadows was also effected by nesting ducts, compressed air and steam lines between the crane rails and columns. The steel roof deck is welded to the purlins, and a sprinkler system sprays the roof in summer to maintain working comfort. Mercury-vapor lighting is used throughout. Toilet and locker facilities are located in the mezzanine. Offices are placed in a second story section extending along the 340 ft. limestone and brick facade.
In only 10 per cent more floor area than its old plant, the manufacturer has doubled production capacity of spot welders, punching and riveting machines in this new plant. A 60 ft. monitor aisle for final assembly is flanked on each side by 30 ft. aisles where standard machining operations and sub-assemblies take place. Side walls are of glass except for the brick veneered executive office area, and bar joists support the metal roof deck. Fluorescent lighting supplies 20 foot-candles at all machine locations.
MACHINE TOOLS

ALBERT KAHN, INC., ARCHITECTS & ENGINEERS
JAMES STEWART & CO., GENERAL CONTRACTORS

OFFICE BUILDING

FLOOR PLAN

CAFETERIA

CONFERENCE

OFFICES
To replace its existing plant of 25 separate buildings, this company built an entirely new plant housing all its manufacturing under one roof, and is now capable of expansion in all directions. The manufacturing plant is a one-story building, 960 x 520 ft., with 182 x 40 ft. wings on two sides containing shower and locker rooms. Column spacing is 60 x 40 ft. and clear working space is 14 ft., except in center crane bays where 36 ft. and 38 ft. clearance is provided. Vertical monitors of the continuous ventilator type provide daylighting. Toilets are placed on bottom chords of roof trusses. The administration building has two stories and basement, housing executive, production, and engineering departments. Cafeteria and recreation rooms are in the basement. The pattern and storage building, a third unit, incorporates also garage and boiler house. A cinder block firewall separates the pattern shop from the garage. The boiler house, of cinder block construction, supplies steam for heating and processing and also houses three air compressors and three motor generators supplying direct current.
MACHINE TOOLS

All the manufacturing facilities of an abrasive manufacturer, formerly spread out in Cleveland, Detroit, and Stamford, Conn., have been brought together in this new $7,000,000 factory and office building. The product is used in metal cutting, drawing wire, and dressing grinding wheels. The manufacturing plant is a one-story welded steel frame and brick building and the two-story office building is reinforced concrete, faced with brick on the front. Since some of the metal powders employed are hydroscopic, humidity is kept at a very low level, and a temperature of 85° is constantly maintained. All water, except that used for sanitary purposes, is reclaimed by the use of trenches leading to a settling basin, from which it is pumped to a cooling tank and reused in the air conditioning system production machines and general cleaning. The plant also includes complete hydrogen manufacturing facilities. In the office building, incandescent lighting provides 55-40 foot-candles, and the factory is equipped with both mercury-vapor lamps and fluorescent tubing with a foot-candle intensity of as much as 50 at working levels.
High percentage of waste in the old plant plus increased demand prompted the building of a new fuel pump and injector plant, which has been planned for further expansion. Welded rigid frame sawtooth cross-section was adopted because of superior lighting in a clean-cut shadow-free interior. Dustless air, required for testing and assembly operations, is provided by filters in the unit heaters at air intakes. Plating operations are accommodated in a special glass-enclosed room in the center of the main bay. The general character of the building design is harmonious with the new research laboratory (below) which is also part of the broad expansion program.

Daylight working conditions have been provided in the research laboratory by means of a novel whaleback cross-section which introduces light through a fin supported by a 50 ft. rigid frame arch. Six test rooms, separated by observation corridors and each equipped with its own hoisting machinery, ventilation and special lighting, line one side of the plant. On the other side are chemical and metallurgical laboratories. Power distribution is facilitated by overhead busways.
SHIP BUILDING

Seventy foot subchasers and torpedo boats are on a line production basis for the first time in this new 142,000 sq. ft. plant. The unit is equipped with mechanical handling facilities in two main 70 ft. monitor aisles, with a 100 ft. clear span at the end of the lines where the boats are finished. There are four parallel production lines, each boat moving along on its own cradle. All primary operations are concentrated in 50 ft. aisles on either side of the assembly area, while deck houses are assembled on a mezzanine at one end of the plant above the storage area, locker rooms and toilets. The boats are built upside down, and then turned over on their cradles ready for decking and machinery installation. Progress inspection required a mezzanine observation walkway commanding a general view of the assembly lines. Use of stock steel members made it possible to complete the building in 75 days.
Monthly capacity of 6,000,000 pounds was added to production by this new highly mechanized, straight line production rolling mill. The 155,000 sq. ft. floor area (plus 50,000 sq. ft. in the basement) is split into four main aisles, two 80 ft., one 70 ft., one 50 ft., with crane service in the three wide aisles. A substation adjoining the building supplies both d.c. and a.c. power, and distribution systems provide water, acid, oil and gas. Executive and engineering quarters are provided in a separate building.
The 34 plants that constitute these steel works have been called one of the most modern mills in the world. Begun before national defense was as pressing a problem as it is today, the plant has an annual capacity of 672,000 tons of strip products, processed from slabs that come from a mill seven miles away. Most impressive unit of the works, the strip mill itself is 2,520 ft. long and nearly 100 ft. wide. It is topped in size only by the annealing plant which is 2,544 ft. long and 125 ft. wide. Begun in May, 1937, the first unit was in production March, 1938. Generally regarded a major feat of construction organization, work progressed day and (under batteries of floodlights) night. During the winter months it required even “heating all outdoors” when forced draft unit heaters were employed to warm the workmen. The magnitude of the project is revealed in such figures as: Area under roof, 31 1/2 acres; Conduit, 200 miles; Installed horsepower, 300,000.
The plant illustrated above was built for the production of mechanical rubber goods, including hose, belting, batteries, gaskets and a variety of other appliances. At present the building contains 300,000 square feet of floor space and provision has been made for future expansion. Cost of the factory was approximately $1,500,000.

The importance of the synthetic rubber industry lies in the present dependence of this country on sources which could be cut off in time of war. A number of processes are well beyond the experimental stage, and it has been estimated that an expenditure of $200,000,000 for factories would ensure a production adequate for all U. S. requirements. While housing a complex of highly specialized chemical equipment, it is of interest to note that the structure shows no important deviation from the standard pattern of the present-day factory.
UTILITIES
TENNESSEE VALLEY AUTHORITY

Latest of the dams to be put in operation as part of the integrated system of the Tennessee Valley Authority, the Guntersville Dam, built at a cost of $32,500,000 was opened early this year. Regarded by military experts as a vital unit in the national defense system, the several plants of the TVA serve a large number of war-industrial plants in the Tennessee Valley—among them factories that produce essential metals, military cloth, munitions, planes and plane parts. The dam, 94 ft. high, has a total reservoir volume of 1,018,700 acre-feet. The power house, interior shown at the right, has a present capacity of 72,900 kw. with a possible ultimate capacity of 97,200 kw. Chickamauga Dam, another unit of the TVA system just completed, is 129 ft. high and has a potential capacity of 108,000 kw. (for complete description of TVA power plants, see THE ARCHITECTURAL FORUM, Aug. '39, p. 92).

ROLAND A. WANK, PRINCIPAL ARCHITECT

CHICKAMAUGA DAM
If Boulder is the world's most dramatic storage and power dam, Grand Coulee stands out as the greatest producer of power. Linked with Bonneville Dam, this engineering giant will be part of a unified transmission system with a capacity of 2,400,000 kilowatts, bringing cheap electricity to industry, farms and domestic consumers. The Pacific Northwest is a comparatively undeveloped region, rich in minerals of critical importance in the defense program, and the significance of these dams is already expressed in the contracts recently made with aluminum, iron, electrical and other industries. Added to the national wealth being created by the projects is the vast quantity of water being impounded by the dams, some of which will be used to bring now arid lands under cultivation.
This $3,500,000 sewage plant handles over 100,000 gallons of sewage a day. It is equipped with six-inch and one-inch screens through which the sewage passes to grit chambers and then to settling tanks which are the longest of their type in the world. Solids caught in the screens and tanks are mechanically removed either by rakes or vacuum filters, hauled away, or shredded and incinerated. The sewage finally passes through effluent screens and the clear water flows out into the river. When river water is low a chemical is added to produce a floe that carries down with it particles which otherwise would not settle in the tanks.
FREIGHT TRANSFER STATION

RAILWAY EXPRESS TERMINAL, NEW YORK CITY

H. O. WEYGAND, ARCHITECT

THE ARCHITECTURAL FORUM
While the chain-drawn truck method of sorting and conveying is not new, this plant differs from previous ones in that it is completely new and represents the highest level of technique yet attained in the field. The method is of particular interest, not only because it speeds up parcel handling, but also because it has many uses in industry, for classifying scrap, selective assembling, aggregating, shipping, receiving and the like. The chain-drawn trucks are attached to an overhead conveyor, forming a loop 964 ft. in length; they can handle about 25,000 packages per hour. One side of the conveyor loop is adjacent to an unloading platform, where loads to be sorted are brought in, the other is used by trucks which carry sorted loads to their ultimate destination. Color codes make the conveyor trucks easy to identify; the work of trans-shipment of parcels is further accelerated by the use of gravity conveyors, as illustrated in the large photograph above.
The Kansas City Food Terminal, covering some 62 acres of ground, is one of the largest perishable food terminals in the country. Built at a cost of approximately $6,000,000, it houses a number of different enterprises: a farmers' wholesale market, four large produce buildings, a cold storage building with a central refrigeration plant, brokers' offices, a merchants' building, and fifteen acres of parking space. The small illustration shows an interior of one of the produce markets with the exterior wall made up entirely of overhead doors. The Terminal has been well placed in relation to highway facilities; from all directions roads, coupled with viaduct and street approaches, make possible rapid access from any part of the two Kansas Cities. The project was made possible by a Public Works Administration grant.

Produce Buildings:
Architects: Gentry, Voskamp & Neville, Architects, Inc.
General Contractor: Patti Construction Co.

Farmers' Market Group, Cold Storage Building and Merchants' Building:
Architect: Joseph W. Radotinsky.
DEFENSE PLAN
FOR THE CITY

Defense for the city does not begin or end with preparations for the reception of hostile airmen. Many a U. S. community, well out of the range of bombs and bullets, was nevertheless severely damaged in the last war by ill-considered expansion, extension of city limits, waste of surrounding resources and other activities undertaken in the fever of war hysteria. With this experience as a background, THE FORUM's editors presented W. Earle Andrews with the case of a typical American city, now faced with the double problem of cooperating in the defense program, while still maintaining its hard-won amenities and financial stability.

The City discussed in Mr. Andrews' report is imaginary. Its status and problems are not the less real, however. In size, population, property values, tax rate and public debt it represents an average of Allentown, Pa.; Charlotte, N. C.; El Paso, Texas; Lawrence, Mass.; and Savannah, Ga. It has a population of 94,400 and occupies 8,562 acres or 13.4 square miles. Assessed valuation of private property is $94,900,000, 77 percent of true appraised value. Taxed property is 85 1/3 percent of all real estate. Real estate taxes are $1.60 and total taxes are $3.63 per $100. The bonded debt is $7,170,300.

Following Mr. Andrews' report is a statement on passive defense for the City by Richard M. Bennett, covering the necessary steps to be taken by the City to protect its citizens and property.

W. EARLE ANDREWS Engineer and town planner. Associated in design of Long Island parkways and State Parks including Jones Beach, Deputy Chief Engineer Jones Beach and Bethpage Authorities; General Superintendent New York City Park Department, Chief Engineer and General Manager Marine and Henry Hudson Parkway Authorities; all under Robert Moses. General Manager New York World's Fair. Now in private consulting practice designing parks, parkways, beaches and municipal developments.

Air view of the Chemical Company's plant. Expansion of the plant, which involves tripling its present size, would involve the use of vacant land to the south, part of which is shown in the foreground.
Mayor of The City
City Hall
Dear Sir:

You have asked us to comment on the following activities for national defense in The City.

1. EXPANSION OF THE CHEMICAL COMPANY

The Chemical Company expects to expand to manufacture explosives. Production is to be tripled, adding 7000 men to the 3000 now employed. Of the new workers 4500 would be drawn from outside The City. Cutting and hauling slash pine to feed the mill and other incidental services would provide new employment for 500 city residents and 500 who would move to The City.

Existing rail and dock facilities are adequate for shipping the finished product. The bulk of raw material would come in by truck.

The Chemical Company has an option on 115 undeveloped acres on the downstream side of the plant for the proposed expansion.

The present factory is in an unrestricted zone but the area required for enlargement is zoned for Class B residence, with single family houses built up to the proposed new property lines.

2. INCREASED PRODUCTION OF THE CLOCK COMPANY

The Clock Company has converted the idle one-third of its present plant to manufacture precision parts for projectiles. Without adding to its buildings it will employ 500 more men and 500 more women, mostly local residents.

3. CONVERSION OF THE OLD FORT TO MUSTER TROOPS FOR TRAINING

The military garrison of 450 occupies a walled fortress originally built for frontier protection. It is planned to build temporary barracks on the old parade ground to receive and equip for transfer to other camps men reporting for military training.

The dock now used for fuel delivery is to be replaced by a covered pier to be used as a quartermaster's depot.

4. INCIDENTAL INCREASED ACTIVITY

With business stirred by defense activities, it is estimated that there will be new or expanded service, delivery and supply establishments to employ 1500 more workers. The new jobs would be largely in scattered small businesses and filled by kinsmen or neighbors of manager-owners.

There are 1300 men and women on work relief in The City.

There can be no assurance that the expansion will be permanent.
6. POPULATION INCREASE

The 5000 new workers will arrive in The City over a period of about three months. A large number will not bring families at first, but the migration will come to a head at the time of school closing in the early summer when you may anticipate an increased population of at least 10,000 men, women and children.

With the exception of scattered community stores, your retail business is concentrated in the older part of The City. Like most municipalities there is too much property zoned for business.

A business block properly developed pays more taxes than a residential block of the same size. Business property demands less in the way of police and fire protection and sewer and garbage disposal.

However, having too much property zoned for business tends to deter sound development rather than to stimulate it and the threat of too much of it discourages business initiative. With the announcement of the proposed plans for the defense program, there will be insistent demands to change zoning on the margin of your present retail district from Class B residence to business. Your Building Department will be swamped with applications to use the ground floors of the old three-story residences for retail establishments.

You should not extend the area of your principal business zone. It is large enough. If you adopt a firm stand, your new prosperity can do much to clean up the dilapidated condition of the vacant stores on its outer edges and side streets. Emphasis should be placed on cleaning up and improving public facilities within it and the rejuvenation of the adjacent residential zone neighboring business rather than on promising owners of residential property on the margin of business that their values can be increased if the business zone can be extended to include their property.

Your City grew in waves from the old trading post, and radiated from this core to newer homes on the outer rim of a gradually enlarging wheel. The little expanding frontiers left behind decaying developments and skyrocketed land prices to make reasonable home construction too expensive. Your growth has reached natural limits. The City is built up now to the steep hills on the east and west, to the throat of the valley on the south and to the suburban development on the north. It may be fortunate that limited room for expansion requires the repair of areas which are rapidly becoming slums. Property owners would be encouraged to renovate if they can be assured that the forces which caused their property to deteriorate in the past can now be checked. Widening of several streets through the old area and building three new playgrounds will do much toward rehabilitation.
Your Building Code should be reviewed and modernized to encourage renovation as economically as possible without relaxing safety and health measures.

The low cost housing development proposed by The Limited Dividend Corporation in the slum area south of the Railroad station should be again considered. We understand that the Corporation seeks partial tax exemption and contribution of land left over by closing streets. There is also the question of The City assuming the operating cost and control of the playgrounds. If the project is ever to go ahead it should do so now in connection with your new activity.

Projects to build cheap houses on the outskirts of The City will be placed before you. You will be asked to ease restrictions in the name of expediency. Such requests should be scrutinized carefully with particular study of the probable tax return. It is possible that there may be less return than the families occupying them require in the school budget alone.

The former infantry regiment using the State Militia Armory has been converted into an anti-aircraft unit and will require permanent storage for several hundred pieces of new mobile equipment. The Armory need not be extended at the present time but land should be reserved for the expansion if time proves that it is a permanent need. In the meantime, the unused carbarn three blocks away owned by The City since scrapping street railways can be used for the temporary storage of the militia's new equipment.

Substantial increase in population will reflect larger annual maintenance budgets. New money brought into The City will not increase city revenue in proportion to maintenance costs for a long time.

Your Police Department will require little increase in personnel to preserve order, especially if the slum districts are cleared up, but you will run into substantial increase with added traffic confusion. During the last generation there has been steady transfer of police officers from control of crimes of violence to the control of traffic. Police work has been aided materially by radio cars, improved communication and better street lighting, but regulation of increased traffic has more than offset savings. You can afford to make substantial capital outlays to relieve traffic bottlenecks. A measure of their cash value would be the number of policemen relieved from traffic duty.

Your health budget need not increase much unless your area is expanded and provided you do not allow the further pollution of The River. You should require expanded industrial plants to adhere strictly to your modern standards of waste disposal. You should review the history of the over-expansion of The Chemical Plant in the last war when your shellfish industry was completely destroyed, and
Above: Diagram of present traffic density. The street widening program is based on accurate periodic measurements.

Left: 1. Direct channels of traffic into the heart of the city were constructed as incidental improvements when the airport was built in 1936. 2. Main Street between City Hall and the Normal School was widened and straightened after the fire of 1906. 3. The inter-regional highway was widened through the city in 1931. Main street intersections have since been rebuilt. 4. The parkway was built in 1939 on the abandoned right-of-way of the old short line railroad.
Above, a view of the Watch Company plant. The building will be used in part for the manufacture of ammunition components, but no expansion in size is contemplated. The sketch of the old fort shows barracks on the site of the former parade ground.
only by the enactment of laws limiting the amount and governing the manner of
disposal of industrial waste has it recovered in fifteen years.

The renovation of the old law tenements should make unnecessary increase in
your fire fighting service within the present built-up zones, but if you expand
your area, you will have to build new stations.

Your hospital budget will be increased, and it is doubtful if you have
enough beds in your hospitals for substantial increases in emergency service.

Your recreation budget will be increased for custodial services to the ex-
tent to which you expand your facilities, but the benefits derived from furnish­
ing recreation are well known to reduce police, juvenile delinquency and other
corrective expenses.

The teaching staffs of your public schools, which account for a substantial
part of your taxes, will be increased with the number of pupils. You remember
the confusion during the last war when classes were enlarged and two daily ses­sions attempted. The increase in school population will occur next fall and by
then you will have to measure the need for new school buildings or the extent of
renovation of partly used buildings in old areas.

Your Normal School offers free extension night courses for all residents of
The City. Your enrollment will be greatly increased by men living away from
home, and, as The City shares the cost of this extension service, there will
probably be addition to your budget for this.

Your social welfare budget will be reduced to the extent men on work relief
are reemployed. The permanent or temporary nature of increased employment cannot
be determined at the present time and you should not look yet upon savings in
this service as a permanent lowering of your budget.

You now have 1300 men on work relief. The men are paid by the Federal Gov­
erment but most of the materials are supplied by The City. The relief workers
are employed on construction jobs and on white collar projects. The value of the
building projects under way is estimated at $1,400,000 and the projects average
about half completion. While social workers hold that few of the men are capable
of competitive employment, we believe that most of them will respond to offer of
private work. Relief construction projects under way, which should not be aban­
donned, would represent an appropriation approaching $1,000,000. Many of the so­
called white collar W.P.A. projects have drifted into expected local government
service. If there is offer of complete employment in the community, the need for
these jobs by the workers will cease to exist and the cost of services which con­
tinue may fall back on the local government.
You are asked to re-zone the Residence B area to industrial use for The Chemical Company plant to expand. We know that you are prepared to make any necessary sacrifice in the present emergency but before you risk the permanent stability of your principal industry you should recognize that you may be killing the goose that lays the golden egg.

