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UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 11 ON POLICY AND PROCEDURE

SITE PLANNING

The objectives of good site planning and recommended methods of procedure are discussed in this Bulletin. The recommendations are not intended as regulations or arbitrary requirements. They are intended rather as suggestions which may help the designer in evaluating his problems against a larger background of experience. Especially is there no desire to discourage experimentation. New types of design and traditional plans may be equally good, so long as this objective is constantly kept in mind: low-rent and low-cost housing in attractive and healthful surroundings.

In the site plan, as in the building plan, economy of first costs and economy of maintenance costs are most important. Economy of first costs is specifically imposed by the United States Housing Act of 1937. It is evident, moreover, that the widest possible benefits of a low-cost housing program can be attained only by keeping the cost of individual units down to the minimum.

Economy of maintenance cost will result directly in low rent. Under the provisions of the Act, cost of maintenance is the greatest single factor affecting rentals. The essential failure or success of the entire United States Housing Authority program will be determined in large measure by the degree to which the lowest possible rentals are achieved.

Compactness of layout should characterize all low-cost housing projects even when plenty of land is available. Most items of site development cost are almost directly proportional to the area covered, such as grading, planting, streets, walks, storm sewers and all utilities; and many maintenance operations are proportional in cost to the area which they cover. Land not needed for housing is generally most useful and most economical to maintain if it is kept in relatively large units of area, rather than broken up into many small pieces.

In the notes which follow, no effort is made to weigh the various items which result in a good site plan. Each plan must be evaluated individually with a full knowledge of its specific limiting conditions. For example, the costs of utilities, since they influence the entire economy of the site plan, are an important over-all consideration; nevertheless, an economical layout of utilities which results in bad orientation for an overwhelming majority of dwelling units does not produce a good site plan. The designer should endeavor to achieve that balance which results in the greatest economy and the greatest amenity.

I. The Technique of Studying a Site Plan

As soon as a site is under serious consideration the collection of data should begin: property line maps, air maps (which may be enlarged from the original negatives where a mosaic of the city has been made), utility plan, etc. When the site is definitely selected, a topographic survey and the requisite soil investigations should be made.

While preparation of the building schedule and studies of unit plans are under way, the site planner should study the site and its surrounding neighborhood thoroughly. He should know all plans for the development of the neighborhood, as a basis for formulating his ideas with respect to the principal traffic flows to and from the future project. The broad placing and organization of the layout should be studied coincidentally with schematic plans showing house-and-land patterns with various kinds of access and servicing.

The schematic plans should then be applied to maps of the property, modifying the typical scheme in application to the actual topography. If topography is a controlling factor, paper patterns of the buildings which can be moved around may be helpful in arriving at the best placing.

When a satisfactory scheme has been drawn up, it should be taken to the site and checked against actual conditions, even to the point of staking out roads or axes, and some of the buildings, if the site is sufficiently clear. Thorough study of the site is the best insurance against unimaginative formalism in the site plan.

II. Relation of the Site Plan to the City Pattern

The advice of the City Planning Commission, where such authority or advisory body exists, should be obtained with respect to changes in street patterns or widths, appropriate densities, and the availability of school facilities, parks, and playgrounds.

Population Densities.

Population density over the project area should be consistent with its location in the general city pattern. On inlying sites a higher density than is permissible in other locations may be necessary in order to realize economically the advantages of existing transportation and other utilities, and proximity to work, shopping, and amusement centers. Outlying sites may be developed economically at lower densities, but a low density may increase disproportionately the initial and maintenance costs of land development. The objective, in all cases, should be a density which permits economical use of utilities and community facilities (including schools) without overcrowding, and maintains desirable standards of light, air, and open space.

Travel Routes.

The project must have convenient routes of access to employment, recreation, and shopping centers. Location adjacent to, but not on, a main traffic route is most favored. Intersection of a project site by a traffic route is clearly undesirable; even minor streets which bisect the site will interfere with the community life of the residents and with the operation of the project.

Where streets are closed, the other streets of the neighborhood may be expected to carry more traffic and if these form part of the site boundary, provision should be made by means of ample setbacks for future widening.

Neighborhoods.

A small project, the site of which lies within an existing neighborhood, should be planned to form part of the neighborhood.

Relatively large or isolated projects will naturally form neighborhoods of their own and should therefore be planned to provide the setting for a well-integrated neighborhood life. This means provision of space in the plan for stores, recreation areas, elementary schools, and other facilities whose radius of influence is the neighborhood, even if such facilities are not provided as part of the housing program. Close cooperation between the local authority and other departments of the local government should be maintained so that any schools, parks, playgrounds, or other facilities planned under the programs of these departments may be related to the housing program.

The Superblock.

The superblock, a relatively large area free from through streets which is served by streets with clearly articulated functions (i.e., traffic, residential, and pedestrian), has been widely used as a basic pattern for residential planning. Often it is penetrated by cul-de-sac or dead-end streets which branch from a circumferential traffic street. Many modifications of it are possible; and one of these may determine the type of organization of the site plan. The superblock is not the only acceptable type of pattern, however; each project will have its own solution.

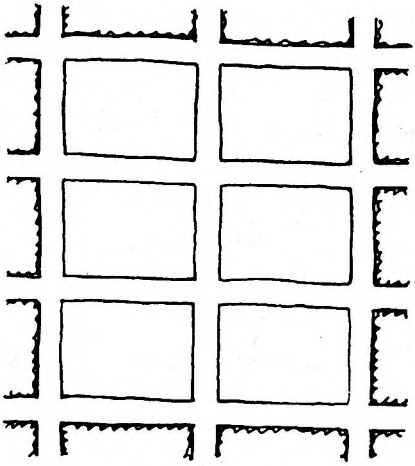
Diagram I: Various Types of Superblock Planning (below).

Diagrammatic plans illustrating superblocks or traffic-free residential areas in an existing city plan. "A", the area to be replanned. "B", a true superblock, subdivided only by cul-de-sacs. "C", turned lanes, avoiding the use of turn-arounds and saving time in route servicing. "D", lanes running through the property. "E", similar lanes at an angle, for aesthetic effect or for better relation to the topography. "F", through and turned lanes combined to secure a large central open area. In all cases through or fast traffic in the residential area is diminished by providing a wide and well paved street around the area and by using narrow pavements within it.

III. Topography

Relation of Buildings to Contours.

Plans should always be studied over a topographic map of the site. Even though the land may be so flat that topography is not an essential factor, the grouping of buildings must be studied with respect to surface



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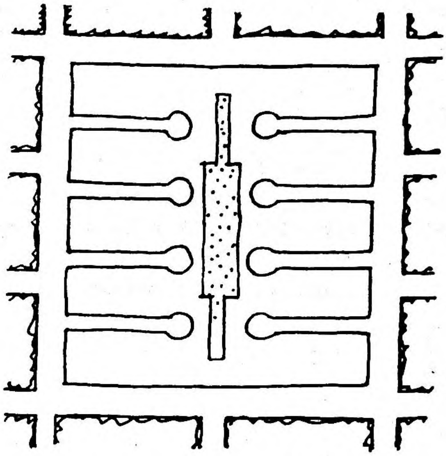

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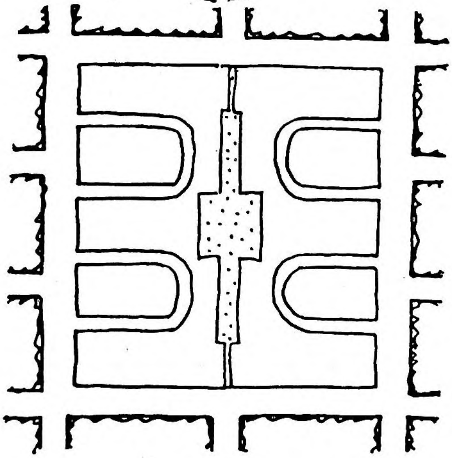

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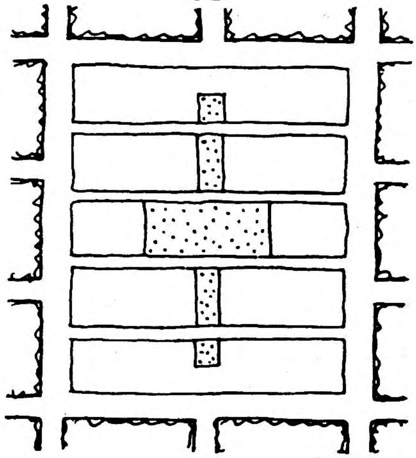

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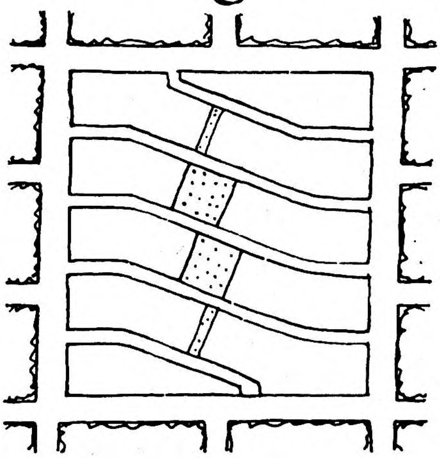

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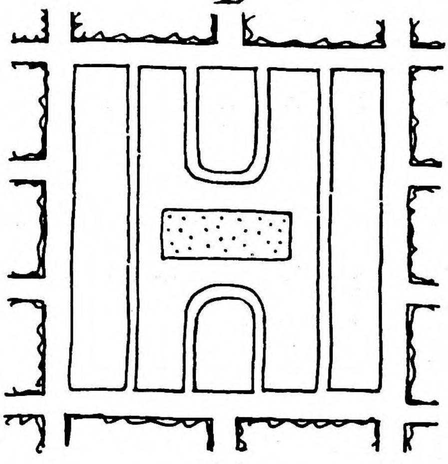

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drainage. If there is any marked variety in elevation, a correlation of the site plan with the topography usually results in economy of first cost and maintenance, and assures convenience in use, as by avoiding steep slopes in lawns or steps in walks. An intelligent use of topographic variations also tends to give a plan individuality and rational organization.

A very steep or broken site may result in excessive development cost unless dwelling spaces or basements can be introduced which utilize the excess walls on the lower side of the buildings. On a moderate slope the rows of buildings should normally run parallel to the contour lines. By a careful study of cross sections it can be determined: (1) whether to draw the buildings close together along the entrance side, leaving most of the slope to be taken up in the wider garden areas, or (2) to concentrate all the garden area on one side (usually uphill) of the row, with only a walk on the other side giving access to the entrance front of the houses.

<u>Preservation of Trees and Buildings</u>

Existing trees should always be shown in topographic surveys, and an effort made to preserve a reasonable number of them. A few old trees add much charm to a group of buildings, and the slight variations made in the plan in order to save them may add a pleasing informality to the appearance of the project.

If the site is built up, a few of the houses may be worth saving. An imaginative handling of the design may make of an old building a very welcome note of variety.

IV. Orientation and Spacing of Buildings

<u>Sun and Wind Orientation</u>

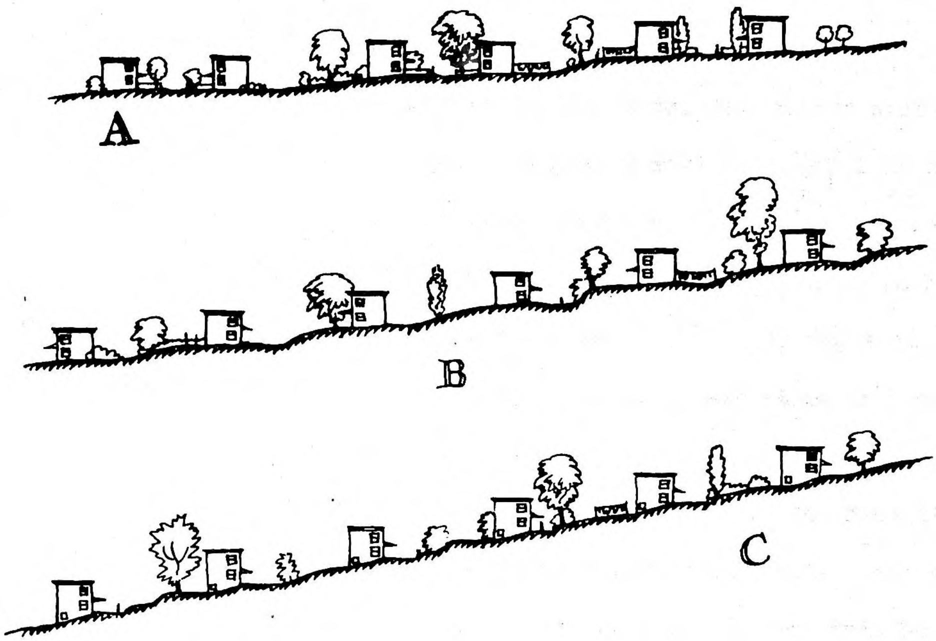


Diagram II: Development of Sloping Land

Section "A", with a moderate slope, is developed with two rows of buildings brought close together along an access walk or drive, and the floor elevations kept as nearly as possible the same. With a steeper slope, "B", the rows are spaced equally but farther apart because more room is needed to take up differences of level. In "C", the steep slope is taken up in part by using basement stories, partially or completely exposed on the lower side, and the building acts as a retaining wall.

The factors of sun and wind orientation should always be considered, and may become the controlling factors when the site permits a free choice in the direction in which the buildings may lie. In the north the sun is likely to be the controlling factor; in the south, the summer wind.

In the north, orientation for sunlight is most successful when it makes sunshine available in the kitchen in the morning, especially in winter, and in the living room in the afternoon, except in summer, when it is better to escape the hot sun of summer afternoons. It is obviously impossible to get ideal orientation in all units if the houses face each other in parallel rows, but it is better to have the sun available, even if not in the preferred room at the preferred time, than to have no sun. The fact that people will live in badly oriented houses or apratments should not encourage the planner to ignore sunlight. Since men are usually away from home during most days, they are less likely than women are to appreciate the importance of orientation. Most women, even though they fail to arrive at specific opinions concerning preferable exposures, do recognize one room or apartment as being more "cheerful" than another.

For row houses the best compromise is a location with the length of the row lying northeast-southwest, at an angle of thirty to sixty degrees off north. Rows running north and south are acceptable, although such orientation lets in little sun at midday, and too much during summer afternoons. Long buildings lying true east-west are to be avoided in the north because they shade the ground on the north side in winter, preventing the melting of snow. The northwest-southeast diagonal admits no sun for an hour or two in mid-morning, and gives an excess of sun in the afternoon.

In the extreme south, a location with the length of the row running east-west is preferred because the height of the sun in summer prevents sunlight from entering the house during the middle of the day.

Orientation to take advantage of summer breezes cannot be discussed with precision because winds vary in direction and because the behavior of wind in and around buildings is difficult to observe. In the absence of scientific information, intelligent local opinion must be the principal guide.

Spacing of Buildings.

Modern housing standards tend toward wider spacing than has been observed in the past.

For apartment buildings with their longer sides parallel, three, four, and six story buildings should be spaced at least 60, 65, and 75 feet apart. At the ends, where secondary windows are involved, these distances may be somewhat reduced.

For row houses in a series of parallel rows, an average center-to-center spacing of about 100 feet is a reasonable standard. This may be arranged to give alternate open spaces between rows of approximately 60 and 85 feet, or 55 and 90 feet. In a small group, or where minimum spacing is aimed at, two story houses may be as close as 50 feet, and one story houses somewhat closer if these dimensions alternate with spaces at least 15 or 20 feet greater.

As a general rule, rows should be fairly close end to end in order to allow liberal spacing between rows, where openness contributes most to livability.

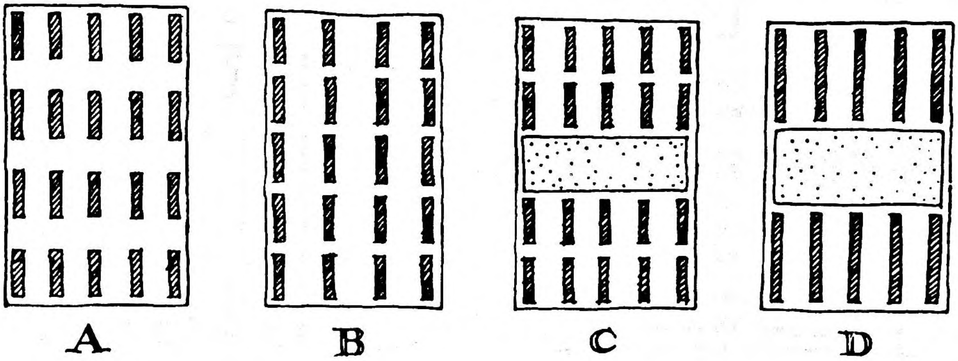
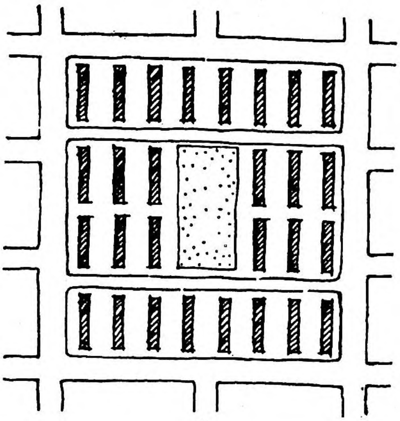


Diagram III: Spacing of Rows

Diagrams showing various distributions of space and buildings. In all cases, the number of linear feet of buildings is the same. "A" shows liberal spacing between the ends of the buildings. This tends to increase development costs (roads, walks, utilities) without much increase in livability. In "B" the buildings are close together in the rows, thus permitting the rows to be set farther apart. Development cost goes down and there is a gain in air, light, and privacy. All the land can be tenant-maintained if it is a row-house layout. "C" returns to the five rows of buildings, but the spacing is reduced, the land thus saved being thrown together in a usable public area. In "D" this area is increased still further and the construction and development costs (assuming the site to be level) are still further reduced by using longer buildings.



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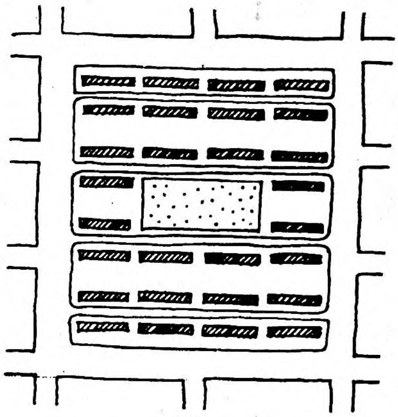

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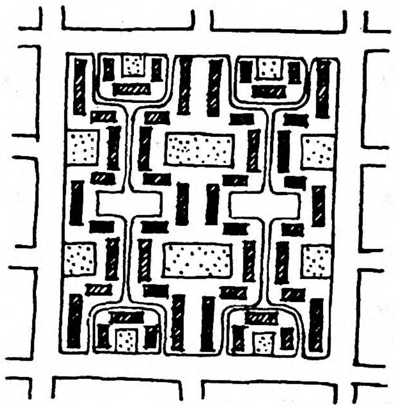

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Diagram IV
Project Organization

Three basic types of project organization, using the same number of linear feet of buildings. "A" and "B" have 28 buildings, "C" has 48. Plan "A" illustrates "end-access" to rows of houses (or flats), with the buildings set perpendicular to the lane. In "B" the buildings are parallel to the lanes, which must be more numerous, but may be narrower and thus may save walks and facilitate servicing. "C" is a court plan. This type creates numerous large open areas and may have visual charm. It is usually more expensive to build and to maintain, however, than a plan in which either the project-maintained land is mainly in one large area, or in which practically all the land is assigned to the tenants and maintained by them.

V. Building Types

Selection.

Whether the living units comprising the project shall be single or row houses, flats or apartments, will be determined by considerations of cost, location of the site, local preferences and living habits, and local housing policy.

In setting up the distribution of units by size and type, an effort should be made to accommodate a typical range of family size and composition. Although population trends indicate that the average family size is smaller than it has been in the past, it should be remembered that the larger families have more difficulty in finding suitable houses and are likely to be in greater need of rent-subsidy.

Row Houses

Experience has shown that the row house offers some advantages in construction cost and maintenance economy over the single house. Even in those parts of the country where the single house is the traditional form of housing, row houses have proved acceptable after they were built and occupied.

The economic advantage of the row house is greatest when the rows are long. Many architects, however, are reluctant to use long rows because they consider them institutional and regimented in appearance. That this is a matter of arbitrary current fashion is evidenced by the success with which architects, from Renaissance times to the present day, have used long rows in some of their most effective plans. There are many ways of varying from mechanical repetition, however; one is the use of groups composed of rows of varying length in place of rows of medium but uniform length.

Breaks in the alignment of the front and rear walls of long rows are often made for architectural effect. Such breaks are expensive and their effect rarely justifies the expense. An equivalent aesthetic effect may be achieved by the widening of a porch, the introduction of a bay window or balcony, or by some other form that adds to the livability of a housing unit.

Stepping the floor level in order to fit a row to sloping ground is also expensive and usually requires walls or terrace slopes at the points where the levels break. Stepping should be avoided when possible; but the added cost, where it may be required, should be weighed against the cost of long runs of outdoor steps plus the additional wall, and extra grading costs.

Combination of Types

A close intermixture of apartments, flats, and row houses is sometimes used. While such an arrangement makes possible the use of apartment basements for heating plants, incinerators, laundries, and storage space, and gives wider and more interesting views from the apartment windows, it diminishes whatever element of privacy there may be in the row-house gardens and almost inevitably results in an intricate layout of public walks. It should, therefore, be used only to attain important practical advantages. Two-story flats, especially when they are arranged so that each flat has its own garden, are capable of more convenient combination with row houses than are apartments.

VI. The Site Plan with Respect to Community Services

Administration and Community Buildings.

Provisions made for housing the project manager and for the administration and operation of the project should be conspicuously straightforward and economical. Where available, exposed basement space may be used. Management and renting offices should be located for convenient access from the point of entrance to the project. Service and repair shops should be centralized, preferably near the central heating plant, if there is one. Community rooms or building should be readily accessible to all tenants, and also to management offices for supervision.

Streets and Parking Spaces.

For purposes of economy and utility, the design of streets should be closely related to the particular function each street will perform. Many residential streets and their utility layouts are wastefully oversized because they are designed to meet the possible future requirements of business or industry. In a large project, however, where the land is in single ownership and maybe expected to remain in residential use for many years, the conditions surrounding a street within the project may be predetermined and fixed. New streets within a project should be planned for dedication to the municipality in order both to relieve the project of their maintenance and to provide public space for utility installation. They should be planned economically, but must be adequate in width to serve the anticipated traffic, to permit easy circulation and safe driving, and, in many instances, to afford parking space on one or both sides.

Existing streets should be retained if present and future economy is served thereby. However, existing streets are often unnecessarily wide or long for the needs of the project, and the value of the area gained by their closing may exceed the value to the project of the existing improvements. In some instances, existing streets may be closed to traffic and converted into playgrounds. If expensive changes in drainage facilities are involved, however, or if the present pavement will require resurfacing or other changes in cross section, little or nothing will be saved by this procedure.

Direct vehicular access to the entrance of each building is unnecessary, but driveways should be at a reasonable distance from all buildings. Streets and driveways should be arranged to permit easy access to all fire hydrants by fire-fighting equipment.

As a means of simplifying construction and operation, the theoretical ideal is a plan in which all access to each pair of rows of houses is concentrated along a single channel. This means that all visitors, deliverymen, the postman, and even the garbage collector, will come to one entrance to the house, usually by a drive or walk (perhaps two walks) serving a pair of rows. The opposite or garden side of the house may open upon a strictly private yard and normally there will be no need of a drive or walk to serve these yards.

This scheme concentrates paving where it is most needed, and results in economy of initial and maintenance costs. In all cases, whatever form the plan takes, the site plan should find a better arrangement than the old-fashioned layout for row houses with a street in front and an alley behind.

Minor service drives, parking spaces, etc., should preferably be retained by the project for purposes of control. Minimum widths for service drives may be taken as 16 feet for two-way drives and 10 feet for one-way drives. Turning spaces should be at least 30 feet in width, and more if possible.

Provision of parking area for the cars of tenants must be made. The ratio of car ownership, as a basis for planning, must be judged independently in each case, and may vary from nearly zero in a New York City apartment project to nearly a hundred per cent in Detroit. Where the ratio of car ownership is apt to increase, space should be reserved for possible future expansion of car ownership.

To provide garages, or even open sheds, does not seem feasible under the present program. The most acceptable alternative is off-street parking in parking lots or courts. Cars owned by low-income tenants are likely to stand unused for considerable periods, especially in winter, a condition which makes curb-parking along perimeter streets and project drives the more objectionable. The trend in traffic control is strongly in the direction of limiting or eliminating car parking on streets, not only to facilitate the movement of traffic and permit full use of street pavements, but also to promote safety and to improve the appearance of streets. All-night parking is widely recognized as a nuisance and most cities have ordinances limiting such parking or prohibiting it. Opposition to this use of streets is likely to increase with time, and all projects should therefore be planned initially with satisfactory provision for parking tenant-owned cars.

The preferable location for off-street parking areas is around the boundaries of the project, where the parking lots fall between the housing units and, for example, a noisy thoroughfare.

In a small project the best solution may be a single parking lot placed near the administrative offices or the heating plant, with only one entrance to the lot, so that some degree of supervision may be exercised. To give the tenants a place to work on their cars at night, a few covered stalls might be provided.

Utilities.

Since a scattered or wide-spread layout of sewers, water, gas and electric lines will increase both initial and maintenance costs, closely knit planning of utility systems is mandatory. Lines should ordinarily be located in streets or drives, for ready accessibility, but may run elsewhere when required by topography or economy of layout.

Water, gas, and electric distribution systems should be laid out with the objective of supplying the projects with these services at the minimum annual cost to tenants. In many cases, the lowest feasible annual cost may result from purchase by the project of these services on a wholesale "pooled meter-reading" basis, and resale or redistribution to the tenants by the project. If this is under consideration the interest and amortization on the capital cost of the project distribution system should be taken into account in making a final judgment.

An overhead electric distribution system costs 55 to 67 per cent as much initially as an underground system. The choice of system, however, will depend also on soil conditions, climate, topography, and local practice.

Playgrounds.

Play areas for children of pre-school age should be provided within the project boundaries. One such area, located where it may be reached without crossing a traffic way, should be provided for each block or group of buildings. An area of at least 1200 square feet is needed to accommodate the ordinary equipment, such as sand boxes, swings, seesaws, slides, etc. Larger play areas may be developed with a shaded area containing park benches; a paved area for play with carriages, carts, etc.; and an open space for free play with a soft footing.

No fencing is recommended around play areas unless proximity to driveways or other conditions require it. Shrubbery is definitely undesirable because of the tendency of children to enter a play area from all directions. Rows of trees make the best marking around play spaces, and the areas they shade may be developed as sitting areas. Such sitting areas, skillfully placed, have been found to be among the most desirable types of space use. A surfacing of gravel, or even ordinary soil, somewhat sandy, may be found most practical for such areas.

Wading pools and spray pools are almost universally popular but their cost of maintenance is an appreciable item and should be carefully considered. Generally, no more than one pool can, in any case, be supplied in a development. It should be borne in mind that the play space in which it is located will receive more intensive and more widespread use than the others.

The provision of a playground for children of school age may properly be regarded as a function of the local community, and should be included in a project plan only when no other arrangement, such as the use of a nearby school playground, is feasible. Wherever possible, the maintenance and operation of such a playground should be delegated to the city.

An area of two acres, preferably three, may be regarded as minimum for a playground which offers a desirable range of play opportunities. Actual space requirements, however, will be governed by the facilities and types of play areas provided.

In some cases it may be desirable to supplement the provisions of an existing playground with additional facilities within the project area. Facilities provided should be based on a selection of uses which (1) require a minimum of space for a maximum of users, and (2) will attract participants rather than spectators. Among such uses are paddle tennis, shuffleboard, softball, etc. Where the project is large, a hard paved area may be developed for roller skating in warm weather and for flooding and ice skating in winter.

A playground of two or three acres may result in noise or a damage hazard, especially when surrounded by residential buildings abutting on all four sides. In such cases, heavy planting may be used to shield the buildings against the noise. Surfacing material should be chosen in accord with local practice, based on climatic and soil conditions, type of activities, and location and size of area.

Garbage Collection and Disposal.

The method of collection or other disposal of garbage (an important maintenance item) must be defined and incorporated in the site plan. Garbage may be collected from the yards in the usual way, it may be taken by the tenants to large pails at collection points on vehicular ways, or it may be carried to group incinerators.

Where the collection point or group incinerator systems are used, local custom and climatic conditions should determine the maximum distance which tenants are expected to traverse in order to dispose of garbage. The system should be considered practically, without too much regard for conventional proprieties. Tenants may be expected to carry garbage out by way of the living room and to keep a garbage pail in the "front" yard if economies of drives, walks, or operation will result.

VII. Landscape Development of the Site

Surfaces.

Low-rent housing projects cannot afford expensive landscape development. Landscape or open areas should be simple and straightforward in design, and be made serviceable and effective by a very limited selection and disposition of materials. Economy of maintenance is an important factor. The desirability and economy of preserving existing trees has been mentioned. This applies also to hardy shrubs and suitable topsoil, although in some cases topsoil may be purchased at lower cost.

In apportioning the land to various kinds of surface treatment--lawns, playgrounds, parking areas, etc.--the cost of maintenance of each type is an important consideration. Lawns are cheaper to build than any paved surface. However, they are usually more expensive to maintain, and the introduction of paved areas may reduce the upkeep by an amount large enough to justify the higher first cost. But the cost of maintaining landscaped areas varies greatly according to the character of the plan and the standard of horticultural finish that is maintained. A layout of irregularly shaped lawns, enriched with shrubbery of many species, may cost over five hundred dollars per acre per year to maintain in top condition. Under a lower standard of upkeep a play field several acres in extent, surrounded by trees or one row of hardy shrubs, may be kept in usable shape for less than fifty dollars an acre.

Planting should be spaced initially so that rearrangement will not be necessary. Large plants, giving immediate effect, will be found costly, while unusually small sizes requiring special care will make more demands on maintenance.

Grading.

A thorough study of grades is necessary (1) to obtain a proper balance of cut and fill, and (2) to provide necessary soil and surface drainage and shaping of the site with respect to landscape development.

The use of terraces to adjust grades is recommended to avoid the use of expensive retaining walls. However, economical retaining walls avoid high initial and maintenance costs of long, steep terraces.

Walks.

Particular attention should be given to the provision of walk connections to service drives in order to permit convenient delivery of goods and collection of refuse. Economy of walk layouts may often be achieved without sacrifice of convenience by serving more than one entrance with one walk from street to dwelling.

Plain concrete, divided into flags by full-depth joints (to facilitate maintenance in case of settlement) is recommended as the best material for walkways from the viewpoints of low initial cost and low maintenance cost.

VIII. The Site Plan with Respect to Maintenance

House and Garden Maintenance.

As a means of reducing rents, the United States Housing Authority recommends the policy of placing upon the tenants as much responsibility

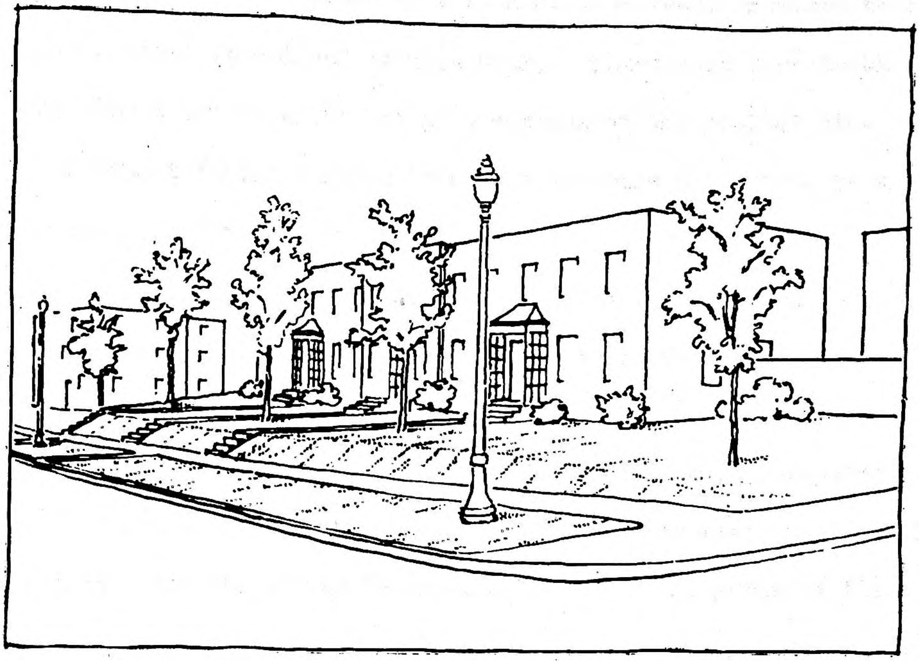

Diagram V: A Costly and Poorly Handled Site Plan

This sketch illustrates several points in site planning which have been poorly handled and will result in excessive maintenance costs.

The "tree lawn" (between curb and sidewalk) might have been reduced in width or eliminated. The walks crossing the tree lawn are unnecessary. There is no "berm" or level strip along the foot of the terrace slope. Both the lawn and the terrace will be costly to maintain. The terrace is too steep and will probably erode; it could probably have been omitted entirely, thereby making possible the elimination of the ugly, inconvenient, and expensive concrete steps.

The lawn in front of the row houses is unattractive and practically useless, and will require a high degree of project maintenance. The space might better be divided into private front yards both for greater convenience and for lower maintenance costs.

as possible for the maintenance of both house and land, provided that their actual living cost is reduced by this means. Under most circumstances this will result in the allotment of a maximum of the project area to the individual tenant families for cultivation and care in accordance with usual American custom.

Modern patterns of land subdivision such as the apartment superblock introduce difficulties in accomplishing this objective. In regions, however, where the care of a private yard is customary, and an interest in gardening is widespread, almost all of the ground area of a housing project composed of row houses, single or twin houses, or flats with private entrances, may satisfactorily be incorporated into the yards of the tenants.

In other localities where private yards are not customary, the maintenance of a yard in a manner consistent with the requirements of close group housing may be a burden upon the tenant. In such cases, it may be more economical for the management to maintain the open areas by means of a power mower, provided the open spaces are organized into relatively large unit areas.

<u>Maintenance of Community Services.</u>

The physical installation for services ordinarily supplied by the city, such as street lighting, road maintenance, garbage removal, playground supervision, etc., should be planned for operation by the city now or in the future. In the case of cities now experiencing financial difficulties, it may sometimes be necessary to recommend operation by the project of certain services in order to assure their satisfactory performance.

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Housing projects have as their sole purpose the provision of shelter in a good environment within the limited means of the people who will live in them. If the houses are decent and comfortable shelter and if reasonable provision is made for outdoor recreation and space, the test of success for the project will be low rents. Unless the rents are low, the architects, the local housing authority, and the United States Housing Authority will have failed in their purpose. Architects who seek in their site plan to create a magnificent piece of civic art, or municipal officials who wish to beautify the approach to a new bridge, are likely at moments to let their attention diverge from the one essential objective--low rents.

Nor is it consistent with that objective to make a site plan that is dependent for its effect upon meticulous institutional upkeep. The project should not be thought of as a show place where life is carried on in neat and orderly perfection. Escape from the slums should not be escape on to a stage-set where people sit on porches in their Sunday clothes and never walk on the grass.

A project should be so planned that it will look well even though the grass in public areas is worn bare, and there is as much variety in the upkeep of the yards as there is in the yards along an average city street.

(Sgd) NATHAN STRAUS,

Administrator.

August 4, 1938.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 12 ON POLICY AND PROCEDURE (Aug 15, 1938)

DWELLING UNIT PLANNING

The United States Housing Act defines low-rent housing as "decent, safe, and sanitary dwellings within the financial reach of families of low income, and developed and administered to promote serviceability, efficiency, economy, and stability . . . ." This implies good design and arrangement; the basic standards of adequate space and privacy, ventilation and light, and sanitary facilities; and economy in management, operation, and maintenance. It also implies design and planning which will "build in" these standards for the anticipated useful life of the dwelling units constructed under the Act.

The Act limits the cost of construction to $1,000 per room, and $4,000 per dwelling unit, except in cities of more than 500,000 population where, in the discretion of the Authority, the limits may be $1,250 and $5,000, respectively.

It further states that loans are to be made only for projects which are undertaken in such a manner "(a) that such projects will not be of elaborate or expensive design or materials, and economy will be promoted both in construction and administration, and (b) that the average construction cost of the dwelling units (excluding land, demolition, and nondwelling facilities) in any such project is not greater than the average construction cost of dwelling units currently produced by private enterprise, in the locality or metropolitan area concerned, under the legal building requirements applicable to the proposed site, and under labor standards not lower than those prescribed in this Act."

Thus, the Act clearly defines both its objectives and the limitations within which these objectives are to be achieved.

Regional and even local differences in living habits and requirements exist, which may have their origin in climatic difference, difference in racial background, or difference in custom. Architects should plan to interpret these differences sympathetically in terms of the objectives of the Act and within the limitations which it imposes. They should therefore give careful consideration to prevailing local building practices and methods of construction, available materials and labor skills, and dwelling patterns. Above all they should plan for maximum economy in first costs and maintenance costs, and the maximum durability feasible within these costs.

The notes contained herein are a basic general guide toward the achievement of these objectives. In all instances the recommendations set forth are intended to permit of reasonable freedom in their physical expression. They are not intended to serve as arbitrary rules or formulae to replace the essentially creative processes of analysis, planning, and design. In certain instances minimum requirements are set. These are arbitrary limits which represent in the judgment of the United States Housing Authority the lowest standards of amenity consistent with the spirit of the Act. They are subject to change as testing in use may indicate the desirability of raising or lowering them. They may--in fact, should--be exceeded when, through economy in design and construction, greater amenity may be achieved without sacrifice of the low costs required by the Act.

Distribution of Dwelling Units by Size

Sizes and types of units should be appropriate to the families to be housed and provide for a normal range of living needs and family sizes.

The distribution of dwelling units by size should be based on an analysis of family sizes in the "pool" of eligible tenants and an estimate of trends in family size, adjusted to make the greatest feasible provision for larger families and to comply with the double limitation imposed by the Act in room costs and dwelling unit costs. Since kitchens and baths are the most expensive rooms in a dwelling unit, and their cost must be prorated over the total number of rooms in order to arrive at the average per room cost, dwelling units with multiple bedrooms will show lower per room costs than small dwelling units. Thus, the average cost per room over a project may be lowered at the same time that provision is made for the larger families with children.

Selection of Type of Dwelling Unit

The selection of the type of dwelling units for a particular project whether one or two story row house, flat, apartment, or a combination of these--must be based on a careful study of local and cost factors.

Because of the annual contributions which the United States Housing Authority is empowered to make in order to reduce rents, the costs of operation, maintenance, replacement and insurance are the significant factors in the determination of rents. Planning for low rents, therefore, must carefully weigh these factors in the choice of dwelling types. (A forthcoming bulletin on Rents will discuss this subject in detail).

Row houses and flats have been found to require approximately half as much janitorial service as apartments, and, in addition, permit a maximum of tenant maintenance of grounds. They will usually result in lower rents than apartments (in the same locality under the same conditions), especially where the arrangment of units makes possible the disposal or removal of garbage without a project collection system. However, the choice of a dwelling type which requires a maximum of tenant maintenance of building, services, and grounds on an inlying site in a large city where such tenant responsibility has little precedent must be very carefully studied in order that the success of a project may not be jeopardized by assumptions in planning which cannot be realized in management.

Comparative insurance costs of fire-resistive and nonfire-resistive construction should be studied in order to determine the lowest overall annual cost to the tenants.

Among other factors which govern the choice of dwelling unit types are

(1) Relation of the proposed site to the city pattern, and appropriate density of development. (Note: For a discussion of density see USHA Policy and Procedure Bulletin 11, "Site Planning".)

(2) Character of surrounding development.

(3) Prevailing local customs and preferences with respect to dwelling unit types.

(4) Effect of building code and other applicable regulations on the relative costs per dwelling unit in each type.

The final choice should be based on an evaluation of the composite effect of these factors on rents and the success of a project.

Minimum Dwelling Unit Requirements

Each family unit should contain a living room, permanently installed cooking facilities, and permanently installed washing, bathing, and sanitary facilities.

Rooms should be of adequate size and shape to accommodate the usual furnishings and equipment, with sufficient open space left to permit circulation and the proper use of such equipment. This requirement should be studied carefully with respect to all door and window locations.

The following room sizes are the smallest which are acceptable to the United States Housing Authority.

Living Room - not less than 150 square feet.

Dining Room - not less than 100 square feet.

Dining Space - (in order to be counted as a half room) not less than 60 square feet in addition to the minimum required area of the Living Room or Kitchen to which it is added.

Kitchen - not less than 60 square feet. When added to Dining Room or Living Room, this requirement is in addition to the minimum required area of the room to which it is added. When a separate room, a Kitchen with area between 60 square feet and 70 square feet must be not less than 7 feet wide.

Kitchenette - (in order to be counted as a half room) a space containing permanently installed cooking facilities with not less than 3 feet of clearance passage in front of such facilities. When added to Dining Room or Living Room, this requirement is in addition to the minimum required area of the room to which it is added.

First Bedroom - not less than 120 square feet.

Second Bedroom - not less than 90 square feet.

Third or Fourth Bedrooms - not less than 80 square feet each.

Aggregate net area requirements providing for more space than the minimum combinations possible under the above provisions are required in dwelling units with two or more bedrooms, as follows:

In a family dwelling unit with two bedrooms, the total net area of the Living Room and Kitchen, together with any dining space which may be provided, should be at least 240 square feet.

In a family dwelling unit with three or more bedrooms, the total net area of the Living Room and Kitchen, together with any dining space which may be provided, should be at least 260 square feet.

Design Factors

A. Compliance with Building Codes

Building codes and other regulatory ordinances may in many instances contain arbitrary and excessive requirements when applied to projects planned under the Act since they are often unrelated to large-scale planning practice and are based on requirements which have not been adjusted for the qualities and capacities of modern building materials. In cases where such legal requirements are in excess of the requirements of careful planning for light, sunlight and air, substantial construction, safety from fire hazard, or economical maintenance, and compliance may result in substantially increased cost, every effort should be made locally to obtain exceptions or waivers. The United States Housing Authority cannot empower others to disregard the requirements of local building codes.

B. Plan Arrangement

In general, care should be exercised not to introduce those fads and fancies of plan and design which do not add to livability. Service entrances, entrance halls, foyers, and similar plan elements may well be minimized or eliminated wherever feasible in low-rent housing. Nor should plan arrangments which have been adopted through lack of choice or for expediency be accepted as inevitable patterns. A dining room which is used only on accasion is wasteful planning, whereas dining space added to the kitchen or living room may make both these rooms appreciably more serviceable.

Plans should be simple and compact, requiring minimum space for halls and corridors. The rooms themselves should make the best possible use in dimension and arrangment of space for furniture, movement, and access. Door and window locations should be carefully studied to give the greatest possible variety of interior arrangements and relate interior spaces to the out-of-doors. In general, the room which permits the greatest flexibility of use is the best room.

C. Circulation and Privacy

Circulation should be direct and should provide clearance for the moving of ordinary furniture and safe egress in case of fire. Consideration should be given to the placement of furniture and its effect upon circulation. Kitchen equipment should be arranged for minimum travel, stooping and reaching, and maximum efficiency.

Living rooms which are expected to be used for sleeping should be arranged to give privacy to the sleeper. This may be accomplished in many cases by providing alternate passage to bedrooms and bath through the kitchen.

Bedrooms should open directly on to a common hall without passage through another room.

Bathrooms should be located conveniently to bedrooms and open on to a common hall.

D. Ventilation and Light

Each room should have direct outside exposure with a window or windows so placed in relation to interior doors, other windows, or ducts, that good natural ventilation (through or cross) will result. Mechanical ventilation is not acceptable in place of natural ventilation. Through or cross ventilation for each family unit is highly desirable.

Windows must provide, in addition to ventilation, ample light and sunlight penetration without undue glare. The total glass area in each room except kitchens should generally be at least 15 per cent of the net floor area with the window head as close to the ceiling as possible and the sill no less than 30 inches from the floor line. Kitchens should have a glass area equal to 20 per cent of the floor area.

Direct sunlight in each room at some period of the day is highly desirable. (For planning with respect to sunlight, see USHA Policy and Procedure Bulletin 11, "Site Planning".)

E. Ceiling Heights

Ceiling heights should generally be no less than 7' 10" from finished floor to finished ceiling in order to provide for adequate sunlight penetration and air circulation. Actual heights will be determined by unit sizes of materials and should be uniform throughout one level.

F. Exterior Design

Pleasing design may be achieved economically through a skillful handling of mass, proportion, placing of openings, color, and textures without the need for carving, cornices, and other embellishments which add unnecessarily to costs.

Repetition of building types need not result in monotony. Buildings may be so adapted to topography and related to each other as to result in orderly variety as well as economy of capital cost.

Buildings should probably not exceed 200 feet in length as expansion joints are advisable beyond this length to guard against damage to the structure from unequal thermal or shrinkage movement, or from unequal settlement. The initial and maintenance costs of such expansion joints will probably outweigh any savings effected by the use of greater lengths.

Economy of Materials and Construction

Economy in initial costs demands the maximum allowable structural use of materials, and this influences the arrangement, general design, and to some extent, the sizes of dwelling units.

The choice of materials and structural systems should be based on comparative analysis of initial costs, costs of installation and maintenance, probable length of life, and suitability for the purpose. In such analysis, local materials may generally be given preference but careful study of existing uses of materials should be made to justify in demonstrable experience the assumed useful life of the structures to be built.

A. Use of Stock Sizes

For reasons of economy in labor and materials, a "modular" system of planning, based on standard, stock sizes of materials and fabricated equipment, should be followed.

Floor joists should, in general, be uniform in depth and of sizes which make the most economical use of materials. They should be of stock lengths used without overlap except as required for bearing.

Our studies indicate that a building depth of approximately 26'-6" permits a livable plan with an economical use of materials by means of continuous framing in one direction and a bearing wall or beam in between the outer walls. When wood joists are used, this depth of building permits the use of 2 x 10's exactly 12 and 14 feet long, and the loading utilizes these sizes almost to capacity. Longer spans require greater depths of joists, thereby increasing the area of exterior walls (an appreciable item of cost) or greater width with a less economical use of lumber.

In fireproof construction the plan should be arranged for uniformity in spans and duplication of slabs and beams both for span length and depth.

Story heights and window and door sizes and locations should be dimentioned to suit units of masonry or standard lengths and spacing of studding as required.

B. <u>Stair and Incinerator Framing</u>

In two-story units of frame construction, a placing of stairs parallel with the joists will avoid the introduction of long headers and permit simple and economical framing. This arrangement should be followed wherever it will permit a livable and otherwise economical plan.

In masonry construction, incinerators and plumbing slots should be placed out of the line of interior beams in order to maintain continuity of framing.

C. <u>Partitions and Doors</u>

Straight interior partitions are economical in construction and add to the orderly appearance of rooms. External angles require corner beads, are subject to damage and continual maintenance costs, and should therefore be minimized.

Partitions which are not needed for privacy are an unnecessary expense. In certain instances the kitchen may be treated as an extension of the living room by the use of a minimum of partition work and a maximum width opening without a door. Where the partition between the two spaces is a bearing partition, the opening should be limited to about 7'-6" as the cost of special framing beyond this width may exceed any savings.

The elimination of doors not required for privacy does not reduce the livability of a room and materially lessens its cost (when all items of door framing, fitting, hardware, and finish are considered). Similarly, the omission of the front wall on bedroom closets is a decided saving in initial costs and does not increase maintenance costs. This leaves to the tenant the furnishing of an inexpensive hanging to cover the closet opening.

D. Plumbing Stacks

Economy of plumbing stacks must be rigidly observed. This may be achieved by the placing of kitchens, baths, or kitchens and baths back-to-back, and vertically aligned. Wherever feasible, an arrangement of all the fixtures in one dwelling unit on one stack and one water supply control valve is preferable.

In fireproof construction, bathroom fixtures should be placed so that the slots run parallel with the slab reinforcing. Bathroom fixtures should be placed along one wall, for economy of plumbing lines.

E. Basements

Unless the type of heating system used requires basement space under each dwelling unit, basement areas should be consolidated and so far as economically feasible, minimized or eliminated. Some basement area will be necessary to provide space for a central or group heating plant, if used, the storage requirements of tenants, project storage, maintenance and repair shops, central laundries and drying space, and indoor recreational facilities unless these may more economically be located above grade or in separate buildings.

While the particular conditions surrounding a project--climatic, soil, costs of excavation--and its special requirements with respect to common or service spaces will influence the extent and location of basement areas, these elements should all be studied concurrently as the relative cost of basement space may influence the character and location of these facilities.

Where grade conditions require deep foundation walls on one side, all or a portion of the space they inclose may be used economically for basement area. In some cases, a partial basement may be constructed economically by the use of a dwarf wall as a retaining wall and the space over the unexcavated area used for storage and circulation of air.

Areaways, grates, etc. add to basement costs and in general basement walls should be carried up sufficiently above grade to provide windows above grade.

Where no basement is constructed, the first floor level should be as close as possible to finished grade, but careful consideration should be given to surface water conditions in order to insure proper drainage and prevent condensation on joists. Pipe spaces, where a central heating system is used without fully excavated basements, should be as shallow as possible, but allow for easy installation of mechanical work. If the number of lineal feet of space required is great, it may be desirable to raise the first floor one foot or more above grade, depending on the thickness of the first floor construction, thus requiring less excavation and permitting the venting of space with vent blocks above grade. Adequate ventilation should be provided and vents equipped for closing in winter in order to avoid cold floors in first floor units.

F. Parapets

Where code requirements permit, parapet walls should be avoided for reasons of economy. Roofs may be extended beyond the face of the wall, thus eliminating the need for flashing, copings, etc., and minimizing the danger of leaks. Where parapets cannot be eliminated they should be reduced to a minimum and constructed economically.

G. Porches and Entrance Projections

Porches add appreciably to the livability of a dwelling unit and make both interior and exterior space more useful. They may most economically be provided by making entrance platforms large enough to provide adequate area for sitting out. Concrete platforms or terraces should be built independently of the main structure in order to avoid cracks at the juncture in the event of future settlement; slabs may rest on fill without foundation walls, if feasible.

Canopies, where provided, must be of the most economical design possible.

Common Services and Facilities

The extent to which certain services are provided for common use and maintained by the project--or left to the individual tenant's responsibility--will affect the choice of unit types, the design of units, and the relation of the units to ground areas. For example, the choice between community and individual laundry facilities may affect the layout and equipment of the kitchen, its location in the dwelling unit, and the provision of laundry drying rooms or drying yards, or both, in the site plan.

The disposition of project facilities, such as laundries, storage space, garbage disposal and collection, and individual or central and group heating plants, located within the unit or elsewhere, will have direct bearing on the planning of the unit. The disposition of other facilities, such as management, social, education, and health, will have an indirect bearing on the planning of the unit.

The type and extent of community facilities should therefore be studied concurrently with unit and group plans.

A. Provision for Tenant Storage

Requirements for tenant storage beyond that supplied within the dwelling unit will vary with local conditions and habits of the group to be housed. Space allotted should be sufficient for essential storage only.

Storage space will generally be required in buildings over two stories in height or where individual basements are not available.

Easily accessible storage space for perambulators, bicycles, kiddie cars, etc. should be provided in the basement or on the first floor. Twelve square feet per family requiring such space is considered adequate for this purpose. In addition, centralized tenant storage space which is accessible only under management superintendence should be provided for trunks. Eight square feet per family requiring such space is considered ample for this purpose. Project storage for yard maintenace equipment, screens, etc. should be provided either in basements or in separate yard stations where basement space is not available.