In the first place, you are vitally concerned with the conservation of slash pine. This is the reason this plant is located in the City. From the lesson learned in the last war, when the surrounding area was almost completely cut over, you have secured State laws which limit cutting to the extent which new growth is set out. It took a long time to do this and you have just reached a sound balance between supply and demand. Substantial stepped-up cutting will endanger future supply of this raw material. We understand that timber might be transported by rail or water for the temporary emergency but it will be risky to expand a plant for the consumption of raw material, part to be shipped from a distance but the part which cannot be spared temptingly convenient near by.

The Chemical Plant is ugly but generally well located. Its buildings are tucked against the hillside. The plant takes its wash water from The River and dumps it back with chemically harmless refuse. The buildings are generously spaced.

The proposed extension will be wedged between The River and a built-up residential area. The plant could be extended into about one-half of the area proposed without lowering the value of the private homes in the neighborhood if the intervening open space was permanently established as a park and recreation area.

Your local laws regulate the volume of wash water taken from The River and the character of refuse returned. While this industrial waste of The Chemical Company is unpleasant to look at, it is not a health menace now. There is a serious question, however, if The River can take as much as the intended expansion would add to its pollution.

It is our judgment that you should deny the application to change the zoning to the extent requested for the expansion of The Chemical Company. You should change the zoning for approximately one-half of the proposed area, which would permit doubling production. You should acquire at city expense the remaining land for a public park. This would establish a buffer and permanently fix the character of the adjacent residential area.

We know that it is difficult for public officials to make any decisions which would appear to retard business. The proposed expansion, however, is greater than your city can absorb in an orderly manner. The margin between your
bonded indebtedness and your borrowing power is insufficient to pay for improvements you would need immediately. Such sudden growth would add greater annual tax burdens than you can bear. It would encourage unsound speculation. It would create a boom unlikely to survive.

Competition between communities for temporary war-time facilities often results in spotty over-congestion and permanent distortion of normal growth. This was true in many places during the last war and many communities regretted when the war was over that the persuasive powers of local leaders had left them with all the problems of a boom town after the boom had passed. In your own particular case, there are other communities in your general region that could share the burden of increasing production in plants similar to yours and it would be wiser to distribute some of the production which has been planned for The City.

We recommend that you point out to the directors of The Chemical Company that you are willing to cooperate in extending the plant for about 1400 feet along The River but that beyond this it would infect your whole community more than it can stand.

The Clock Company expansion requires no specific action by your City government. Increased production will largely involve the reemployment of former workers or the employment of their sons and daughters who grew up in the shadow of the established enterprise. It is a good thing for your community. A large number of the workers will be drawn from the flexible line between employable and unemployable. The new part of the industry, catching up on delayed manufacturing of ammunition components, will probably continue for a long time.

The conversion of the old Fort to muster troops for training is not strictly a matter before you but you should inform the War Department that the proposed housing of troops within the present reservation would cause congestion which is not allowed elsewhere in your city. While your water supply is adequate for increase in personnel at The Fort, the sewage treatment plant in this area is not large enough for the increased service. There will be traffic congestion on the streets crossing the railroad tracks at grade to reach The Fort and there is no justification for the municipality to spend considerable sums to widen roads and possibly eliminate grades without knowing how long the congestion will last. This camp should be located either in a larger city or be a self-contained unit in the open country. It does not belong in the heart of your city. The improved dock for the quartermaster’s depot will not create any problems as the transfer of freight will be largely from ship to rail.
We advise that you call together the responsible heads of the three townships touching your city to work out uniform regulations for gas stations, hot dog stands, so-called tourist camps, and roadside signs. They are not permitted in The City and should not be allowed to crop up just over your line because the rural and suburban sections are as yet unzoned.

You have a good city. It grew from a trading post to a well-balanced metropolis. You built your streets, parks, schools, hospitals, university, water supply, sewage treatment works and other improvements as you learned that these things were good investments for people living in cities.

The heterogeneous plan of the old city flows with minimum confusion into the better layouts of later years. The map of The City speaks for the orderly growth of the community. It is evident that the past generations responsible took stock of conditions which were unlikely to change, foresaw clearly the major physical developments likely to happen anyway and adjusted incidental requirements to these inevitable happenings as they were needed and as you could afford them.

In the present emergency, the greatest problems revolve around the extent to which the proposed industrial expansion in The City will be permanent. It is impossible, of course, to estimate the length of time the accelerated program of munition-making will continue. It is certain, however, that at some future time it will taper off or stop suddenly. So the continuation of industry in The City at the scale proposed will depend largely on the possibilities of converting the plants to post-war production without too great changes.

We could not attempt to outline in a report of this scope details of plans. We have simply tried to remind you what to look out for and urge you to maintain the high standards which now make The City a good place in which to live.

[Signature]
Mayor of The City
City Hall
Dear Sir:

The City, with oil station, industry and transportation, is a target of total war. Total war strikes at civilian production, not primarily to kill people, but to destroy machines and drive the workers away from their posts.

Your program of Air Raid Precaution must have three objectives:

1. Humanitarian. The reduction of civilian casualties.
2. Strategic. Protection to be achieved in such a way as to release as many airplanes and soldiers as possible to carry the war to the enemy.
3. Political. Protection to be extended to all citizens equally so as to prevent dissension springing from class distinctions.

PASSIVE DEFENSE

First of all, passive defense is hiding from the enemy, and may be achieved by camouflage, erection of shelters, and evacuation of as many people as possible from danger zones. It is also essential to prevent the spread of fires, to minimize paralysis of industry by dispersing it, and to supply it with auxiliary utilities and well-planned emergency communications and transport.

CAMOUFLAGE

The City's rivers make it almost impossible to hide. However, the new plants outside of town and the extension of the chemical plant under the protecting bluff can be concealed. At night the blackout will be effective but here again reflection from the water will prove a handicap. The Park Department should be advised by military authorities in their tree-planting program so that the trees will help in the general camouflage scheme. Highly reflective roofs and road surfaces should be treated to reduce their visibility from the air.

TYPES OF SHELTERS

Air raid shelters are of five types:

1. Garden or surface shelters, providing protection from blast, splinters, and falling debris. These keep the population dispersed and minimize casualties.

2. Basement shelters can be made effective by reinforcing cellar walls and ceilings and providing exists which will still be open even if the superstructure collapses.

3. Factory shelters must be provided near each worker's post.

4. Large-group focal shelters must be provided in the business districts for those caught in the streets when warning is given. These should be divided
into compartments each holding no more than fifty people. The larger shelters must be equipped with sanitary conveniences, and those near the river must be safeguarded against flooding.

5. Complete bomb proofs for the main telephone exchange, the fire and police signal station, and the operating rooms in both of the main hospitals. Some shelter can be effectively provided by tunnelling into the hillside.

SHELTER POLICY

Until such time as a national program is formulated, the City should decide on a municipal program of protection for its citizens. Those citizens who can do so will probably build garden shelters, those below a certain income level must be provided for by the City. These family shelters need not be started until an emergency arises, provided the necessary materials are at hand. The City should require new industrial structures to allocate areas where shelters can be speedily built. Focal shelters for street crowds and recreational buildings have been tentatively located on the master plan. The City should inaugurate a survey to locate definitely such sites and determine which buildings have basements that can or should be trussed for use as shelters.

DUAL-PURPOSE SHELTERS

Large shelters will be expensive and take time to build. If they can be used for peacetime purposes, then the cost need not all be charged to "insurance." One suggestion has been the erection of underground parking areas, the objection being that the many columns needed for the loads of a bombproof shelter prevent easy parking of automobiles. This difficulty might be obviated by building all the column footings, designing the spans for parking and then installing temporary steel columns in time of war. Such a shelter and parking lot under the City's Center Park would be ideally located for a focal shelter and would help with the parking problem along Main and Ferry Streets. It is hoped that more examples of dual-purpose shelters can be projected as the study progresses.

EVACUATION

The present slum area near the freight yard should be razed. Its potentiality as a firetrap would endanger not only the lives of those in the area, but would also threaten the industrial plant along the river.

Plans should be made to have the children, aged and infirm leave the City. The summer houses, private schools, and hotels on the near-by lake can care for large numbers of people. The rural education system, by morning and afternoon sessions and the employment of the City's teachers, will be able to take on the extra load.
The drawings above show one scheme for a large bomb-proof shelter, capable of peacetime use as a parking garage. Staggered walls provide maximum strength with minimum wall sections. When taken over for A.R.P. the interior walls would be extended, as indicated by the dotted lines, to take the additional roof loads.

The diagrams directly above illustrate an Anderson type shelter (earth-covered metal sheets), a reinforced basement, and a bombproof. Note that in the latter the bottom slab is very thick to resist the action of bombs exploding deep in the ground. At the left is the plan of a factory bombproof with four stairways for rapid access and egress. Stairs should always face a concrete wall which acts as a baffle protecting the shelter’s occupants.
Hospitals in the City should be cleared of chronic patients. Many of the rural sanatoria could take these patients.

It should also be recognized that some provision may have to be made for handling evacuated people moving inland from the coast.

**ORGANIZATION**

The primary job that must be done by the government of the City is to organize those groups which will bear the brunt of enabling the people to exist, and which will help to keep up production and morale. Signs and plans should be in readiness so that each citizen will know what he is to do in any emergency. Exhibits should be arranged to show the people how they can help defend themselves during attacks. Air Raid Wardens should be organized and trained. It will be their duty to get the people to shelters, cooperate with fire fighting brigades, and once the raid is over, keep traffic moving and help to complete the demolition of dangerous ruins.

All attics and other spots susceptible to incendiary attack must be kept under strict control. An air raid warning system must be set up.

The City's location probably insures it against daylight raids, but that does not keep it from being subjected to the blackout. All new industrial plants and other establishments in continuous operation must be able to function during the blackout by means of forced ventilation. Corners of buildings, curbstones, lighting standards, entrances, etc., should be painted white and other measures taken to aid during the blackout. The City must make sure that all vulnerable points in utilities, such as the water supply, electric lines, etc., may be replaced quickly, or by-passed, if destroyed.

The Air Raid Protection outlined above may seem elaborate. It is a form of insurance, something bought when it is not needed because it is without price if it is needed. The City may have but little time to decide on its policy, to plan and organize against air attack, for an outbreak of war will find the people demanding action—and for the sake of all of us, may that action be wise.
Whether Air Raid Protection is a subject of immediate U.S. concern is a question of expert military opinion—and of mass psychology. To date no decisive answer has come from either quarter. Meanwhile, the responsibility for successful Air Raid Protection—if and when needed—is not the least of Building’s far-flung Defense assignments. Preparedness means the development of carefully worked out skeleton plans for complete ARP. And it entails, so far as practical, insuring minimum hazards and maximum potential protection in the buildings now being designed and built.

Both jobs require an understanding of the nature of the danger which is to be guarded against, and

All data, drawings and photographs in this section were collected and prepared for THE ARCHITECTURAL FORUM by Erling F. Iversen. Mr. Iversen has just returned from a two year study of Air Raid Protection covering fifteen countries and 25,000 miles. He is now conducting a course on the subject at Pratt Institute.

For additional ARP and Camouflage references, see Bibliography, page 15.
a knowledge of the principles and methods which have so far been found to provide the most efficient protection.

Becoming the target of an enemy bombardier is the obvious first danger to any building. This is the danger of being seen, either by the eye, or, more particularly, by the camera. It is the even greater danger of being recognized—or mistaken—for an objective. The consequences vary from a direct hit to the shell fragments of an anti-aircraft barrage.

Study of the photographs and data on these pages will reveal the striking power of different types of bombs and the nature of damage inflicted

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**1.** Bombs always fall at an angle, and frequently hit the side rather than the roof of a building. This photograph shows a wall-bearing structure which collapsed after a pier was hit at the third-floor level, indicating the weakness of this type of construction.

**2.** Effects of a delayed action fuse. The bomb exploded after passing through the upper floors.

**3.** Fragmentation bombs explode immediately on impact, making but a small crater. Splinters fly horizontally at twice the speed of a rifle bullet. As illustrated here, they can penetrate an eight-inch brick wall.

**4.** Light-case bombs also explode at the surface. The comparatively large explosive charge produces a tremendous blast effect, with results as shown.
under varying circumstances—all of which must enter into defense calculations. And to these manifold risks should be added the incendiary bomb.

In the face of such dangers Air Raid Protection has three major objectives:

1. To prevent men and buildings from becoming targets.
2. To minimize damage.
3. To provide escape in bombproof shelters.

Most talked about, the air raid shelter is logically a last resort.

An underlying principle of all ARP measures is to spread the risk. Thus, the first step in preventing a building from becoming a target is to

1. The heavy-case bomb has a small charge but high penetrating power. Designed to pierce armor plate and reinforced concrete fortifications, it is seldom used against cities. The illustration shows a deep crater with practically no damage to nearby shops.

2. Most devastating are the medium-case bombs, which combine the "favorable" characteristics of all other types. The effects of a 500-pound medium-case are shown.

3. Immediately after the shock of an explosion there follows a suction wave (see diagram), less powerful than the initial blast, but lasting three times as long. Walls, where not properly anchored to the floor joists, may collapse outwards due to this effect.

4. The pressure caused by the explosion of a 500-pound medium-case bomb will be about 30 pounds per square inch at a distance of 25 feet. A substantial masonry structure can withstand such a pressure, as indicated in the photographs, and most surface shelters are designed on the basis of this fact.

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1. Associated Press of Great Britain, S. Graphy
HIGHWAYS passing through town and village centers are a source of congestion; in wartime these bottlenecks may seriously hamper the movement of mechanized troops and equipment. Such photographs as the one shown give sufficient evidence of the completeness with which a road through a town may be blocked. In the open country the highway may also be bombed; under such conditions, however, the sides of the road are not closed in by ruined buildings, and traffic can get past the crater without much difficulty.

The by-pass road, used more and more as a means of lessening congestion, has distinct military value as well as peacetime usefulness. One way in which this value may be enhanced is suggested in the plan below.

The drawing shows a two-lane road, with a dividing strip of asphalt. By orientation in the direction of prevailing winds, the various sections of the road could serve as an excellent emergency airport. Trees are planted close to the hangars to eliminate ground shadows. Each lane is served by a separate bridge at the crossing, a practice frequently followed on the German military highways. The increased cost over that of one bridge is slight, while vulnerability to air attack is greatly reduced.

locate it away from other exposed targets which include congested industrial areas, main rail and road arteries and primary military objectives. Preferably, the location should afford natural protection through trees and hills—surroundings which suggest neither military nor industrial activity and offer covering and shadows which can be further exploited through camouflage.

Just as the location should avoid announcing the building's presence, it is important that the design of the structure itself be as unobtrusive as possible from aerial observations. Revealing geometric patterns which cast recognizable shadows, reflecting windows and exposed surfaces which pick up light, and colors which contrast with the general surroundings should be avoided. Prominent and characteristic features such as chimneys should be as far as possible from the main center of activity. Breaking up the buildings into units of varying sizes and shapes and generous use of trees and informal landscaping further reduces the hazard of discovery.

Many of these principles are hostile to the ordinary demands of peacetime economy and design. However, the efficiency of war-time camouflage can be increased in direct relation to the extent that such provisions are made in the original plan and location of the building.
Camouflage, as generally known, is the imitation of the surrounding color scheme, or the disruption of the general form of objects to make them indistinguishable. To be effective, camouflage must work in all likely weather and with equal effectiveness under varying day and night conditions.

The devices which can be employed are limited only by the designer's ingenuity. Stock items include painting the roofs with flat coats of protective covering, planting roofs with grass and shrubs, introducing new and extraneous shapes to the structure, spreading leaf-covered nets, etc. Particular attention is given to all approaches which might reveal the building's presence, i.e. railroad spurs, docks, roads and parking fields. Under certain conditions the camoufleur's art includes diverting the enemy's attention to decoys in the form of neighboring evacuated buildings.

In planning new buildings, much can be done to minimize air raid damage. The risk of complete demolition can be considerably lessened by spreading building units over a wide area. Further assurance is provided by auxiliary utility connections and traffic exits, and by decentralizing essential bottleneck operations.

Provisions should be made to step up to the maximum all normal facilities for fire prevention and fire fighting, with particular attention to roofs.

1. The water-cooling towers of a power house in England. This type of camouflage serves little useful purpose, since it would not be visible from a height of two miles or more, and the structures would stand out very distinctly.

2. A diagram showing how the water towers would actually appear to a flyer. The problem here is largely one of erasing shadows, and its solution is not to be found in the mere application of paint. Placing trees around the towers would be one means of concealing them, and much more practical. Obviously such measures cannot wait until war comes, and the improved appearance of normally unsightly industrial communities offers one incentive for carrying out a tree-planting program in peacetime.

3, 4. In the group of tents paint has also been used, but more effectively. Having sloping roofs, the tents cast small shadows and would hence be less easily detected. Irregular placement would be a further aid to concealment.
and to the location of storage facilities for inflammables which should preferably be underground. The menace of glass splinters demands that fenestration be planned to make screening devices feasible.

Decentralization of the buildings not only lessens the danger of complete demolition from one hit, but also reduces the effectiveness of successful projectiles whose explosive violence is increased if the expanding gases are confined by neighboring buildings. Thus, open spaces between buildings are highly desirable, and narrow courts and alleys are to be avoided. Structural frame construction is preferable to solid masonry walls. And simplicity of design will eliminate the danger of falling decorative elements.

1. Hiding so prominent a structure as a power plant is of tremendous importance. One well-placed bomb between the stacks and the plant, along with factories dependent upon it, might be put out of commission for the duration of the war. Where new units are to be built, they should be designed to resemble adjacent buildings as closely as possible, using forced draft to eliminate the need for excessively tall chimneys. The strategic advantages of building a number of small plants rather than one large one should also be evident. Another solution might involve the installation of telescoping metal chimneys, and of mounting decoys on evacuated firetraps in the neighborhood.

2. Many chimneys in England have been painted as shown. The technique is effective only when the tower is seen from a low altitude. Highlights and shadows cannot be eliminated, or even materially reduced in this manner.

3. An excellent illustration of the vulnerability of industrial structures. The forms of the oil tanks are unmistakable, and while their light-reflecting properties might be reduced by the use of paint, they cannot possibly be hidden in this manner. It will be noted that some of the tanks have been so treated that their tops merge in with the ground; nevertheless the shadows and highlights make them instantly recognizable.

4. The concealment of oil tanks is not difficult, particularly where the terrain is somewhat hilly. The diagram shows how they could be hidden from aerial observation on level ground. The ten-degree slope to the east, north and west will not cast shadows, and when landscaped the spot would escape detection even on an aerial photograph.
1. All the shelters illustrated at the right offer protection against blast and splinters, but will not withstand a direct hit. Since the overwhelming majority of casualties come from bomb fragments, concussion and falling debris, such structures have an extremely important function. Shown here are individual steel shelters for air raid wardens, being tested to determine their resistance against falling masonry.


3. Another concrete structure, built of precast blocks. It would be more effective if it were not so large. Use of a window as shown is entirely inadmissible.

4. A group shelter, later to be covered with a six-inch slab. The brick partitions are only for privacy.

The diagram directly below illustrates the destructive power of the more common types of bombs. Provision of complete bombproofs, with roofs containing five feet of reinforced concrete, is obviously completely beyond the means of the individual.
As in all other phases of air raid protection, the principle of spreading the risk applies to air raid shelters. Fundamental reason: If five hundred people are divided among five shelters instead of concentrated in one of equal quality, potential casualties per successful hit are reduced 80 per cent. British practice has tended to favor many small shelters over few super-shelters for the added reasons that short-notice raids require ready access to nearby shelters and it was also found quicker and cheaper to turn out a quantity of small minimum shelters rather than attempt a program of large bombproofs.

Due to a geography which guarantees advance warnings and the absence of an immediate emergency, this reasoning is not entirely applicable to the U.S. Many authorities believe that the best—and most economical—protection can be provided in this country through relatively few large shelters affording maximum safety.

As is seen on pages 435 and 436, the shelters which have been developed to date range from low cost mass production structures which afford "reasonable" protection to expansive underground works which aim at complete immunity. As has been suggested with wry humor in some British periodicals, and with rather grim Utopian vision in H. G. Wells' cinema "Things to Come," the present era of civilization may presage remarkable development of subterranean living. Obviously, the air raid shelter today is in an elementary form. The ultimate development of its protective qualities, its all-important sanitary facilities, and general livability depend partly on the discovery of new materials and techniques, and partly on the competence of designers who comprehend the manifold consequences of aerial attack.
To assure adequate and prompt defense, new housing facilities are required the country over—

3,000 dwelling units for Ranger Aircraft Engine employees in Farmingdale, N. Y., 200 for Army civilian employees in Savannah, Ill., 1,500 for Navy enlisted men in Long Beach, Calif., and 50 there, a growing grand total now officially and conservatively estimated at 200,000. That is a lot of housing; it comes close to one-half the 475,000 total produced last year when the building industry, sparked by the biggest peacetime housing demand in history, set a ten-year production record.

And, it means a lot of money—if each dwelling unit costs $3,500, it means $700 million, one-third the $1.5 billion spent on residential construction in 1939. Yet, this is only a cushion under normal housing needs which should continue about as large as ever.

Regardless of its attitude toward meeting normal needs, building must quickly supply the defense housing demand. Otherwise, housing shortages in vital defense centers will deflate the morale of both the armed forces and the industrial workers and will provoke a high turnover in industrial labor with attendant financial loss, time wastage and production inefficiency. In the previous national emergency, some informed observers predicted that, had hostilities continued beyond 1918, the acute housing shortage would have caused a breakdown in U. S. armament production. Prime lesson of that previous emergency was that housing must be considered in conjunction with military and industrial expansion, not after it; and in many cases, construction of the former must precede the latter. So far, that lesson has not been heeded; industrial and military construction is already a leap ahead of housing.

Other lessons, however, have been heeded, for the U. S. has already acted to prevent housing from falling too far behind. Today, Government has a Defense Housing Coordinator, the beginnings of a defense housing program, $850 million with which to grease it and a half-dozen housing agencies among which to divide the money. When the apportionment is complete and the recipients have settled down to work, they will locate, design and finance about 80,000 dwelling units—all of them for rent, most of them detached, some of them temporary and, supposedly, none of them in competition with private enterprise. To the initiative of local architects, builders, and financiers is left the bigger and equally important task of producing the other 120,000 dwelling units—primarily in areas where the housing demand will exist after the emergency has passed.

While Government housers are getting squared around to the gigantic organizational job before them, building may study the many facets of the defense housing demand (p. 438), review the legislation which will eventually drop $250 million in its corporate purse (p. 441), preview the defense housing machinery (p. 442) and consider the design and construction of two dozen housing projects which either have been developed specifically for national defense purposes or are of such a nature that they cast helpful light on the picture (p. 444-467).
DEMAND

Before national defense became the topic of the day, the housing need was placed by informed economists at some 1.2 million dwelling units annually during the Forties—$800,000 to provide for newlyweds, growing families and people whose houses burn down, blow away and wear out, plus 400,000 more to “pay off” the accumulated housing deficit. Two and a half times last year’s production, this total is a statistical measurement of a potential demand which must be met to bring the standard of U.S. living up to pre-Depression levels. By adjusting its operations to the market and by better merchandising its products, the building industry in recent years has translated much of this potential demand into insistent demand, and this year will produce close to 325,000 new dwelling units—more than twice the average annual volume of the trying Thirties.

Today, this big, normal demand still exists. But, the national defense program, with speed as its keynote, has spotlighted the need, has shifted and concentrated it and, above all, has made it imperative that much of it be supplied immediately. As painfully proved by World War I experience, housing conditions govern the supply and turnover of labor which, in turn, govern the speed and efficiency of the nation’s industrial and military machinery. Adequate housing is a prerequisite to adequate national defense.

GENESIS

Creation of the defense housing demand began with the first injection of the $1.5 billion shot-in-the-arm which Government is administering to the national economy. To handle defense orders, manufacturers the country over are stepping up existing production facilities; many are erecting entirely new factories. Government-operated armament plants are expanding, and new ones are being built. Moreover, to accomplish the end of national defense, the growing army, navy, marine and air corps are requiring bigger bases and more of them.

Were generally increased employment the only factor, defense housing would be a comparatively simple problem. But, there is another: the employment increase is scattered, not general, and entails a shifting of workers from one community to another in step with labor demand. To cope for this shifting population segment is the defense housing problem. In general, it means the immediate provision of adequate shelter wherever military or industrial expansion has over-taxed the available supply. Statistically, it means the production of some 200,000 new dwelling units as well as the procurement of countless others (via remodeling, renovation, improved transportation, etc.) which already exist but are either substandard or out of reach.

DEFENSE HOUSING DEMAND BY STATES—Dwelling Units

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<td>8275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhode Island</td>
<td>3200</td>
<td></td>
<td>638</td>
</tr>
<tr>
<td>South Carolina</td>
<td>3100</td>
<td>200</td>
<td>385</td>
</tr>
<tr>
<td>South Dakota</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Tennessee</td>
<td>2900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texas</td>
<td>5100</td>
<td>1050</td>
<td>925</td>
</tr>
<tr>
<td>Vermont</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td>13850</td>
<td>350</td>
<td>3035</td>
</tr>
<tr>
<td>Washington</td>
<td>3400</td>
<td>600</td>
<td>150</td>
</tr>
<tr>
<td>West Virginia</td>
<td>2700</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>120933</td>
<td>11995</td>
<td>10983</td>
</tr>
</tbody>
</table>

SUB TOTAL        | 131888      | 13075             | 14233           | 8125             |

1—Total reported demand as itemized on p. 440; all figures are estimates, most are conservative, a few may be excessive. 2—Officially reported distribution of units to be built by PBA with Army’s $457 million. 3—Unofficial estimate of distribution of units to be built by Navy with its $94.0 million. 4—Actual distribution of units in 21 defense projects to be financed with $231.3 million of USHA funds. 5—Part of this “balance” will be supplied with the $150 million FWA housing fund. See “Procedure,” p. 422.
Such, in brief, is the national view of defense housing needs. But, the picture does not compose that easily. Essential to a wise and rapid solution of the problem is analysis of the defense housing demand's many facets which may be classed under two all-important headings: "where"—the local sources of the spotty demand—and "for what"—the type of housing required to meet it.

WHERE

While in its assignment of defense contracts and the selection of sites for new armament plants, Government may be wisely influenced by local labor and housing conditions, it is a sure bet that most of the industrial burden will be carried by a comparatively few States—those that already have production facilities and can get under way immediately. Today, about 75 per cent of all defense factory and major manufacturing plants are in only 200 of the nation's 3,070 counties, most of which are east of the Mississippi and north of the Ohio and Potomac Rivers. It is therefore an equally sure bet that most of the industrial defense housing demand will be concentrated in this area.

Outside these States are other communities which housing demand's many aspects which may be classed under two all-important headings: "where"—the local sources of the spotty demand—and "for what"—the type of housing required to meet it.

FOR WHAT

Just as the defense housing demand is specialized in location, it is specialized in several other aspects which determine the type, size, cost, construction and durability of the needed dwelling units and dictate whether they must be built for sale or rent, and by private enterprise or Government. Simultaneously, just as the quantitative demand must be measured locally for complete accuracy, its qualitative dimensions are dependent upon local factors and will vary widely in accordance with the nature of the demand. From an analysis of the demand in its broadest aspects, however, it is possible to gauge roughly the kind of housing required for national defense.

FAMILY INCOME

While workers in defense industries earn substantially more than industrial workers as a whole (1938 average annual income: $81,430 and $81,274, respectively), their families are far from easy street. Unfortunately, they cannot afford the type of new housing which the building industry is accustomed to produce. Current rent wage rates in the selected defense industries average about $31 per week or $1,530 per year, assuming a full 50-week work year. About these workers pocket an average of about $830 per week or a comfortable $2,500 per year; the middle 40 per cent, about $289 per week or a slim $1,000 per year. Those earning less than $1,000 per year are largely unskilled workers, who are drawn from the ranks of local unemployed and are not, therefore, a part of the migratory group which causes the biggest housing headache.

Applying the nominal rule-of-thumb that families in these income brackets may economically spend 20 per cent of income on housing expenses (including rent or mortgage amortization and interest, maintenance costs, taxes, etc., excluding heat, light and refrigeration), it is apparent that these three groups of industrial defense workers can afford shelter costing an average of $46, $244 and $817 per month, respectively. Obviously, the lowest income group must be excluded from the market for new housing, for its annual savings (from which come down payments on purchases) are nil, and its monthly savings are far too small to enable any to rent two small rooms in private enterprise's cheapest new apartment project. Consequently, where new housing is required for this group, it must be supplied, as in the past, by Government subsidy.

In addition to industrial workers and their families, the shifted population segment includes the families of men in the nation's armed forces. To the 250,000-man regular army of this summer have been added 110,000 more "regulars," and soon to be called are 250,000 National Guardsmen and 800,000 draftees—a grand total of 1,4 million men in the first year of 1941. Most "regulars" and guardsmen under the rank of sergeant and almost all draftees will be unmarried, and their housing (tents and barracks) will be provided by the War Department on military reservations (see p. 344). Non-commissioned officers on the other hand, may be married and will require housing for their families—off the reservations in many instances. Depending upon their rank (staff, technical, master, etc. sergeants) and extent of service, these "non-coms" are paid $60 to $138 per month and are given an addition for room and board. Privates, however, can only afford rent for the latter runs about $29 per man per month. Families of commissioned officers, including "regulars," guardsmen and reserves will also call for some off-reservation housing. Their monthly salaries run from $125 (2nd Lt.) to $335 (Colonel); their monthly rent allowances from $40 to $125. Presenting a problem is the army's highest paid officer, Retired General Pershing who gets $13,500 per year plus an allowance of $8,000 for "quarters, heat and light."

Due to the instability of this Army demand, most of that part of the housing (Continued on page 468)
DEFENSE HOUSING DEMAND BY CITIES
larger ones—have not yet been reix)rted. The table covers about
'^^1)0 communities for which a defen.se housing demand of 131.688
(Iwclliiig units lias been reported. (The c-on.servutively estimated
ii.ilional demaiiil exceeds '•2()().000 units.) Most of the units to be
supplied by the .*1()0 million Anny-Xavy housing funcl and all
tho.se to Iw supplied by the .$.'51.1 million USHA fund are included
in the tabulation. (.\n asteri.sk indicates units to be supplied by
the .\rmy's share of the $100 million fund.) The letter A after a
conununily indicates that the demand's .source is Army enli.sted
men: AC. Army civilian em|)loyes; N, Navy enlisted men: INC. Navy
civilian employes; P, employes in airplane and parts plants.

The Army and Navy have made known many of the loeatioiKs
of their defense hoii.sing needs, and the U . S. Hou.sing Authority,
on the basis of local surveys, has estimated .some atlditional defen.se
liousing requirements. Housinp needs in other trouble centers have
b<>en surveyed and estimated by the Defense Housing Coordinator's office, but it choo.ses to keep them secret. From all
available sources. T H E FORUM has compiled the followinj? tabulation of defen.se housing requirements by cities. I t docs not [)urj)orl
to be entirely .iccurate. for the figures are based upon estimates
rei)orted by Government agencies; nor does it purport to he complete, for estimates covering many communities—partieidarly the

ALA.

Anniston (A)
Fairfield
Ivlontgomery (A)
Montgomery
Selma
Tarrant

ARIZ.

Fort Hauchuca (A)
Tucson ( A l

GAL.

Bakersfield
Benicia lACI
Fort Ord (AC)
Fort Ord (A)
Fresno (A)
Long Beach (N)
Long Beach
Los Angeles
Mare Island ( N O
Mare Island (Nl
Mare Island
Oakland (N)
Oakland ( N O
Oakland
Riverside (A)
San Diego (N)
San Diego (P)
San Diego
San Rafael (A)
Santa Monica
Stockton (A)
Sunnyvale (A)

COLO.

Denver (A)
Lowry Field tAi

CONN.

Bridgeport
East Hartford (P)
Croton ( N O
Hartford
New Britain
New London (N)
New London ( N O
Stratford (P)
Waterford

DELA.

Delaware City ( A l

D. C.

Washington ( N '
Washington ( N O
Washington

FLA.

GA.

440

50*
1000
200<'

Boise (A)

100*

ILL.

Belleville (A)
Champaign
Decatur
East Moline
Granite City
Great Lakes (N)
Madison Co.
Moline
Peoria
Rantoul (A)
Rantoul
Rock Island
Savanna ( A O

100*
200
200
200
300
200
200
300
300
200*
100
300
200*

Delaware Co.
Hammond
Lawrence

300
200
35*

IOWA

Davenport
Croyden (A)
Leon (A)

300
250*
250*

KAN.

Fort Riley (A)

KY,

424
500
400
30*
1 50200
50100450*
150*
1500
300
800
3000
400
200
400
800
1300
150*
1500
3500
300
175*
200
150*
15050*
125*
510
5000
200
2000
200
200
200
3500
400

IND.

100
125*
350*
664
50*
325*

Albuquerque (A)

150*

VT.

Essex Junction (A)

N. Y.

500
Bethpage (Pi
Brooklyn ( N l
200
Buffalo (PI
1400
1400
Buffalo
Lackawanna
Tonawanda
3000
Farmingdale (P)
Fishers Isl. Village (A
20*
Hempstead (A)
200-:'
Long Island City (P)
500
Schenectady
500

VA.

Arlington (A)
35*
Bristol
200
Dahlgren ( N i
100
Dahlgren ( N O
300
Hopewell
200
Langley Field (A)
350*
Lee Hall ( A l
25*
Newport News ( N O 4000
Norfolk (N)
3000
Norfolk (NC)
1000
Norfolk (N)
500
Phoebus (Al
90*
Portsmouth i N l
600
Portsmouth (NC)
1200
Portsmouth
600
Quantico (N)
100
Quantico
50
Richmond
100 •
St. Juliens Creek (NC) 200
Virginia Beach (A)
50*
Yorktown ( N l
100

Fayetteville (A)

OHIO

125*

OKLA.

Fort Sill (A)

Ashland
Louisville
Fort Knox (A)
Fort Knox ( A O

200
300
600*
100*

PA.

LA.

Baton Rouge
Shrcveport

200
175

ME.

Bath ( N O
Bath
Bangor (A)

200
300
150*

MD.

Aberdeen ( A O
Annapolis
Baltimore (A)
Baltimore (P)
Cumberland
Edgewood (Al
Hagerstown
Indian Head ( N O
Odenton ( A i
Piney Point (N)

Allegheny Co.
12 localities
Beaver Co.
7 localities
Chester
Crawford Co.
Erie
Fayette Co.
Hattiesburg
Philadelphia (N)
Philadelphia ( N O
Philadelphia
Reading
Schuylkill Co.
Westmoreland Co.
Monessen
New Kensington

MASS. Chicopee (A)
Fort Devens (A)
Holyoke
Quincy
Squantum (N)

200*
300*
500
2000
100

MICH.

Battle Creek (A)
Mt. Clemens (A)

MISS.

Jackson (A)

NEB.

Omaha

NEV.

Hawthorne ( N l

N. H.

Portsmouth ( N l
Portsmouth (NC)

200
2000

N. J .

Camden
Fort Dix (A)
Harrison ( N O
Kearny
Lakehurst ( N i
Long Branch (A)
Long Branch ( A O
Newark
Elizabeth

2000
100*
600
1000
50
50*
475*
1800

R. 1.

500

150*
2000
800
500
200
175
250
800
100
1000
900
350
200
1000

Newport & Quonset Pt.
(Nl
500
Newport & Quonset Pt.
2000
(NO
Pawtuckct
500
100
1500
1000
200*
200
100

S. D.

Fort Meade (A)

50*

TENN.

Alcoa (NC)
Chattanooga
Knoxville
Memphis

TEX.

Brownsville
100
1000
Corpus Christi (N)
1000
Corpus Christi ( N O
Del RIO
200
200*
El Paso (A)
Fort Clark (A)
50*
Fort Sam Houston (A) 200*
Galveston
375
200*
Houston (A)
1000
Orange (NCI
300*
San Antonio (A)

50

T H

550*
500
500
1000
500

Charleston ( N l
Charleston ( N O
Charleston
Columbia (A)
Greenwood
Parris Is. (N)

S. C.

250*
130*
50*

60=

N. M.

Cincinnati
Cleveland
Steubenville
Youngstown

500*
300
100*
1000
200
500*
100
1000
30*
100

100*
300

San Angelo (A)
Waco

Paterson
Perth Amboy

N. C.

40*
500
500
600

500
Jacksonville (N)
500
Jacksonville ( N O
Jacksonville
4000
100
Key West (N)
Key West ( N O
100
100Orlando (A)
300
Pensacola (N)
300
Pensacola ( N O
100
Pensacola
Miami ( N l
400
200
Miami ( N O
100Tallahassee (A)
300^:=
Tampa (A)
Tampa
200
West Palm Beach ( A l 300»
Albany
Augusta (A)
Columbus (A)
Columbus
Rossville (A)
Savannah

IDA.

c

A

R C

400
1500
500
500

H

1 T

E C

WASH. Fort Lewis (A)
Fort Lewis (AC)
Puget Sound (N)
Puget Sound (NC)
Seattle ( N l
Seattle
South Tacoma (A)
Spokane (A)
Tacoma
Bremerton

225*
25*
200
1200
200
100
150*
200*
500
600

W. VA. Charleston
600
Elkins
100
Homington
600
Morgantown
200
South Charleston (N) 100
South Charleston
(NC)
900
Wheeling
200
SUB TOTAL

120,933

ALASKA
C, Z.

325
Balboa & Coco Solo
(N)

2500

Balboa & Coco Solo
(NO

2500

CUBA

Guantanamo (N)
Guantanamo ( N O

200
200

T. H.

Honolulu (N)
Honolulu
Island Oaku (A)
Hickam Field

P. 1.

Cavite (N)

P. R.

Aquadilla (A)
Cayey (A)
San Juan (A)
San Juan (N)
San Juan ( N O

300*
20*
200*
400
400

V. L

St. Thomas (N)

100

50

TOTAL

U R

A

L

2200
800
300*
250*

131,678

F

0

R U M


Defense housing is off to a fair start. Coincident with Germany's invasion of the Low Countries this spring, the U. S. began talking about defending itself, and some thoughtful observers immediately dusted off 35-year-old reports on the nation's previous industrial-military effort to show that a neglect of housing had slowed up the whole program. Determined that this should not recur, the President by mid-August had appointed a Defense Housing Coordinator to assist the National Defense Advisory Commission, and various and sundry housing bills were already popping up on the floor of Congress. On the books a month ago went the last of four important defense housing acts involving, among other things, Federal appropriations totaling $350 million. And, while the pattern for the projected program is unfortunately far from complete, defense housing is actually under way in a handful of communities—seven months after defense began. (It was ten months after U. S. declaration of war in 1917 before the housing problem was even officially recognized, and it was another four months before Congress had appropriated a penny toward its solution.)