B. Laundries

Provision for laundering and drying operations should be made in every project plan, though no general rule concerning such provision can be stated. Each project must base its choice of (1) central laundries with indoor drying space, (2) central laundries with indoor and outdoor drying, (3) individual combination sink and laundry trays, (4) individual laundry trays, or combinations of any of these on a careful survey of existing practices and preferences: In general, the provision of outdoor drying facilities is recommended in every case, and where common facilities are provided, they should be adequate to permit use by every family for approximately one half day per week.

It should be remembered that central laundries may increase both initial and maintenance costs, and unless they are used intensively enough to justify this added expense in rent, their provision is an unnecessary burden on the tenants. Apartments and flats, as a rule, require some form of central laundry since kitchens are small and access to outside drying space is difficult from them. The most economical arrangement which is acceptable to the tenants is the most desirable arrangement.

C. Garbage Removal

Wherever feasible, garbage disposal should be so arranged that the tenant handles the garbage to the point where it is collected by an outside agency. Disposal of tenant garbage for apartment buildings, three stories and higher, may be achieved at lowest cost and with maximum sanitation by the use of incinerators built into the structure. Operation and maintenance costs of incinerators will vary within a wide range with the number of families served by one incinerator.

In a project of both row houses and apartments, the incinerators may be made available to the row house dwellers by building them on the outer walls, but careful consideration should be given to climatic and other local factors in order to determine whether tenants may reasonably be expected to carry their garbage outside the buildings for disposal, and how far.

Garbage disposal for row houses and flats may be (1) the collection point type in which the tenants deposit their garbage at properly placed yard collection stations for removal by the city or private agencies, or (2) the group incinerator type with incinerators located conveniently for each group of buildings, except in those cases where the city will collect garbage and refuse directly from houses facing on or backing on streets.

D. Management and Maintenance Space

General considerations in the location and design of management and maintenance space are discussed in USHA Policy and Procedure Bulletin 11, "Site Planning."

Maintenance and repair space requirements will vary almost directly with the size of the project and with the management policy. Space should be provided to house (1) a general repair shop for carpentry, sheet metal, roofing, glazing, plastering, ironwork, etc., with easy access to the outside, preferably by ramp, and to electric power outlets; (2) a separate plumbing, heating, and electrical repair shop (except in small projects where the two shops may be combined); (3) a paint shop for storage and mixing of paints, enclosed with a fire-resistive wall; (4) a stock room or rooms for storage of heavy materials, fittings, small fixtures, and scaffolds; (5) superintendent's office, located adjacent to stock room if possible (except in small projects); (6) locker space for superintendent and other employees with toilets and showers; and (7) janitor stations with water connections in apartment projects.

Office space for management will likewise vary with size of project and with the extent to which management control is centralized in the local housing authority's offices. Space should be provided for (1) manager's office, (2) public space, (3) general work space, (4) book and storage vault, and (5) toilet facilities. Larger projects may require, in addition, a conference room. Such space should be accessible both for renting of units and rent payment when the project is in operation.

E. Recreational, Educational, and Health Facilities

Minimum community facilities for adult and juvenile recreation, and pre-school and adult education, should be provided on the site or in the immediate neighborhood to ensure the stability and increase the livability of the project. These may include an assembly room of modest size, clubroom space, vocational workshop space, kindergartens and/or nurseries. These may be provided in one or more dwelling buildings, in basement space, or in large projects, in a separate building.

Where pre-school educational facilities are provided by local authorities, consideration should be given to a kindergarten or nursery school designed to operate on the basis of a seven to eight hour day, providing for the study, play, eating, and sleeping activities of young children.

Incorporation of a public health clinic in a project should be governed by need and the policy of the local housing authority.

Nathan Straus

NATHAN STRAUS,
Administrator.

August 15, 1938.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 13 ON POLICY AND PROCEDURE

Aug 18, 1938

PREPARATION OF DRAWINGS AND SPECIFICATIONS

This bulletin has been prepared to aid local authorities and architects in drafting plans and specifications for low rent housing projects in accordance with the applicable provisions of the United States Housing Act of 1937 and the loan contract between local authorities and the United States Housing Authority and outlinging the procedure in connection with the submittal of plans and procuring the approval of the United States Housing Authority of such plans and specifications.

This bulletin is divided into two parts. The first part contains general information as to the requirements of the United States Housing Authority, the relationship between the United States Housing Authority and the local authorities with respect to submittal of documents and approval of same and general suggestions as to the preparation of plans and specifications.

The second part hereafter referred to as the Appendix contains detailed information as to the job program, preliminary and final drawings, preliminary and final specifications, outline specifications and working drawings.

1. General Requirements - Cooperation - Review and Approvals

As indicated in the publication on "Terms and Conditions" accompanying the contracts of loan and annual contributions, the final plans, specifications and contract documents for the construction of a project must meet with the approval of the USHA before construction contracts may be awarded by the Local Housing Authority. To facilitate and aid the Local Housing Authority and its Architect, the following points are suggested:

(a) During the period of the entire production of plans, specifications, estimates and contract documents, the staff of the USHA is available to assist with advice and with published documents on standards and so forth.

(b) As an important step, as soon as feasible after the loan contract is executed, it is suggested that the Local Authority prepare and submit to the USHA a Job Program; that portion which is prepared by the Architect should be as outlined in this bulletin. During the course of the preparation of the Job Program, staff members of the USHA will be available to cooperate with the Local Housing Authority and its staff, and it is hoped that, by this process of collaboration, when the Job Program is formally submitted, it will be substantially ready for formal approval, and that, once approved by the Local Housing Authority and the USHA, it will constitute a clearly defined basis for the specific project plans, specifications and contract documents. (Note: Where convenient, the Job Program may be prepared any time after the application for financial assistance has been completed in final form and before the contracts of loan and annual contributions have been executed, but, in order to avoid misunderstandings, it is suggested that this be done only with the concurrence of the USHA.)

(c) The suggested form of Architect's contract anticipates that the final plans will be drawn in ink on tracing cloth. At the option of the Local Housing Authority, pencil working drawings, if fully adequate for the purpose, may be used for the purposes of taking bids and awarding contracts. In such cases the pencil working drawings may be traced in ink on tracing cloth as a matter of record during the life of the Architect's contract with the Local Housing Authority or, if the Local Authority so desires and subject to the USHA's approval of an equitable adjustment in the Architect's contract, the pencil working drawings may constitute the permanent record. But regardless of whether pencil working drawings or ink working drawings are used for the purposes of taking bids and awarding construction contracts, the plans, specifications and contract documents must have the approval of the USHA before bids are taken.

(d) During the preparation of the working drawings, specifications and contract documents, the assistance of the staff of the USHA will be available to the Local Housing Authority and its staff and, as in the case of the Job Program, it is hoped that, by collaboration the working plans, specifications and contract documents, when submitted for formal approval, will be in shape for approval without delay.

(e) Throughout the period from loan contract to construction contract, the officers of the USHA will be in a position to give informal working approvals of plans and specifications as they are developed. Within the degree of authority delegated to them, and in order to expedite the work, the staff members of the USHA may give such informal working approvals in the field as the work progresses. Likewise, on matters which require review and discussion in Washington, such informal working approvals can be given during visits of the Local Housing Authority or its staff in Washington, or by letter following the review of plans or other documents.

(f) The review and approval of plans and so forth by the USHA are essential in carrying out the responsibility of the USHA to determine that the project complies with the terms of the United States Housing Act. The procedures suggested in this bulletin are designed to facilitate the work of the Local Housing Authority and the USHA, and should be interpreted and used for that purpose.

(g) As indicated in this bulletin, the USHA requests ten whole copies of the Job Program when submitted by the Local Housing Authority for formal approval, after it has been worked over to its completion. For purposes of a formal acceptance of the final working drawings, specifications and contract documents, the USHA requires six complete sets of the drawings and the other documents but, in order to facilitate and expedite review and formal acceptance, the USHA strongly recommends that this number be increased to eight complete sets. In the case of the drawings, it is further requested that the prints provided be sufficiently clear so that reproductions can be made by the USHA in Washington in the event that additional copies are needed for the USHA staff work. Good, clear blue prints will serve this purpose. In the case of specifications, it is requested that at least one of the copies be carbon-backed, on thin paper, so that, if necessary, blue prints can be made from this copy. The USHA will need only one copy of such material as structural design computations and miscellaneous data. The above refers only to the number of copies of Job Program and of complete sets of construction plans, specifications and contract documents submitted for final acceptance prior to taking bids. During the process of development of the drawings and specifications and whenever these are submitted to Washington for purposes of securing informal approval and suggestions, the number of copies will have to be determined in the light of circumstances at that time, but it is anticipated that in no case will the number of copies of drawings or other documents submitted for these purposes exceed eight. It is suggested that the number of copies of contract documents to be supplied by the architect, and for which blank spaces are provided in Section 6 of the suggested form of Architect's Contract, be made to conform to the above.

(h) No approval, formal or informal, by the USHA shall be construed to relieve the Architect of his responsibility to the Local Housing Authority as to the accuracy and completeness of the plans and other contract documents. The Architect should submit, with his final working drawings and specifications, a statement to the effect that all drawings have been carefully checked for accuracy of dimensions, structural strength, space requirements and materials, that the specifications have been properly coordinated within themselves and with the drawings, and that the requirements of the local Building Department and of other agencies, public or private, having jurisdiction, have been complied.with, or exemptions to existing requirements have been obtained.

(i) It is suggested that, to obtain the lowest insurance rate consistent with all the factors involved, the local authorities refrain from taking up with any local insurance exchanges or brokers any plans or specifications during the formative stage, but that they get in touch with representatives of the Project Planning Division, as steps are now being taken by the United States Housing to attempt to obtain uniformly low insurance rates on low rent housing projects throughout the United States.

2. Construction Costs

The United States Housing Act of 1937 sets a maximum limit on the cost per room and per dwelling unit, and a further limit on the total cost of a project is established in the loan contract. It is obvious that Architects must design within these limits. The cost estimates used in Job Program and those based on the working drawings should be low enough to allow for a margin of about five per cent to cover extras during construction. These, however, are to be regarded as maximum cost limits, and do not relieve the Architect of his responsibility to design for the lowest costs attainable in his locality consistent with good construction and good planning. The Act specifies "(a) that such projects will not be of elaborate or expensive design or materials, and economy will be promoted both in construction and administration and (b) that the average construction cost of the dwelling units (excluding land, demolition and non-dwelling facilities) in any such project is not greater than the average construction cost of dwelling units currently produced by private enterprise, in the locality or metropolitan area concerned, under the legal building requirements applicable to the proposed site, and under labor standards not lower than those prescribed in this Act."

3. Scope of the Architect's Work

The Architect should obtain, at the outset of his work, a definite statement from the Local Housing Authority setting forth the limits of the work to be covered by his plans and specifications, so that all street improvement and utility work which is not to be performed by the City or other outside agency, may be shown on his drawings. It will be the Architect's responsibility to coordinate his drawings with plans to be prepared by other agencies in connection with the housing project; further, to obtain from the City approval of his drawings for street and utility work to be performed in City streets or on land which it is proposed to dedicate to the City.

4. General Suggestions

The following observations, while in a sense self evident, are made in the hope that they will promote a certain degree of consistency in the work of all of the architects operating under the program of the United States Housing Act, and that this, in turn, will facilitate the review of the plans and specifications by the USHA.

(a) The drawings should indicate completely the scope of the work to be executed, while the specifications should only cover that which the drawings are not competent to explain. The drawings should be carefully coordinated with the specifications to avoid omissions, repetitions, inconsistencies and contradictions; likewise the several parts and divisions of the specifications should be coordinated within themselves.

(b) Notes on the drawings should be specific as to extent of work and kinds of materials, but should avoid naming exact varieties of materials or trade names.

Examples:

Say "wood," not "White Pine."

Say "Metal," not "Wrought Iron."

Say "Sheet Metal," not "16 ounce Copper."

Say "Brick," not "Face Brick."

Say "Screen Cloth," not "16 mesh bronze Screen."

The above, like all general rules, cannot always be observed to the letter, but consistent observance will avoid many conflicts between plans and specifications.

(c) Drawings should include complete Door, Window, and Interior Finish Schedules, placed on drawings where most available for reference. A schedule of buildings, dwelling units and rooms should also be included. Schedules should be carefully checked with drawings and specifications.

(d) Each drawing should be properly described in the legend or index and should be dated and numbered to facilitate handling, recording and filing.

Attached to and made a part of this bulletin is an Appendix containing a discussion of the following:

(a) Job Program

(b) Pencil working drawings, ink working drawings and specifications.

(c) Outline specification.

(d) Working drawings.

Nathan Straus

NATHAN STRAUS,
Administrator.

August 18, 1938

APPENDIX

Section A.

JOB PROGRAM

(See Section 3, Paragraph (a) in suggested form of "Architect's Contract")

I. General

Since the Job Program is the basis for the working drawings and specifications, it should be sufficiently comprehensive to show the scope of the work and the character of construction, to supply the information to estimate construction costs, and to indicate compliance with mandatory requirements. All drawings should be prepared on tracing paper at least 18" x 28" in size but preferably the same size as the sheet determined upon for final working drawings.

II. Architectural Work Included in Job Program

Ten each of the following items, bound in sets to form booklets, are required by the USHA (see B 3., relative to submission of items by groups):

(1) Architectural Site Plan

Site plan of entire property at a decimal scale of 1" = 100' or larger if sheet will permit. Preferred size of sheet is 30 inches by 42 inches to cutting lines. Site plan should show:

(a) Property line survey.

(b) Existing street utilities and their sizes.

(c) Existing and proposed streets, named or identified.

(d) Existing and proposed alleys, parking areas, walks, parks, play and recreation areas.

(e) Contours and other data influencing site plan.

(f) Approximate finished grades sufficient to give a clear conception of the extent of cut and fill, if extensive grading operations are contemplated.

(g) Buildings proposed and to be retained, indicating number of stories of proposed buildings, and identifying buildings.

(h) Location of central or group heating plants, social facilities, management office, maintenance and repair space, laundries, stores, etc.

(i) Serial number or other designation for each building and a schedule of building and dwelling units, identifying dwelling units in each building, and number of rooms in each dwelling unit.

(j) A graphic scale, direction of prevailing winds, and north point.

The above information may be shown on a single site plan, or on more than one drawing if preferred.

(2) Unit Plans

Unit plans at scale of ¼" equals 1'-0" of each dwelling unit fully dimensioned; include by line indication the contemplated system of framing, kitchen equipment, plumbing fixtures, doors, windows, stoves, flues, etc., and location of all electric outlets and radiators, and showing possible furniture layout.

(3) Typical Buildings

Plans and elevation of one typical building of each construction type at scale of not less than 1/8" equals 1'-0". The plans should show over-all dimensions only.

(4) Cross Section of Typical Building

Cross section of typical building at scale of not less than ½" equals 1'-0" with dimensioned story heights, notes on materials, and indication of types of footings, etc.

(5) Wall Section of Typical Building

Wall section of typical building at scale of not less than 3/4" equals 1'-0" for all building types contemplated, sufficient to indicate type of construction, materials, interior trim, proposed ceiling and window heights, etc.

(6) Utilities Distribution Site Plans

Site plans of entire property, at same scale as architectural site plans, as follows:

(a) Electrical, showing all buildings and indicating the proposed electric distribution system, yard lighting, and the point or points of pickup with service lines. The telephone conduit system, if underground, should also be indicated. No feeder sizes or diagrams are required. Indicate obstructions above ground, such as trees, etc., which are to be retained.

(b) Heating, showing all buildings and indicating the proposed boiler room or rooms, the machine rooms, and the distribution system. No pipe sizes or radiation need be figured.

(c) Utilities, - indicating:

1. Existing sewers, water mains and gas mains in public rights-of-way crossing or bordering the project site, and existing grade contours, if not covered by architectural site plans.

2. Proposed sewers, water mains and gas mains to be installed in connection with the project, but <u>not</u> to be included in the architect's plans and specifications.

3. Proposed sewers, water lines and gas lines, including all service lines, to be covered by the architect's plans and specifications. Definite sizes and grades are not required.

(7) <u>Existing Conditions - Site Plan</u>

Plan showing all existing basements, etc., when this complete information is not covered by architectural site plans.

(8) <u>Landscape Plan</u>

Plan of the entire property, at same scale as architectural site plan, indicating the type and extent of the proposed landscape development and the intended uses of all land. If considered necessary to illustrate the work more fully, a separate drawing of a typical block plan may also be submitted.

(9) <u>Outline Specification</u>

An outline specification in sufficient detail to explain the scope of the proposed improvements, including all buildings, yard and street improvements, utilities, mechanical work, incineration or other method of garbage disposal, access to project for fire protection, landscaping, etc. It should describe the proposed system of construction, materials and finish to be used, call attention to any special conditions which may be anticipated, such as excess foundations (including with this statement reports on immediate and proposed soil investigations and condition of existing buildings), and state whether the proposed development is in accordance with building codes, zoning ordinances, etc., or, if not, whether exceptions have been obtained or are required. To assist in the preparation of this item, there is appended hereto a form of Outline Specification (Appendix "A"). All major items of construction materials proposed should be checked against this outline, crossing out items not applicable to the project and adding important items not listed on the form. Preface the outline specification with a statement dealing with unusual and special conditions which may affect the materials and methods of construction proposed in the outline specification, such as special local conditions, unusual site conditions, unusual local constructions and materials, and code and zoning requirements.

(10) Work not Covered by Architect's Contract

A description of any work to be done other than by construction contract with Local Housing Authority, together with copies of agreements pertinent thereto.

(11) Tabulation of Dwelling Units

An itemized tabulation of the dwelling units with room ratios and room areas.

(12) Non-dwelling Buildings and Equipment

A complete description of non-dwelling buildings and equipment, including arrangements for garbage disposal, maintenance of streets, driveways, parks, playgrounds, etc.

(13) Itemized Estimate of Development Costs

An estimate as set forth under Section 3, Paragraph (a) in the suggested form of "Architect's Contract."

(14) Itemized Estimate of Annual Costs and Rents

An estimate, prepared by the Architect or by other employees of the Local Housing Authority, broken down as to all annual costs and as to rents including utility charges to tenants.

III. Submission of Items by Groups

Certain of the items may be grouped and submitted in advance of the remainder if considered desirable in order to expedite approval; these items consist of Nos. (1), (2), (3), (4), (5), (9), (11) and (12).

Section B.

I. PENCIL WORKING DRAWINGS

1. General

After formal approval of the Job Program, the next step in the development of the project is the preparation of pencil working drawings. These should be prepared in such manner and in such number of sheets as may be required to illustrate fully the entire scope of the work, the materials to be employed and the exact details of construction, finish, mechanical work, landscape work and all other items comprised by the formally approved Job Program. These drawings, when ready for submission for approval, should be in shape for tracing and hence should be complete in every respect except with respect to such matters as cross hatching and other material indication, minor details and notes, and finished titles.

The USHA does not undertake to prescribe the exact manner in which the drawings shall be prepared, the various scales to be used, the number of sheets required or any other details as to presentation, leaving such matters to the judgment of the Architect in conformity with his contract with the Local Housing Authority. However, to the extent which its necessary review demands, the USHA requires that the plans be logical, clear, accurate, complete and in conformity with good architectural and engineering practice. It is the intent that these drawings, together with the specifications and the other contract documents, will constitute an instrument whereby accurate bids may be received and the work properly executed without undue difficulty. See Appendix "B" containing suggestions relative to the number and size of sheets, scales to be used, grouping and numbering of drawings and all related matters.

2. Use of Pencil Working Drawings for Bidding and Contract Purposes

See Section A 1., Paragraph (c) in which it is stated that "at the option of the Local Housing Authority, pencil working drawings, if fully adequate for the purpose, may be used for the purposes of taking bids and awarding contracts." In such event, the pencil working drawings, as described in the foregoing Section C 1., should be carried to the degree of completion described hereinafter under Section E 1.

II. FINAL SPECIFICATIONS

(FIRST DRAFT)

1. General

All of the provisions of the foregoing section "PENCIL WORKING DRAWINGS" should govern the preparation of the first draft of the final specifications so far as these provisions are applicable. Attention is directed to the suggestions relative to contract forms and documents contained in USHA Bulletin No. 9 on "Policy and Procedure." Preferably, these documents should form Part I of the Specifications; Part II should consist of the technical specifications.

Mimeographed or printed copies of this draft of the final specifications are not recommended; this should be deferred until final review is made and approval given.

The USHA contemplates issuing a bulletin containing suggested specifications covering most of the various trades normally required in this general kind of construction. It will be issued to Local Housing Authority, for such use as they may care to make, upon publication.

NOTE: See APPENDIX "B", item (16) relative to preparation of separate contract documents for Landscape Work.

III. INK WORKING DRAWINGS

These are the tracings of the pencil working drawings; they should be prepared with black waterproof ink on good tracing cloth. They should include, in addition to the suggested requirements noted previously in this bulletin, such items as suitable cross hatching and other material indication, minor details and notes, finished titles, sheet numbers, etc., and all other notes and indications necessary to make them complete in every respect. See Appendix "B".

IV. FINAL SPECIFICATIONS

(SECOND DRAFT)

These are the duplicated copies of the corrected "FINAL SPECIFICATIONS (FIRST DRAFT)". It is suggested that Parts I and II be bound under one cover, with title page and index for ready reference.

Section C.

OUTLINE SPECIFICATION

DATE ______________________

PROJECT NO. ______________________

______________________ HOUSING PROJECT

______________________ , ______________________
City State

____
ARCHITECTS

______________________ CHIEF ARCHITECT

____
Location of Project

Project Consists of a total of ______________________ Buildings

containing ______________ ______________ Story Apartment Buildings,
No. No.

______________ ______________ Story Group House Buildings,
No. No. of Stories

______________ ______________ Flat Buildings,
No. No. of Stories

______________ ______________ ______________
Other Buildings

______________ Dwelling Units ______________ Rooms

Community Facilities* ______________________

Administration Unit* ______________________

Heating Facilities* ______________________

Maintenance and Repair* ______________________

*State if in separate buildings.

____

Describe nature of site: (Vacant) (Slum)

LOCAL CONSTRUCTION METHODS

1. CODE REQUIREMENTS.

2. ZONING ORDINANCES.

3. UNUSUAL OR LOCAL CONSTRUCTION METHODS.

4. NEW METHODS OR MATERIALS (IF ANY) CONTEMPLATED.

GENERAL

1. ACCESS TO PROJECT FOR FIRE PROTECTION.

2. INSURANCE RATES.

SITE CONDITIONS

1. If project site is encumbered by existing buildings, describe briefly the types.

2. Basements: General condition of existing basement spaces; wet or dry.

3. Is all or part of the project filled land, if so state approximate average depth and material of fill.

4. Will rock be encountered in excavations? Are there springs or other water courses on site?

5. Is any portion of ground ever flooded?

6. Will piles or deep foundations be required? (If required) Timber or concrete piles? Substantiate by subsoil data.

7. Are utilities available on or at borders of site? (Water, sewer, gas, elec.) Are they of adequate capacity?

8. Are there trees on site, if so state kinds, sizes and disposition.

9. Will it be necessary to fill any portions of site?

10. Will surplus dirt have to be removed from site?

TYPE OF CONSTRUCTION

1. Fireproof

2. Semi-fireproof

3. Non-fireproof

NOTE: Give brief description.

PRINCIPAL CONSTRUCTION MATERIALS

NOTE: Cross out items not used. Insert after each heading explanatory remarks, brief descriptions and any material or items not listed.

1. FOOTINGS:

Concrete: Plain - Reinforced.

Concrete piers and grade beams.

Concrete Piles: precast - steel casing.

Timber Piles: plain creosoted.

2. FOUNDATION WALLS:

Concrete; Concrete Block; Brick; T.C. Tile; Cinder Block.

Dampproofing; Waterproofing; Foundation Drain Tile.

3. SUPERSTRUCTURE WALLS (EXTERIOR):

Solid Brick; Brick facing with Tile or Masonry Unit Backing.

Brick Veneer with Stud Backing; Concrete Block painted.

Cinder Block, Painted; Stucco on Tile or Masonry Unit Backing.

T. C. Block, Painted.

T. C. Block (No Finish).

Outside Walls dampproofed on Inside Surfaces.

Mastic Type dampproofing.

Cut-back Asphalt Type dampproofing.

Outside Walls furred.

4. SILLS:

Brick; Stone; Cast Stone; Slate; Metal; Wood.

Lug sills; Slip sills.

5. FLOOR CONSTRUCTION:

Wood Joist, Concrete Flat Slab; Combination Slab;

Bar Joists, with Metal Lath Concrete Slab; Precast concrete joists with concrete slabs on Metal Lath Precast tile joists with tile and cement slabs.

6. ROOF CONSTRUCTION:

Flat Type; Pitched Type.

Timber Construction; Concrete Slab; Metal Construction.

Bar Joists with Wood Deck.

Bar Joists with Concrete Slab on Metal Lath.

Suspend Ceilings.

Attached Ceilings.

No Plastered Ceilings.

Copper Flashings; Zinc-coated (Galvanized) Flashings;

Tin Flashings.

Gutters; Downspouts.

7. ROOFING MATERIAL:

Sheet Metal; Composition (No. of Piles); Slate; Tile;

Asbestos Shingle; Mineral Surfaced Felt.

8. COPINGS:

Stone; Glazed Tile; Metal; Brick; Precast Concrete.

9. STAIR CONSTRUCTION:

Wood; Concrete; Steel and Concrete; Steel and slate.

Treads; Cement fill; Checkered Plate; Asphalt Tile Covering;

Safety Treads; Alumdum aggregate in top of treads.

Fire Escapes.

10. INTERIOR PARTITIONS:

Wood Studs; Metal Lath and Plaster; Gypsum Lath and Plaster; Wood Lath with Gypsum Plaster.

Gypsum Tile; T. C. Tile; Solid Plaster Partitions.

11. CEILING FINISH:

Plaster as for Walls; Fiber Board; Plywood.

Concrete surface; unfinished; painted.

12. INTERIOR FINISH:

Plaster, unpainted; Plaster, painted; Plaster Board.