Since current Federal defense housing legislation means much more to promote building than its $825 million face value, it merits an act-by-act analysis:

**ACT I**

**USHA defense housing**

Eager to adjourn temporarily for the Republican National Convention, Congress on June 28 passed without careful reading an important national defense bill labeled, "To expedite shipbuilding and for other purposes." Upon return from the Philadelphia fireworks, the House, long antagonistic to the U. S. Housing Authority, was shocked to discover that by approving the bill's "other purposes" it had given USHA power: 1) to develop and operate such projects itself without loan construction; 2) to develop and operate such projects itself without loan construction; 3) projects for defense purposes are exempt from the original provisions that no State receive more than 10 per cent of USHA's total funds. Most important, the new legislation is retroactive to the extent that any project for which USHA funds have already been earmarked or placed under loan contract may be revised to fit the new USHA defense housing program, and any project under construction may likewise be shifted.

To date, USHA has launched 21 such projects for some 8,100 families—17 of them being handled by local authorities, the other four by the Army and Navy in communities which have their housing authorities (see tabulation, p. 338). First begun, most nearly complete is a $124,000 project for the families of Army airmen near Montgomery, Ala.'s Maxwell Field. It is scheduled for completion on December 2 (see p. 458). But without additional working capital, USHA's defense housing program will not produce $50 million worth of housing—a fair estimate. For a few additional projects it may recind and reallocate existing and unused earmarkings and, if it can circumvent the need for subsidies in its defense projects, it may put to work the last $150 million of its original $800 million authorization which is otherwise useless (see Arch, Forum, Jan. 1940, p. 4). Much to the chagrin of public housingers, chances are small that USHA's barren city register will soon be replenished by Congress. And, chances are only fair that USHA will get some of the $150 million appropriated via the FWA housing act (see below).

**ACT II**

**Army-Navy housing**

As part of the second Supplemental National Defense Appropriation Bill enacted in August, Congress gave the President $100 million for allocation principally to the War and Navy Departments for the accommodation of families of enlisted personnel and civilian employees in housing whose average cost per dwelling unit including land, utilities, and services may not exceed $3,500. Congress also authorized the secretaries of these departments to "utilize such other agencies of the U. S. as they may determine upon."

With the military housing demand long since defined, the President in jig time divided the $100 million fairly evenly between the Army and Navy, serving a small slice to the Maritime Commission. Forthwith, the Army, bee-busy with other housing problems (see p. 344), turned most of its $48.9 million over to Administrator John M. Carmody of the Federal Works Agency which, in turn, passed it along under the nose of FWA's USHA to Commissioner W. R. Reynolds of FWA's Public Buildings Administration. Why the funds permit their use under the more lenient legislation of the FWA housing act (see below). All told, the Army's money will produce about 13,000 dwelling units—15,000 by FWA, 900 by the Army.

Unlike the Army, the Navy of necessity has a slower expansion program and therefore has time to build all of its own housing. With its share of the $100 million (about $44 million) it plans to provide some 12,000 dwelling units. The funds will be used under the terms of the FWA housing act (see below).

The Maritime Commission with its $22.4 million will build, via FWA, 700 dwelling units exclusively for ship yard workers.

**ACT III**

**RFC equity housing**

From the $100 million "blank check" which Congress handed him in June, the President quickly ripped off a $10 million dollar piece, gave it to Chairman Jesse Jones' Reconstruction Finance Corp. for defense housing. With this money, Defense Homes Corp., a new RFC subsidiary, will provide equity capital for large scale rental projects set up under Section 207 of FHA's mortgage insurance program. Theory is that, where private investors are hesitant to supply the necessary 20 per cent equities in defense boomed communities, RFC will immediately step in with the necessary cash, will seek later to sell out to private investors when the projects are completed and successfully operating. As in the past, insurance companies would supply the 80 per cent balance of the projects' cost in return for 20-year FHA-insured mortgages. Thus, RFC's $10 million of ready equity money will produce $50 million worth of housing—in the neighborhood of 14,000 dwelling units. Month ago, "defensive housing" was reported by RFC toward construction of projects in fourteen communities.

**ACT IV**

**FWA housing**

Biggest pile of Federal defense housing dollars was appropriated October 13 to service the so-called "Lanham Act" which the President signed the day before. Drafted by Housing Coordinator Palmer and introduced in Congress by Representative Fritz G. Lanham, this act gives FWA Administrator Carmody $150 million, requires him to hand $10 million of it over to RFC to reimburse the President for his "blank check" housing donation. Balance of the funds will be disbursed through FWA's sub-agencies for the provision of housing for the families of enlisted men, military civilian employees and industrial defense workers.

Significantly, the act states that this money shall be spent only in areas

(Continued on page 64)
ORGANIZATION AND PROCEDURE

While they are basic, Federal laws and money alone will not give the U. S. the defense housing it needs. In between must be organization—a coordinating system centered in Washington but reaching out to include small builders in small West Coast cities. And, before defense houses are produced in the necessary quantity, there must be procedure—a definite pattern for action made known to everyone. Combined, these two necessities will foster......

ORGANIZATION

National. Unlike the local division, the national organization got under way early, should soon be ready for action. It dates back to August 10 when the National Defense Advisory Commission established the office of Defense Housing Coordinator, put in it 48-year-old Realtor Charles F. Palmer, chairman of Atlanta’s local housing authority, past president of National Assn. of Housing Officials, head of a private real estate business in his home town and housing student extraordinary. Charged with the planning and prosecution of the defense housing program, “Chuck” Palmer’s specific duties are: 1) to channelize and coordinate the activities of Federal agencies engaged in the program; 2) to anticipate housing needs and act to avoid housing shortages; 3) to determine via surveys whether necessary new housing be provided by private enterprise or by public agencies; 4) to review plans for industrial plant expansion in the light of the housing needs they may create; 5) to certify design and construction standards of dwellings to be financed by Government; 6) to keep his eye on building labor employment and possible shortage; 7) to recommend whatever additional legislation may be deemed essential to an adequate defense housing program.

Obviously Palmer alone cannot shoulder this task. To his offices (in Washington’s new RFC Building) as right-hand men he has called as assistant coordinators, Jacob Crane, former assistant USH.Administrator, and R. L. MacDougall, WP.Administrator for Georgia who will soon resume his WPA duties as southeastern regional administrator; as legal adviser, Herbert S. Colton, former chief counsel for FHA’s rental housing division; executive assistant, Carl H. Monsees, ex-chief of the National Assn. of Housing Officials’ field service; as statistical director, Samuel J. Dennis, formerly with the Committee De- partment; as program planners, Carl L. Bradt, from the executive directorship of Detroit’s housing authority, and William V. Reed, former principal project planner for USHA. Volunteer consultants include: Herbert U. Nelson, executive vice presi- dent of the National Assn. of Real Estate Boards; Miles Lanier Colean, one-time assistant FH.Administrator now housing research director for the Twentieth Century Fund; S. M. Buckingham, manager of Cleveland Terminals Building Co. and representative of the National Assn. of Building Owners and Managers; and Colle- man Woodbury, director of the National Assn. of Housing Officials.

Local. Largely voluntary and, as yet, sadly undeveloped, local defense housing organization is essential to accomplishment of the program. Without it, only Government-financed houses would be built with the result that Federal appropriations would have to be more than doubled to reach the estimated goal of 200,000 dwell- ing units.

Setting a commendable precedent for every defense-affected community in the country, a few cities have already appointed National Defense Committees which have launched exhaustive surveys of local industrial capacities, plant va- cancies and sites, labor supplies, raw ma- terial sources, transportation facilities and possibilities and housing conditions. While the prefered housing coordinator is nat- urally most interested in housing, he is also concerned with all the other factors insofar as they relate to housing. Vital as an aid to the coordinator in advising on the allocation of defense industrial con-

tracts and in roughly appraising the hous- ing problem is an immediate, preliminary survey of each community’s industrial transportation and labor facilities; its housing vacancies classified as to type, size, condition, sales price or rental; its volume of housing now under construction similarly classified; its probable increase in employment during coming months; its probable need for importing out-of-town labor; its distribution of workers by wage groups, sex, race and family size. Cor- rulled in short order via a sampling pro- cess, these statistics should then be checked and amplified by a comprehen- sive survey embracing details of potential increased supply of dwelling units via repair, remodeling, conversion, extension of transportation and new con- struction; availability of sites; labor wage and material price levels and trends; pres- ence of building organizations equipped to handle large scale low cost housing, etc.*

With these facts in hand, the local defense committee may not only assist the national housing coordinator but also give helpful advice to local builders on the specific demand for new housing: location, type, size, cost, etc. Only with such advice can the new private housing market be ex- pected to produce the requisite amount of housing tailored to the defense market. Today, the lack of authentic sources for this advice remains the weakest link in the $700 million housing program.

PROCEDURE

Public. Of the total, $825 million have been appropriated by Congress from the U. S. Treasury via the President to the Army; $44 million, Maritime Commission, $24 million, Army, $889.8 million, and Federal Works Agency, $130 million, $10 million of which goes to the RFC. (At month’s end the President had yet to allo- cate about $4.7 million of the Army-Navy fund.)

According to long-established practice, the Navy will divide most of its share among the commanders of its far-flung bases in proportion to their emergency housing needs. They, in turn, will hire local contractors, negotiating their con- struction contracts under the cost-plus-fixed-fee provisions of the enabling legis- lation. Other details will also follow a set pattern: All designs and specifications will come from the Navy Department’s archi- tectural offices in Washington. Except in a few instances, therefore, pri- vate architects will not be required. While there will be adequate design variety within each project, standardization between projects will be developed to a high degree. All houses will be low cost (maxi- mum average: $6,500, excluding land, util- ities and sewers); all will be built to rent at figures established by the Navy; a large proportion will be “temporary.” Total number of dwelling units: 12,640.

* In its book, “Housing for Defense,” the Twentieth-Century Fund outlines in complete detail the factors to be covered in such pre- liminary, comprehensive and periodic surveys.
Somewhat different will be the Army approach. About $45.7 million of its $48.9 million have already gone to the Federal Works Agency's Public Building Administration for disbursement. New only in name, PBA was formerly known as the Office of the Supervising Architect, was formerly affiliated with the Treasury Department's Procurement Division and has handled the construction and operation of Federal buildings (mostly post offices) all over the country since the days of President Andrew Jackson. More familiar with its new housing assignment than most PBAsters is its 67-year-old spark plug, Architect N. Max Dunning, one-time director of FWA's long-defunct Housing Division and, before that, an officer of the U. S. Housing Corp. of World War I fame (see p. 329).

Based on Army suggestions, the average dwelling unit will consist of living room, combination dining room and kitchenette, two bedrooms and bath. Its average cost is expected to be well below the statutory maximum of $3,500—probably close to $1,200 including land, utilities and services. Present plans call for the use of both "permanent" and "temporary" or "demountable" construction—as the needs indicate. From its lengthy list of capable builders PBA will select as many as needed for each project, award them cost-plus-fixed-fee contracts and then supervise construction. Chances are that local architects will be called in on the larger projects, but only for site and utility planning.

Rentals for dwellings built on Army posts will be fixed by the Army, all others will be determined jointly by PBA and the Army. In neither case need they be equal to the economic rent necessary to put the projects on a break-even basis.

Month ago, PBA was about ready to go. The Army had asked that its $45.7 million be spent for some 13,000 dwelling units in 70 projects (28 States and two Territories) ranging in size from 20 units at Fort H. G. Wright in Fisher's Island Village, N. Y. to 700 units at Fort Knox, Ky. (see p. 440). Sites for 19 of the projects are already owned by the Army, and in anticipation of the program PBA field representatives have already made preliminary explorations toward purchase from private owners of the other 51 tracts. In addition to the 13,000 dwelling units which PBA's Army program will produce, it is estimated that another 900 will be built directly by the Army with the $8.2 million which were not given to PBA.

Like the Army, the Maritime Commission, with only about 82.4 million to spend, has entrusted the building of its 700 dwelling units to PBA.

Under a different act (see "Act IV," p. 441), FWA has $140 million with which to supply local defense housing demands upon orders from Defense Housing Coordinator Palmer via the President. Choices are that a large part of the funds will go toward already requested Army and Navy rental projects not covered by the $100 million appropriation discussed above. Another sizable chunk will answer demands brought to Palmer's attention by other members of the National Defense Advisory Commission, by the owners of booming manufacturing plants suffering from high labor turnover, by local housing authorities and other municipal officials and by the heads of local labor unions. Further to keep posted on present (Continued on page 66)

**PRODUCTION FLOW CHART 200,000 defense housing units**

Graphic summary of the approximate distribution of the 770 million necessary to supply the required 200,000 dwelling units for national defense, with Federal funds as presently appropriated.

All figures are nominal; all dollar amounts are in millions. Dotted lines with (?) indicate possible but improbable channels. FHA is assumed to insure mortgages for half the privately financed housing.

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PRODUCTION FLOW CHART

200,000 defense housing units

**U.S. TREASURY** $281

1938

**FUND** $26

**PRIVATE CAPITAL** $419

**$100 THE PRESIDENT** $150

$4.7 $440 $89 $2.4

**MARITIME COMMISSION**

NAVY ARMY FWA

$150

$5.2

**$10 EQUITY CASH**

$140

$171

**FHA INSURANCE**

$40 MORTGAGES

$171 MORTGAGES

$189 EQUITY CASH

$50

UNINSURED MORTGAGES

**PRIVATE BUILDERS** $700

PUBLIC HOUSING 79,600 UNITS

PRIVATE HOUSING 120,400 UNITS

NOVEMBER 1940
THE ARCHITECTURAL FORUM

DEFENSE HOUSE by Skidmore, Owings & Merrill, Architects.

If all the low cost house designers in the country got together, compared their floor plans and combined the best features of each in one composite plan, the result would be only slightly different from most of the originals but would certainly be worth building, worth standardizing. And, standardization would permit manufacturers to concentrate their production on materials and equipment tailored to the generally accepted dimensions of this standard house. Lower costs would naturally follow.

The defense housing program needs such a house. It also needs standardization, for, above all, it demands low cost construction, lots of it and in a hurry. To this end, The Forum last month gave Architects Skidmore, Owings and Merrill a collection of low cost house floor plans gathered from builders in all parts of the country, asked them to study the conglomeration of ideas and resolve it into a standard house with the design controlled by 1) use of standard materials in standard sizes; 2) minimum FHA requirements for mortgage insurance eligibility; 3) practices acceptable to local builders as evidenced by the houses they are currently building and 4) a desire that the resultant design be adaptable either to conventional frame construction or the vertical panel system employed by leading prefabricators.

With an eye to the specific needs of the defense housing program, The Forum also suggested to Messrs. Skidmore, Owings and Merrill that, once devised, their basic one-level floor plan be developed further to permit: 1) access to a basement; 2) provision of one extra room in the attic, 3) two attic bedrooms, 4) two attic bedrooms and a bath with private access, 5) use of the floor plan in a double-decker two-family house and 6) repetition of all these units in a row house or garden apartment project. Theory behind variations Nos. 2, 3, and 4 is that the demand for housing by unmarried defense industrial workers will be large in many communities (sometimes as large as the demand by families—see p. 468) and that provision of extra rentable rooms in new houses will not only help meet this demand but will also give the purchasers of these houses an income which will help foot monthly mortgage costs. Since much of the defense housing demand is for low rental apartments (see p. 468), the need for low cost multi-family projects is self-evident. The row house is the cheapest form of multi-family construction.

Presented on these pages is a study in low cost house planning—an analysis of the solution by Architects Skidmore, Owings and Merrill to the many-sided defense housing problem as outlined by The Forum. First, the governing factors behind the selected room arrangement (below); then, development of the basic plan (opposite); next, adaptation of the plan to the many different national defense requirements (p. 446-448); finally, one modified version of the basic house as conceived with a free hand by Architects Skidmore, Owings and Merrill.

This study is intentionally incomplete; exterior design, interior details and material and equipment specifications are but a few of the many important sub-problems left to local architects to solve with their knowledge of local requirements and preferences. This presentation is, however, a much more complete planning study than most architects and builders usually give to the low cost dwelling unit—the most important housing type in the defense program. As such, it may save some valuable housing dollars and contribute to the general improvement of low cost housing design.

Plan selection and orientation. Large majority of existing four-room houses spring from only two different types of floor plans: in one, the bathroom is between the kitchen and a bedroom, in the other it is between the two bedrooms. The former was selected for this study because: 1) location of kitchen and bathroom back-to-back facilitates plumbing installation, may save as much as $20 and 2) this room arrangement permits greater flexibility in the shape of the house and its orientation. Thus, as shown below, a square plan containing this room arrangement may be elongated in either direction and each resultant rectangle may be turned two ways on the street and in both positions may be flipped over to reverse the plan. Result: eight useful plan variations.

Further justifying selection of this basic plan is the orientation study, right. Around the compass on a hypothetical street (represented by the circle's circumference) have been placed the eight plan variations, each in its best possible location with respect to winter sun and summer breeze on the living room and kitchen exposures. Bold arrows extending from each plan designate the range of compass directions each plan may face without violating any primary orientation principles. Example: plan A4 is best faced midway between east and east-southeast (a direction nauticaly known as east-by-south), but with decreasing desirability it may face as far south as south-southeast, as far north as north-east. It will be noted that five of the eight plans may face in the best possible direction, south-southwest, and that one plan, A3, falls directly on this compass point.

To find the best possible plan for a given site, determine the direction in which the site faces, plot this direction on the chart, judge which of the plans is nearest the line. Example: if the lot faces west, use plan B2; if northwest, plans A1 or B1; if south, plans A2, B2 or B4. If the site is on a street intersection, place the living room of any of the eight plans to the street corner. While this chart may be used under average conditions in most parts of the U. S., it should be adjusted to local prevailing wind conditions and, in the extreme southwest, to sun conditions.
Developed by Architects Skidmore, Owings and Merrill as the basic layout for the FORUM Defense House, the large scale plan to the left displays improvement over each of the three flush-facade studies above. Actually, it is a combination of the right half of the first plan and the left half of the second. While the bedroom projection violates the modular planning principle to a minor extent and requires 14 ft. joists, it produces a better shaped room, a more interesting entrance and, when the basic units are combined in rows (left, below), a less monotonous facade.

Essentially the general pattern being followed by low cost house builders the country over, the basic plan veers from tradition in only two respects—and both have their merits: First, between the bedrooms, plywood walls create three curtained closets and two dresser recesses, increasing the total closet area at no sacrifice of usable bedroom area. Second, open planning at the other end of the house permits a flow of space and easy circulation between living, dining and kitchen units. A space-saving plywood partition shields the rear entrance, creates valuable storage space which may also be used as a workshop—particularly desirable in industrial communities where home invention is encouraged.

Those who object to the open plan might be satisfied by provision of a curtain or folding-wall between the ends of the plywood partition and the kitchen-living room spur wall.

Note that the design lends itself readily to prefabricated construction; 26 standard 4 ft. panels (twelve of them with windows or doors) and two smaller units will wall the entire house. The second and third plans (above) would require only 4 ft. panels.

Attached to produce row house buildings (left), the basic plan requires no alteration, but in interior dwelling units the substitution of a glass screen for the plywood partition would improve the lighting of the dining space. Bedroom ventilation is improved by arranging the units in offset rows. In all row house projects, units should be paired with rooms of the same function arranged back-to-back; otherwise, undesirable conditions will result—dining space overlooking a kitchen entry (near left, above) or living room noise disturbing the occupants of an adjacent bedroom (near left, below).
BASIC PLAN WITH STAIRS TO... ONE ATTIC BEDROOM...

Least expensive way to produce an attic bedroom for a larger family or for a roomer is to run the stairs parallel to the roof ridge, thus obviating the necessity for a dormer. Noteworthy details: stairs rise from the hall, connecting second floor bedroom with first floor bath; dining table folds down below window, clearing way to basement stairs (or closet); sliding plywood panels close off attic storage space; lavatory over stair bulkhead in attic bedroom; use of standard length framing members as shown in section. Because the attic is lighted and ventilated only at the ends of the house, this variation of the basic plan may be repeated only in twin houses (right). Combination of two attics produces one two-bedroom unit, one four-bedroom unit. The owner might occupy the latter, rent the attic to two roomers, the adjacent first floor (in which the stairs become a closet) to another family.

BASIC PLAN WITH STAIRS TO...

By introducing a staircase with winders, the basic plan is modified to provide two extra rooms in the attic, one of which is a large bedroom, the other storage space (or, in a pinch, another bedroom). Extension of the necessarily large dormer to the full length of the house would improve the attic interior, but, as in all small “salt box” houses, would present a difficult exterior design problem. Noteworthy details: stairs connect attic bedrooms with first floor bath; one attic room is readily provided with a lavatory; use of standard length framing members as shown in section; dining table folds up to mask kitchen (see detail drawing, next page). While indefinite repetition of the unit in a straight row eliminates cross ventilation in all bedrooms, offset arrangement permits retention of double attic windows—at both ends of each unit when a continuous offset pattern is followed. And, with the exception of the end units (which for appearance’s sake might contain only one attic bedroom), all units in a row house would have full-length dormers and, therefore, better shaped rooms.
VARIATION WITH LIVING ROOM STAIRS TO...

TWO ATTIC ROOMS AND BATH...

REQUIRES REAR DORMER AND BAY

VARIATION WITH PRIVATE STAIRS TO ATTIC APARTMENT

**Above.** Basic plan (top), varied by shifting bedroom projection to the rear, provides access to two attic bedrooms (one of which might easily be fitted with a kitchenette) and an extra bathroom; stairway rising from living room is, therefore, permissible. Projecting entrance vestibule in lower plan permits private access to attic apartment; in upper plan it is not essential and is unsightly in a detached house. Its appearance is improved when units are combined in rows.

**Right.** Insertion of a 4 ft. section between basic plans provides private access to full second floor flats in a four-family building, also increases the storage space in each unit. Four-family buildings may be repeated in straight rows or cut in two (entailing a slight shift of one wall) to produce two-family double-deckers. Living room table folds up to mask kitchen; kitchen table folds down when not needed as extra counter (below). They may be combined for party use.
THE BASIC HOUSE IMPROVED FOR RATIONAL LIVING

Plan and section studies on the foregoing pages have been two small steps ahead of conventional practice in that planning of the living areas has been opened and certain details have been built-in to conserve space. Designed with a free hand by Architects Skidmore, Owings and Merrill, the house to the right is still more forward looking, for form, fenestration and detail of the usual low cost house have been discarded in favor of more modern design principles.

Living spaces have been zoned to facilitate desk work at home, study or reading, conversation, dining and entertainment. Partitions are of thin, structural insulating panels which conserve space and decrease the sound transmission between rooms. Windows of living room are projected to form an interior flower shelf. Deep vertical divisions of this projection and the cantilevered shed roof above it improve diffusion of light.

Connected to both the living and dining areas is a large terrace for outdoor living. Framing of the trellis is designed eventually to take a roof, in the meantime may be covered with a summer awning. Once roofed, it may be used as either a porch or an automobile shelter.

Most important, this extra space may be readily enclosed and converted into guest quarters or a rentable apartment—entirely private but connected with one door to the original house. (The other doorway would be blocked up, the door and frame being used for exterior access to the new apartment.) Closets and bathroom in the smaller unit act as buffers against noises in the adjacent dining and kitchen areas of the larger unit. Heat in the smaller unit would be supplied by a space heater. When the addition is made, shutting off light from the original dining space, the temporary partition between this space and the storage room would be replaced by a glass screen. Note that the floor plan lends itself readily to duplication in a two-family twin house.
Perspective—Basic plan with outdoor living space

Basic plan with outdoor living space...

Converted into apartment

November 1940
ONE-FAMILY DEFENSE HOUSE project designed by Architect Gregory Ain.

Working on a Guggenheim fellowship in low cost housing, California Architect Gregory Ain in collaboration with Partner Joseph Allen Stein last month developed this unusual design specifically for defense housing purposes, claimed that in volume production the house could be completed in six working days at a Southern California cost of $1,000. A 24 ft. square, the plan is divided into three 8 ft. bays spanned with 4 x 8 ft. plywood box girders which first serve as forms for the L-shaped concrete pylons at the corners. Other features: compact plumbing assembly, an open flexible plan divided into rooms by shop-built closets and a sliding bedroom-living room wall panel, ample fenestration, trellises to improve the boxlike appearance and permit easy camouflage. Major material requirements: 9 cu. yds. of concrete for 600 sq. ft. of floor slab and for corner pylons; 135 lbs. of steel; 1,200 bd. ft. of lumber; 1,570 sq. ft. of plywood; 200 sq. ft. of sheet metal; 600 sq. ft. of roofing; four exterior sliding doors; two hinged interior doors and a sliding panel; eleven windows; cabinets comprised of 540 sq. ft. of plywood and 150 bd. ft. of lumber.

ONE-FAMILY DEFENSE HOUSE partially prefabricated for the Navy in Norfolk, Va.

"Fifty one-family units are now being built by the Navy at the Naval Base, Norfolk, Va., as a 'trial run' to see how cheap and fast housing to meet naval requirements can be built. These houses (following the plan on the opposite page) are equipped with a combination gas house heater and hot water heater, a gas cooking stove, an electric ice box, metal kitchen cabinets and shelves, etc. With ordinary care and maintenance they should last 50 years. The original estimate of cost was $1,995 per house, and progress indicates . . . a somewhat lower figure. It is anticipated that 50 houses will be completed and ready for occupancy 50 days after the contract was let." Thus, before a recent Congressional hearing testified Rear Admiral Ben Moreell, Chief of the Navy Department's Bureau of Yards and Docks, concerning the project pictured below and right. Representing a compromise between prefabricated and in-place construction, these houses are built of pre-assembled steel frame, covered on the exterior with fiber board, chicken wire and sprayed gunnite; on the interior with large insulating boards precut to exact wall and ceiling dimensions. Plumbing "roughing in" is preassembled with sweat fillings, can be completely set in one operation. Admiral Moreell said that his contractor, having set up his jigs and trained his men on the initial 50 houses, could handle a bigger order at the rate of twenty units per day. Builder: Byrne Organization of Dallas, Tex., which last month was awarded a contract for more than 1,000 additional houses at Norfolk.

† The Upson Co.
When Rear Admiral Moreell described to Congressmen his Norfolk, Va. project (see text, p. 450), he also talked about these designs which will be used over and over again when the Navy spends its $844 million for housing the families of enlisted personnel, Navy civilian employees and defense industrial workers (see p. 442). Said Moreell: "The Bureau of Yards and Docks of the Navy Department has developed standard floor plans for single-family and two-family units. By minor changes in partition arrangements, the two-family units can give combinations of one bedroom, two bedrooms or three bedrooms, which should meet the requirements of most families. Various exterior treatments can be used with pitched roof or flat roof, and an adaptation for the Tropics has been developed with the house set up on posts, and a wide-eaved roof, screened porch and so forth. These houses are standardized as to floor plans, equipment and accessories, but can be built using frame construction, metal-lumber construction (as below), prefabricated steel panels, concrete or numerous other materials. . . . The Bureau is prepared to furnish complete detailed contract drawings and specifications for these one-family and/or two-family standard houses within 48 hours after receipt of final information as to type of substructure, roof and construction."
ONE-FAMILY HOUSES sold in Maryland for $150 cash down payments.

One of the most attractive low cost projects in the U.S., this Bladensburg, Md. subdivision of 46 houses was sold out this Spring in 30 days at a price of $2,990 per unit and at an advertising cost of under $50. Major attraction: a 5 per cent ($150) cash down payment made possible by 30-year ground leases with options to purchase the 55 x 90 ft. lots at $45. Annual ground rent is 6 per cent, or $20.40 per year, $1.60 per month. Other monthly costs, primarily debt service on a $2,500 FHA-insured 15-year Title I loan, taxes and insurance, total $85.40. Cost breakdown: labor, materials and equipment, $2,345; fees, permits, insurance, etc., $205; contractor's profit, $195. Subdivision: Newton Village. Subdivider: Park Properties, Inc. Architect: Fred E. Taylor. Contractor: Schuyler, Inc.

ONE-FAMILY HOUSES at $2,550 with lot in Jackson, Miss.

Another low cost subdivision to which FHA points with particular pride—Colonial Courts in Jackson, Miss., by Architects Fort and White (Frank and Dudley H., respectively). Each of the 60 houses (22 have already been built and sold) springs from the same floor plan, but exterior variations are achieved via alternate roof treatments, colors and garage and porch locations. Standard $2,550 sales price includes land, concrete walks, gravel drives, garage, grading, landscaping, closing costs and real estate commission. Cash down payment: $250. Mortgage: $2,300 FHA-insured under Title II, 20 years. All inclusive monthly payments: $17, first year; $19.90 thereafter. Construction features: reinforced concrete footings; brick piers with 4 in. curtain wall across front; frame walls and ceilings covered with canvas and paper; each room piped for gas space heaters. Builder: G. H. Harris.
Designer of some 24,000 small houses in the most active U. S. residential building center, Long Island, N. Y., Architect Arthur E. Allen is now assigned to the Army Industrial College at Washington as a Reserve Officer. Before he was called to active duty, Major Allen designed these houses for Subdivider W. R. Gibson’s Sunbury-at-Hewlett development. In this project, as in most of its Long Island neighbors, standardization has been carried to an economical extreme—only two first floor plans are used, and their single difference is the omission or inclusion of a fireplace. Exterior variations, however, run into the dozens, three of which are presented here. The one-story Cape Cod model sells for $4,900 plus land at $900 and may be expanded with a finished attic room (see plan) for about $500 more. A Dutch Colonial roof provides more attic headroom.

ONE-FAMILY HOUSES of moderate cost for well-paid Hartford defense workers.

Claiming “we have housed over 10,000 persons,” experienced Subdivider N. K. Winston Co. is building these houses in its Hillside Homes development for employees of Hartford’s booming defense industries—Hamilton Propeller, United Aircraft and Colt’s Patent Fire Arms. And, some purchasers work in Pratt & Whitney’s small tool plant in West Hartford. One-story house (Cape Cod design with barn red walls and yellow blinds) sells for $5,000, has finished stairway and water, waste and electric lines already installed in roomy attic for future expansion. Note that one-and-one-half story house, selling for $5,550, is of famous “salt box” design. Both prices include 52 x 150 ft. lots and these selling details: dining alcoves with upholstered seats, built-in kitchen radios; brass water pipes; copper screens and leaders; full insulation. Architects: Ruben Henri Bowden and W. M. Dowling.
ONE-TO SIX-FAMILY HOUSES combine to solve an industrial housing problem in Front Royal, Va. With the aid of FHA mortgage insurance private enterprise has built close to 300 garden apartment projects. On the average they have provided about 130 dwelling units each, have been valued at about $5,000 per unit and have been rented for about $14.50 per room per month—far above the financial reach of the defense housing market. Pulling these averages down is this significant rental project in the industrial (American Viscose Co.) town of Front Royal, Va.—about 65 miles southwest of Washington, D. C. Smaller in every respect, Front Royal Gardens contains 44 dwelling units, is valued at $194,400, or $4,354 per dwelling unit.
and rents for only 88.12 per room—a near record for the entire FHA program.

Situated on a 3.75 acre site with a 20 ft. drop along its narrowest (320 ft.) dimension, the project illustrates an interesting use of several building sizes. There are six one-family detached houses which spring from four basic plans, eight four-family buildings which spring from two basic plans, and one six-family building. The fact that six of the four-family units are comprised solely of one-bedroom flats contributes importantly to the project's low cost. In addition there are eight four-room units, twelve four-and-a-half room units.

Construction outline: foundations, 8 in. brick walls and 12 in. piers on concrete footings; exterior walls, typical stud construction finished on the outside with asbestos siding, on the inside with lath and plaster; roof, asbestos shingles (note snow covered appearance of roofs, left) atop 30 lb. felt; insulation, 4 in. rockwool in top floor ceilings. Each dwelling unit is individually heated, the equipment being housed in a utility room. There are no basements. Architect: A. R. Clas. Contractor: E. Newton Snider. The Federal National Mortgage Assn. holds the FHA-insured mortgage originally amounting to $804,000—about 77 per cent of the project's value.
One of the lowest rent projects ever built without public subsidy, this 19-acre, 82-family row house development was sponsored by Little Homes, Inc., financed by two life insurance companies with $215,000 of FHA-insured mortgages covering about 75 per cent of its $295,000 value. Its uncommonly low rents, averaging $9.50 per room per month, contributed to the fact that the 82-family dwelling units were 100 per cent rented prior to completion last Spring.

Ranging in size from two to eight units, Little Homes' 25 buildings contain 29 three-room units which rent for $30, 30 three-and-one-half-room units at $34.50, 23 four-room units at $37.50. The site also makes room for adequate parking space, pre-school playgrounds, and utility houses for maid service. Rents exclude the cost of electricity for cooking, refrigeration and lighting and fuel oil for the individual recirculating forced air heating system with which each apartment is equipped.

Low costs resulted from heady planning and design rather than from the material used, a point readily proved by these construction details: foundations of 8 in. concrete blocks atop concrete footings; exterior walls of 4 in. cinder block tile veneered with 4 in. brick; lath and plaster ceilings insulated with rockwool; steel casements screened outside with bronze mesh in metal frames; inside with Venetian blinds; copper tubing for water lines. Each of the 82 dwelling units cost about $3,600 including land. Architect: Chas. W. Connelly. Contractor: Blythe Bros. Construction Co.
TWO-FAMILY DEFENSE HOUSES built with USHA funds for Pensacola, Fla., naval airmen.

Scheduled for completion on December 4, eighteen weeks after its approval by the President, Moreno Court will be the second of the USHA's 21 defense housing projects to be completed under forced draft by construction crews working day and night. (For defense project No. 1, see p. 438). Its occupants will be the families of Navy civilian employees in nearby shipyards, and despite the absence of Federal subsidies, will pay an estimated monthly rent of only $16.40 per dwelling unit plus $4.48 for utilities.

Comprised of 100 one-story two-family buildings, the project covers 26 acres of formerly vacant land purchased by the local housing authority for $15,200 or $594 per acre. Total cost of the project including land will approximate $646,211, or $3,331 per dwelling unit.

Construction outline: foundations, 8 in. brick; first floor, concrete slab on fill; exterior walls, 8 in. cavity brick (4 in. brick on exterior, 2 in. air space and 2 in. brick plastered on interior); roof, 2 x 6 in. wood trusses, asbestos cement shingles; partitions plastered gypsum board on strips nailed to bottom chord of trusses; heating equipment, individual gas-fired space heaters and hot water heaters. Architects: Yonge & Hart. Contractor: Dyson & Co.
Congress gave USHA authority to develop defense housing projects on June 28 by modifying the legislation behind its slum clearance program (see p. 441). One month later ground was broken in Montgomery, Ala., for the first such project, and its first units were opened last week to accommodate families of the increasing personnel of the Army's nearby Maxwell Field. A 494-family, 43.4 acre addition to a previous low rent project (Riverside Heights—see site plan, right) undertaken by the local housing authority with USHA financial assistance, the defense project is called "Cleveland Courts," contains 170 three-room units, 170 four-and-a-half-room units and 84 five-and-a-half-room units—all of them in one-story row houses ranging in size from two to six units. Reflecting the complete absence of Federal subsidy, estimated rents will average $18.86 per unit per month plus $3.84 for water, electricity for lighting and gas for cooking, individual space heaters and hot water heaters.

Construction outline: foundations, terra cotta tile; exterior walls, 6 in. speed tile veneered with 4 in. brick damp-proofed and plastered inside; floor, concrete slab on fill; roof, asbestos shingles; partitions, 2 in. solid plaster, ceiling, metal lath and plaster. Total estimated cost, including $151,120 for site acquisition: $1,573,835, or $85,712 per dwelling unit. Architect: Moreland Griffith Smith. Builder: Algernon Blair.
TWO-STORY ROWS AND FLATS
of unusual construction in the first West Coast public housing project.

Not a defense project, San Francisco's Holly Park is significant because: 1) it is the first USHA project to be completed (June 1940) west of the Rockies; 2) it admirably solves the problem posed by a steeply sloping site; 3) it is of reinforced concrete construction; and 4) its exterior treatment has a refreshing Modern flavor.

Only about 36.5 per cent of the small (2.68-acre) formerly vacant site is covered with the ten two-story buildings, but the project makes room for 118 families in three-and-one-half, four-and-a-half and five-and-a-half room flats and row houses. Construction outline: foundation, 8 in. concrete; exterior walls, reinforced concrete (8 in. first story, 7 in. second story) with furred metal lath and plaster inside; first floor, 5 in. framed solid slab; roof, flat wood truss; partitions, 2 in. solid plaster; floor finish, asphalt tile and linoleum. Total cost, including $70,615 site acquisition: $548,772, or $4,651 per dwelling unit. Rents: $13.78 per unit plus $.34 for water, electricity for lighting and gas for individual space heaters, hot water heaters and cooking. Architect: Arthur Brown, Jr. Contractors: Barrett and Hilp.
TWO-STORY ROW HOUSES AND FLATS in Omaha, Neb. A 522-family USHA project with

Admirably adapted to the gently sloping site from which it takes its name, South Side Terrace is one of the largest low rent slum clearance projects built under the USHA program. Its 522 dwelling units are contained in 54 two-story buildings aligned, for the most part, parallel to the contours of the 26.2-acre site. Unit floor plans (right) are repeated to produce:

- 20 2-room flats
- 122 3½-room flats
- 244 4½-room row houses
- 90 5½-room row houses
- 16 6½-room row houses

Cost saving site plan details worth noting in the panorama above: 1) location of service walks close to buildings, eliminating connecting walks to front and rear stoops, 2) continuous clothes lines parallel and adjacent to rear service walks, 3) central garbage collection stations to which tenants must bring their refuse. Construction outline: exterior walls 4 in. double-size brick, 4 in. air space, 4 in. tile (or concrete block in basement) plastered direct; floors, steel joists, hollow tile and concrete on continuous wall beam covered with asphalt tile (except kitchens and bathrooms, linoleum); partitions, solid plaster; roofs, flat, 4-ply tar and gravel with 16 oz. copper cornice. Formerly a "partial" slum, the site cost the Omaha Housing Authority $293,364, helped to boost the total project cost to $2,679,416, or about $5,170 per dwelling unit. Rents reflect large Federal and municipal subsidies, average $13.35 per month per dwelling unit, plus $7.82 per month for utilities. Heat is supplied from a coal-fired four-boiler central heating plant. Architects: N. R. Brigham and J. M. Nachtigall. Contractor: Peter Kiewit Sons Co.
The wall construction provides five apartment sizes.
Two-story rows and flats cut a well-studied site pattern in Houston, Texas.

Convincing proof that the most economical form of housing—the two-story row house—can also be an attractive form is Houston's USHA project, "Cuney Homes." Of course, the buildings' admirable clean facades are complimented by the large trees which already graced the formerly vacant site, but good architecture contributes much to the pleasing overall appearance. Layout of the 62 buildings was influenced strongly by local wind and sun conditions. Thus, during spring months the prevailing breeze is from the south; during summer months, from the southeast. Since all buildings face generally north and south, they capitalize on this wind condition.