Plywood; Painted; stained; papered.

13. FLOORING MATERIALS:

Cement; Hardwood; Softwood; Asphalt Tile; Composition Tile; Linoleum; Ceramic Tile in Bathrooms.

14. WINDOWS:

Double-hung wood; Weighted or sash balance; Wood casement; Weatherstrips; Steel casements; Screens.

15. DOORS:

Stock, 4 panel; 5 panel; 6 panel; flush veneered 1-3/8 inch thick; 1-3/4 inch thick.

16. INSULATION:

Top Story Ceiling Insulation; insulated with 4" of loose fill;

2" of loose fill; 2" blanket; 2" Bats; Insulating Lath 1/2"

Roof Insulation: one inch fiber board roof insulation; 2" fiber board.

Wall Insulation: one inch blanket; 2" blanket or Bat.

17. PAINTING:

Wood: primed and one coat; primed and two coats; stained and one coat.

Metal: primed and two coats; primed and three coats.

Plaster: Casein paint; Lead and Oil paint - 2 coats; Papered; Unpainted.

18. KITCHEN CABINETS:

Wood cabinets with doors; no doors; metal cabinets; open shelving.

19. KITCHEN EQUIPMENT:

Ranges; Stoves; gas; electric; wood; coal.

Refrigerators; ice; gas; electric.

20. GARBAGE DISPOSAL:

Incinerators; garbage cans.

Individual collection.

Group stations.

21. PLUMBING:

Enamel iron sink; Cement laundry trays;

Combination sink and laundry trays; recessed bath tub;

Syphon jet W. C.; Wash down type W. C.; Enamel iron lavatory;

Enameled steel plumbing fixtures; Copper tubing;

Galvanized steel piping; Galvanized wrought iron piping.

NOTE: Give brief description of each item.

22. HEATING:

Warm air; Stoves;

Gravity 2 pipe H. W. system;

2 pipe Gravity steam up-feed system;

Single pipe Gravity steam up-feed system;

Vacuum system;

Central Heating Plant;

Group Heating Plant;

Individual plants for each building;

Space heaters; Electric heating;

Individual tank for hot water;

Fuel - Oil; Gas; Coal; Coke; Wood.

NOTE: Give brief description of each item.

23. ELECTRICAL WORK

Overhead distribution; Underground distribution; Rigid conduit;

BX conduit; Steel tube conduit; non-metalic cable;

Outlet for electric range; outlet for electric water heater;

Outlets for refrigerators.

NOTE: Give brief description of each item.

Section D.

WORKING DRAWINGS

1. General

The suggestions contained in this Appendix will, if adhered to, result in a uniform presentation of the drawings which will greatly facilitate their review by the USHA and this, in turn, should be of mutual benefit to all concerned.

It will be noted that the set-up given is for the final working drawings but that exceptions are noted to cover items or parts of items not required in the submission of Pencil Working Drawings.

2. Size of Drawings - Scale - Numbering System

In order to facilitate filing, a standard size sheet of 30" x 42" to the cutting lines is recommended; in no event should the sheet sizes be greater than 36" x 50", and a binding margin of $1\frac{1}{2}$" should be provided on the left side.

The scale of plans, except plot plans and surveys, should be not less than 1/8"; plot plans and surveys should be at as large a scale as possible within the limits of sheets of reasonable size. The scale of drawings of every class should be 1/32", 1/16", 1/8", 1/4", 1/2", 3/4", 1-1/2", 3" or full size, except in the cases of survey maps and site, block and planting plans, for which decimal scales may be used.

The following numbering system of drawings is recommended:

X-1 to X-10 - Surveys.

1 to 299 - Architectural Drawings.

300 to 399 - Utility and Site Improvement Drawings.

400 to 599 - Structural Drawings.

600 to 799 - Mechanical, Heating, Plumbing and Electrical Drawings.

800 to 899 - Landscape Drawings.

899 to - - Details.

The above numbers should be preceded by the letters "A", "S", "H", "P", "E", "L", "D", etc., indicating Architectural, Structural, Heating, Plumbing, Electrical, Landscape and Details, etc., respectively. These letters should be combined where drawings include more than one of the above subdivisions (except in the case of Architectural drawings). In the preparation of working drawings, it is essential that groups or blocks of buildings be numbered so that a complete set of drawings for each block will be in consecutive order (excepting detail drawings).

3. Drawings

The complete set of working drawings should include the following:

(1) Title and Index Sheet, listing the number and title of each sheet. (Not required for "Pencil Working Drawings").

(2) Survey Map or Maps and other site information furnished the Architect by the local Housing Authority in accordance with Section 11 of the suggested form of "Architect's Contract," including:

(a) Property line map and present utility layout. This is to be the original tracing of survey prepared by licensed surveyor.

(b) Topographical map showing all existing contours, existing buildings, if any, depth of present basements, location of existing trees to be retained, and other existing physical conditions. A complete log of all available soil data is to be submitted with this map. These data may cover borings, test pit explorations, test loads and location of ground water.

(3) Site Plan - The site plan at the same scale and as called for under "Job Program," revised as required and developed to a final stage by the addition of over-all and other dimensions. This is to serve as a general control plan for the entire project, and as a key to Block Plans. Where the project consists of a single block, the site plan may serve also as the "block plan," in which case the scale should be large enough to allow for detailed information. The site plan should include the schedules and other miscellaneous items under Item (1) of the "Job Program." The plan should also include the postal addresses, as approved by local postal authorities, and the apartment numbering system, but this information is not required for "Pencil Working Drawings."

(4) Block Plans, fully dimensioned, consisting of a plot plan of each block (not necessarily a city block area) at a scale of

1/16" or 1/20". They should contain all necessary information including:

(a) Location of all buildings and their first floor elevations.

(b) Existing contours.

(c) Established or proposed grades of walks, drives, recreation areas, terraces, open areas, etc., also proposed grades at corners of and entrances to buildings.

(d) Location of walks, drives, parking areas, terraces, play and recreation areas, retaining walls, fences, clothes poles, light standards, transformer vaults, storm water inlets, manholes, fire hydrants and other site improvements, and utility structures appearing at finished grade.

(e) Location and grades of all surface improvements in City streets, including grade elevations along existing curbs; also indication of street work to be done by the City in connection with the project; notes should indicate clearly that such work is not included in the general contract but is shown so that the general contractor may coordinate his work with that done by others.

These plans may be also used as roof plans, and in conjunction with plumbing work may indicate downspouts, yard drainage and sewer lines (but this need not be included for "Pencil Working Drawings)". Buildings should be identified to conform with site plan identifications.

(5) <u>Unit and Building Plans</u> at 1/4" scale of each typical building unit and all other units in the project such as central or group heating plants, laundries, social facilities, management office, stores, maintenance and repair space, etc. Separate plans should be drawn for like units of opposite hand. Plans should be fully dimensioned for interior partitions, exterior wall openings, column centers and overalls. These plans should show items such as equipment and fixtures to be included in the general contract, door swing, etc., electric outlets and branch circuits, and radiator locations. Proposed grades at corners of and entrances to buildings should be shown.

(6) <u>Plans and Elevations of each Typical Building</u> at 1/8" scale. Buildings repeated need be shown only once, except that like buildings of opposite hand should be shown, and a schedule, identifying all buildings for which the drawing is intended and consistent with the site and block plan identification, should be included. Separate plans and elevations for all

variations, including variations in basement plans, should be shown, but when the apartment units for two or three floors are typical only one plan need be drawn. Plans should show exterior dimensions, but no interior measurements are required except where variations from 1/4" scale unit plans occur. Exterior dimensions should include unit plan dimensions, overall dimensions to all breaks in walls, and general overall dimensions. Where topography requires variations in porches, steps, etc., an elevation should be drawn of perimeter walls from bottom of footings to first floor sills showing various conditions.

(7) Key Plans of the site should be placed on each drawing to locate buildings shown on that drawing.

(8) Scale and Full Size Details adequate to cover fully all items. The following are suggestions as a check list:

(a) 1/2" or 3/4" details of interior stairs, kitchen cabinets, and incinerators.

(b) 3/4" details of all exterior features such as entrances, porches, etc.

(c) 3" details of wall sections showing conditions at floor levels, wall opening sills, heads and jambs, parapets, eaves, and roofs.

(d) Full size details of windows and doors including frames and jambs, interior trim and base, thresholds and solid plaster partitions including anchorage to floor, ceiling and jambs.

(e) Any other special features not listed above.

For the "Pencil Working Drawings," only the more important details, particularly those of features which repeat many times, need be shown.

(9) Material and Finish Schedule, complete for all rooms and other spaces.

(10) Door and Window Schedules, complete including diagrams showing arrangement of window lights and door panels.

(11) Structural Work. In general the set-up for structural drawings should follow that outlined above for the architectural plans of typical and special buildings, and the scales employed should be the same. Buildings of ordinary construction having no

basements may have first floor framing and foundation plans combined, but in all other cases the foundations should be separate. The foundation drawings should include the solution of all special problems, footings for boilers, incinerators and special equipment, the present and proposed grades at building corners, the bottom elevations of all footings, and the elevations of all floors. The following should also be included:

(a) Schedules, details (at large scale to show typical and special arrangement of members and materials), notes and dimensions.

(b) Complete log of all available soil data, incorporated as part of the contract working drawings. These data may cover borings, test pit explorations, test loads, and location of ground water.

(c) Copy of computations for the checked structural design. (This will not form part of the contract drawings).

(12) Heating Work drawings should include the following:

(a) Site plan of project area showing all buildings (identified) and steam distribution system.

(b) 1/8" scale plans of each basement or pipe space. Separate plans should be prepared for like plans of opposite hand. On 1/4" and larger scale drawings, the plumbing, heating and electrical system may be preferably combined. For plans above basements, the Architectural Drawings may be used to show locations only of radiators and risers.

(c) 1/4" scale plans of boiler room or rooms, machine rooms, etc.

(d) Details in connection with heating system.

The details need not be shown on "Pencil Working Drawings."

(13) Plumbing Work drawings should include the following:

(a) Site plan of project area showing all buildings (identified) and plumbing, gas-fitting and yard drainage system.

(b) Same set-up as for heating.

(c) Same set-up as for heating.

(d) Same set-up as for heating.

(14) Electrical Work drawings should include the following:

(a) Site plan of project area showing all buildings (identified) and electrical distribution, yard lighting, and telephone distribution.

(b) 1/8" scale basement layouts showing electric layouts and riser diagram. Separate plans should be prepared for like buildings of opposite hand. In lieu of these 1/8" scale plans, the plumbing, heating and electrical work may be combined on 1/4" scale plans.

(c) The outlets and circuit wiring in each type of dwelling unit, social rooms, management office, maintenance and repair space, boiler room or rooms, laundries, stores, etc. These may be shown on the 1/4" scale Architectural Drawings.

(d) Details in connection with transformer vaults; manholes if distribution system is underground; service entrances for overhead electric and telephone services; meter locations and metering centers; special diagrams for time controlled circuits; details of exterior lighting fixtures if special in character.

(e) Lighting fixture schedule. This should designate the type of lighting fixture for each location, together with the size and type of lamp to be used.

(15) Utility and Site Improvement Work drawings should show, in addition to the site improvement work on the Site Plan and the Block Plans, the following:

(a) Cross sections of streets and driveways and profiles (where necessary for proper determination of grades) of streets and drives.

(b) A utility site plan as described under "Job Program," checked fully and approved by the municipal departments and utility companies having jurisdiction. (Tentative approval will suffice for the "Pencil Working Drawings" but the final drawings should bear the signed approval of the municipal departments and the utility companies have jurisdiction). This plan should show all proposed sewer grades and should be supplemented with complete details of appurtenances required. All utility plans should be correlated with planting plans.

(16) Landscape Work

Note: The complete landscape contract documents, including plans and specifications, should be prepared as a separate contract. Any variation of this procedure should be approved in writing by the local Housing Authority. The landscape drawings should include:

(a) The block plans called for above under Item (4) traced and developed as planting plans. The landscape plans should show:

(1) Buildings, roads, parking areas, walks, play and recreation areas, banks, terraces, etc.;

(2) Locations of all trees and other plants;

(3) Indication of all plants with scientific names conforming to "Standardized Plant Names" by American Joint Committee on Horticultural Nomenclature;

(4) Elevations of terraces, steps, walk intersections and first floors;

(5) Existing trees to be retained or transplanted. (For the "Pencil Working Drawings," only, and in the event that the site plan is such that a typical block may be selected from which there are only minor variations in the remainder of the project, only one block need be developed in detail. The block plan selected should be of sufficient size to afford a basis for the landscape cost estimate of the entire project. The remaining landscape block plans should show only in general the type of landscape development proposed and the allocation of land). Planting plans must be correlated with utility plans.

(b) Typical construction details at 1/2" or other suitable scale showing methods of planting, pruning and guying, tree wells if required, drainage facilities and other special details.

(c) A cost estimate, to be submitted with the "Pencil Working Drawings," for the landscape development of the entire project. The estimate should show the total quantities of plant materials, topsoil, sod, etc., and the unit prices. If subsoil conditions are not favorable for landscape development, definite recommendations should be submitted, and the cost involved in improving conditions should be outlined. The total area of the project should be scheduled in this estimate as:

(1) Types of paved areas such as roads, walks, parking, recreation, etc.

(2) Landscape areas such as sod, seeded, topsoil, planted, etc.

(3) Total ground area covered by buildings and other structures. The total of these three areas must equal the total area of the project to the property lines. The area to be improved between property lines and street curbs of boundary streets should also be noted.

(d) A report of the available topsoil on the site (Average depth and total cubic yardage) containing recommendations for stripping, storing, (outside the limits of building construction and street and yard work) and replacing during landscape construction. The cost of such work should be compared with purchase of other soil. The Landscape Architect should submit a signed statement that the plant materials indicated for use are generally available locally to contractors. Items under this paragraph to be submitted with the "Pencil Working Drawings."

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 13 ON POLICY AND PROCEDURE
Dec. 10, 1938.
Addendum No. 1

PREPARATION OF DRAWINGS AND SPECIFICATIONS

1. Bulletin No. 13 on Policy and Procedure includes the following statement:

"The review and approval of plans and so forth by the USHA are essential in carrying out the responsibility of the USHA to determine that the project complies with the terms of the United States Housing Act. The procedures suggested in this bulletin are designed to facilitate the work of the local housing authority and the USHA, and should be interpreted and used for that purpose."

In conformity with the foregoing, the USHA finds it necessary to make a review and check of all drawings and specifications prior to approval for contract purposes in order to determine that the contemplated buildings will provide decent, safe, and sanitary dwelling facilities at the lowest possible cost, and in order that all other requirements comprehended by the USHA Housing Act of 1937, as amended, are met.

In making this examination and review of proposed contract documents, it is only natural and proper that the technicians performing this service should also examine the plans and specifications from a technical and construction point of view, and that the attention of local housing authorities should be called to such errors, discrepancies, and oversights as might be encountered in this review. This has been, and will continue to be, the policy of the USHA.

However, local housing authorities and their architects, should bear in mind the fact that the facilities of the USHA are not unlimited, and that, in consequence, and because of the fact that project plans and specifications cannot always come to the USHA in orderly and regular sequence, time is not always available for a thorough and careful check of the plans and specifications from the technical and construction point of view.

Local authorities are, therefore, urged not to place unlimited dependence upon the fact that the USHA proposes to make a technical and construction check of the plans and specifications, but to review these thoroughly and painstakingly prior to submission for approval. By such procedure three objectives will be obtained:

(a) The facilities of the USHA will not be overtaxed.

(b) The USHA will be able to render more prompt service in the review and approval of contract documents.

(c) The chances for errors and oversights which lead to unsatisfactory conditions or to increased cost, or both, will be greatly diminished.

2. In connection with the preparation of final specifications, Bulletin No. 13 on Policy and Procedure directs attention to the contract forms and documents contained in USHA Bulletin No. 9, and suggests that these documents form Part I of the specifications. One of the most important points for consideration in connection with Part I of the specifications has to do with <u>the manner in which bids are to be taken</u>. This question, together with the related question of alternate bids, warrants the most serious and careful consideration.

Bulletin No. 9 includes a discussion on the subject of letting general contracts on the basis of dividing a project into two or more parts, and of segregating from general construction contracts such items as plumbing, heating, and electrical work. It is here restated that local authorities should give consideration to this question and should weigh the several advantages and disadvantages of such a procedure, taking into consideration the fact that certain state laws make it necessary, on Public Works, to segregate and take separate bids on parts of the work other than the general construction.

However, it should be borne in mind that the complications attendant upon splitting the work into a number of contracts are manifold, and that these complications increase much more rapidly than in direct proportion to the number of contracts. The following discussion is intended as an aid to local authorities in reaching its determination relative to this important question.

To begin with, the local authority should attempt, in the early stages of the work, to formulate its policy with regard to the manner in which bids should be taken and the alternates to be included, since this has an important bearing upon the site plan itself, and upon the manner in which the drawings are prepared. For example, it will be appreciated that certain site plans lend themselves more readily to several general contracts than do others, and that the distribution of utilities, arrangement of walks, and other features, are also involved in this problem. With respect to the drawings, these should contemplate the effect which alternates will have upon related work. Hence, an early decision as to the division of contracts, if any, and with respect to the taking of alternate bids, will enable the plans to be prepared, and the specifications written, in a manner less susceptible to misunderstandings and disputes during construction than would otherwise be the case.

A multiplicity of contracts and alternates involves four major difficulties:

a. Contract Documents and Bid Forms:

The preparation of the contract and bid forms in such manner that the requirements desired may be clearly and unmistakably understood by all intending bidders. The difficulties may not be readily apparent until an attempt is made to set up the documents, nor are they always perceived at that time. However, to form some conception of the difficulties involved in a relatively simple case - assume the hypothetical problem of one project divided into four bidding areas for general construction purposes, with one area including a building, or buildings, for which an alternate is proposed to exclude these buildings; then assume that it is necessary, under State laws, to take separate bids for plumbing, heating, electrical work, and that it seems desirable to separate the paving work as well as the landscaping work from the general contracts; in addition, assume that alternates are desired covering four items on the construction work, and as few as two items each on the mechanical trades. With the necessary provision that over-all bids must also be taken in order to insure that the lowest possible price has been obtained, such a case as is cited would involve the taking of as many as 80 to 100 base bids and 200 to 400 alternate bids. Under such circumstances, a long and painstaking analysis of the bid documents becomes necessary in order to insure that there is no overlapping of items or gaps to be bridged by extra expenditures after the contracts have been awarded.

b. Evaluation of Bids:

The mere process of tabulation of bids under the hypothetical case cited is no small task, but the evaluation of these bids after they have been tabulated is not only difficult, but may be even impossible in some cases. It is easy to conceive that in order to pick out the lowest possible combination of bids it may become necessary to do so on a basis that may not produce the best possible results, and that in certain cases the awards may be determined by virtue of the acceptance or rejection of certain alternates, a situation almost certain to produce embarrassment for the local authority. In certain states where the law requires that awards be made on the basis of the base bids, without regard to alternates, it is altogether probable that certain desirable alternates may be accepted only if excessive prices are paid; the conclusion is that in such states the base bid should include the most desirable materials and methods, covering those that are less desirable by the alternates. In all events, the number of alternates should be held to the minimum.

c. Construction Difficulties:

The presence of a large number of contractors on any one project leads to confusion, division of responsibility, and delays. For example, contemplate a situation under which a central heating plant and its steam distribution lines is under one contract, and the heating system within the buildings is under one, or more, other contracts. Under such a situation, if the heating of one or more of the buildings is unsatisfactory, both contractors will disclaim any responsibility, each charging the other with the fault. Each contractor must have access to his site, and such access will frequently cross the area under the jurisdiction of another contractor. Claims arising out of difficulties due to surface drainage will often develop. Delays are certain to ensue. From a management point of view, differences in equipment and in types of materials resulting from divided contracts impose added maintenance costs. Other difficulties too numerous to cite can be readily forecast.

d. Increased Overhead:

It is obvious that under a large number of contracts a local authority must assume the function of coordination which normally belongs to a general contractor, and that the administrative cost of such coordination accounts for at least a considerable portion of the savings which may seem to result from a division of the contracts. Moreover, the direct supervision cost may increase in more or less direct proportion to the number of contractors engaged.

The foregoing statements are not in any sense intended to indicate that the USHA is empowered, or desires, to interfere with any reasonable proposals that local authorities may make relative to the manner of securing bids. It is appreciated that many local authorities desire to keep contracts small enough so that legitimate local competition can be had. The argument has also been advanced that local contractors will have a greater personal interest in the work and that they are easier to get back on the job to remedy such latent defects as normally develop on construction work. The USHA is sympathetic with these and other arguments that have been advanced, but it feels a proper responsibility to see that all proposals for the division of work and for the inclusion of alternate bids should be kept within reasonable bounds and to that end it is prepared to discuss each individual problem as it develops. In conclusion, the point is again stressed that early consideration of this particular problem is most advisable.

Nathan Straus

NATHAN STRAUS,
Administrator.

December 10, 1938.

59905 H

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 13 ON POLICY AND PROCEDURE

Revised April 17, 1939
(Substitute for Bulletin No. 13, dated
August 18, 1938)

PREPARATION OF DRAWINGS AND SPECIFICATIONS

A. Objective

This Bulletin has been prepared to aid local housing authorities and architects in drafting plans and specifications for low-rent-housing projects in accordance with the applicable provisions of the United States Housing Act and the loan contract between local authorities and the United States Housing Authority and outlining the procedure in connection with the submittal of plans and procuring the approval of the United States Housing Authority of such plans and specifications.

The Appendix to this Bulletin contains detailed information as to the preliminary and final drawings, and specifications.

B. General Requirements

As indicated in the "Terms and Conditions" accompanying the loan contracts, the final plans, specifications and contract documents to be used for the construction of a project must meet with the approval of the USHA before construction contracts may be awarded by the local housing authority. To facilitate and aid the local housing authority and its architect, the following points are suggested:

As soon as feasible after the loan contract is executed, it is suggested that an authorized member or representative of the local authority accompanied by the architects (and the architects' designers and engineers, as necessary) visit the USHA in Washington.

The architects should send in advance, or bring with them, preliminary studies, these to consist of a site plan, sketch plans of the housing types, a description of the proposed type of construction, a tabulation of the unit distribution, and the pertinent data used in formulating the preliminary studies. The preliminary studies should be based upon such considerations as the site boundaries and adequate information as to the topography, detailed knowledge or maps of the utilities systems available and proposed, the proper system of heating, and the estimates of cost in the Application as approved and adjusted to the then current situation. The studies prepared in connection with the Application, if fulfilling the above requirements, will suffice for this purpose.

When the architects and the members or representatives of the local authority arrive to confer with the USHA there will be a comprehensive discussion of the entire problem with the various specialists and technicians of the USHA participating. It is desirable that the architects and members or representatives plan to remain in Washington for a time sufficiently long so that when they leave they may carry with them working agreements, reduced to sketches and memoranda, as to the following:

Housing types.
Heating, cooking, and utilities systems.
Site plan and site engineering.
Unit plans and unit distribution.
Types and materials of construction.
Program for tests of sub-soil conditions.
Overall estimates and cost limitations.
The system of bidding.
Other pertinent matters which can be readily disposed of at that time.

These agreements will be adequate to enable the architects to proceed expeditiously with the preparation of full preliminary plans and specifications.

The full preliminary drawings and outline specifications are those to which reference is made in Article 3 (a) of the suggested form of Architect's Contract. The Appendix to this Bulletin contains suggestions as to the scope of these drawings and outline specifications. Immediately following their visit to Washington the architects should proceed with these drawings and specifications on the basis of the working agreements. Except in unusual cases, it is not contemplated that the full preliminary drawings and outline specifications need be submitted to Washington for review but that they will be reviewed in the field and working agreements given as in the case of the preliminary studies.

C. Review and Approvals

As soon as working agreements on the preliminary drawings and outline specifications have been reached the architects should proceed with the final plans, specifications and contract documents. The local authority may, in its discretion, submit these in whole or in part to the USHA in Washington for review prior to completion, but this will not be necessary and in general will not be considered desirable since such submission may involve delays.

It is contemplated that the USHA project adviser will, in each case, maintain close contact with the local authority during the development of the final plans and specifications and that he will arrange for field reviews by such technical and other specialists from the USHA as may be necessary in order to secure prompt disposition of all questions as they arise.

However the final plans, specifications and contract documents should be submitted to Washington not later than the time of advertising for bids in order that they may be reviewed at an early date prior to or during the period of bidding and be modified as may be found necessary by addenda.

The suggested form of Architect's Contract anticipates that the final plans will be drawn in ink on tracing cloth. At the option of the local housing authority, pencil working drawings, if fully adequate for the purpose, will be entirely satisfactory to the USHA. However if the contract contemplates the preparation of drawings in ink on tracing cloth and the local authority and the architects agree to substitute pencil working drawings, a suitable adjustment of the fee should be made part of the agreement.

Throughout the period from loan contract to construction contract, the staff members of the USHA, in order to expedite the work, are authorized to reach such informal working agreements in the field, as the work progresses, as may be necessary. These agreements will be summarized in written memoranda given to the local authority by staff members of the USHA. Likewise, on matters which require review and discussion in Washington, working agreements can be reached during visits of the local housing authority or its staff in Washington, or by letter following the review of plans or other documents.

In order to determine that the project complies with the terms of the United States Housing Act, the USHA finds it necessary to make a review and check of all drawings and specifications before or during the bidding period and prior to approval for contract purposes.

However, it should be borne in mind that the primary responsibility for the success of the project rests with the local authority and, through them, with their technical aids, and that the plans and specifications must be so conceived, prepared and checked as to insure this success.

Local authorities are, therefore, urged to review the plans and specifications thoroughly and painstakingly prior to submission for approval. By such procedure the facilities of the USHA will not be overtaxed, the USHA will be able to render more prompt service in the review and approval of contract documents, and the chances for errors and oversights which lead to unsatisfactory conditions or to increased cost, or both, will be greatly diminished.