The project's 360 dwelling units are comprised of 108 three-and-a-half-room flats, 140 four-and-a-half-room duplexes, and 34 five-and-a-half-room duplexes. Rents average $13.03 per unit plus $2.16 for water, electricity and gas fuel for individual space heaters, hot water heaters and ranges. Total cost, including $79,880 for site acquisition: $1,498,143, or $4.26 per dwelling unit. Architects: Stayton Nunn-Milton McGinty. Contractor: R. F. Ball Construction Co.
Construction outline: foundations, concrete grade beams; exterior walls, 4 in. clay tile veneered with 4 in. brick plastered (except in bathrooms) above 4 ft. 6 in. height on inside; first floor, concrete joists and slab; roof, flat five-ply composition; partitions, 4 ft. 6 in. wainscot of terra cotta tile with plastered 3 in. tile above; ceilings, painted concrete. Note cantilevered entrance hoods and stoops in photograph, left.

ONE- STORY ROW AND TWIN HOUSES in USHA's lowest cost Northern project.

On the basis of the construction contract awarded two months ago, the Fort Wayne (Ind.) Housing Authority is building the lowest cost USHA project in the North. Total cost of the 120-family development, including the $4,260 acquisition cost of the 17.5-acre site, will come to $335,066, or only $2,792 per unit.

Strict economy began with the site planning. To take the greatest advantage of existing city streets which surround the site and to minimize the length of new interior streets, sidewalks, driveways and utility lines, the dwelling units were laid out in groups around the site's perimeter, leaving the central portion for recreational and garden space. Another major cost saver is omission of foundations except for a few buildings which are located on uneven grade. Instead, reinforced concrete floors with integral footings are set directly on ground fill. Typical wall section, inside-out: unpainted, tinted plaster, gypsum lath, 2 x 4 in. studs, waterproof insulating board, asbestos siding factory-cut from large standard sheets into wider-than-average "clapboards." Roof: heavy asphalt shingles.

Repetition of one basic plan has produced 27 two-family buildings, eighteen three-family buildings and three four-family buildings. And, in several buildings a two-bedroom addition has been sandwiched between two basic units (see plan, left). Communicating doors between all dwelling units permit considerable flexibility in apartment sizes—from three to seven rooms in conjunction with the two-bedroom addition. Architect: A. M. Strauss. Contractor: Max Irmscher & Sons.
COMPANY HOUSING in Bayport, Minn., costs $2,180 per unit, rents for about $7.10 per room.

Due to poor planning and paternalism, company housing has suffered much criticism, has become almost a thing of the past. Last year, however, in the one-industry (window making Andersen Corp.) town of Bayport, Minn., it was revived in a new and improved form. Andersen’s President Fred Andersen interested a group of local businessmen in his housing idea, formed Bayport Realty Co., raised $24,000 via common stock sales to 100-odd residents and a $14,000 ten-year loan at 5 per cent, then spent the money on an eleven-unit housing project designed by St. Paul Architects Slifer and Cone. The 150 x 40 lot cost $700. Unusual in design (the shower is in the basement along with a pot-type oil-fired hot air heating unit and a one-car garage), the units are all identical but rent for $120.50 to $150.50 per month depending on location, produce a gross annual income of $18,820—enough to pay the sponsoring company a comfortable net return. Stockholders have agreed that no dividends will be paid until the mortgage, requiring $100 monthly interest and amortization payments, is at least 50 per cent retired.

The buildings are of typical wood frame construction atop concrete block foundations. Builder: C. A. Anderson & Son.
With the exception of costly college buildings, dormitories are few and far between. However, the national defense program will call for many of them, particularly where temporarily employed, unmarried industrial workers demand "temporary" housing (see p. 468). In Southern States, such a demand might well be met by buildings similar to these, built by the National Youth Administration at its Resident Center in Hattiesburg, Miss.

As shown in the airview, the four dormitories are only part of a larger project including shop buildings, a mess hall, library-classroom, and administration building. Accommodating 42 persons each, the dormitories are identical and were field prefabricated and erected at a labor, material and supervision cost of about $9,420 each. The labor was youth. Construction outline: foundations, concrete piers 8 ft. o.c.; structure, 4 x 6 in. wood columns over piers; exterior walls, prefabricated demountable plywood panels 4 ft. wide; roof, low pitched panel construction covered with glue, canvas and white lead. Exterior balconies take the place of interior corridors which would have cut off light and air circulation; second floor balconies also perform the function of projecting roofs protecting the continuous fenestration on the buildings' south sides from direct summer sun. The pleasing modern appearance of the dormitories results naturally from their simple construction.

Chief architect and director of NYA's construction program is David R. Williams, who, through his modern architecture, is attempting to "make 'youth' and 'modern' synonymous." A more complete presentation of this program's accomplishments is scheduled for a subsequent issue of The Forum.
A PLANNED COMMUNITY in Ohio provides housing, shopping, school and recreation facilities.

When, for reasons of military strategy and civilian safety, Government decides to erect a huge arsenal or a powder loading plant at a sizable distance from a population center, it may be forced to develop a complete community to go with it. If the plant is to serve solely an emergency purpose, the community would logically be "temporary" and its construction would be of the same character. If, however, the plant is a permanent part of a long-range plan to maintain military preparedness, the community might well be of a more substantial form—not unlike Greenhills, Ohio, pictured to the right. Situated about 11 miles north of Cincinnati in the direction of the machine tool city's industrial growth, Greenhills is the result of an experiment conducted on three fronts (the other two: Greenbelt, Md. and Greendale, Wis.) by the Resettlement Division of the Farm Security Administration. It was built during 1936, 1937 and 1938 with relief money as part of the New Deal's huge relief program and, as such, its primary goal was to put men to work and its ultimate cost was sky high and meaningless. (Total cost less FSA-estimated relief labor allowance: $9.9 million. Dwelling facility cost per unit, excluding utilities and landscaping: $6,780.) Incidental accomplishments include, 1) the development of an interesting community plan unrestricted by land costs and dimensions and 2) the construction of 676 dwelling units and community buildings ranging in size from a small bath house to a three-story school. The project was aimed at comparatively low incomers who might fill any of the 80,000 jobs estimated to be within a 40-minute radius. It hits the target with the aid of heavily subsidized rents averaging $57.62 per dwelling unit, or $8.52 per room per month, excluding heat and water. Due to a shortage of funds, Greenhills' construction program was cut short when only 676 dwelling units plus a school, a swimming pool and half the shopping center had been completed. As shown in the complete site plan, right, there is room for several times as many buildings. The entire proposed site plan, however, is the most significant part of the project. It shows that, to minimize the traffic hazard, only one through highway was permitted to pass through the 5,900-acre tract and that but few project streets intersect this highway. A circuit road provides access to all the best building areas within the community's corporate limits (a 782-acre area—the balance of the acreage is in the surrounding protective "greenbelt") while secondary roads and cul-de-sacs reach in to service individual building sites. Note that all residential buildings were placed close to these arteries to minimize utility line costs and create maximum interior block park areas upon which all buildings face.

NOVEMBER 1940

SCHOOL

SHOPPING CENTER

RECREATION
that is not provided on reservations by the War Department will be built in its behalf by other Government agencies. Private capital will supply only a comparatively small part. The same is largely true for the housing of families of naval and flying officers. And, in these cases the whole housing problem is less acute, for the officers as a rule are better paid and are much smaller in number than in the Army. Moreover, the biggest part of the Navy’s housing demand comes from the families of civilian employees who fall in the industrial defense category discussed above.

RENTS AND PRICES

In view of these average income statistics, private enterprise may serve the defense industry with three major projects: (1) the construction of rental housing, (2) the construction of saleable housing; (3) the construction of temporary housing. Moreover, the biggest part of the Navy’s housing demand comes from the families of civilian employees who fall in the industrial defense category discussed above.

RENT VS. SALE

Under normal conditions, about four out of ten families in the $1,000-$2,000 annual income group own their homes. Among industrial families the percentage is probably smaller. Thus, despite the recent trend toward home ownership, it is safe to say that the biggest part of the current defense housing demand is for rental housing. High incomes may buy real estate as a hedge against inflation, but the instability of employment for industrial defense workers will prompt them to rent rather than buy. All Government-financed defense housing will be built for rent.

TEMPORARY VS. PERMANENT

Since the defense housing problem arises from population shifts, it follows that when the emergency is over some of these families will drift back to their original home towns, carrying with them the housing demand. In other words, part of the present defense housing demand is of a temporary, unstable nature, and “temporary” housing is the logical solution to the problem. This type of demand occurs predominantly in localities whose industries are almost exclusively of the real “war baby” (powder production, shell loading, etc.) variety.

Despite its widespread use, the term “temporary housing” is a misnomer. What this specialized demand calls for is housing which can be built quicker, more cheaply and with a higher salvage value than ordinary housing. It should be either unfinished housing which may be completed at a later date to serve an ordinary housing market or it should be demountable housing which may eventually be knocked down, reassembled to serve another market. In the former case, the initial short life of the housing might dictate the temporary use of soft wood floors, roll roofing, painted but uncovered wallboard on the exterior, post foundations, omission of interior paint and trim, etc. In the latter case, prefabricated units should appear to be the logical answer. In both cases, “temporary” housing will be built almost universally with Government funds.

BULK VS. LOCAL

Bulld of the industrial defense housing need, however, may be supplied with “permanent” construction, for, defense program or no, there will always be a demand in well-established industrial communities for good low rent and low cost housing.

NEW VS. OLD

Contrary to the beliefs of some, the demand is not for new housing but housing—old and new. It is obviously important that the existing supply of suitable dwellings be used to the utmost possible to provide new buildi ng for some 26.5 million dwelling units in the country today, and, although there are more than enough families to go around, some of them are “doubled up” (two or more families to a unit) with the result that many dwelling units are overcrowded. According to recent Census statistics (covering 357 cities) the country as a whole, 1.3 million units, 4.8 per cent of the total, were vacant on April 1, 1940. But, this is an unreal picture of housing conditions. In the first place, due to defense-influenced increases in employment, the number of single-working families are not likely to diminish, and in the second place, the impact of the defense program on housing. Also disturbing the housing supply picture is the fact that the Census statistics include resort and other seasonally occupied houses, many of which were normally vacant in early April. Moreover, according to real property inventories conducted between 1934 and 1936 in some 200 representative communities, 10 per cent of all vacant units are unfit for use and another 24 per cent are in need of major repairs to prevent them from becoming uninhabitable. Finally and unfortunately, these vacancies are spread all over the country, not concentrated in defense communities, and most of them are above the financial reach of defense workers.

Nevertheless, a substantial part of the defense housing demand should and can be met by filling vacant dwellings, both old and new, near the industrial centers of the defense industries.

During World War I, some 70,000 workers were housed in this way. Government commutation subsidy being provided in many cases to tap vacancies in outlying areas. Today, vacancies in still greater radii may be tapped, for the number of automobiles has increased from 2.3 million in 1915 to 26.2 million in 1939, the length of surfaced roads from 257,300 to 1.2 million miles, and local public transit facilities (street cars and buses) from less than 32,000 to more than 59,000 miles.

The cheapest part of the defense housing program will be the immediate filling of suitable vacant units and the rehabilitation of substandard units. Since it will also be the quickest part, it obviously should be tackled first.

Rapid, efficient national defense, however, will require much more than the saturation of existing housing. Even in a community whose vacant units will meet the entire local need, it may be necessary to launch new construction. For instance, defense industries in this particular community might find it difficult to attract new workers.
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Research efforts to uncover sources of information upon the building industry's past and future roles in national defense brought roughly four times the items listed in this sixteen page bibliography. Following are those citations which seem to The Forum's editors most important. The remaining references are now being classified and will be made available, without charge, in mimeographed form if there is sufficient demand for this additional data. It should be noted that the following journal titles are those of English publications (French and German sources speak for themselves):

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- Bibliography of city planning. All phases of geological, administrative and social planning.

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Rockefeller builds again in Cleveland, intro­ducing a new steel frame. Arcy module sys­tem, economical of mass production. The Architectural Forum July '36, 70
Steel-panel prefabricated farm buildings erected in the South by Tennessee Coal, Iron & Railway Co. ill. plans the Archi­tectural Record Jan '39, 38-9
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Housing Demand

(Continued from page 468)

and retain sufficient labor if another nearby industrial center, in bidding for the same kind of labor, can offer the workers new housing. The former would require new housing to meet the competition.

Public vs. Private

In addition to supplying practically all the existing housing that can be used, private enterprise will be called on to finance the great bulk of the new construction. And, of course, private builders will handle all the actual construction whether publicly or privately financed. To fill its part of the estimated total need of 900,000 dwelling units, Government has appropriated only $250 million. Along with about $231 million of old USAH money this is enough to pay for only about 80,000 dwelling units at an average cost of $3,500. To private capital's initiative is entrusted the remaining 120,000 new dwelling units which, on the same basis, would involve a total investment of $420 million. In brief, the projected defense housing program of new construction as presently visioned is about 40 per cent public, 60 per cent private.

Unless private enterprise cannot or will not do its part, Government will supply only that part of the demand that is of a "temporary" or special nature—housing in which private money is not interested.

In the main, Government's field includes housing for families of Army and Navy men, families of really low income defense industrial workers and families whose housing demand is 100 per cent "temporary." Private capital's field includes houses for the great majority of workers who can afford its prices and rents in communities whose housing demand is stable.

Housing Types

As mentioned above, to meet the demand, housing must be offered at low prices or rents, and must therefore be built at low costs. This, in turn, defines the size and types of housing to be built. Except in isolated instances, the program calls for dwelling units containing a living room, a kitchen, dining space, which for economy's sake will usually be combined with the kitchen (where rock bottom costs are necessary), plus one, two or three bedrooms. Biggest part of the demand in both rental and sale housing will be for two-bedroom units ("Worker vs. Family," p. 468). As far as private housing is concerned; dimensions of all these rooms as well as construction details will be ruled largely by FHA's loan insurance requirements.

(Continued on page 60)
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Housing Demand

(Continued from page 58)

Into the vast defense housing pattern, fits practically every type of housing. Most builders have at least a passing acquaintance with all types. Only a few are familiar with the low cost variety of each type—the variety required by the defense program. Herewith a discussion of the types:

- One-family house—Of prime importance in defense industrial areas where the demand is stable, this type will be built primarily for sale. However, private capital will do well to reconsider its use in predominantly rental markets—a practice which has been largely discontinued during the past decade. While, from a cost standpoint, size of the basic dwelling unit should be kept to a minimum (usually four rooms and a bath on one floor), in many cases it may be wise to include one or two extra bedrooms which the purchaser may temporarily rent to roomers. Reasons: 1) the rent will offset part of the purchaser's monthly costs; 2) one or two unmarried defense workers will be supplied with housing—at least a step toward the solution of a tough problem; 3) the extra finished space is a hedge against increases of the purchaser's family. While it is more economical to build a two-bedroom house (with second floor bathroom) on two full stories, current design trends will probably dictate that the extra rooms be provided in the attic of a one-story unit. (For examples, see pp. 444-455.)

- Two-family house—If the reasoning behind the extra space in a one-family house is carried further, it naturally leads to a two-family house in which the dwelling units are either side by side or one atop the other. Chances are that the defense housing demand will revive the popularity of this building type, boost it up closer to the prominent position it enjoyed during the Twenties. In that decade the two-family house accounted for about 16.2 per cent of each year's crop of dwelling units in a representative sample of 257 cities; in booming 1924 the ratio went to a peak of 21.4 per cent. Depression cut it sharply to a low of 4.5 per cent in 1936 from which it boomed to 6.3 per cent in the recovery year of 1937. This year's statistics will probably show another advance—to at least 7.5 per cent—and the expected inflation of national defense economy should continue the upward cycle. (For examples, see pp. 447, 448, 457 and 463.)

- Row house—In addition to being the common form of sale housing in many communities (notably Philadelphia and Baltimore), the row house is the most satisfactory building type for low rental housing. Reasons: it is economical to
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HOUSING DEMAND

(Continued from page 60)

build; economical to operate. (For examples, see pp. 456-457.)

► Garden apartments—A comparatively new type of housing, the low-lying garden apartment project has quickly become the accepted pattern for moderate to low rent private housing and should play a big part in the defense program. Essentially a super-block grouping of row house buildings, it enjoys the construction and operation economies of its component parts and offers tenants many amenities not obtained in multi-story projects. (For examples, see pp. 454-456.)

► Multi-story apartments—Because dwelling units in multi-story apartments cost more, take longer to build and involve comparatively high operation and maintenance costs, they will not figure importantly in the defense housing program. Exception: where high land costs dictate high densities and where high wages prevail, higher buildings and higher rents may be warranted.

► Dormitories—To supply quickly an urgent but temporary need for single worker housing, Government may be forced to build some dormitories. They will surely be of a "temporary" nature, will probably be of prefabricated, de-mountable construction. (For example, see p. 463.)

► Company housing—Although provision of housing by manufacturers for their employees has almost become a forgotten practice during Depression, there is a definite place for it in the defense program. Whether for sale or rent, with or without subsidy, this form of housing eliminates speculation, entails small profits and is therefore cheap. Moreover, it is undoubtedly the surest way for a manufacturer to get housing for his employees and to insure small labor turnover. Such projects may include any or all of the various building types already discussed. (For example, see p. 464.)

► Communities—In isolated instances it may be necessary to plan and erect an entire community with shopping, recreation, and administration facilities to service a wide range of housing types. Need for such a community might arise through Government's announced intention to foster the decentralization of industry—sentiment that the Government might possibly lead to a strategic location of a nest of defense industries. If their existence were planned as temporary, the community would obviously be of the same nature and would logically be built with Government financing. On the other hand, if the industries offered long range employment, construction of the town might prove inviting to private capital. (For example, see p. 466.)
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**HOUSING LEGISLATION**

(Continued from page 441)

localities where the President (presumably upon advice of the Defense Housing Coordinator and perhaps the Federal Housing Administrator) has determined that the needed housing "would not be provided by private capital." Other strings attached to the legislation will require that contracts with builders be of the cost-plus-fixed-fee form, that the maximum average cost per dwelling unit be $3,000 ($4,000 outside continental U. S.) exclusive of expenses for administration, land acquisition, public utilities and community facilities, that the cost of no single family dwelling unit exceed $3,900 ($4,700 outside) exclusive of the same expenses, that the community facilities in each project be limited in cost to 3 per cent of the project's total, and that labor be paid prevailing wages with time-and-a-half pay for work in excess of eight hours per day.

After construction of the projects, the FHA administrator is authorized to let Government personnel, private companies or local public agencies maintain, operate and administer and eventually dispose of them. In all cases, however, FHA will fix the rentals which must be within financial reach of defense employed families, but need not equal the projects' economic rents. To the extent that they do not, the FHA housing program will be Government-subsidized. Probability is that PBA will handle the bulk of the $140 million program which, all told, is expected to produce some 40,000 dwelling units. Possible but not probable, however, is the participation of both USHA and Farm Security Administration (Government's experienced specialist in low cost rural and prefabricated construction) as well as the Army and Navy in FHA's distribution of the $140 million. From all indications, it is equally improbable that any of this money will be used for rehabilitation of existing housing, despite Congress' authorization of such a program.

The act also permits FHA 1) to place under this legislation any funds that other Federal agencies may wish to turn over to it and, conversely, 2) to distribute any of its funds to other agencies for defense housing purposes. As already mentioned, this open door has been used to advantage by both the Army and Navy — the former gave $45.7 of its funds to FHA for keeps, the latter gave all of its $44 million to FHA only to get it back again.

Net effect: practically all of the $100 million Army-Navy housing funds, as well as the $140 million FHA housing funds will be disbursed under the more lenient terms (particularly with respect to maximum unit costs) of the FHA housing act. Terms of the Army-Navy housing act have been cleverly sidestepped and therefore mean nothing.