D. Number of Copies Submitted for Review

As indicated in "Terms and Conditions", six complete sets of plans, specifications, and other contract documents as proposed for bidding should be submitted to the USHA for review at the time of advertising for bids, or before. In addition, and during the process of development of the drawings and specifications and whenever these are submitted to Washington for purposes of securing informal approval and suggestions, the number of copies will have to be determined in the light of circumstances at that time, but it is anticipated that in no case will the number of copies of drawings or other documents submitted for these purposes exceed eight. It is suggested that the number of copies of contract documents to be supplied by the architect, and for which blank spaces are provided in Section 6 of the suggested form of Architect's Contract, be made to conform to the above.

E. Architect's Responsibility

No approval, formal, or informal, by the USHA shall be construed to relieve the architect of his responsibility to the local housing authority as to the accuracy and completeness of the plans and other contract documents.

The Architect should submit, with his final working drawings and specifications, a statement to the effect that the requirements of the local Building Department and of other agencies, public or private, having jurisdiction, have been complied with, or exemptions to existing requirements have been obtained.

F. Construction Costs and Cost Estimates

The United States Housing Act sets a maximum limit on the cost per room and per dwelling unit, and a further limit on the total cost of a project is established in the loan contract. It is obvious that architects must design within these limits. The preliminary cost estimates and those based on the working drawings should be low enough to allow for a margin of about five per cent to cover extras during construction. These, however, are to be regarded as maximum cost limits, and do not relieve the architect of his responsibility to design for the lowest costs attainable in his locality consistent with good construction and good planning.

The Act specifies "(a) that such projects will not be of elaborate or expensive design or materials, and economy will be promoted both in construction and administration, and (b) that the average construction cost of the dwelling units (excluding land, demolition and non-dwelling facilities) in any such project is not greater than the average construction cost of dwelling units currently produced by private enterprise, in the locality or metropolitan area concerned, under the legal building requirements applicable to the proposed site, and under labor standards not lower than those prescribed in this Act." (Sec. 15 (5)).

After execution of loan contract the estimate of development cost in the Application as approved for the loan contract will be transcribed by the USHA to Form No. USHA-512; subject to such modifications as may be agreed upon between the local authority and the USHA this will become the preliminary budget. When the plans and specifications are completed, and prior to the advertising for bids, the local authority will submit its final estimate of total development cost. (See Bulletin No. 15, Revised, for details relative to the preliminary budget and the final estimate of total development cost). The local authority or its architects should, in the interim period, make at least one additional estimate in order to recognize its own position in relation to costs. Upon request of the local authority these interim estimates will be reviewed by USHA representatives in the field or, if the local authority desires, in Washington, but there is no requirement that the local authority submit interim estimates to the USHA.

G. Scope of the Architect's Work

The architect should obtain, at the outset of his work, a definite statement from the local housing authority setting forth the limits of the work to be covered by his plans and specifications, so that all street improvement and utility work which is not to be performed by the city or other outside agency, may be shown on his drawings. It should be the Architect's responsibility to coordinate his drawings with plans to be prepared by other agencies in connection with the housing project; further, to obtain from the city approval of his drawings for street and utility work to be performed in city streets or on land which it is proposed to dedicate to the city.

H. General Suggestions

The following observations, while in a sense self-evident, are made in the hope that they will promote a certain degree of consistency in the work of all of the architects operating under the program of the United States Housing Act, and that this, in turn, will facilitate the review of the plans and specifications by the USHA.

1. The drawings should indicate completely the scope of the work to be executed, while the specifications should cover only that which the drawings are not competent to explain. The drawings should be carefully coordinated with the specifications to avoid omissions, repetitions, inconsistencies and contradictions; likewise the several parts and divisions of the specifications should be coordinated within themselves.

2. Notes on the drawings should be specific as to extent of work and kinds of materials, but should avoid naming exact varieties of materials or trade names.

3. Drawings should include complete door, window, and interior finish schedules, placed on drawings where most available for reference. A schedule of buildings, dwelling units and rooms should also be included. Schedules should be carefully checked with drawings and specifications.

4. Each drawing should be properly described in the legend or index and should be dated and numbered to facilitate handling, recording and filing.

I. Job Program

Attention is directed to the fact that Bulletin No. 13 as issued under date of August 18, 1938 contemplated the preparation of a Job Program consisting of certain material specified in the "Outline of Job Program" and submitted as a whole for formal approval. Henceforth the procedure with respect to the Job Program shall be as set forth hereinafter, provided; that in the case of any project which has, at the date of issuance of this Bulletin, advanced to a state which would make it impractical to modify the former procedure, the new procedure need be used only to the extent desired by the local authority.

The Job Program form shall be considered as an outline under which all matters having to do with the composition of the project are initiated, considered, and determined step by step up to the time when the final plans, specifications and other construction contract documents are ready for bidding purposes. The essential point in the procedure is that the various items of the Job Program form shall be disposed of as early as possible and in logical sequence rather than that the material be assembled for consideration and disposition as a whole. The Job Program form should be used as a check list to see that no items are overlooked in the development of the project.

J. Method of Bidding; Alternate Bids

In connection with the preparation of final specifications, the Appendix to this Bulletin directs attention to the contract forms and documents contained in Bulletin No. 9, and suggests that these documents form Part I of the specifications. One of the most important points for consideration in connection with Part I of the specifications has to do with the manner in which bids are to be taken. This question, together with the related question of alternate bids, warrants the most serious and careful consideration.

Bulletin No. 9 includes a discussion on the subject of letting general contracts on the basis of dividing a project into two or more parts, and of segregating from general construction contracts such items as plumbing, heating, and electrical work. It is here restated that local authorities should give consideration to this question and should weigh the several advantages and disadvantages of such a procedure, taking into consideration the fact that certain state laws make it necessary, on public works, to segregate and take separate bids on parts of the work other than the general construction.

However, it should be borne in mind that the complications attendant upon splitting the work into a number of contracts are manifold, and that these complications increase much more rapidly than in direct proportion to the number of contracts. The following discussion is intended as an aid to local authorities in reaching its determination relative to this important question.

To begin with, the local authority should attempt, in the early stages of the work, to formulate its policy with regard to the manner in which bids should be taken and the alternates to be included, since this has an important bearing upon the site plan itself, and upon the manner in which the drawings are prepared. For example, it will be appreciated that certain site plans lend themselves more readily to several general contracts than do others, and that the distribution of utilities, arrangement of walks, and other features, are also involved in this problem.

With respect to the drawings, these should contemplate the effect which alternates will have upon related work. Hence, an early decision as to the division of contracts, if any, and with respect to the taking of alternate bids, will enable the plans to be prepared, and the specifications written, in a manner less susceptible to misunderstandings and disputes during construction than would otherwise be the case.

A multiplicity of contracts and alternates involves four major difficulties:

1. Contract Documents and Bid Forms:

The preparation of the contract and bid forms in such manner that the requirements desired may be clearly and unmistakably understood by all intending bidders. The difficulties may not be readily apparent until an attempt is made to set up the documents, nor are they always perceived at that time. However, to form some conception of the difficulties involved in a relatively simple case - assume the hypothetical problem of one project divided into four bidding areas for general construction purposes, with one area including a building, or buildings, for which an alternate is proposed to exclude these buildings; then assume that it is necessary under state laws, to take separate bids for plumbing, heating, electrical work, and that it seems desirable to separate the paving work as well as the landscaping work from the general contracts; in addition, assume that alternates are desired covering four items on the construction work, and as few as two items each on the mechanical trades. With the necessary provision that overall bids must also be taken in order to insure that the lowest possible price has been obtained, such a case as is cited may involve the taking of as many as 80 to 100 base bids and 200 to 400 alternate bids. Under such circumstances, a long and painstaking analysis of the bid documents becomes necessary in order to insure that there is no overlapping of items or gaps to be bridged by extra expenditures after the contracts have been awarded.

2. Evaluation of Bids:

The mere process of tabulation of bids under the hypothetical case cited is no small task, but the evaluation of these bids after they have been tabulated is not only difficult, but may be even impossible in some cases. It is easy to conceive that in order to pick out the lowest possible combination of bids it may become necessary to do so on a basis that may not produce the best possible results, and that in certain cases the awards may be determined by virtue of the acceptance or rejection of certain alternates, a situation almost certain to produce embarrassment for the local authority. In certain states where the law requires that awards be made on the basis of the base bids, without regard to alternates, it is altogether probable that certain desirable alternates may be accepted only if excessive prices are paid; the conclusion is that in such states the base bid should include the most desirable materials and methods, covering those that are less desirable by the alternates. In all events, the number of alternates should be held to the minimum.

3. Construction Difficulties:

The presence of a large number of contractors on any one project leads to confusion, division of responsibility, and delays. For example, contemplate a situation under which a central heating plant and its steam distribution lines is under one contract, and the heating system within the buildings, is under one, or more, other contracts. Under such a situation, if the heating of one or more of the buildings is unsatisfactory, both contractors will disclaim any responsibility, each charging the other with the fault. Each contractor must have access to his site, and such access will frequently cross the area under the jurisdiction of another contractor. Claims arising out of difficulties due to surface drainage will often develop. Delays are certain to ensue. From a management point of view, differences in equipment and in types of materials resulting from divided contracts impose added maintenance costs. Other difficulties too numerous to cite can be readily forecast.

4. Increased Overhead:

It is obvious that under a large number of contracts a local authority must assume the function of coordination which normally belongs to a general contractor, and that the administrative cost of such coordination accounts for at least a considerable portion of the savings which may seem to result from a division of the contracts. Moreover, the direct supervision cost may increase in more or less direct proportion to the number of contractors engaged.

The foregoing statements are not in any sense intended to indicate that the USHA desires to interfere with any reasonable proposals that local authorities may make relative to the manner of securing bids. It is appreciated that many local authorities desire to keep contracts small enough so that legitimate local competition can be had. The argument has also been advanced that local contractors will have a greater personal interest in the work and that they are easier to get back on the job to remedy such latent defects as normally develop on construction work. The USHA is sympathetic with these and other arguments that have been advanced, but it feels a proper responsibility to see that all proposals for the division of work and for the inclusion of alternate bids should be kept within reasonable bounds and to that end it is prepared to discuss each individual problem as it develops. In conclusion, the point is again stressed that early consideration of this particular problem is most advisable.

Appendix

Attached hereto is an Appendix containing detailed suggestions relative to the preparation of preliminary and final plans and specifications.

Nathan Straus

NATHAN STRAUS,
Administrator.

April 17, 1939

APPENDIX

Section A.

PRELIMINARY PLANS AND OUTLINE SPECIFICATIONS

1. Preliminary Plans

After receiving working agreements based upon discussion of the preliminary studies the architects should proceed with the preliminary plans and the outline specifications. The following suggestions are intended as a general guide as to the scope of the preliminary plans and outline specifications. While these are not mandatory requirements, it is suggested that reasonably close adherence will facilitate both the work of the architects and the reviews by staff members of the USHA.

2. Architectural Site Plan

Site plan of entire property at a decimal scale of 1" = 100' or larger if sheet will permit. Preferred size of sheet is 30 inches by 42 inches to cutting lines. Site plan should show:

(a) Property line survey.

(b) Existing street utilities and their sizes.

(c) Existing and proposed streets, named or identified.

(d) Existing and proposed alleys, parking areas, walks, parks, play and recreation areas.

(e) Contours and other data influencing site plan.

(f) Approximate finished grades sufficient to give a clear conception of the extent of cut and fill, if extensive grading operations are contemplated.

(g) Buildings proposed and to be retained, indicating number of stories of proposed buildings, and identifying buildings.

(h) Location of central or group heating plants, social facilities, management office, maintenance and repair space, laundries, stores, etc.

(i) Serial number or other designation for each building and a schedule of building and dwelling units, identifying dwelling units in each building, and number of rooms in each dwelling unit.

(j) A graphic scale, direction of prevailing winds, and north point.

The above information may be shown on a single site plan, or on more than one drawing if preferred.

3. Unit Plans

Unit plans at scale of $\frac{1}{4}$" equals 1'-0" of each dwelling unit fully dimensioned; include by line indication the contemplated system of framing, kitchen equipment, plumbing fixtures, doors, windows, stoves, flues, etc., and location of all electric outlets and radiators, and showing possible furniture layout.

4. Typical Buildings

Plans and elevation of one typical building of each construction type at scale of not less than 1/8" equals 1'-0". The plans should show overall dimensions only.

5. Cross Section of Typical Building

Cross section of typical building at scale of not less than $\frac{1}{4}$" equals 1'-0" with dimensioned story heights, notes on materials, and indication of types of footings, etc.

6. Wall Section of Typical Building

Wall section of typical building at scale of not less than 3/4" equals 1'-0" for all building types contemplated, sufficient to indicate type of construction, materials, interior trim, proposed ceiling and window heights, etc.

7. Utilities Distribution Site Plans

Site plans of entire property, at same scale as architectural site plans, as follows:

(a) Electrical, showing all buildings and indicating the proposed electric distribution system, yard lighting, and the point or points of pickup with service lines. The telephone conduit system, if underground, should also be indicated. No feeder sizes or diagrams are required. Indicate obstructions above ground, such as trees, etc., which are to be retained.

(b) Heating, showing all buildings and indicating the proposed boiler room or rooms, the machine rooms, and the distribution system. No pipe sizes or radiation need be figured.

(c) Utilities, indicating:

1. Existing sewers, water mains and gas mains in public rights-of-way crossing or bordering the project site, and existing grade contours, if not covered by architectural site plans.

2. Proposed sewers, water mains and gas mains to be installed in connection with the project, but not to be included in the architect's plans and specifications.

3. Proposed sewers, water lines and gas lines, including all service lines, to be covered by the architect's plans and specifications. Definite sizes and grades are not required.

8. Existing Conditions - Site Plan

Plan showing all existing basements, etc., when this complete information is not covered by architectural site plans.

9. Landscape Plan

Plan of the entire property, at same scale as architectural site plan, indicating the type and extent of the proposed landscape development and the intended uses of all land. If considered necessary to illustrate the work more fully, a separate drawing of a typical block plan may also be submitted.

10. Outline Specification

An outline specification in sufficient detail to explain the scope of the proposed improvements, including all buildings, yard and street improvements, utilities, mechanical work, incineration or other method of garbage disposal, access to project for fire protection, landscaping, etc. It should describe the proposed system of construction, materials and finish to be used, call attention to any special conditions which may be anticipated, such as excess foundations (including with this statement reports on immediate and proposed soil investigations and condition of existing buildings), and state whether the proposed development is in accordance with building codes, zoning ordinances, etc., or, if not, whether exceptions have been obtained or are required. To assist in the preparation of this item, there is included herewith a form of outline specification. All major items of construction materials proposed should be checked against this outline, crossing out items not applicable to the project and adding important items not listed on the form. Preface the outline specification with a statement dealing with unusual and special conditions which may affect the materials and methods of construction proposed in the outline specification, such as special local conditions, unusual site conditions, unusual local constructions and materials, and code and zoning requirements.

59905 H

OUTLINE SPECIFICATION

DATE ____________________

PROJECT NO. ____________________

____________________ HOUSING PROJECT

____________________, ____________________
City State

____
ARCHITECTS

____________________ CHIEF ARCHITECT

____
Location of Project

Project Consists of a total of ____________ Buildings

Containing ____________ Story Apartment Buildings,
No. No.

____________ ____________ Story Group House Buildings,
No. No. of Stories

____________ ____________ Flat Buildings,
No. No. of Stories

____________ ____________ ____________
Other Buildings

____________ Dwelling Units ____________ Rooms

Community Facilities* ____________________

Administration Unit* ____________________

Heating Facilities* ____________________

Maintenance and Repair* ____________________

*State if in separate buildings.

____

Describe nature of site: (Vacant) (Slum)

LOCAL CONSTRUCTION METHODS

1. Code Requirements.

2. Zoning Ordinances.

3. Unusual or Local Construction Methods.

4. New Methods or Materials (If Any) Contemplated.

GENERAL

1. Access to Project for Fire Protection.

2. Insurance Rates.

SITE CONDITIONS

1. If project site is encumbered by existing buildings, describe briefly the types.

2. Basements: General condition of existing basement spaces; wet or dry.

3. Is all or part of the project filled land, if so state approximate average depth and material of fill.

4. Will rock be encountered in excavations? Are there springs or other water courses on site?

5. Is any portion of ground ever flooded?

6. Will piles or deep foundations be required? (If required) Timber or concrete piles? Substantiate by subsoil data.

7. Are utilities available on or at borders of site? (Water, sewer, gas, elec.) Are they of adequate capacity?

8. Are there trees on site? If so, state kinds, sizes and disposition.

9. Will it be necessary to fill any portions of site?

10. Will surplus dirt have to be removed from site?

TYPE OF CONSTRUCTION

1. Fireproof

2. Semi-fireproof

3. Non-fireproof

NOTE: Give brief description.

PRINCIPAL CONSTRUCTION MATERIALS

NOTE: Cross out items not used. Insert after each heading explanatory remarks, brief descriptions and any material or items not listed.

1. FOOTINGS:

Concrete: Plain - Reinforced.

Concrete piers and grade beams.

Concrete Piles: precast - steel casing.

Timber Piles: plain creosoted.

2. FOUNDATION WALLS:

Concrete; Concrete Block; Brick; T.C. Tile; Cinder Block.

Dampproofing; Waterproofing; Foundation Drain Tile.

3. SUPERSTRUCTURE WALLS (EXTERIOR):

Solid Brick; Brick facing with Tile or Masonry Unit Backing.

Brick Veneer with Stud Backing; Concrete Block painted.

Cinder Block, Painted; Stucco on Tile or Masonry Unit Backing.

T. C. Block, Painted.

T. C. Block (No Finish).

Outside Walls dampproofed on Inside Surfaces.

Mastic Type dampproofing.

Cut-back Asphalt Type dampproofing.

Outside Walls furred.

4. SILLS:

Brick; Stone; Cast Stone; Slate; Metal; Wood.

Lug sills; Slip sills.

5. FLOOR CONSTRUCTION:

Wood Joist, Concrete Flat Slab; Combination Slab;

Bar Joists, with Metal Lath Concrete Slab; Precast concrete joists with concrete slabs on Metal Lath Precast tile joists with tile and cement slabs.

6. ROOF CONSTRUCTION:

Flat Type; Pitched Type.

Timber Construction; Concrete Slab; Metal Construction.

Bar Joists with Wood Deck.

Bar Joists with Concrete Slab on Metal Lath.

Suspend Ceilings.

Attached Ceilings.

No Plastered Ceilings.

Copper Flashings; Zinc-coated (Galvanized) Flashings;

Tin Flashings.

Gutters; Downspouts.

7. ROOFING MATERIAL:

Sheet Metal; Composition (No. of Piles); Slate; Tile;

Asbestos Shingle; Mineral Surfaced Felt.

8. COPINGS:

Stone; Glazed Tile; Metal; Brick; Precast Concrete.

9. STAIR CONSTRUCTION:

Wood; Concrete; Steel and Concrete; Steel and slate.

Treads; Cement fill; Checkered Plate; Asphalt Tile Covering;

Safety Treads; Alumdum aggregate in top of treads.

Fire Escapes.

10. INTERIOR PARTITIONS:

Wood Studs; Metal Lath and Plaster; Gypsum Lath and Plaster; Wood Lath with Gypsum Plaster.

Gypsum Tile; T. C. Tile; Solid Plaster Partitions.

11. CEILING FINISH:

Plaster as for Walls; Fiber Board; Plywood.

Concrete surface; unfinished; painted.

12. INTERIOR FINISH:

Plaster, unpainted; Plaster, painted; Plaster Board.

Plywood; Painted; stained; papered.

13. FLOORING MATERIALS:

Cement; Hardwood; Softwood; Asphalt Tile; Composition Tile; Linoleum; Ceramic Tile in Bathrooms.

14. WINDOWS:

Double-hung wood; Weighted or sash balance; Wood casement; Weather-strips; Steel casements; Screens.

15. DOORS:

Stock, 4 panel; 5 panel; 6 panel; flush veneered 1-3/8 inch thick; 1-3/4 inch thick.

16. INSULATION:

Top Story Ceiling Insulation; insulated with 4" of loose fill;

2" of loose fill; 2" blanket; 2" Bats; Insulating Lath 1/2"

Roof Insulation: one inch fiber board roof insulation; 2" fiber board.

Wall Insulation: one inch blanket; 2" blanket or Bat.

17. PAINTING:

Wood: primed and one coat; primed and two coats; stained and one coat.

Metal: primed and two coats; primed and three coats.

Plaster: Casein paint; Lead and Oil paint - 2 coats; Papered; Unpainted.

18. KITCHEN CABINETS:

Wood cabinets with doors; no doors; metal cabinets; open shelving.

19. KITCHEN EQUIPMENT:

Ranges; Stoves; gas; electric; wood; coal.

Refrigerators; ice; gas; electric.

20. GARBAGE DISPOSAL:

Incinerators; garbage cans.

Individual collection.

Group stations.

21. PLUMBING:

Enamel iron sink; Cement laundry trays;

Combination sink and laundry trays; recessed bath tub;

Syphon jet W. C.; Wash down type W. C.; Enamel iron lavatory;

Enameled steel plumbing fixtures; Copper tubing;

Galvanized steel piping; Galvanized wrought iron piping.

NOTE: Give brief description of each item.

22. HEATING:

Warm air; Stoves;

Gravity 2 pipe H. W. System;

2 pipe Gravity steam up-feed system;

Single pipe Gravity steam up-feed system;

Vacuum system;

Central Heating Plant;

Group Heating Plant;

Individual plants for each building;

Space heaters; Electric heating;

Individual tank for hot water;

Fuel - Oil; Gas; Coal; Coke; Wood.

NOTE: Give brief description of each item.

23. ELECTRICAL WORK:

Overhead distribution; Underground distribution; Rigid conduit;

BX conduit; Steel tube conduit; non-metallic cable;

Outlet for electric range; outlet for electric water heater;

Outlets for refrigerators.

NOTE: Give brief description of each item.

Section B.

FINAL WORKING DRAWINGS AND SPECIFICATIONS

1. General

The suggestions contained in this Appendix will, if adhered to, result in a uniform presentation of the drawings which will greatly facilitate their review by the USHA and this, in turn, should be of mutual benefit to all concerned.

The USHA does not undertake to prescribe the exact manner in which the drawings shall be prepared, the various scales to be used, the number of sheets required or any other details as to presentation, leaving such matters to the judgment of the architect in conformity with his contract with the local housing authority. However, to the extent which its necessary review demands, the USHA requires that the plans be logical, clear, accurate, complete and in conformity with good architectural and engineering practice. It is the intent that these drawings, together with the specifications and the other contract documents, will constitute an instrument whereby accurate bids may be received and the work properly executed without undue difficulty.

2. Size of Drawings - Scale - Numbering System

In order to facilitate filing, a standard size sheet of 30" x 42" to the cutting lines is recommended; in no event should the sheet sizes be greater than 36" x 50", and a binding margin of 1½" should be provided on the left side.

The scale of plans, except plot plans and surveys, should be not less than 1/8"; plot plans and surveys should be at as large a scale as possible within the limits of sheets of reasonable size. The scale of drawings of every class should be 1/32", 1/16", 1/8", 1/4", 1/2", 3/4", 1-1/2", 3" or full size, except in the cases of survey maps and site, block and planting plans, for which decimal scales may be used.

The following numbering system of drawings is recommended:

X-1 to X-10 - Surveys.

1 to 299 - Architecural Drawings.

300 to 399 - Utility and Site Improvement Drawings.

400 to 599 - Structural Drawings.

600 to 799 - Mechanical, Heating, Plumbing and Electrical Drawings.

800 to 899 - Landscape Drawings.

899 to - - Details.

The above numbers should be preceded by the letters "A", "S", "H", "P", "E", "L", "D", etc., indicating architectural, structural, heating, plumbing, electrical, landscape and details, etc., respectively. These letters should be combined where drawings include more than one of the above subdivisions (except in the case of architectural drawings). In the preparation of working drawings, it is essential that groups or blocks of buildings be numbered so that a complete set of drawings for each block will be in consecutive order (excepting detail drawings).

3. Drawings

The complete set of working drawings should include the following:

(1) Title and Index Sheet, listing the number and title of each sheet.

(2) Survey Map or Maps and other site information furnished the Architect by the local housing authority in accordance with Section 11 of the suggested form of Architect's Contract, including:

(a) Property line map and present utility layout. This is to be the original tracing of survey prepared by licensed surveyor.

(b) Topographical map showing all existing contours, existing buildings, if any, depth of present basements, location of existing trees to be retained, and other existing physical conditions. A complete log of all available soil data is to be submitted with this map. These data may cover borings, test pit explorations, test loads and location of ground water.

(3) Site Plan - The site plan at the same scale and as called for under Section A, revised as required and developed to a final stage by the addition of overall and other dimensions. This is to serve as a general control plan for the entire project, and as a key to block plans. Where the project consists of a single block, the site plan may serve also as the block plan, in which case the scale should be large enough to allow for detailed information. The site plan should include

the schedules and other miscellaneous items under Item (1) of Section A. The plan should also include the postal addresses, as approved by local postal authorities, and the apartment numbering system.

(4) Block Plans, fully dimensioned, consisting of a plot plan of each block (not necessarily a city block area) at a scale of 1/16" or 1/20". They should contain all necessary information including:

(a) Location of all buildings and their first floor elevations.

(b) Existing contours.

(c) Established or proposed grades of walks, drives, recreation areas, terraces, open areas, etc., also proposed grades at corners of and entrances to buildings.

(d) Location of walks, drives, parking areas, terraces, play and recreation areas, retaining walls, fences, clothes poles, light standards, transformer vaults, storm water inlets, manholes, fire hydrants and other site improvements, and utility structures appearing at finished grade.

(e) Location and grades of all surface improvements in city streets, including grade elevations along existing curbs; also indication of street work to be done by the city in connection with the project; notes should indicate clearly that such work is not included in the general contract but is shown so that the general contractor may coordinate his work with that done by others.

These plans may be also used as roof plans, and in conjunction with plumbing work may indicate downspouts, yard drainage and sewer lines. Buildings should be identified to conform with site plan identifications.