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HOUSING PROCEDURE
(Continued from page 443)

and prospective housing bottlenecks, the housing coordinator's hirelings, pending development of local organization, spent last month totaling defense contracts awarded in each U. S. city, comparing the sum with the city's industrial capacity as shown in the 1937 Census of Manufacturers, and flashing to Boss Palmer as a potential housing trouble center the name of any city in which the defense contract total reached 25 per cent of manufacturing capacity. Fortwith, a housing investigation is launched either by local authorities or by a special trouble shooter dispatched from the Coordinator's office.

When the necessity for new housing is officially established, FWA moves into the picture, disperses some of its $140 million through any one of four separate channels: 1) construction by the Army or Navy, 2) construction by USHA, either directly or through local housing authorities, 3) construction by the Farm Security Administration or 4) construction by PBA, either direct or through local housing authorities. While Washington defense houses were still in a fog fort­night ago as to how the $140 million would be spent, good guess is that channel No. 4 will be used almost to the exclusion of the other three and that most of the money will go directly through PBA to private builders without the intermediate assistance of local housing authorities.

(Thus, the pattern for this 40,000-unit program would be similar to PBA's Army housing assignment—see above.) To help clear the fog, FWAdministra­tor Carmody at month's end asked his Assistant WPA Commissioner, Col. Lawrence Westbrook, to serve as director of FWA's defense housing program.

Private enterprise has 60 per cent of the defense housing problem—an estimated $840 million worth—to solve, but, for lack of local organization (see p. 442), has no established procedure to aid it. Unless and until local housing surveys are complete and the resultant facts are in the hands of a local central committee (as well as the national coordinator), the local architect, builder, realtor, material dealer and financier must rely largely on his own initiative to help the program along and help himself. Some needed advice may be had from local manufacturers, Army and Navy officials and municipal housing authorities. Moreover, in some communities the defense housing demand is so acute that even the uninformed can recognize its size and character.

Next to the lack of local defense housing organization, the absence of Government cooperation and coordination in the production of the 120,000 dwelling units required of private enterprise is the biggest bottleneck in the housing program.

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BACKDROP: WORLD WAR I
(Continued from page 329)

Convinced that private enterprise could not do the task without Federal assistance, the Corporation set up a housing department, started one project, promoted several improvements in transportation of workers. Lacking power to acquire land, it hesitated to go further without first getting Congressional approval. Early in January it requested a $80 million housing appropriation, went boldly ahead with a few projects as housing shortages grew more alarming.

Adding to the general legislative confusion, other Government agencies began to enter the housing scene. The Army's Ordnance Department, out of its general production appropriation, loaned money for six projects located near isolated explosive and bag-loading plants. The Treasury, through its War Finance Corporation, pondered plans for industrial housing. In February the Secretary of Labor undertook to centralize all housing activities in the Labor Department, appointed Builder Eidtz, director of its new Bureau of Industrial Housing and Transportation, prepared a bill supported by the Army and Navy authorizing the President to spend $100 million for war housing (an increase of $50 million over the Defense Council's request).

Congress diddled over the legislative tangle. Finally the appropriations were made. In March 1918 the Emergency Fleet Corp. got its $50 million for housing (later increased to $75 million) plus another $20 million for improvement of transportation facilities. Early in June the Labor Department's new Housing Bureau was given $50 million plus an additional $10 million for housing Government workers in the District of Columbia. A month later this appropriation was upped $40 million and the Bureau formally became U. S. Housing Corp. Total appropriations for workers' housing: $195 million.

Funds, however, were not made available until late in July—ten months after the National Defense Council's first recommendation for Federal funds, less than four months before the Armistice. Action came too late to consolidate the housing work under a single agency.

U. S. Shipping Board. Powers voted by Congress to the Emergency Fleet Corp. were broad. It was authorized "to purchase, lease, requisition, or otherwise require, and to sell or otherwise dispose of improved or unimproved land, houses, buildings." Loans were to be made for a period not exceeding ten years. It could not take cost-plus contracts, however, without fixing the construction price in advance. Moreover, all powers were to come to an end with the war's end.

Well heeled with its $75 million appropriation, the Fleet Corp. operated like a banking house, seeking to lend funds on safe security while at the same time pushing projects forward as rapidly as possible. Although only a lender of Government money, the agency nevertheless exercised powers typical of ownership. Under each mortgage it reserved the right to control the project's rentals, sales, management. It also approved the selection of architects, engineers and contractors, besides determining the amount of their compensation.

Main policy, however, was to avoid placing the Government in the building or landlord business directly. To this end the Fleet Corp. first sought to determine whether local housing shortages could be relieved by providing transportation to less densely populated areas nearby.

Schedules were revised, special trains run, street car lines extended, ferries operated. In providing such facilities, private companies did all the work. The Fleet Corp. merely advanced funds at 5 per cent, demanding repayment of 75

(Continued on page 74)
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per cent of the loan within five years after the war's close and absorbing the remainder as an outright subsidy. Its accomplishments on this approach to housing are noteworthy: ten days before the war ended some 60,000 ship workers were commuting on sponsored lines, a month later the total had more than doubled. The completed program would have accommodated 184,000 workers.

Besides arranging for shipyard employees to live at a distance, the Fleet Corp. requisitioned about 400 old houses to prevent workers being gouged by rent-greedy landlords. Only when measures like these failed to relieve the short­age was money advanced for new houses.

On each housing project a realty company served as the shipbuilder's subsidiary. Improved land usually had to be supplied by the shipbuilder and title turned over to this company. (In some cases, where the asking price was ex­cessive or delay would have occurred, the land was requis­itioned.) The realty company then mortgaged the property to the Fleet Corp. for a 10-year loan at 5 per cent, pro­ceeded with construction and renting of dwellings. Dividends on its stock were limited to 5 per cent until the loan was repaid, to 6 per cent thereafter. If revenues were not suf­ficient to meet carrying charges, then the Fleet Corp. could have the property appraised within two to five years after the war and absorb a maximum write-off of 30 per cent on the mortgage in recognition of high wartime costs.

By October 1918 housing funds had been allocated to 22 shipyards and one turbine plant. A substantial number of workers were already living in new quarters. However, two of the authorized projects had not started construction when the Armistice intervened: these were canceled, two others cut down in size. Otherwise the program was carried through as originally planned. Total output: some 8,900 private houses, 830 apartments, a sprinkling of dormitories, boarding houses and hotels, accommodating altogether about 28,000 workers.

U. S. Housing Corp. Off to an even later start, the Labor Department's housing agency scored a still less impressive record despite its efforts to get workers properly sheltered before the war ended. Five months elapsed from the time the Bureau of Industrial Housing was set up until it ac­quired its $60,000 million appropriation from Congress and became incorporated under New York State laws.

Fortunately, the Bureau had obtained a $60,000 advance from the President's general fund to get together a small staff of experts, investigate housing needs, earmark allot­ments, draw up standard plans, propose contract forms, frame financing and operating policies. As soon as funds became available, everything was ready to start construc­tion of houses in communities where the need was greatest.

First big question was what type of housing to build. Bar­racks could be thrown up quickly. Unmarried workers, it was decided, should therefore be housed in temporary dormi­tories fitted with individual sleeping rooms and common recreation rooms. However, manufacturers reported that it was impossible to hold married skilled workers even in the best equipped dormitories. For this group it was neces­sary to build houses for family occupancy. Durable rather than temporary construction of such houses was agreed on as a general policy. Reasons: less likelihood of deterioration, greater protection against weather, higher salvage value.

Next step was to draw up minimum standards covering room sizes, materials, lighting, ventilation, heating, sanita­tion, fire prevention. Armed with a manual of standard instructions, the Bureau's architects then prepared standard
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BACKDROP: WORLD WAR I

(Continued from page 74)

house plans in the hope of reducing costs through large-scale construction.

Most difficult question to answer, however, was the best way to disburse the anticipated appropriations. Plans considered:

1) Supervised loans to local builders through local lending institutions. Strikingly similar to current FHA procedure, this scheme called for 15-year, 5 per cent amortized mortgages up to 80 per cent of total cost. In return for control over design, construction, sale or rental prices, the Government would assume excess war costs. Objections to plan: necessary speed could not be obtained without excessive speculation profits; supervision would be difficult; advantages of standardization and quantity production would be lost; builders might not be available in sufficient numbers; priority orders for materials, comparatively simple to handle in the case of a single large contractor, would involve almost endless complications in the case of many small local builders.

2) Supervised loans to a single housing corporation to be formed in each locality and operated with limited dividends. Resembling the Fleet Corp.'s plan, this scheme required a local equity of 20 or 30 per cent. Chief objection was the idea's newness: public housing and limited dividend companies were still virtually unknown. In many places the equity could not be raised; in others, unsuited land might be unloaded on the Government, or the manufacturer with war orders might be the only one able financially to underwrite the housing company. Workers, it was pointed out, would be likely to object to any company housing.

3) Direct Government construction and operation. Just about the time the Housing Corp.'s staff had concluded Plan 2 was the speedier and more efficient, the entire debate was cut short by the Secretary of Labor's use: "The Government will build, own, control and rent the houses until after the war."

New building was undertaken, however, only where it was impossible to obtain sufficient housing facilities by other means. Investigators were dispatched to find whether war contracts were being delayed because of housing shortages. Estimates indicated a need for housing almost 300,000 workers in some 70 cities. Then a Homes Registration Service, utilizing local police and mail carriers, undertook quick surveys of vacancies in about 150 communities. Rentable dwellings were listed and classified. Thus, over 70,000 workers were placed. Rent-a-room campaigns helped many others to find quarters. Local committees also cracked down on rent profiteers by threatening unfavorable publicity. Helped owners of old vacant houses to make repairs, secured priority orders for materials for private builders to put up new houses.

Private enterprise was encouraged in this manner to build approximately $45 million worth of houses, accommodating roughly 30,000 workers (figuring two to each private dwelling). Vacant properties in Washington and elsewhere were requisitioned for another 2,500 workers. Transportation facilities were subsidized and improved to bring housing in neighboring areas within reach of 8,000 more. Altogether about 110,000 workers were provided homes without the Housing Corp.'s spending any money on new construction.

Certain communities nevertheless required immediate house building. Land was appraised and bought; if delays occurred, it was requisitioned. A trio of designers—representing architecture, municipal engineering, landscape architecture—worked jointly on each project. Plans ready, the Housing Corp. then purchased prior-fixed materials through

(Continued on page 78)
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BACKDROP: WORLD WAR I (Continued from page 76)

the Army's Construction Division, awarded contracts based on cost plus a fixed fee to the lowest bidder.

At Armistice 60 construction contracts had been let, 34 other projects were hanging over the fire. Work was ordered continued only on those undertakings where the need was still great or where the Government stood to net more salvage from the sale of finished houses than from the sale of materials on order. Fifty-four projects were abandoned, fifteen curtailed, twenty-five completed as originally planned. Later Congress ordered work stopped on all projects less than 75 per cent completed. Final figure: 87 completed projects.

First tenants moved in as the new year began, nearly two months after the war ended. The last project was not ready for occupancy until the next autumn. Total housed: about 6,000 families in individual units, about 8,000 single men and women in dormitories and hotels or as boarders in family houses.

 Costs. The Emergency Fleet Corp. spent approximately $70 million on housing and loans to municipalities and utility companies while U. S. Housing Corp. disbursed about $52 million on its projects.

Directed by Congress in 1920 to dispose of its properties as soon as possible the Fleet Corp. acquired a new headache. Shipbuilding companies refused to buy the houses at cost minus the stipulated 30 per cent write-off. None had been required to guarantee repayment of loans made by the Government to the subsidiary realty companies. Foreclosure was the only solution. Sold on the open market projects brought in prices ranging from 6 to 90 per cent of their original cost. Total salvage: roughly $25 million (about 37 per cent). Losses ran still higher however since the Fleet Corp. had to accept mortgages on most of the properties sold. These mortgages were disposed of with discounts of 8 to 20 per cent.

Likewise directed to sell its dwellings at their fair market value the Housing Corp. recovered approximately $19 million (about 37 per cent). Five projects were turned over to the Army and Navy; others were sold to prospective homeowners on the basis of appraisals made by local committees. Figuring rentals, interest, return on principal, plus sales revenue, total receipts ran to about $27 million (51 per cent of cost).

Evaluation. After the war a Congressional committee was appointed to investigate housing work. Ignoring the Emergency Fleet Corp. and other Government ventures, it went a-gunning after the Housing Corp. Findings: houses were too good and too costly. Operations too slow and too inefficient.

Undeniably, the housing was substantial and durable. Projects showed advances in house design and neighborhood planning exceptional for a period when quality was generally sacrificed for speed. The houses have lasted well; they still hold their own in looks.

More equitable perhaps is the verdict which appears in the Twentieth Century Fund's report (1940): "To judge war housing policy by the housing agencies' accomplishments would not give an adequate picture of the situation. The root of the matter lies in the period before these agencies were set up. The major deficiency was lack of planning. The two prerequisites to adequate planning are awareness of the problem and a body of relevant factual data, neither of which was present. ... Prior planning might have lessened the difficulties by enabling the housing program to go hand in hand with the defense program instead of following it."
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INDUSTRIAL BUILDING
(Continued from page 374)

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Saturation and conversion. Remembering well the disastrous over-expansion of industrial production facilities which World War I provoked, the U. S. is proceeding more cautiously today. Plants which have long been idle with Depression and which lend themselves readily to modern straight-line production systems (multi-story factories usually do not qualify) are gradually going back to work. This trend is particularly noticeable in Pittsburgh. Moreover, the U. S. is literally beating its plowshares into swords by converting non-essential industrial production to more immediate needs. Several farm equipment manufacturers are now turning out gun carriages and combat wagons. The conversion program has already accounted for a partial shift from refrigerator production to the making of airplane parts, from printing presses to howitzer recoil mechanisms, from watches to time-fuses, from vacuum cleaners to gas mask parts, from lawn mowers to shrapnel cases, and from shoe machinery to artillery guns.

Even without additional Federal appropriations for defense, U. S. industry and industrial construction will hum for many months. As far as actual expenditures are concerned, construction will probably peak in September 1941, the total program in the Spring of 1942. With higher prices—and they have already started up—and with more appropriations, manufacturers either willingly or by force will continue to expand their production facilities. Last spring the nation’s jaw dropped when the President mentioned $5 billion for defense; today the total is close to $8 billion; tomorrow it will probably go higher. World conditions remaining unchanged, not unlikely is an average annual defense expenditure of about $10 billion during the Forties. If so, industrial building will have to hold its hat.
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THE EDITORS
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FORUM OF EVENTS

(Continued from page 14)

AWARDS

J. André Fouilhoux, New York architect, has been appointed chairman of the Advisory Council of the Cooper Union Art Schools.

To Lilian Holm, Bloomfield Hills, Mich., an award for the best design in craftsmanship shown at the summer exhibition of the Society of Designer-Craftsmen, New York.

To Eliel Saarinen, Eero Saarinen and J. Robert F. Swanson for their design for the Smithsonian Institute, Washington, D. C., a Special Honor Award of the Detroit Chapter, A.I.A. This and the following Honor Awards are in resumption of the practice followed by the Detroit Chapter some years previous to 1931. To Lyndon & Smith, Detroit architects, for their Farmington Auditorium, Farmington, Mich. To Eliel Saarinen for the Institute of Science, Cranbrook Academy of Art. To Marshall Fredericks, sculptor, Cranbrook Academy of Art, for his models of bronze bas-reliefs for a government building. Honorable Mentions to O'Dell & Rowland; Hewlett & Luckenbach, Detroit architects, for the Charles Housing Project, Detroit. To J. Robert F. Swanson, architect; Pipsan Saarinen Swanson, interior designer, for the Charles J. Koehler residence, Grosse Pointe. To Albert Kahn, Detroit architect, for the Steel Rolling Mill, Ford River Rouge Plant.

To Julian Benford, Estree Worden Day and Caron Davenport the Virginia Artists Fellowships by the Virginia Museum of Fine Arts. The Fellowships, paying more than $2,000 a year, are grants-in-aid awarded on basis of merit plus need.

Thomas C. Parker has been appointed director of the American Federation of Arts, having resigned as deputy director of the WPA Art Program to accept the post.

To Henry Kreis, Essex, Conn., the commission for three sculptural groups on the facade of the War Department Building. Sixty-three competitors entered models.

To Henry Koerner, 94 year old Viennese refugee artist now living in Brooklyn, first prize of $1,000 in the poster competition conducted by the American Society for the Control of Cancer. Eight hundred entries were received. Second prize, $500, to J. T. Ross of Pittsburgh; third prize, $250, to Herbert R. Loges of New York; fourth prize, $50, to Joseph Binder of New York; fifth prize, $25, to Henry Russell of New York.

COMPETITIONS


SIXTH AMERICAN TEXTILE DESIGN COMPETITION, closing January 10, 1941. Conducted by the Fairchild Publications, New York. Further details may be had by addressing Miss Elizabeth Crawford, Fairchild Library, 3 East 14th St.

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It explains the methods of finishing and maintaining hardwood floors recommended by E.L. Bruce Co., famous hardwood flooring maker. Tells the secrets of getting a superior finish on both old and new floors. Tells how to save time, money and materials. And how to clean, wax and polish floors to new lustrous beauty.

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NEW
"Cosmopolitan" BENCH BATH

All hands agree—here's modern styling, added utility and extra value. The Bench Bath is typically Kohler in design and construction—made in one piece of rigid cast iron and finished in super-luster enamel. Three sizes—4½, 5, 5½ feet. Harmonizes with other Kohler fixtures to make smart Matched Sets. Write TODAY for latest Kohler news on fine fixtures and fittings. . . . Kohler Co. Founded 1873, Kohler, Wisconsin.

SCRATCH TEST PANEL MAKES "BRUCE-WAY" JOBS EAST TO SELL

In just a flash with this "Scratch Test" Panel, you can dramatically prove the superiority of this amazing finish. Half is finished the new "Bruce-Way." The other half is finished the ordinary surface way. Scrape a coin across both finishes. See how the ordinary surface chips away while the "Bruce-Way" finish is unaffected.

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1630 THOMAS STREET
MEMPHIS, TENN.

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PLANNED PLUMBING AND HEATING

**NATIONAL DEFENSE CANNOT WAIT**
NEW HOUSES NEEDED...

...as national defense puts thousands back to work!

DURING the rush to complete new housing, you men in the building industry must guard America against creating future slums or wasteful boom town shacks. For workers in new or enlarged defense plants, build modern housing, quickly and economically. Build comfortable, good looking but low priced houses that will uphold morale, minimize social problems and pay dividends in increased production.

For this vitally needed task, Flintkote pledges you wholehearted cooperation from distributors of its time-proved materials for new construction and rehabilitation of old dwellings. Strategically located Flintkote factories and warehouses assure prompt delivery of all types of roofing, siding, sheathing, wall board, insulation, sound deadening and waterproofing.

Special materials ranging from war-tested camouflage factory coverings to airport surfacings are also available. Flintkote's research facilities and reserve manufacturing capacity are at your service to develop materials or produce large orders.

Complete information is available from your nearby Flintkote branch office. Or simply air-mail, wire or phone your inquiry to:
DAYLIGHT BROUGHT INDOORS WITH HYGRADE FLUORESCENT!

Finest quality Fluorescent lighting—complete "packages" of daylight—
MIRALUMES!

Architects report highly successful installations!
You can now pour daylight into every corner of
any building . . . with HYGRADE MIRALUMES!
• Overhead, glare and shadows vanish, people see
better, work better, feel better! For MIRALUMES
provide more light—without harsh glare or
shadows—light 50% cooler. • And MIRALUMES
are complete fixtures—wired and ready to install.
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only Fluorescent Lighting Units made complete—lamps, fix-
tures, starters—under one roof! Designed, engineered, built,
sold complete and guaranteed by HYGRADE! Quality manu-
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factor and stroboscopic effect (flicker). Starters easily accessible.
Maintenance cost low! Underwriters Laboratory Approved.