(5) Unit and Building Plans at 1/4" scale of each typical building unit and all other units in the project such as central or group heating plants, laundries, social facilities, management office, stores, maintenance and repair space, etc. Separate plans should be drawn for like units of opposite hand. Plans should be fully dimensioned for interior partitions, exterior wall openings, column centers and overalls. These plans should show items such as equipment and fixtures to be included in the general contract, door swing, etc., electric outlets and branch circuits, and radiator locations. Proposed grades at corners of and entrances to buildings should be shown.

(6) Plans and Elevations of each Typical Building at 1/8" scale. Buildings repeated need be shown only once, except that like buildings of opposite hand should be shown, and a schedule, identifying all buildings for which the drawing is intended and consistent with the site and block plan identification, should be included. Separate plans and elevations for all variations, including variations in basement plans, should be shown, but when the apartment units for two or three floors are typical only one plan need be drawn. Plans should show exterior dimensions, but no interior measurements are required except where variations from 1/4" scale unit plans occur. Exterior dimensions should include unit plan dimensions, overall dimensions to all breaks in walls, and general overall dimensions. Where topography requires variations in porches, steps, etc., an elevation should be drawn of perimeter walls from bottom of footings to first floor sills showing various conditions.

(7) Key Plans of the site should be placed on each drawing to locate buildings shown on that drawing.

(8) Scale and Full Size Details adequate to cover fully all items. The following are suggestions as a check list:

(a) 1/2" or 3/4" details of interior stairs, kitchen cabinets, and incinerators.

(b) 3/4" details of all exterior features such as entrances, porches, etc.

(c) 3" details of wall sections showing conditions at floor levels, wall opening sills, heads and jambs, parapets, eaves, and roofs.

(d) Full size details of windows and doors including frames and jambs, interior trim and base, thresholds and solid plaster partitions including anchorage to floor, ceiling and jambs.

(e) Any other special features not listed above.

(9) Material and Finish Schedule, complete for all rooms and other spaces.

(10) Door and Window Schedules, complete including diagrams showing arrangement of window lights and door panels.

(11) Structural Work. In general the set-up for structural drawings should follow that outlined above for the architectural plans of typical and special buildings, and the scales employed should be the same. Buildings of ordinary construction having no basements may have first floor framing and foundation plans combined, but in all other cases the foundations should be separate. The foundation drawings should include the solution of all special problems, footings for boilers, incinerators and special equipment, the present and proposed grades at building corners, the bottom elevations of all footings, and the elevations of all floors. The following should also be included:

(a) Schedules, details (at large scale to show typical and special arrangement of members and materials), notes and dimensions.

(b) Complete log of all available soil data, incorporated as part of the contract working drawings. These data may cover borings, test pit explorations, test loads, and location of ground water.

(c) Copy of computations for the checked structural design. (This will not form part of the contract drawings.)

(12) Heating Work drawings should include the following:

(a) Site plan of project area showing all buildings (identified) and steam distribution system.

(b) 1/8" scale plans of each basement or pipe space. Separate plans should be prepared for like plans of opposite hand. On 1/4" and larger scale drawings, the plumbing, heating and electrical system may be preferably combined. For plans above basements, the architectural drawings may be used to show locations only of radiators and risers.

(c) 1/4" scale plans of boiler room or rooms, machine rooms, etc.

(d) Details in connection with heating system.

(13) Plumbing Work drawings should include the following:

(a) Site plan of project area showing all buildings (identified) and plumbing, gas-fitting and yard drainage system.

(b) Same set-up as for heating.

(c) Same set-up as for heating.

(d) Same set-up as for heating.

(14) Electrical Work drawings should include the following:

(a) Site plan of project area showing all buildings (identified) and electrical distribution, yard lighting, and telephone distribution.

(b) 1/8" scale basement layouts showing electric layouts and riser diagram. Separate plans should be prepared for like buildings of opposite hand. In lieu of these 1/8" scale plans, the plumbing, heating and electrical work may be combined on 1/4" scale plans.

(c) The outlets and circuit wiring in each type of dwelling unit, social rooms, management office, maintenance and repair space, boiler room or rooms, laundries, stores, etc. These may be shown on the 1/4" scale Architectural Drawings.

(d) Details in connection with transformer vaults; manholes if distribution system is underground; service entrances for overhead electric and telephone services; meter locations and metering centers; special diagrams for time controlled circuits; details of exterior lighting fixtures if special in character.

(e) Lighting fixture schedule. This should designate the type of lighting fixture for each location, together with the size and type of lamp to be used.

(15) Utility and Site Improvement Work drawings should show, in addition to the site improvement work on the site plan and the block plans, the following:

(a) Cross sections of streets and driveways and profiles (where necessary for proper determination of grades) of streets and drives.

(b) A utility site plan as described under Section A, checked fully and approved by the municipal departments and utility companies having jurisdiction. The final drawings should bear the signed approval of the municipal departments and the utility companies having jurisdiction. This plan should show all proposed sewer grades and should be supplemented with complete details of appurtenances required. All utility plans should be correlated with planting plans.

(16) Landscape Work

Note: The complete landscape contract documents, including plans and specifications, should be prepared as a separate contract.

Any variation of this procedure should be approved in writing by the local housing authority. The landscape drawings should include:

(a) The block plans called for above under Item (4) traced and developed as planting plans. The landscape plans should show:

(1) Buildings, roads, parking areas, walks, play and recreation areas, banks, terraces, etc.;

(2) Locations of all trees and other plants;

(3) Indication of all plants with scientific names conforming to "Standardized Plant Names" by American Joint Committee on Horticultural Nomenclature;

(4) Elevations of terraces, steps, walk intersections and first floors;

(5) Existing trees to be retained or transplanted. Planting plans must be correlated with utility plans.

(b) Typical construction details at 1/2" or other suitable scale showing methods of planting, pruning and guying, tree wells if required, drainage facilities and other special details.

(c) A cost estimate (not a part of the working drawings), for the landscape development of the entire project. The estimate should show the total quantities of plant materials, topsoil, sod, etc., and the unit prices. If subsoil conditions are not favorable for landscape development, definite recommendations should be submitted, and the cost involved in improving conditions should be outlined. The total area of the project should be scheduled in this estimate as:

(1) Types of paved areas such as roads, walks, parking, recreation, etc.

(2) Landscape areas such as sod, seeded, topsoil, planted, etc.

(3) Total ground area covered by buildings and other structures. The total of these three areas must equal the total area of the project to the property lines. The area to be improved between property lines and street curbs of boundary streets should also be noted.

(d) A report of the available topsoil on the site (Average depth and total cubic yardage) containing recommendations for stripping, storing, (outside the limits of building construction and street and yard work) and replacing during landscape construction. The cost of such work should be compared with purchase of other soil. The landscape architect should submit a signed statement that the plant materials indicated for use are generally available locally to contractors. Items under this paragraph to be submitted with the cost estimate.

4. Specifications

Attention is directed to the suggestions contained in Bulletin No. 9 relative to contract forms and documents. Preferably these documents should form Part I of the specifications; Part II should consist of the technical specifications. The USHA has prepared suggested specifications covering most of the various trades normally required in this general kind of construction; copies will be issued to local authorities upon request.

Attention is also directed to that portion of this Bulletin relative to "System of Bidding; Alternate Bids."

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 14 ON POLICY AND PROCEDURE
(Aug. 23, 1938)

SITE ENGINEERING DESIGN

This bulletin contains recommended practices in the design of site improvements: grading and surface drainage, walkways, project streets and driveways, parking spaces, fences, location of utility lines, water distribution, gas distribution, sewerage systems, and street improvements. Landscape development, the design of recreation areas, and the design of electric distribution systems will be covered in subsequent bulletins.

The recommendations contained herein are intended to serve as a general guide to site engineering design; they will not, of course, be universally applicable to the varying conditions on all projects.

I. Grading and Surface Drainage

Grade Studies

A careful study of yard grades should be made early in the project design for use as a guide in establishing building floor elevations and for obtaining a satisfactory balance of cut and fill. The study should include fixing the finished grades of walks and driveways and of planted and surfaced areas, and the calculation of earthwork quantities. While the grades so fixed will be subject to subsequent adjustment, the study should be made thoroughly at the outset in order to avoid subsequent change in building elevations, or objectionable grade conditions.

Starting Point of Grade Studies

Established street grades must obviously serve as the starting point for working out finished grades for the project site, and these should be fully determined before grade studies are begun. (Sewer grade elevations must also be taken into account.) If street grades have not been established, or if alteration in established grades is required, definite action or approval by the city should be obtained. On vacant sites where extensive new streets or drives must be planned, roadway profiles should be prepared at the outset and grades established. If such streets are to be dedicated to the public use, the proposed grades should be approved by the city.

Method of Indicating Finished Grades

Site grading may be studied conveniently in contours and, except in the case of sites with little slope, finished grade contours may be indicated on preliminary site or block plans.

On working drawings in the majority of cases, it is preferable to indicate finished grades by elevations rather than by contours. In staking out surface improvements, contour grades must be translated into elevations and if this is done in advance on the working drawings, the designer's intentions will be better understood and carried out. Where grade contours are used, slight changes in grades made during the preparation of the working drawings (many final adjustments are always necessary) necessitate laborious alteration in the contours. Grade elevations and grade contours should generally not be shown together as conflicting requirements may result.

Finished grade elevations should be shown, in general, wherever they are required for carrying out grading work and yard improvement construction (assuming uniform slopes between points where finished grades are indicated). This includes grades along street curbs and sidewalks, at the corners of all buildings, at yard walk intersections, at points of change in the rate of slope in walks and surfaced areas, and at the top and bottom of banks.

Contours of the existing surface should be shown on site or block plans where finished grade elevations are indicated; these may be shown at one-foot intervals on comparatively flat sites, and at intervals of two feet or more on steeper sites. (They may be placed in very light dotted lines on the back of the tracings to save trouble in erasures.) However, existing grade contours may be omitted from block plans when they make these drawings too confused and a special grade map may be prepared to show present grades, controlling finished grades, grades at buildings and floor elevations. This map would serve principally for computation of earthwork quantities.

Surface Drainage

Two basic requirements should be observed in planning yard drainage:

1. All yard areas of whatever nature should be sloped for drainage, with outlet provided for the escape of surface water.

2. Except in special cases, all surfaced areas should be designed to drain into walkways, streets, driveways, or inlets to underground drains, as the case may be, without depending upon the escape of surface water laterally across grassed areas.

If these requirements are not observed, pooling of water on walks and surfaced areas is certain to occur and, except in the extreme South, snow and ice will impede drainage during the winter season and become a source of inconvenience and hazard to tenants.

Profiles of walks and drives should be smooth and present a pleasing appearance, without sharp breaks in grades. Earth banks, which should be avoided wherever possible, should have a curved profile at top and bottom. A very shallow sod gutter, sloping toward an outlet, at the top of banks will aid in preventing wash; and the bottom of banks adjacent to walks should be at least two feet from the walks.

Building Floor Elevations

Breaks in floor levels should be avoided, so far as possible, in fixing building elevations. Where the topography is such that breaks must be introduced, they should be limited to 18 inches, if possible.

The grade levels of building floors will be governed not only by yard drainage requirements but by architectural considerations and by sewer depths.

Maximum and Minimum Grades

The following table gives approximate maximum and minimum slopes for yard areas which experience has shown to be desirable:

	Maximum Slope	Minimum Slope
Main walkways	6.0%	0.50% (Preferably 0.75%)
Short approach walks	6.0%	1.00% (Preferably 2.0%)
Driveways (concrete or bituminous)	10.0% (Preferably 6%)	0.50%
Lawn areas	---	0.50% (Preferably 1.00%)
Play areas, sitting areas	2.0%	0.60%
Earth banks	3 to 1	---

In climates where snow and ice are common, the slopes of surfaced areas should, where practicable, be kept well within the maximum rates just given. For low maintenance, with reference particularly to power mowing, it is very desirable that grassed slopes be not steeper than five to one, although it should be borne in mind that a power mower will negotiate a 3 to 1 slope and that such slopes may be used occasionally where it is not practicable to secure a flatter slope.

It is often difficult to give walks and other yard areas the necessary minimum pitch; for example, where a walkway parallels closely a row house building, variable riser heights may be necessary in steps at building entrances; and on very flat sites, walkways may have to be laid to a profile consisting of a series of high points and depressions, with drainage to surface inlets in the depressions.

Surface Inlets

Underground drains and inlets for carrying off storm water require an appreciable outlay in first cost and maintenance, but experience indicates that failure to provide adequate facilities of this kind may result in increased maintenance, property damage, and inconvenience to tenants.

In general, surface inlets should be located immediately adjacent to and connected with walkways. If placed in grassed areas apart from walks, the inlets will fail to drain the walks properly, especially when the ground is covered with snow and ice.

Complete reliance should not be placed on a single inlet or a single drain, if its stoppage would result in the flooding of a building floor, in other property damage, or in inconvenience to tenants; drainage facilities should be so arranged that if any one inlet or drain is stopped, the overflow will escape into a service drive or another drain without causing serious damage. (Note: Recommendations with respect to type of surface inlets are given under "Sewerage System.")

II. Walkways

Layout

The location of walkways should be designed to give direct access to buildings and circulation between buildings, facilitate deliveries and the collection of refuse, etc., and protect the landscape development of the site. Failure to provide walks along all natural courses of traffic will result in increased landscape maintenance.

It has been found that where walks parallel to row houses are located at some distance from the buildings, and necessitate relatively long approach walks, paths will be formed in the lawn area between dwelling entrances. The location of rear walks close to buildings may discourage this but will also tend to limit privacy and make the allotment of ground areas to the tenants for their own maintenance more difficult.

Roundings at walk intersections will tend to increase walk costs but facilitate lawn maintenance.

Widths

The following walkway widths have been found generally satisfactory:

Main circulation walks	5 feet and up
Main approach walks to apartment buildings	5 feet
Secondary approach walks to apartment buildings	4 feet
Approach walks to row houses:	
Single entrance, front	3 feet
Single entrance, rear	2 feet
Double entrance, front	4 feet
Double entrance, rear	3 feet

Stepping stones, or walks even less than 2 feet wide, may be used in special cases.

Design

Plain concrete is generally the best material for walkways in low-rent housing developments. Various other materials possess architectural advantage, but are, as a rule, more expensive to lay or maintain. Bituminous walks have proven unsatisfactory, due in part to the difficulty of obtaining good compaction. Division of concrete walks into "flags" by full depth joints will prevent cracking and facilitate maintenance, since the flags can be raised easily in case of settlement. Walks should have a cross slope when adjacent to buildings, and a slight crown when in open areas; 1/4 inch per foot is recommended in each case. Special fitting or warping may be required at walk intersections and at surface inlets to carry out the scheme of drainage. Precast concrete slabs may be used in very narrow walkways for maximum economy.

Steps

Steps in yard walks are a source of inconvenience and hazard and are to be avoided wherever possible. A single riser should never be used. Long flights of steps without landings are also to be avoided and, in cold climates, the use of a hand rail should be considered for all flights containing more than about six risers. The height of risers should be not less than 4 inches and not more than 7 inches.

Where the system of garbage collection by the project management involves the use of small trucks over walkways, steps must not be used in walks leading to the collection stations. (Note: It is important that the method of garbage disposal be determined and necessary arrangements made with local authorities at the outset of the project design.)

III. Project Streets and Driveways

Layout

Driveways should be designed to discourage through traffic while affording easy access for the service needs of the project. They may be designed to provide some parking space also, and should be laid out to serve as a convenient location for utility lines.

Project streets and drives must afford access to hydrants by fire fighting equipment, and the local fire department's advice with respect to this element of the site plan should be obtained. It should be noted, however, that such access by fire fighting equipment will rarely be necessary; hence, practicable, rather than convenient, access should be provided.

The driveway layout should permit the use of existing street and alley pavements when such use is feasible. Driveways of sufficient width or importance to be considered as streets should be planned for dedication to the public use, and street parking areas arranged in a manner acceptable to the city.

Widths

Sixteen feet may be taken as a minimum width for two-lane service drives and 9 or 10 feet for single lane drives. Two-lane drives can frequently be operated "one-way" to advantage. Three-lane drives (or streets), which will accommodate parking on one side, should be not less than 26 feet wide, and drives accommodating parking on both sides should be at least 32 feet wide. Curbs should have a radius at intersections of at least 12 feet; where feasible, 15 to 20 feet is more desirable.

Section

A "dished" section (drainage to center) is most economical for service drives in so far as drainage is concerned; further, this section facilitates crossing street sidewalks at sidewalk grade, which is a desirable arrangement for driveways serving light traffic. The dished section also eliminates the positive need for curbing, although a low monolithic curb (assuming the driveway is of concrete) is most desirable for the protection of adjoining planted areas, fencing, and other improvements.

A crowned section is recommended for (1) all driveways having other than concrete surfacing, (2) drives more than two lanes in width, and

(3) long, important or "front" driveways, even if only two-lane (for appearance reasons). The pavement cross-section should show subdrains where soil and climatic conditions warrant them.

Surfacing Material

From the viewpoint of maintenance cost, concrete makes a very satisfactory surfacing material for service driveways; and with respect to first cost, a concrete pavement with monolithic curb is little or no more costly than a good, pre-mixed bituminous surfacing laid on a stone base, and provided with concrete curbs and gutters. Where there is an existing base which can be utilized, bituminous surfacing will be far less expensive than concrete; and where very low costs are imperative, a macadam or gravel base course with light surface treatment may be used, or untreated surfacing may be laid. The advice of municipal or State authorities should be obtained concerning the specifications best adapted to conditions and to materials available locally.

Soil and climatic conditions, the nature of traffic, and cost limitations will govern the design of the surfacing used in each case. State highway or city standards are convenient for reference and compliance with them may be specified. Where there is but a limited amount of surfacing of any one kind to be laid, the inclusion of a brief description of the essential requirements in the general specifications for the project, rather than reference to an elaborate State specification, may result in lower costs.

Concrete is an economical and satisfactory material for curbs, except at important street intersections, where stone is preferable.

IV. Parking Spaces

Space Required

General considerations in the determination of extent and design of parking areas are discussed in USHA Policy and Procedure Bulletin #11, "Site Planning."

The space per car required for parking on streets and drives, with allowance for ample clearance, is roughly 150 square feet; on special parking areas the space required per car is about 215 square feet and upwards. This difference is due to the fact that in parking areas considerable space must be provided for car maneuvering, while in streets and driveways the traffic-way is used for this purpose. A parking area width of about 54 feet is needed for two lines of cars parked "head in," with maneuvering space between the rows.

Surfacing Material

Comparison of the space requirements for parking on streets and for parking in special areas indicates that, for equal construction cost, a lower cost type of surfacing must be used for special parking areas. Nevertheless, deterioration of the surfacing is equally severe in both types of area, and cheaper types will probably require higher maintenance cost.

The type of surfacing selected--e.g., untreated macadam, or similar material with light surface treatment, or a more permanent type of pavement--will depend on the character of the project and varying local conditions, and no definite recommendations can be stated. Dustless, "trackless" material, having low maintenance cost, is of course desirable, but cost limitations may necessitate the use of a material which is not satisfactory in every respect. For areas on which tenants may do much repair work on their cars, tar-mix topping will be preferable to asphalt because it will be less damaged by dripping oil and gasoline.

Curbing or other type or barrier should generally be provided along the edges of parking areas.

V. Fences

Fencing is useful for various purposes in housing projects, e.g., along project boundaries to prevent trespassing, along steep banks, around play areas for protection of children, around drying yards and, most important, along yard division lines for enclosing tenants' yards.

Fencing may preferably be omitted from the initial project development, when doubt exists as to its need, and installed later as required in the way which will best serve its purpose.

Although no definite recommendation with respect to the extent and location of fencing can be made, the decision to use it should be based on consideration of the types of dwellings, the habits of the people housed, climate, and topography. The following advantages should be weighed in determining which areas are to be fenced and how:

1. demarcation of yard lines, and definite placing of responsibility for yard maintenance on the tenants;

2. protection of vegetable and flower gardens, if any;

3. provision of enclosures for small children;

4. protection of laundry hanging.

However, these advantages must be weighed against the added cost and the possible loss in attractiveness.

Substantial chain-link fencing is recommended for fences around play areas, along project boundaries, etc. Although this type has also been used extensively for tenants' yards, consideration should be given to some less expensive type, such as several strands of heavy wire supported on light steel posts.

Where clothes drying facilities are provided in tenants' yards, the clothes poles may be set in the fence line and used to replace heavy end or gate posts required.

VI. Location of Utility Lines

Main sewer, water, and gas lines should be placed in city streets or project driveways wherever possible. With these lines in the city streets, the project will incur no responsibility for their maintenance; with these lines in project driveways, the project will be relieved of their maintenance in the event that the drives are later dedicated to the city. Such location also makes utility lines more accessible for maintenance and does not require the granting of easements through yard areas. Where practicable, utility lines in project streets and driveways, should be at the side of the pavement.

Special attention should be given in the landscape and utility design to coordinating the locations of utility lines with the locations of trees throughout the site.

VII. Sewerage System

The sewerage system comprises all sewers--sanitary, storm, and combined-- culverts, and other subsurface drains needed to conduct sanitary sewage and storm water from the project site.

Basis of Design

Local codes and the practice of the local city engineering department will serve generally as a satisfactory basis of design, and these may be supplemented, if necessary, by reference to "Recommended Minimum Requirements for Plumbing," issued by the Bureau of Standards, United States Department of Commerce. Therefore, the following material covers only certain points which have been found to require special attention in connection with sewerage and drainage systems for housing projects.

Existing Sewers

A thorough investigation should be made to determine whether or not the existing or proposed main sewers will be adequate at all times to carry away sanitary sewage and storm water without back-flooding. The necessary information may be available from the city engineering department, or a field inquiry may be necessary to determine whether any basement flooding or similar condition has been experienced in the area during heavy rains. Experience has shown that unless a very thorough investigation is made and proof obtained that the sewers are of ample capacity, serious trouble will be experienced later. The investigation should be extended to cover all main and trunk sewers which affect drainage from the project site. If the present sewerage facilities are not entirely adequate, additional sewers or drains must be provided or precautionary measures taken to prevent flooding of basements or other damage to the project.

When old street sewers or services are to be utilized in the project sewer system -- particularly when such lines will be project-maintained -- they should be examined to determine whether their condition is satisfactory for incorporation in the new system. This precaution is important in order to guard against substantial extras during construction. If such sewers are not found in good condition, they should receive any necessary repairs.

Roof Drainage

The connecting of downspouts to sewers is an important item of project cost. This is especially true where the sewerage system is not of the combined type, and where row houses with pitched roofs requiring storm sewers along both sides are used. Where soil conditions, topography, and building coverage permit, the roof water may, in occasional cases, be discharged on to splash blocks from which it will flow over lawn and surfaced areas.

Surface Inlets

The location of yard inlets is fixed by the project grades, but the grade studies and yard drainage system design should be carried out jointly, in order to avoid, on the one hand, excessive filling to shed the water to border streets and, on the other, an unnecessarily expensive system of drains.

Where a surface inlet discharges directly into a combined sewer, a catchbasin with water seal should be provided; where the discharge is into a storm sewer (and the city code permits), or where the discharge subsequently will pass <u>through</u> a catchbasin, a simple inlet without water seal or catchment space may be used. Trapped basins are undesirable where not strictly necessary, because they require more maintenance than simple inlets and standing water may be a breeding place for mosquitoes.

Three feet each way is a convenient interior, horizontal dimension for yard catch basins and inlets; and brick makes a satisfactory material for walls, as it facilitates adjustment in the elevations of the castings.

Surface inlet gratings should be specified to be set at least two inches below adjoining yard grades in order to intercept drainage effectively. Gratings in yard areas should be heavy enough to keep children from removing them.

VIII. Water Distribution System

The water distribution system comprises all new water mains and service lines, outside of building lines (or to a point near the building lines), needed for domestic water supply and fire protection for the project. While local regulations and practice will generally govern the water system design in public rights-of-way, these requirements should be checked to insure an adequate supply for domestic uses and fire protection.

Maximum Rates of Flow

Although the average daily water consumption per dwelling unit on housing projects may vary from less than 200 gallons per day to almost 300 gallons, depending on the nature of the development and climatic conditions, these figures have no direct relation to the maximum rates of flow, or "maximum momentary demand," on which pipe sizes should be based. Extensive study has led to the following recommended maximum rates of flow for determining sizes of water supply piping to housing projects and to buildings within projects. These figures do not apply to supply lines on which fire hydrants are located.

Number of Dwelling Units	Maximum Rate of Flow With Flush-Valve Toilets	Maximum Rate of Flow With Tank Toilets
10	125 G.P.M.	75 G.P.M.
20	150 "	100 "
30	175 "	125 "
40	200 "	150 "
50	225 "	175 "
75	275 "	225 "
100	300 "	250 "
150	375 "	325 "
200	450 "	400 "
300	575 "	550 "
400	700 "	700 "
500	800 "	800 "
750	1100 "	1100 "
1000	1400 "	1400 "

Pipe Sizes

With these maximum rates of flow as a basis of design, pipe diameters should be calculated to give not less than 15 lbs. per sq. inch pressure at any fixture (preferably 20 lbs. for flush valves) with the ordinary minimum pressures in city mains. Where fire hydrants are located on supply lines, the domestic demand may be taken as the daily average consumption (ordinarily it will be negligible compared with the demand for hose streams) and pipe sizes should comply with the minimum requirements of the National Board of Fire Underwriters.

Layout of Services

The simplest and (with respect to first cost) most economical arrangement for water supply is generally a single service to each building or small group of buildings. However, unless water is purchased at a flat rate or meter readings are "pooled," this arrangement may add greatly to the cost of water. Where water is purchased on a sliding scale, every effort should be made to arrange for the pooling of meter readings, so that all water consumed will be billed as if taken through a single service. If this arrangement is not feasible, it will generally be advantageous to take water through a master meter(for larger projects, through two or more connections off different mains, each connection with its master meter) and provide a distribution system within the project. The choice of method must be based on comparative cost analyses, weighing both first cost and project operating cost.

Fire hydrants should be located on metered lines only when the cost of providing separate fire lines would be excessive. The local fire department, or other municipal authority, should be consulted on the location of all fire hydrants.