NOTE: Extraordinary lighting efficiencies are obtained in fluor-
scent lamps, and by tuning the electric discharge to concentrate
ultra-violet energy at the precise
2537 Angstrom Unit wavelength
most effective in causing the porous
film (Hygrade patent 209:G93)
to
generate light, the best results are
secured. The means for achieving
these results as important to the ef-
ciciency of HYGRADE LAMPS,
are described in patent numbers
2126787 and 2201817 now controlled
in this field by HYGRADE. The
high power factor non-stroboscopic
circuit used in this unit is described
in Hygrade patent No. 2195114.

COMMERCIAL MIRALUME C-220: 200-
watt unit; 4 40-watt lamps, length 49".

WRITE TODAY for free MIRALUME cata-
logue, with complete information, prices,
discounts. Address Dept. AF11, Hygrade
Sylvania Corp., Ipswich, Mass.—or see
your Electrical Contractor.


FORUM OF EVENTS

(Continued from page 82)
ing Magazine, New York, from whom full particulars may
be had.

EDUCATIONAL
COLUMBIA UNIVERSITY, NEW YORK, has adopted a program
enabling graduate students in public administration, soci-
ology and economics to take housing and city planning as
a minor field of study. The new program will be admin-
istered by Professors Robert M. Haig, Robert S. Lynd,
Schuyler C. Wallace and Carl Feiss.

METROPOLITAN MUSEUM OF ART, NEW YORK. Its special
lecture series, "Study Hours on Color and Design," which
began its 24th season in September, consists of 102 gallery
talks and demonstration lectures. Lectures are given by
Grace Cornell, Dean Leopold Arnaud, Nancy V. McClel-
land, all of New York, and Dean Joseph Hudnut of Harvard
University.

HOUSING STUDY GROUP, 56 West 45th St., New York, is an
organization under the leadership of Clarence Stein and
Henry Churchill, and consists of men and women of the
architectural profession who are interested in housing. Open
forums are held about once a week with guest speakers.
Jack Wahl, Secretary, 5 East 57th St. would welcome cor-
respondence with architectural draftsmen in other cities
who would form similar organizations.

PRATT INSTITUTE, BROOKLYN. Beginning October 21, courses
in air raid precautions are being given in the architectural
department under Ering F. Iverson who has studied air
raid precautions for the past two years, both in England and
in Germany.

CALENDAR
November 1-January 2, 1941 "Art Finds a Way" an exhibi-
tion in the Brooklyn Museum demonstrating the origin and
development of production techniques in several fields.

November 11-December 31. Christmas Exhibition of Ameri-
can Designer-Craftsmen held by the Society of Designer-
Craftsmen, 64 East 55th St., New York.

November 25-December 1. Art Week to be observed at
1,000 community sales-exhibits, planned to sell American
paintings, sculpture and crafts to the American home.

December 2-7, Fourteenth National Power Show, Grand
Central Palace, New York.

December 5. Meeting of the New York Society of Ceramic
Arts, Metropolitan Museum of Art, New York. Waylande
Gregory, speaker.

February 5-26, 1941. Fortieth Annual Exhibition, New York
Society of Ceramic Arts, National Arts Club, 15 Gramercy
Park.

PERSONAL
James T. Canizaro, architect, has moved his office to Capital
National Bank Building, Jackson, Miss.

Pier L. Cherici, architect, announces the removal of his
offices from 277 Broadway, New York, to 30 Court St.,
Brooklyn, N. Y.
Because frame, floors, walls and ornament were cast as a unit, first cost was low.

Because the enclosing walls were erected as the building rose, precious time was saved.

Because of concrete's economy of first cost and maintenance, low rentals with profit were made possible.

Because of low rentals for such a smart, modern building, high occupancy was quickly attained.

This outstanding example of Architectural Concrete construction—the Kimbrough Towers, at Memphis—was designed for John F. Kimbrough, Jr., realtor, by H. M. Burnham, architect, and H. B. Hulsey, associate architect; Gardner & Howe, structural engineers; S. & W. Construction Company, contractors (all of Memphis).

Ask your architect or engineer about the advantages of concrete. Write for illustrated booklet, "The NEW Beauty in Walls of Architectural Concrete," mailed free in the U. S. or Canada, or ask for a representative to call. See Sweet's 4/48.

PORTLAND CEMENT ASSOCIATION
Dept. 11-7, 33 W. Grand Ave., Chicago, Ill.

A national organization to improve and extend the uses of concrete...through scientific research and engineering field work

Architectural Concrete...Combining architectural and structural functions in one firesafe, enduring material
You ask—

Are Round Boilers Coming Back Again?

DON'T know about other round makes.
But as for the Burnham, we are each year surprised at its sales.

In spite of the fact of its having no jacket, and not in the least doled up, a lot of folks insist on having it.

One thing sure, although it's nothing fancy to look at, it certainly does make a most satisfactory looking fuel bill. Which is something.

See Siet's. See for yourself.

BURNHAM BOILER CORPORATION
Irvington, N. Y.
Dept. J
Zanesville, Ohio
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BURNHAM BOILER

AIR-SEALED
with Brownskin

$25.00 Makes Walls Tight and Dry

Mr. Limited Pocketbook wants a warm, tight, dry house. Air-Sealing with Brownskin gives built-in basic "insulation". Saves repair and fuel bills. So long as the house lasts—Brownskin prevents the passage of wind, water, moisture, vapor.

ANGIER CORPORATION
76 WIDDELL STREET, FRAMINGHAM, MASS.

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Far superior to ordinary shaving papers because (1) Resilient with a stretch of 15%; (2) Specially treated to resist deterioration and highly Waterproof; (3) Extremely tough; (4) Windproof; (5) Dustproof; (6) Most effective economical Vapor-Seal.

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Prove
AMERICAN MATS
Are Better

... which accounts for the imposing customer list of America's Largest Manufacturers and Distributors specializing in Floor Matting

A few of the thousands who rely on American Matting include:


Offering the most complete matting service in the United States, through a trained staff of encouriers who will cooperate in solving your problems.

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Missing Copies?

For those who wish to obtain back issues cited in the Bibliography of Reference Data published between pages 56 and 57 of this issue, copies of the following numbers of THE ARCHITECTURAL FORUM are available from the publishers' reserve file:

1935: April, May, June, August, September, November.
1936: January, February, March, April, May, June, July, August, September, October, December.
1937: January, February, March, April, May, June, July, August, September, November, December.
1938: January, March, April, June, July, August, September, November, December.
1939: January, February, March, May, June, September, October, December.
1940: February, April, May, July, August, September, October.

In many cases only one or two copies of an issue are available. Orders accompanied by remittance of one dollar per copy should be sent to:

THE ARCHITECTURAL FORUM
TIME & LIFE BUILDING, ROCKEFELLER CENTER
NEW YORK, N. Y.
WHEREVER in time of Peace or in preparation for National Defense, men responsible for America's industrial, naval and military buildings have long recognized the quality of the original solid Corrugated Wire Glass manufactured by Pennsylvania Wire Glass Company.

CWG is a corrugated sheet of glass with wire netting incorporated in it during the process of manufacture. The corrugated principle increases its strength many times over an equal thickness of flat glass.

Where the problems of adequate light, sufficient ventilation, low maintenance and the factor of safety are involved, the original solid Corrugated Wire Glass offers the solution. Specify this modern and practical material for skylights, sawtooth and side wall construction.

Our engineering service department will gladly assist you with your plans. Write for our 20-page book (A. I. A. File No. 12-J) which gives complete detailed installation drawings.

PENNSYLVANIA WIRE GLASS CO.
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Specify UNI-CHECK and this is all they'll ever see!

THE MODERN CHECK THAT GAINED NEW FRIENDS BY DROPPING OUT OF SIGHT

- No Hinges
- No Unsightly Arms

Out of Sight...

There is scarcely anything about a Uni-Checked door to even hint at the existence of the rugged door closing mechanism concealed at top and bottom. Rixson Uni-Checks for single-acting interior doors, are the modern device that permits architects to give doors the same clean, symmetrical treatment as the rest of the building at no cost premium over exposed type closers.

and Out of Mind

And that’s not all. Uni-Checks are built to last—to give gentle but positive closure for long, attention-free periods. There are only 6 moving parts, no complicated adjustments. Can be installed on any interior wood or metal door in any type of floor. Require only 2 9/16" floor depth. Made in 4 capacities.

Get all the facts and a demonstration from your nearest Rixson representative; or, write direct for data sheet.

THE OSCAR C. RIXSON COMPANY
4444 Carroll Avenue, Chicago, Illinois

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PHOTOMURALS
by KAUFMANN AND FABRY

Snow-laden coolness of the north adds charm to a modern Florida home. Eastman Decorators, Inc., New York City, selected Kaufmann & Fabry to execute this unique treatment. A useful folder showing many beautiful applications of photomurals is yours for the asking. Write for it.

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425 S. Wabash Ave. Chicago, Ill.

CHAMP IN ANY PLANT

• PERFORMANCE makes a champ. And just that makes Jamison-Built cold storage doors unbeatable.

Easy operation, maximum insulating qualities, seals that seal, and time-tested durability are the built-in features of Jamison-Built doors that assure their outstanding performance.

When buying doors insist that they are Jamison-Built. Their performance is your protection. Jamison Cold-Stor Age Door Co., Hagerstown, Md.

Jamison, Stevenson and Victor Doors

(See our catalog in Sweet's Catalog File)
Here is a new and better protection against sabotage and fifth-column activities as well as natural risks of normal and defense production and storage.

The Dudley Compulsory Tour System—for Watchmen, is meeting the new and imperative demands of executives awakened to war-time risks. It is adaptable to every kind and size of industry and is absolutely dependable, simple and inexpensive. It gives complete mechanical control over watchmen's activities. It can flash or permanently record time of inspection, and warn by alarm in emergencies.

Underwriters' Approved

The Dudley System has been examined, tested and is listed as approved equipment by Underwriters' Laboratories, Inc., and also by the Laboratories of the Associated Factory Mutual Fire Insurance Companies of Boston, Mass.

Mechanical and Electrical Recordings
check, safeguard and supervise watchmen

Dudley Lock Corporation is the largest supplier of combination locker locks for schools and industry. The combinations of built-in locks can be changed almost instantly without removing any part from the locker door. Dudley also manufactures a line of key locks considered to be the most nearly pick-proof of any on the market.

Above is shown the Dudley Combination MasterKeyed Padlock which utilizes the famous Dudley 4-in-1 key that can not be duplicated on commercial key-making machines. No key blanks are sold and absolute key control is assured. At the left is a built-in combination locker lock with the same protective features. Write for full details.

DUDLEY LOCK CORPORATION
Dept. 1118 325 N. Wells St. Chicago, Ill.
Death breathes close behind many a newsman today... but nowhere closer and hotter than along "newspaper row" in Shanghai.

Before every entrance of the old and respected Shanghai Evening Post & Mercury—American-owned and just across the street from the International Settlement—stand armored cars, pillboxes, barbed wire barricades, and guards with drawn guns.

► For the terrorists who serve either the Japanese or their Chinese puppet, Wang Ching-wei, have bombed the Post plant five times, slaughtered guards, wounded pressmen, and last July murdered Samuel H. Chang, director of the Post and its Chinese edition, the Ta Mei Wan Pao.

Cornelius V. Starr, owner, and Randall Gould, editor, have been ordered out of the country by the puppet regime. Neither paid any attention. Gould is still at his post; Starr stayed four months, came home when he got ready, plans to return soon.

► Why are the invaders of China trying to drive U. S. newsmen out of the country?

Because their Chinese editions reveal various heartening truths to the far-from-subjugated Chinese.

Because their English-language papers are the cement which holds together the International Settlement, which in turn props up Chinese resistance.

Because their cables let America know that the first great modern war of aggression is not yet won, that the Japanese military machine is desperately behind schedule, that there still stands a vast, stubborn, and strategic power in the mountains beyond the Yangtze.

► Thus a few resolute Americans, controlling vital news outlets from the unique and unmanageable city-state of Shanghai, stand square in the road of Japanese conquest. For Japan must control the mind and morale of its subject peoples, must direct world-thinking the Japanese way, if it is ever to realize the dream of a "Greater East Asia"—domination of China, India, the Indo-Chinese peninsula, and all the East Indies including the Philippines.

Now that Japan and her allies in Europe have formally threatened war on the U. S., if any resistance is made to such aggressive plans, it is time for the American news-reader to study as never before the dispatches of his courageous correspondents in the Far East.

Our typical attitude toward China since the Japanese invasion has been the usual friendly American sympathy for the underdog. But now our interest in China goes much further than this. Now the top dog is snarling at us, and every intelligent news-reader knows what a tight spot we shall be in if the underdog relaxes his grip.

► Most Americans are glad to find that our interests coincide with those of the Chinese people. We have grown to like them, their peaceful and philosophic way of looking at life, their tenacity and courage in misfortune, the beautiful things they make, and the humorous things they say.

Perhaps we don't realize that the Chinese, in their turn, have grown to like us. They are grateful for the medical knowledge that has routed some of their worst diseases, for the industrial techniques that have helped them put up such a good fight. Many of them are grateful for the Christian religion. They remember how we backed up their dream of building a new, strong China. And they are glad to get the things we have to sell. Contrary to popular opinion, they like the Standard Oil Co. which brings them the blessings of kerosene... and they find a thousand uses for the cans it comes in.

► Brilliant Chinese leaders by the score owe their education to American universities. Our schools of journalism have had more effect, proportionately, on Chinese newspapers than on our own.

The old notion that "You can't understand the Oriental mind" is being dispelled by able writers and journalists of both races. Lin Yutang and Mme. Chiang Kai-shek show us China from the inside—John Gunther and Carl Crow from the outside. J. B.
The road of Japanese ambition

Powell continues to give us his important journal of opinion, the China Weekly Review, though he is on Wang's blacklist and has to have a bodyguard.

And just as important as the books and magazines are the day-by-day cables... from men like A. T. Steele of the Chicago Daily News, the N. Y. Times's Hallett Abend, and F. Tillman Durbin, and TIME's own T. H. White, who came via Harvard and the Chinese information ministry and is now on the hot spot in Indo-China.

► Sometimes readers ask why TIME devotes so much space to the Orient. It is because TIME has always believed that the day would come when an understanding of that area with its billion people, half the population of the earth, might be of the utmost importance to America.

How the good will of these people can be channelled and become a force in world strategy is a profound challenge. But on such intangibles world history has turned and tyrannies have fallen.

► This is why TIME, and its sister publications, FORTUNE and LIFE, have gathered and used such a storehouse of information on China, Japan, and the Philippines... and why TIME's week-by-week analyses of the Far Eastern situation seem to more thoughtful news-readers essential equipment for the decisions we face across the Pacific.

In these days of crisis, the free press is more than ever a vital force in making our democracy a living, working success. Therefore, TIME is seeking, in this series of advertisements, to give all the readers of ARCHITECTURAL FORUM a clearer picture of what the press in general, and TIME in particular, is doing to keep the people of this nation safe, strong, free, and united.

TIME
THE WEEKLY NEWSMAGAZINE

NOVEMBER 1940
97
Here is a new short-cut for busy architects and builders on those troublesome problems, building adequate safe flues and chimneys. PARTIAL LIST OF Contents: Common Errors, Shapes of Flues; Dangers of “Under-fluing”; Sizes of Flues; Chimney Heights; Flue Linings; Chimney Location; Chimney Foundations; Expansion; Insulation; Suggested Specifications and Materials; Chimney Footings and Construction; Lined and Unlined Chimneys; Fireplaces; Twenty Causes of Chimney Troubles and Their Cures; Building Better Fireplaces. TIMELY - AUTHORITATIVE - USEFUL. Write our nearest office for your FREE copy of “Flue Planning for Modern Homes.” Just off the press.

NATIONAL COAL ASSOCIATION
The Nation-Wide Organization of Bituminous Coal Producers

SUCCESSFUL ARCHITECTS
YOU'RE SURE of satisfying clients permanently with PAYNE gas-fired house heating equipment. Product of one of the Nation's pioneers in gas heating and winter air conditioning, every style of PAYNE Furnace delivers years of reliable, economical, safe warmth—through the coldest of winters.

Advanced design, attractive and space-saving. Many exclusive features. Styles and sizes for any kind of house from bungalow to mansion. Investigate the moderate cost and quality features of PAYNEHEAT.

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TIMBERS joined by TECO Connectors will do more work than timbers joined the old way—with many bolts, plates and angles. Frequently a single 2½" TECO split ring connector will carry more load than six one-half inch bolts.

Timber construction, fundamentally our lowest cost means of doing heavy work, can now be employed for a wide variety of new applications.

The connector system has revised traditional formulas for designing in timber—changed it from a carpentry to an engineering material and stimulated the establishment of widespread new capacity for shop fabrication.

TECO Connectors spread the load on a timber joint over practically the entire cross section of the wood. In bolted joints this stress is localized around the bolt.

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nearly 30,000 new structures—hangars, bridges, trestles, dry docks, barracks, trusses, towers and oil derricks—have saved money by employing low-cost TECO-equipped lumber construction?

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TECO ENGINEERING COMPANY INC.

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YOUNG STREAMAIRE CONVECTORS
It's good sound reasoning that's leading more and more architects to specify Young STREAMAIRE Convectors for all types of buildings. Their clean-cut, modern design combined with the most advanced engineering features make them a stand-out in appearance and heating performance. Including six distinct types of enclosures and many styles and grille patterns they're made to harmonize with any architectural or decorative scheme. Whether planning new buildings or modernizing old ones, specify Young STREAMAIRE Convectors and assure complete satisfaction to the building owner.

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YOUNG RADIATOR COMPANY
RACINE, WISCONSIN

Where the Entrance Doors Have No Shelter
... and still you want to use modern overhead concealed door control, the LCN 500 series closer fills the bill perfectly. The mechanism is entirely hidden in the head frame with only the lever arm exposed on inner side of door. Hold-open feature optional. For other details see LCN catalog in Sweet's or send for separate catalog. Norton Lasier Company, 466 West Superior Street, Chicago, Illinois. (Makers of LCN concealed and surface door closers in 86 types and sizes.)

for defense

SPEED UP CONSTRUCTION
with CALDWELL

New Adjustable Sash Balance Cuts Window Installation Time 2/3!

★ FOR HOSPITALS:
Veteran's Bureau Hospitals at Batavia, Conandigua, Northport, Palo Alto, Waco, Huntington, New Bedford, and many others.

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You save on every type of window with CALDWELL because this new adjustable sash balance means faster installation—lower cost of frame construction.

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The Caldwell Manufacturing Company
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MAYO & MAYO, Architects, Chicago :: JOSEPH MAGESKEY, General Contractor, Evanston, Ill. :: WALTER H. HEINICHERN, Painting Contractor, Chicago.

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This list is typical of many in specifications being written by architects from coast to coast. These architects have the full co-operation of the Pratt & Lambert Architectural Service Department nearest them. This timely, practical aid is extended to any architect seeking maximum decorative results.

PRATT & LAMBERT - INC., Paint & Varnish Makers
NEW YORK · BUFFALO · CHICAGO · FORT ERIE, ONTARIO

Pratt & Lambert Paint and Varnish
The advertising pages of THE ARCHITECTURAL FORUM have become the recognized market place for architects and all others engaged in building. Each month these pages offer the most complete guide to materials, equipment and services to be found in any magazine. A house or any other building could be built completely of products advertised in THE FORUM. While it is not possible for a magazine to certify building products, it is possible to open its pages only to those manufacturers whose reputation merits confidence. This THE FORUM does.

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