IX. Gas Distribution System

Pipe sizes, materials, and the layout of the gas distribution system will be governed by conditions of gas purchase, by the nature of the soil, and the characteristics of the gas supply (source, pressure, water content, etc.). The recommendations of the local department or company may generally be taken as an acceptable basis of design, and reference may be made to "Standards for Gas Service," published by the United States Department of Commerce; National Bureau of Standards, or to the latest recommendations of the Distribution Committee of the American Gas Association. The installation of drip-pots at proper points should not be overlooked.

X. Street Improvements

The work referred to under this heading consists principally of street paving, street sidewalks, main water lines and main sewers and their appurtenances, which, although built as a part of the project and included in the general contract work, will be taken over and maintained by the municipality.

Plans for such work should contain the full detail required for design and construction, with street profiles when necessary, grading details for intersections, plans for incidental changes in utilities, etc. Plans for street work must conform generally to established city standards. In general, the controlling design consideration, as in other elements of the project development, should be the lowest first cost compatible with low maintenance cost. Expensive types of street pavement, such as sheet asphalt or brick on concrete base, should be avoided when possible.

It is recommended that plans for street work be kept separate, in so far as practicable, from plans for work within the site. This will facilitate obtaining approval of plans for street work from the city, which approval should be obtained from the municipal department having jurisdiction.

Nathan Straus

NATHAN STRAUS,
Administrator.

August 23, 1938

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 15 ON POLICY AND PROCEDURE (Aug 30, 1938)

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS OF LOAN AND ANNUAL CONTRIBUTION

This bulletin describes the necessary steps in the development of a low-rent housing project from the execution of the Loan and Annual Contributions Contracts up to the point where the local authority has advertised for bids and awarded the principal construction contracts. This bulletin is therefore a companion to Bulletin No. 5, which describes the progressive steps in the initiation of a low-rent housing project from the beginning of local activity to the execution of the Loan and Annual Contributions Contracts. Many of the matters referred to generally in this bulletin have been covered more specifically in prior bulletins or will be made the subject of more detailed treatment in subsequent bulletins.

The execution of Contracts of Loan and Annual Contribution with the United States Housing Authority does not diminish but rather increases the need for constant and sympathetic cooperation between the local authority and the United States Housing Authority. The more complex problems which arise after the contracts are signed require greater technical skill to prevent error, and greater speed and active enthusiasm to prevent the program from bogging down. Toward both these ends, the local authority should feel free to ask and the United States Housing Authority is eager to give every practical form of assistance.

This bulletin deals with the following steps, arranged in the order in which they most generally will be taken, although in the interest of speed it will be desirable and prudent at times to proceed with two or more steps simultaneously:

I. Organization of Permanent Staff.
II. Accounting Procedure.
III. Performance of Conditions in Loan Contract.
IV. Development of Fund Agreement.
V. Advance Loan.
VI. Budget.
VII. Preparation of Site.
VIII. Architect's Contract.
IX. Preparation and Submission of Job Program.
X. Preparation and Submission of Construction Plans and Specifications.
XI. Preparation and Submission of Revised Estimates of Development Cost.
XII. Advertisement for Bids and Award of Contracts.

I. Organization of Permanent Staff. One of the first steps to be taken by a local authority after the execution of the Contracts of Loan and Annual Contribution is to organize a permanent staff, if this has not already been done. The development of a low-rent housing project is a major community undertaking involving a great amount of work. It cannot be carried forward speedily or successfully without an adequate clerical and technical staff under competent supervision. The local authority should also make arrangements for adequate office space and equipment.

Upon request, the USHA will be glad to supply the local authority with suggestions bearing upon the size and character and economical management of the local staff which experience has proved necessary to develop a worthwhile housing project.

In establishing salaries for employees of the local authority, care should be exercised that these salaries are commensurate with the size of the local program and the responsibilities involved.

II. Accounting Procedure. In order that all transactions relating to the receipt and expenditure of funds in connection with the development of the project may be properly recorded, the local authority should establish an acceptable accounting procedure as provided in the "Manual of Instructions of Accounting Procedure for Local Housing Authorities", the adoption of which will expedite the approval of requisitions by the USHA and will facilitate the auditing of the local authority's books. This Manual of Instructions will be forwarded to a local authority upon request. Wherever possible, the USHA will send a representative to the local authority to assist in setting up the initial books of account.

III. Performance of Conditions in Loan Contract. Since the local authority will not be able to proceed very far until some funds have been advanced to it by the USHA, all conditions precedent to such advances should be performed without delay. Generally the Loan Contract will contain some such conditions precedent. Their performance may involve negotiations with local municipal officials regarding equivalent elimination (see Bulletin No. 3), local annual contributions (see Bulletin No. 6), or may involve negotiations to obtain assurances that at least 10% of the development cost of the project can be raised locally. These negotiations should be effectively concluded in order that an advance loan by the USHA may be made.

IV. Development Fund Agreement. The "Terms and Conditions" (USHA Form 300, Paragraph 3, Part II) which are made a part of each Loan Contract provide that any funds received by the local authority from the USHA shall be deposited in a separate account, to be known as the "Development Fund", in a bank which is acceptable to the USHA. To provide an expeditious method of withdrawal and to safeguard the use of loan funds solely for the development of the project, the USHA requests the execution of a Development Fund Agreement embracing instructions about the disbursement of funds against receipt of checks and supporting vouchers. Under the terms of this Agreement, the depositary bank will not honor any withdrawals from the Development Fund unless such withdrawals are accompanied by certificates, signed by appropriate officers of the local authority and stating that the funds covered by the withdrawal will be used in the development of the project and indicating the purposes of the expenditures. The loan funds may be withdrawn from the bank merely upon the basis of such certificates by the local authorities. A separate approval by the USHA of each withdrawal will not be required. The early execution of the Development Fund Agreement will expedite the advance of funds to the local authority by the USHA, and to this end three conformed copies of the executed Agreement should be forwarded to the USHA at once.

The procedure contemplated by the Development Fund Agreement is a simple and expeditious one, with which most banks are familiar. In addition, the USHA has prepared a suggested form of Development Fund Agreement (USHA 425) and a form of Accounts Payable Voucher which includes the required certificates. Copies of these forms will be furnished to the local authority upon request.

V. Advance Loan. It is important that funds be obtained in sufficient time to meet all costs as they accrue in the development of the project. The Loan Contract will provide that upon a satisfactory showing that there is a need for funds which cannot otherwise be met, and upon the performance of the conditions precedent contained in the Contract, the USHA may make an advance to the local authority on account of the loan. As soon as the need arises and the conditions have been performed, the local authority should file an Advance Loan Requisition with the USHA, together with the necessary supporting documents. (See Bulletin No. 7 for a detailed description of the Advance Loan Requisition procedure). Additional requisitions may be filed from time to time as funds are required. All such requisitions, if supported by the required data, will be honored by the USHA without delay.

The advance loan may be used to pay architectural, engineering and planning fees, costs of preparation of plans, specifications and other forms of proposed contract documents, costs of acquiring land, and other expenses to be incurred prior to the sale of definitive bonds. In most cases definitive bonds will not be sold until the site has been acquired and construction contracts awarded.

The local authority should not use any of the funds advanced by the USHA to reimburse itself or others for expenditures made prior to the date of the Loan Contract until a project auditor from the staff of the USHA has examined the items and reported his findings to the central office of the USHA where it will be determined whether they are eligible to be charged to the project as "Development Costs".

VI. Budget. During the formative stages of the project, either before or after the first requisition for an advance loan, but in any event prior to the second requisition, the local authority should prepare and submit to the USHA for approval an itemized budget of its anticipated overhead costs (see Bulletin No. 4) classified in accordance with the "Manual of Instructions of Accounting Procedure for Local Housing Authorities". This budget may be revised from time to time. It is suggested that, for convenience, the budget cover periods of time as follows:

(a) Prior to execution of Loan and Annual Contributions Contracts.
(b) From time of execution of Loan and Annual Contributions Contracts to award of principal construction contracts.
(c) Quarterly periods subsequent to award of principal construction contracts.

VII. Preparation of Site. In the preparation of the site, these steps should be taken as expeditiously as possible so that there will be no delay when construction contracts are awarded: (a) the acquisition of the land, (b) the relocation of tenants, (c) the closing of streets and the relocation of utilities, (d) the obtaining of easements and rights-of-way, (e) the investigation of subsoil conditions and (f) the demolition of existing buildings.

(a) Land Acquisition. As soon as the site has been selected by the local authority and approved by the USHA, both of which should be done very soon after the execution of the Loan Contract where they have not been done even earlier, the local authority should proceed immediately with the acquisition of land. Bulletin No. 8 describes in detail the necessary requirements of the USHA and the procedure to be followed by the local authority. Close attention to the critically important and urgent matter of land acquisition is particularly urged.

(b) Relocation and Rights of Tenants. During the period of land acquisition, the status of existing tenants in the area should be investigated. This status will in large measure be revealed in gathering title information, and the final title papers should be accompanied by an affidavit setting forth the names of the parties in possession and their status.

In the case of many built-up sites, it will be desirable to make a survey of the existing buildings and the families living in them for use in determining which of the dwelling units to be demolished will classify as substandard and hence be counted toward "equivalent elimination", and also for use in relocating the dispossessed families and in rehousing them in the project in so far as that proves feasible. The USHA will gladly assist in the formulation of such surveys.

Steps should be taken to relocate all tenants in ample time to permit demolition of the buildings as soon as title to the property is acquired. Bulletin No. 10 suggests a sound method of relocationg tenants in terms of speed and socially desirable practices.

(c) Street Closings and Utilities. In addition to the acquisition of the privately owned property within the proposed project area, the site plans for the project may necessitate the closing of designated streets and alleys and the relocating of existing utilities. In all such cases, the local municipal authorities and the utility companies concerned should be consulted at an early date, to avoid delay in ironing out the necessarily co-operative procedures involved. In the interest of both speed and sound economy, the local authority and the architects should utilize existing utilities and streets and keep the relocation of utilities and the closing of streets to a minimum, but in no case should this be done unless it is consistent with proper site planning.

(d) Easements and Rights-of-Way. All necessary rights-of-way and easements over the property of others (including existing streets which are to be vacated, and new streets which are to be dedicated) for the carrying of water lines, sewers or other utilities should be obtained, or granted, as the case may be, simultaneously with the acquisition of the site of the project.

(e) Subsoil Investigation. During the period of land acquisition, full and complete information should be obtained concerning the type of soil and its bearing value and also concerning any unusual conditions which might affect construction. When securing options on the property, it may be desirable in some instances to include in the option a clause giving the local authority the right to enter on the premises for the purpose of inspection and the making of topographic surveys and test pits and borings. In some instances, however, this information may readily be available in the offices of the City Engineer.

(f) Demolition. As soon as a sufficient portion of the site has been acquired to permit an orderly demolition procedure, bids should be invited for the demolition of the buildings on the site. When a demolition contract is let before title to the entire site is acquired, the local authority should protect itself against delays in the acquisition of the remaining parts of the site. Because of the salvage accruing to the contractor, the actual cash consideration, if any, passing to or from the local authority under a demolition contract will in many instances be negligible. Therefore, the size of the performance bond required of the contractor by the local authority should be determined by estimating in advance the cost to the contractor of demolishing or removing the buildings and structures from the site, without the allowance for the value of salvaged materials. Unless there are local laws to the contrary, the amount of the bond should not be less than 50 per cent of this estimated cost. If the value of the salvage material which is easily removable without demolishing the building is considerable, the amount of the bond should be increased accordingly.

Bulletin No. 9 on Construction Contracts contains general information with regard to construction contracts, much of which is applicable to a demolition contract. A suggested form of demolition contract has been prepared by the USHA and is available to the local authority upon request.

VIII. Architect's Contract. Immediately after the execution of the Loan Contract, the local authority should complete contractual arrangements with the architect or group of architects that it has chosen for the project. Pursuant to "Terms and Conditions" (Paragraph 1 (a)(8) of Part III), the local authority should submit to the USHA a copy of each proposed architect's contract for approval or comment before such contract is executed by the local authority and by the architect. In order to centralize responsibility, it is recommended that one architect's agreement be entered into covering all phases of the work, rather than separate contracts for each phase, such as construction, landscaping, etc. However, if the local authority desires to enter into a separate contract with a landscape architect or a consulting engineer, the USHA will have no objection to this procedure, provided that the total of architectural fees for the project does not exceed the schedule of fees meeting the approval of the USHA.

At the time the proposed contract is submitted to the USHA for approval or comment, and before that date if possible, there should be submitted to the USHA a schedule of salaries and wages which the architect proposes to pay to the various classes of architects, technical engineers, technicians, laborers and mechanics to be employed by him under the contract. Such schedule should be supported by any available evidence obtained by the architect or by the local authority which tends to establish such schedule of wages as the prevailing wages. These submissions are necessary in order that the USHA may determine whether the wages proposed are the prevailing wages as required by the United States Housing Act and by "Terms and Conditions," Part III, Section 1 (a) (2).

The USHA has prepared suggested forms of architect's contracts which, together with suggested maximum fees meeting the approval of the USHA, are available upon request for the guidance of the local authority.

In the schedule of fees suggested by the USHA the architect's fee is designed to apply to the total estimated construction cost of the project (including landscaping and engineering work), and the fees for the landscaping and engineering work are allowable in addition to the architect's fee. These fees are not mandatory, but represent suggested maxima.

In connection with the architect's contract, a decision should be made at an early date as to whether the architect or the staff of the local authority itself will supervise construction. Most local authorities are finding it advantageous to have the supervision carried out by the architects.

IX. <u>Preparation and Submission of Job Program.</u> The suggested form of contract for architectural services provides under Section 3, paragraph (a), for preliminary documents which include drawings, outline specifications, and estimates of cost. These documents, together with certain other data, comprise the Job Program which, when formally submitted by the local authority and approved by the USHA, will constitute the working basis for development of the specific project plans, specifications and contract documents. Bulletin No. 13 entitled "Preparation of Drawings and Specifications" contains detailed information relative to that portion of the Job Program which should be prepared by the architect. The following is a summary of those items, followed by a list of the supplementary data contemplated to complete the Job Program. A suggested form for making up the Job Program may be obtained from the USHA.

(a) <u>Items in Job Program to be prepared by Architect:</u>

1. Architectural Site Plans
2. Unit Plans
3. Typical Buildings

4. Cross Section of Typical Buildings
5. Wall Section of Typical Buildings
6. Utilities Distribution Site Plans
7. Existing Conditions - Site Plan
8. Landscape Plan
9. Outline Specification
10. Work not covered by Architect's Contract
11. Tabulation of Dwelling Units
12. Non-Dwelling Buildings and Equipment
13. Itemized Estimate of Development Costs.

(b) Supplementary Items to complete Job Program:

1. An estimate, broken down as to all annual costs and as to rents, including utility charges to tenants.

2. Statement comparing estimated cost of dwelling construction with construction costs by private enterprise, including basis for such comparison.

3. Statement comparing number of dwelling units, distribution and rent levels with number and characteristics of eligible families.

4. Tabular statement of relocation problem.

5. Statement listing and evaluating capital donations.

6. Statement summarizing the proposed financing of the development cost.

7. Status of negotiations for land; anticipated purchase price.

8. Statement covering specific agreements which have been negotiated with the city or utility company having jurisdiction with regard to paving streets, alleys or driveways; enlarging, repairing or extending sewer, water, gas and electric mains; amounts to be paid for these site improvements or extent to which these may be donations.

9. Statement covering the status of negotiations with utility companies on electric, gas, water or steam rates. State rates presently proposed and the influence they have had upon the type of equipment proposed, the system of yard distribution, and the method of metering or otherwise providing services to tenants.

10. Statement covering specific action which has been taken with respect to:

(i) Zoning or rezoning the areas surrounding the project site in order to protect it against adverse influence.
(ii) Zoning or rezoning the project site in harmony with the proposed development.
(iii) Securing waivers or exemptions in such portions of the building, sanitary, and related codes as may be inconsistent with the proposed development.

In preparing these data for the Job Program, note the discussion of these items herein and the references to other bulletins dealing with these subjects.

All of the items comprised in the Job Program should be bound together in booklet form and ten complete copies submitted to the USHA.

X. Preparation and Submission of Construction Plans and Specifications. As soon as the architect's contract has been executed, the architect should, if he has not already done so, proceed immediately with the preparation of the construction plans and specifications. Bulletin No. 13 entitled "Preparation of Drawings and Specifications" covers this subject in detail. In such preparation, the following items are of outstanding importance:

(a) Compliance with State and Local Laws. In the development of the plans, the local authority should consult the necessary state and local officials to insure that the plans will conform with applicable local ordinances and state laws, and at the proper time should obtain the necessary approvals of state and local officals having jurisdiction. Where exceptions to the applicable local ordinances and state laws are necessary, assurance should be obtained that such exceptions can and will be made.

Utilities. In the development of the plans and specifications, it will be necessary to consult with the respective utility companies as to available facilities, and as to the terms and conditions and rates at which new utilities where needed will be provided. The comparative costs of the several alternative services, such as gas, electricity and steam, should be obtained so that the least expensive, not only as to development cost but also as to operating cost, may be utilized.

For example: (i) if commercial steam is available, what is its cost for heating purposes, as compared with the cost of an Authority-operated steam plant or of individual heating units for the several buildings?; (ii) what is the cost of gas for cooking and refrigeration, as compared with electricity? Final commitment as to facilities and rates should be avoided until approval of the USHA has been obtained.

In negotiations with utility companies regarding estimated rates, the local authority should be particularly careful to utilize in full the representatives of the USHA who are specially trained and equipped as advisers on these particular technical matters.

(c) Municipal Services. Prior to the preparation of plans and specifications, the local authority will usually have made at least tentative arrangements with the local municipality regarding any improvements or extensions of municipal services that are to be furnished by the municipality to the project. Such tentative arrangements should, if possible, be made definite and final in the Job Program, so that the architect may proceed with the final plans and specifications on a definite basis. The following items need usually to be considered and arranged for in the development of any plans: (i) water service; (ii) sewer connections, both storm and sanitary; (iii) street lighting; (iv) construction of new streets or the repairing or resurfacing of existing ones; (v) fire protection, including new fire lines and hydrants; (vi) rerouting of transportation lines and (vii) educational and playground facilities. The necessary changes in zoning laws and building regulations should be initiated at an early date.

(d) Insurance. In the preparation of plans and specifications, and in determining the proposed type of construction, the architect should take into consideration the prevailing insurance rates. The USHA is conducting negotiations with insurance rating bureaus, and is prepared to advise a local authority as to the insurance rates which will be applicable for the various types of construction. This will help the architect in developing a design that will be economical from the standpoint not only of original cost but also of operation and maintenance.

(e) Site and Unit Plans. Bulletin No. 11 entitled "Site Planning" contains detailed suggestions concerning site planning, and Bulletin No. 12 entitled "Dwelling Unit Planning" contains detailed suggestions concerning unit planning. The local authority and architect are, of course, under no compulsion to follow these suggestions of the USHA. In fact, the USHA will encourage each local authority and each architect to exercise their skill and ingenuity in developing new ideas.

(f) Construction Contracts. Bulletin No. 9 entitled "Construction Contracts" (Chapter I, section 7) discussed the question of splitting the general construction work of a project into two or more sections and suggests that consideration be given to such procedure. A related question is that of separate contracts segregated as to types of construction. The local authority should endeavor wherever possible to put all of the related construction work under the contract and to avoid segregated contracts. However, it is recognized that in many instances this will be impracticable, and that more than one contract will be necessary. For example, in some cases it will be advisable to let a separate contract for landscaping; also some state statutes may require that a segregated contract be let for each phase of the construction work, such as electrical, heating and ventilating, plumbing, etc.

Where split or segregated contracts are to be let, the several contracts should be drawn in such a way as to provide for full coordination and a minimum of interference.

Bulletin No. 9 entitled "Construction Contracts" contains a suggested form of construction contract for the use and guidance of the local authority. This form contains all the applicable requirements of the United States Housing Act and of Part II of the Terms and Conditions.

(g) Physical Improvements after Partial or Complete Occupancy. The local authority should bear in mind that funds will be available (through the issuance of additional bonds, if necessary, representing part of the unused 10% margin of safety as provided in Paragraph 6, Part II of "Terms and Conditions") for physical improvements to the project during a three year period subsequent to the date when the project is ready for complete occupancy. Any items which prove to be necessary during this period may be added to the project. For this reason, the local authority may determine that it is wise to omit from the plans and specifications certain items until the necessity for them has been established during a short period of operation. However, any additional expenditures made applicable to dwelling facilities cannot be in an amount which would make the total dwelling facilities cost exceed the maximum limitations of the United States Housing Act.

(h) Submission of Plans and Specifications. As soon as the plans and specifications and other contract documents have been completed and the local authority is ready to advertise for construction bids, at least six copies (eight, if possible) should be submitted to the USHA in accordance with Paragraph 1 (a) (1), Part III of the Terms and Conditions. They should be accompanied by two copies of a statement showing the wage rates prevailing in the locality for each trade or occupation to be engaged in work under the particular contract, as determined under applicable state law, or, in the absence of state law, as found by the local authority after investigation. The USHA will examine the plans and specifications and other contract documents and will advise the local authority whether they comply with the terms of the United States Housing Act and with the Loan Contract. If the documents as submitted are acceptable, the USHA will authorize the local authority to take bids and will return to the local authority one complete set with an indication of acceptance by the USHA stamped upon each drawing and document. If the documents as submitted are subject to certain minor modifications but are acceptable for the purpose of advertising for bids, the USHA will return to the local authority one complete set together with an indication of the suggested modifications, and an authorization to advertise for bids subject to a subsequent determination of the points of suggested modification. If the documents as submitted are not acceptable to the USHA for the purpose of taking bids, the USHA will so advise the local authority together with an indication of what changes are necessary to make the drawings and documents acceptable.

During the period between advertising and receiving bids, the local authority should transmit to the USHA six copies of each item of all material (addenda, etc.) issued to prospective bidders.

XI. Preparation and Submission of Revised Estimates of Development Cost. After the preparation of the construction plans and specifications has been completed, the local authority should submit to the USHA an itemized estimate of the total development cost of the project based upon the final plans and specifications, the actual costs incurred to date for all items (such as land, demolition, cost of preparing plans and specifications, etc.), the latest estimates of overhead costs and of all other costs relating to the project. This revised estimate of the total development cost should be submitted to the USHA prior to the date of the submission to it of the construction bids received.

XII. Advertising for Bids and Award of Contracts. As soon as the plans and specifications and other contract documents have been found acceptable by the USHA, the local authority should advertise for bids. Bulletin No. 9 on "Construction Contracts" contains suggested forms of advertisement, bids and related matters. The local authority should advise the USHA as to the time and place fixed for receiving bids. A representative of the USHA will in most cases attend the bid opening and be available to the local authority for advice with respect to any questions which may arise at the time. As soon as the local authority has had an opportunity to study the bids, and before the award is made, it should submit to the USHA a written statement of the bids received and the proposed award of the contract. The USHA will check the bid figures against the estimated costs in the Job Program, and against the provisions of the United States Housing Act and the Loan Contract. The USHA will then advise the local authority that the proposed award is acceptable, or that it is acceptable subject to certain qualifications, or that it is not acceptable, giving reasons therefor. If the proposed award is acceptable to the USHA, the local authority may execute the construction contract with the successful bidder. Four conformed copies of the executed contract and all accompanying plans and specifications should be forwarded to the USHA. If these copies are all in good order, the USHA will return one set to the local authority with an indication that they are approved for construction. Upon the execution of the construction contract and its approval by the USHA, the local authority may advise the contractor to commence work under the contract.

Suggested Forms. In order to assist the local authority in taking the steps outlined in this bulletin, the USHA has available suggested forms of documents relating to:

(a) Equivalent elimination,

(b) Local cooperation and local annual contributions in the form of tax exemption,

(c) Public sale of local authority bonds,

(d) Local capital donations,

(e) Surveys, title information, guarantee policies, title certificates, appraisals and options.

(f) Architect's services,

(g) Construction contracts, and related documents,

(h) Deposit of Loan Proceeds in Development Fund,

(i) Accounting Procedure,

(j) Advance Loan Notes, and Proceedings authorizing same,

(k) Housing Authority Bonds, Trust Indenture securing same and proceedings authorizing issuance thereof, and

(l) Other matters involved in the financing or development of projects.

In each case the forms will be adapted to the local law and furnished to the local authority upon request.

Nathan Straus

NATHAN STRAUS,
Administrator.

August 30, 1938.

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UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 15 ON POLICY AND PROCEDURE

Addendum No. 1 (Jan. 10, 1939)

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS OF LOAN AND ANNUAL CONTRIBUTION.

Section VI, page 4 of Bulletin No. 15 on Policy and Procedure is hereby modified to read as follows:

VI. Budgets. In order to provide the local housing authority with a means of controlling the nature and extent of expenditures in the development of its project, the USHA has prepared a form of Development Cost Budget to be used as provided hereafter:

(a) There should be submitted a Preliminary and a Final Budget for each project. These Development Cost Budgets are to be prepared on USHA Form 512 and shall be so arranged as to conform to the Standard Classifications of Accounts in accordance with the Manual of Instructions of Accounting Procedure For Local Housing Authorities, Part I, approved by the ADMINISTRATOR April 29, 1938.

(b) The Preliminary Budget should be prepared and submitted on the Budget form by the local housing authority as soon as possible after the execution of a loan contract but in any event its submission is required prior to the filing of the second requisition for advance of funds. The USHA Project Planning and Auditing advisers will render such assistance in the preparation of the Budgets as may be necessary. The Preliminary Budget should be, in general, based on the proposed development cost used as the basis of loan contract, but the total amount may be reduced or the distribution of amounts be modified in view of further information or commitments on the various items available since the date of the loan contract.

(c) The amounts included in the Budget form shall be distributed among the appropriate control account classifications, i.e., 7-10 Administrative, 7-20 Carrying Charges, etc. The amounts shown under the various account classifications, 7-10 through 7-70, shall be net figures representing the actual estimate or commitment, as the case may be. The amount shown under Acct. No. 7-80 Contingency shall (except when especially authorized by the USHA) be equal to five percent of the total of all the items 7-10 through 7-70 and is for the purpose of providing a normal latitude for changes, extras and overruns during development. (This item is not to be confused with the 10 percent margin of safety which, under the terms of the Loan Contract, may be authorized by the USHA for the purpose of meeting unanticipated extra costs during construction and other contingencies, but which margin of safety is not to be included as a part of the Development Cost Budgets.) The total of the eight control accounts shall be the total estimated development cost.

(d) The Final Budget should be prepared and submitted by the local housing authority not later than fifteen (15) days after the execution of the first major superstructure construction contract. This Budget shall, of course, reflect contract amounts wherever contracts have been awarded and as to other items will represent the latest estimate developed in connection with the completion of final plans and specifications and bids received. The amounts included in the budget form shall be distributed among the appropriate control account classifications in the same manner as for the preliminary budget. The amounts shown under the various account classifications, 7-10 through 7-70, shall be net figures representing the actual estimate or commitment, as the case may be. The amount shown under Acct. No. 7-80 Contingency shall (except when especially authorized by the USHA) be equal to five percent of the total of all the items 7-10 through 7-70 and is for the purpose of providing a normal latitude for changes, extras and overruns during development. (In the event that the costs of site acquisition have been definitely determined, the amount represented by this item may be excluded from the total upon which the five percent for Contingency is calculated. In such case care must be taken in the apportionment of the Contingency item to dwelling and non-dwelling costs so that no part of said Contingency is prorated against the item of site acquisition.) The total of the eight control accounts shall be the total anticipated development cost. In the preparation of this Budget, the assistance of USHA advisers will be made available upon request where possible. After the Final Budget has been approved by the USHA, all variations of costs from the items therein shall be treated as underruns or overruns, as the case may be. Overruns in subaccounts which are compensated by underruns within the same grouping do not require USHA approval except for items with respect to which specific limits previously were approved by the USHA. If and when it appears necessary to exceed the total of any one grouping, the approval of the USHA shall be obtained prior to the making of any commitments resulting in such excess. In general the following items are limited by the specific approval of the USHA: legal services, land purchase price, base fee or contract amounts.

(e) It will be noted that the Budget form provides for a summary of the control accounts broken down to reflect the division between dwelling and non-dwelling costs. This breakdown should be submitted with both the Preliminary and Final Budgets and shall be prepared in accordance with the Manual of Instructions of Accounting Procedure For Local Housing Authorities, Part I, sheet 8, paragraph 24, subject to such adjustment in the Contingency account as may be necessary in particular cases as hereinabove described. Sheet 2 of the Budget form has been designed to provide conveniently for such computations.

(f) Budgets, after having been duly approved in the space provided, shall be submitted in single copy form and, when approved by USHA, a photostatic copy will be transmitted to the local housing authority.

Nathan Straus

NATHAN STRAUS,
Administrator.

January 10, 1939.

DEVELOPMENT COST BUDGETS

SUPPORTING SCHEDULES

1. USHA Form 512, on which the local housing authorities will prepare and submit a Preliminary and a Final Budget of Development Costs, provides that certain of the elements of estimated costs are to be supported by a detailed schedule indicating the basis of the estimate.

2. It will be noted that the particular items on which supporting schedules are required are indicated by an asterisk placed at the left of the subaccount classification number.

3. In order to expedite the review and approval of the Budgets by USHA and to permit the determination of the eligibility of the indicated estimated costs, local housing authorities are requested to submit the supporting schedules in adequate detail.

4. The classifications for which supporting schedules are required and the form of their submission are as follows:

TITLE OR CLASSIFICATION	RATE PER MONTH	NO. OF MONTHS	TOTAL

The above headings are to be used in preparing the supporting schedules for the following classifications: 7-10.1 Pay Roll-Executive, 7-10.2 Pay Roll-Technical, 7-10.3 Pay Roll-Site.

FILL OUT APPROPRIATE BLANKS IN FORM USHA 440

For classification 7-10.4 Legal Services & Expenses-Adm. only.

ITEM AND DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL

For classification 7-10.7 Furniture & Fixtures-Office.

CLASSIFICATION OR CHARACTER OF EXPENSE	RATE PER MONTH	OTHER	TOTAL

For classification 7-30.7 Inspection Costs-Salaries & Expense.

FILL OUT APPROPRIATE BLANKS IN FORM USHA 440

For classification 7-40.8 Legal Services-Land only.

FILL OUT APPROPRIATE BLANKS IN FORM USHA 440

For classification 7-40.9 Legal Expense-Land only.

CHARACTER OF SERVICE	BASIS OF COMMISSION	ESTIMATED AMOUNT

For classification 7-40.10 Commissions.

TITLE OR CLASSIFICATION	RATE PER MONTH	NO. OF MONTHS	TOTAL

For classifications 7-70.1 and 7-70.2 Pay Roll Executive and Pay Roll Operations.

ITEM AND DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL

For classification 7-70.6 Furniture & Fixtures-Office.

5. For further information reference is made to sheet 16 of the "Manual of Instructions of Accounting Procedure for Local Housing Authorities," Part I.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 15 ON POLICY AND PROCEDURE

Addendum No. 2 Feb. 25, 1939

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS OF LOAN AND ANNUAL CONTRIBUTION

Section VIII of Bulletin No. 15 on Policy and Procedure deals with the negotiation and approval of contracts for architectural services, and Section IX refers to that part of the architect's contract which provides for preliminary documents including estimates of cost upon which the architectural fees are determined. The purpose of this addendum is to clarify certain questions relative to the determination of architectural fees and the time and manner of payment thereof. The statements herein assume that the suggested forms of architect's contracts prepared and issued by the USHA have been adopted by local housing authorities; to the extent that the actual contracts differ from the suggested forms the procedures suggested herein should likewise be modified.

The architect's contract provides that the compensation of the architect shall be a fixed fee computed by the local authority by applying a stated percentage to the accepted estimated improvement cost and that the fee so computed shall be approved by the architect. The contract also provides, under Article 3 (a), that this estimated improvement cost shall be prepared by the architect subject to check and approval by the local authority. The estimated improvement cost is a part of the first estimate of total development cost which, in turn, becomes the basis for the preliminary budget required to be submitted between execution of loan contract and second requisition for advance loan.

In view of the fact that delay in submission and approval of the preliminary budget would likewise delay the advance of funds to local authorities, the USHA will approve architectural fees computed by the local authority and the architect on the basis of the estimated cost of improvements in the application for financial assistance as approved for purposes of loan contract; provided that the items of allowances for construction contingencies are deleted. At that stage it may be that the costs of mechanical items are very indeterminate because of uncertainties as to type of heating to be used, also that other similar uncertainties may make it practicable to fix only the architectural fee, leaving some, or all, of the other fees open to future determination when better information is available.

As soon as possible after the execution of loan contract, the local authority and the architect should determine (subject to the approval of the USHA) the amount of the fixed fee. This should be submitted as early as is feasible in order that the architect's fee may be established and prorated between dwelling and nondwelling costs and be budgeted accordingly during the early stages of the development. The local authority should indicate how the fee was determined and what items were excluded from the estimates in determining the amount of the fee. The USHA will, thereupon, after clearance of any points at issue, indicate its approval of the architect's fixed fee.

In certain cases it is possible that the question will arise as to whether or not the architect is entitled to a payment on account prior to the determination and approval of the exact amount of the fixed fee. In such cases, local authorities will, of course, be guided by circumstances then existing. Local authorities may make, in justifiable cases, such payments in the form of equitable lump sums to be deducted from the percentage amounts provided in the contracts and to be paid at progressive stages of the work. In no case should such payments exceed the value of the work or service performed to the date of such payment.

Upon receipt of this addendum to Bulletin No. 15, local authorities are urged to check their records to determine whether or not they have supplied the USHA with all pertinent information, up-to-date, relative to their architectural contracts, and to supply any such missing information; this suggestion is made in order to avoid delays in approval of budgets, making of advance loans, reconciling audits of expenditures, or any other service dependent upon complete information.

Nathan Straus

NATHAN STRAUS,
Administrator.

February 25, 1939.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 15 ON POLICY AND PROCEDURE

(Revised May 26, 1939)
(Substituted for Bulletin No. 15, dated January 10, 1939)

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS OF LOAN AND ANNUAL CONTRIBUTIONS

Scope and Content.

The progressive steps in the development of a low-rent housing project from the beginning of local activity through the execution of the Contracts of Loan and Annual Contribution are described in Bulletin No. 5. This Bulletin No. 15 describes the succeeding progressive steps which begin, ordinarily, with the organization of the permanent staff of the local authority and conclude with the award of the principal construction contracts. Thus, Bulletins Nos. 5 and 15 cover the progressive steps in the development of a low-rent housing project from the initiation of local activity to the beginning of actual construction.

The attention of local housing authorities is invited to the fact that some of the matters covered generally by this bulletin have been discussed more fully in other bulletins. The related bulletins are indicated at the appropriate points in this bulletin.

The following specific steps are described below:

I. Organization of Permanent Staff.
II. Adoption of Accounting Procedure.
III. Performance of Conditions in Loan Contract.
IV. Execution of Development Fund Agreement.
V. Application for Advance Loan.
VI. Preparation of Development Cost Budgets.
VII. Preparation of Site.
VIII. Negotiation, Preparation and Approval of Architect's Contract.
IX. Preparation and Submission of Preliminary Plans.
X. Preparation and Submission of Construction Plans and Specifications.
XI. Preparation and Submission of Revised Estimates of Development Cost.
XII. Advertisement for Bids and Award of Contracts.

These steps should ordinarily be taken in the order indicated. Occasionally, however, the local authority may find it possible and advisable to expedite the program by proceeding with two or more steps simultaneously.

I. Organization of Permanent Staff.

The successful development of a low-rent housing project requires a permanent clerical and technical staff under competent supervision. Accordingly, one of the first steps to be taken by the local authority after the signing of the Contracts of Loan and Annual Contribution is to organize a permanent staff and arrange for the necessary office space and equipment. The USHA is prepared, upon request, to make suggestions as to the size, character and economical management of the staff required.

The attention of local authorities is invited particularly to the fact that the salaries of the members of its permanent staff should be commensurate with their respective responsibilities and with the size of the local program.

II. Adoption of Accounting Procedure.

In order that all transactions relating to the receipt and expenditure of funds in the development of the project may be properly recorded, the local authority should promptly establish an acceptable accounting procedure. A satisfactory procedure is outlined in the "Manual of Instructions of Accounting Procedure for Local Housing Authorities" and the adoption thereof will expedite the approval of requisitions by the USHA and facilitate the auditing of the local authority's books. The "Manual" will be forwarded to the local authority when the Loan and Annual Contributions contracts are in process of execution. The USHA will also, upon request, send a Project Auditor to assist in opening the local authority's books.

III. Performance of Conditions in Loan Contract.

The local authority will not ordinarily be able to make substantial progress with its program until an advance loan has been obtained from the USHA. Accordingly, all the conditions precedent to the advance of funds contained in the Loan Contract and related documents should be performed promptly. The performance of these conditions may entail negotiations with local municipal officials with respect to (a) equivalent elimination (see Bulletin No. 3), (b) local contributions or other forms of local aid to achieve low rents (see Bulletin No. 6, Revised) or (c) assurances that at least 10% of the development cost of the project can be obtained from sources other than the USHA. All such negotiations should be completed expeditiously so that an advance loan may be obtained promptly when funds are needed.

IV. Execution of Development Fund Agreement -- Provisions of the Agreement.

The "Terms and Conditions" incorporated in the Loan Contract provide that the funds received by the local authority from the USHA shall be deposited in a separate account, to be known as the "Development Fund", in a bank or banks acceptable to the USHA.1/ To insure the application of this Fund to the development of the project and, at the same time, to facilitate its use, the USHA requires the execution of a "Development Fund Agreement." This Agreement provides for withdrawals from the Development Fund upon the basis of checks and supporting vouchers. Such vouchers must indicate the purposes for which the checks are drawn and must, ordinarily, be accompanied by certificates which certify that the checks are drawn to pay development costs. The Agreement does not, however, require separate approval of each withdrawal by the USHA. The depositary bank is authorized to honor, upon receipt, checks of the local authority supported by the appropriate vouchers and certificates.

Prompt selection of the depositary bank, and prompt execution of the Development Fund Agreement, will expedite the advance of funds by the USHA. The name of the proposed depositary bank should be submitted to the USHA for approval and, upon obtaining such approval, two executed copies and two certified copies of the Development Fund Agreement, together with three certified copies of the proceedings authorizing the execution thereof, should be forwarded promptly to the USHA.

The procedure contemplated by the Development Fund Agreement is simple and expeditious and familiar to most banks. In addition, the USHA has prepared, and will furnish upon request, a suggested form of Development Fund Agreement (Form USHA-425) which contains suggested forms of the certificates required. A suggested form of Accounts Payable Voucher is contained in Part II of the Manual of Accounting Procedure referred to in paragraph II, above.

V. Application for Advance Loan.2/

Funds should be obtained in time to meet costs as they accrue in the development of the project. The Loan Contract provides that upon a satisfactory showing of a need for funds which cannot otherwise be met, and upon the performance of the conditions precedent embodied in the Loan Contract, the USHA may make an advance to the local authority on account of the loan. As soon as the need arises and the conditions have been performed, the local authority should file an Advance Loan Requisition with the USHA, together with the necessary supporting documents. Additional requisitions may be filed from time to time as funds are needed. However, no request for funds for Acct. No. 7-40.1, Land Purchase, shall be submitted unless options have been acquired by the local authority on at least fifty per cent of the parcels involved and such options have been approved by the USHA. All requisitions supported by the required data

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1/ Terms and Conditions, Part II, Paragraph 3.
2/ See Bulletin No. 7, Revised, for a detailed description of the Advance Loan Requisition Procedure.

will be promptly honored. However, it is requested that, insofar as practicable, requisitions for advance of funds be filed at least twenty (20) days prior to the date on which the funds will be needed.

The advance loan may be used to pay architectural, engineering and planning fees, costs of preparation of plans, specifications and other forms of proposed contract documents, costs of acquiring land and other expenses to be incurred prior to the sale of definitive bonds, provided the contracts for the services or items involved have been previously submitted to the USHA and approved by it. In determining the amount of any advance loan necessary, the local authority should remember that definitive bonds will not ordinarily be sold until the site has been acquired and the construction contracts have been awarded.

The local authority shall not use any of the funds advanced by the USHA to reimburse itself or others for expenditures made prior to the date of the Loan Contract until a Project Auditor from the staff of the USHA has examined the particular items of expenditure involved and the USHA has determined that such items are eligible for inclusion in development cost.[3]

VI. Preparation of Development Cost Budgets.

In order to provide the local housing authority with a means of controlling the nature and extent of expenditures in the development of the project, the USHA has prepared a form of Development Cost Budget (USHA-512). There shall be a Preliminary and a Final Development Cost Budget for each project. These Budgets shall be prepared and used as provided in this paragraph VI.

(a) Preliminary Budget. The Preliminary Budget guides the local authority in making expenditures and in requisitioning funds from the time of execution of the Loan Contract until this Budget is superseded by the Final Budget at the commencement of construction. The Preliminary Budget will, necessarily, be based primarily upon the estimate of "Proposed Development Cost" submitted by the local authority as Item 410, Part IV, of its Application for Financial Assistance, as modified and approved for purposes of the Loan Contract. The local authority need not re-submit this estimate to the USHA for budget purposes. The USHA will transpose the approved estimate to the Budget Form (USHA-512) and the original copy of the estimate, as transposed, will be transmitted to the local authority as soon as practicable after the Loan Contract is forwarded for execution. The transposed estimate will constitute the Preliminary Budget.

The attention of local authorities is invited to the fact that the amounts shown under the various account classifications, 7-10 through 7-70, are net figures representing the actual estimate or commitment, as

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3/ See Bulletin No. 4, Revised, for a detailed statement of items of expenditure eligible for inclusion in development cost.

the case may be. The amount shown under Acct. No. 7-80, Contingency, will (unless determined otherwise necessary by the USHA) equal five per cent of the total of all the items 7-10 through 7-70 and is for the purpose of providing normal latitude for changes, extras and overruns during development.

(b) Final Budget. (1) The Final Budget shall be prepared by the local housing authority on Form USHA-512 and shall be arranged so as to conform to the Standard Classifications of Accounts set forth in the Manual of Instructions of Accounting Procedure for Local Housing Authorities, Part I, approved by the Administrator, April 29, 1938. The USHA Project Planning and Auditing Advisors will render any necessary assistance in the preparation of the Budget and will, where possible, be made available upon request.

(2) The Final Budget shall reflect contract amounts wherever contracts have been awarded and, as to other items, shall represent the latest estimate developed in connection with the completion of final plans and specifications and bids received. The amounts included shall be distributed among the appropriate control account classifications, i.e., 7-10, Administrative; 7-20, Carrying Charges, etc. The amounts shown under the various account classifications, 7-10 through 7-70, shall be net figures representing the actual estimate or commitment, as the case may be. The amount shown under Acct. No. 7-80, Contingency, shall (unless determined otherwise necessary by the USHA) be equal to five per cent of the total of all the items 7-10 through 7-70 and is for the purpose of providing normal latitude for changes, extras and overruns during development.4/ (In the event that the costs of site acquisition have been definitely determined, the amount represented by this item may be excluded from the total upon which the five percent for Contingency is calculated. In such case care must be taken in the apportionment of the Contingency item to dwelling and non-dwelling costs so that no part of said Contingency is prorated against the item of site acquisition.) The total of the eight control accounts shall be the total anticipated development cost. After the Budget has been approved by the USHA, all variations of costs from the items therein shall be treated as underruns or overruns, as the case may be. Overruns in subaccounts which are compensated by underruns within the same grouping do not require USHA approval except for items with respect to which specific limits previously were approved by the USHA. In general, the following items are limited by the specific approval of the USHA: legal services, land purchase price, base fee or contract amounts. If and when it appears necessary to exceed the total of any one grouping, the approval of the USHA shall be obtained prior to the making of any commitments resulting in such excess.

4/ Account No. 7-80, Contingency, is not to be confused with the 10 per cent margin of safety which, under the terms of the Loan Contract, may be authorized by the USHA for the purpose of meeting unanticipated extra costs during construction and other contingencies. Such margin of safety shall not be included as a part of any development cost budget.

(3) The attention of local authorities is invited to the fact that Form USHA-512 provides for a summary of the control accounts broken down to reflect the division between dwelling and non-dwelling costs. This breakdown shall be submitted with the Final Budget and shall be prepared in accordance with the Manual of Instructions of Accounting Procedure for Local Housing Authorities, Part I, sheet 8, paragraph 24, subject to such adjustment in the Contingency account as may be necessary in particular cases as hereinabove described. Sheet 2 of the budget form has been designed to provide conveniently for such computations.

(4) The attention of local authorities is also invited to the fact that Form USHA-512 provides that certain items of the estimated development cost shall be supported by detailed schedules indicating the basis of the estimate. The items calling for such supporting schedules are designated by an asterisk placed at the left of the subaccount classification number. If the administrative elements of cost under Account No. 7-10, or any other Accounts, are proratable over two or more projects under one Loan Contract, the supporting schedules required should reflect the total cost of such elements to all such projects collectively and the percentage applicable to each project individually.

In order to expedite review and approval of Final Budgets by the USHA, particularly with respect to the eligibility of the various items of development cost included therein, the local authority is requested to submit the required supporting schedules in adequate detail.

(5) The classifications for which supporting schedules are required in connection with the Final Budgets and the form of their submission are as follows:

TITLE OR CLASSIFICATION	RATE PER MONTH	NO. OF MONTHS	TOTAL

The above headings are to be used in preparing the supporting schedules for the following classifications: 7-10.1, Pay Roll-Executive; 7-10.2, Pay Roll-Technical; 7-10.3, Pay Roll-Site.

FILL OUT APPROPRIATE BLANKS IN FORM USHA 440

For classification 7-10.4, Legal Services & Expenses-Adm. only. (If previously submitted to USHA, resubmittal not required.)

ITEM AND DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL

For classification 7-10.7, Furniture & Fixtures-Office.

DESCRIPTION OF EXPENSE | AMOUNT

For classification 7-10.16, Informational Expense.

CLASSIFICATION OR CHARACTER OF EXPENSE	RATE PER MONTH	OTHER	TOTAL

For classification 7-30.7, Inspection Costs-Salaries & Expense.

FILL OUT APPROPRIATE BLANKS IN FORM USHA 440

For classification 7-40.8, Legal Services-Land only. (If previously submitted to the USHA, resubmittal not required.)

FILL OUT APPROPRIATE BLANKS IN FORM USHA 440

For classification 7-40.9, Legal Expense-Land only. (If previously submitted to USHA, resubmittal not required.)

CHARACTER OF SERVICE	BASIS OF COMMISSION	ESTIMATED AMOUNT

For classification 7-40.10, Commissions.

TITLE OR CLASSIFICATION	RATE PER MONTH	NO. OF MONTHS	TOTAL

For classifications 7-70.1 and 7-70.2, Pay Roll-Executive and Pay Roll-Operations.

ITEMS AND DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL

For classification 7-70.6, Furniture & Fixtures-Office.

In addition to the foregoing schedules, there shall also be furnished a schedule showing the basis for the computation of the amount of interest during development which is distributed under Account No. 7-20.1, Carrying Charges-Interest During Development. This schedule shall be prepared in the form and manner indicated by the specimen schedule which appears in the Appendix to this bulletin.[5]

(6) For further information reference is made to the Manual of Instructions of Accounting Procedure for Local Housing Authorities, Part I.

(7) The Final Budget shall be approved by the local authority in the space provided and submitted to the USHA in single copy form not later than fifteen days after the execution of the first major superstructure construction contract. Upon approval of the Final Budget by the USHA, a photostatic copy thereof will be transmitted to tho local authority.

5/ See Appendix, Exhibit I.

VII. Preparation of Site.

In the preparation of the site, the following steps should be taken as promptly as practicable so there will be no delay when construction contracts are awarded: (a) the acquisition of land, (b) the relocation of tenants, (c) the closing of streets and relocation of utilities, (d) the obtaining of easements and rights of way, (e) the investigation of subsoil conditions and (f) the demolition of existing buildings.

(a) Land Acquisition.[6] As soon as the site has been selected by the local authority and approved by the USHA, both of which should be done promptly after the execution of the Loan Contract or prior thereto, the local authority should proceed immediately with the acquisition of land.

(b) Relocation and Rights of Tenants.[7] During the period of land acquisition, the status of the tenants in the area should be investigated. Their status will, in large measure, be revealed in gathering the title information. The final title papers should be accompanied by an affidavit setting forth the names of the parties in possession and their status.

In the case of many built-up sites, it will be advisable to make a survey of the existing buildings and the families occupying them for use (1) in determining which of the dwelling units to be demolished are substandard and to be credited as "equivalent elimination" and (2) in relocating the dispossessed families and rehousing them in the project as far as practicable. The USHA is prepared to assist in the formulation of such surveys.

Steps should be taken to relocate all tenants in ample time to permit demolition of the buildings as soon as title to the property is acquired.

(c) Street Closings and Utilities. In addition to the acquisition of the privately owned property within the proposed project area, the site plans for the project may entail the closing of designated streets and alleys and the relocation of existing utilities. In all such cases, the local municipal authorities and the utility companies concerned should be consulted promptly in order to avoid delay in working out the cooperative procedures necessary. To the full extent consistent with proper site planning, the local authority and the architects should plan to use existing utilities and streets and to keep the relocation of utilities and the closing of streets to a minimum in order that maximum speed and economy may be attained.

6/ See Bulletin No. 8 for a detailed statement of the requirements of the USHA and the procedure to be followed by the local authority in connection with land acquisition.

7/ See Paragraph II of Bulletin No. 10 for the procedure to be followed in relocating tenants.

(d) Easements and Rights of Way. All necessary rights of way and easements over the property of others (including existing streets to be vacated and new streets to be dedicated) for the carrying of water lines, sewers or other utilities should be obtained, or granted, as the case may be, simultaneously with the acquisition of the site of the project.

(e) Subsoil Investigation. During the period of land acquisition, full and complete information should be obtained concerning the type of soil involved and its bearing value and any unusual conditions with respect to it which might affect construction. In securing land options, it may be advisable, in some instances, to include in the options covering land as to which such information is not known or readily available in the offices of the City Engineer or elsewhere, a clause giving the local authority the right to enter on and inspect the premises and to make topographical surveys, test pits and borings in order to obtain such information.

(f) Demolition. As soon as a sufficient portion of the site has been acquired to permit an orderly demolition program, bids should be invited for the demolition of the buildings on the site. If the demolition contract is let before title to the entire site is acquired, the local authority should protect itself against any delays which may develop in the acquisition of the remaining parcels of the site. The value of the salvage rights accruing to the contractor will in some instances make the actual cash consideration, if any, passing to or from the local authority under the demolition contract virtually negligible. Accordingly, the size of the performance bond to be required of the contractor by the local authority should be determined on the basis of an advance estimate of the cost to the contractor of demolishing or removing the buildings and structures from the project site, without any allowance for the value of salvaged materials. Unless there are local laws to the contrary, the amount of the bond should not be less than 50 per cent of this estimated cost. If the value of the salvage material which is easily removable without demolishing the building is considerable, the amount of the bond should be increased accordingly.

The attention of local authorities is invited to Bulletin No. 9 which contains considerable general information applicable to demolition contracts. The USHA has also prepared, and will furnish upon request, a suggested form of demolition contract.

VIII. Negotiation, Preparation and Approval of Contracts for Architectural Services.

(a) General. Immediately after the execution of the Loan Contract, the local authority should begin contract negotiations with the architect or group of architects selected for the project. The USHA has prepared, and will furnish upon request, a suggested form of architect's contract providing for general supervision of construction by the architect (Form USHA-426) and a suggested form providing for general supervision by persons other than the architect (Form USHA-427). A decision should be made at an early date as to whether the architect, or an appropriate staff of the local authority, will supervise construction. Many local authorities are finding it advisable to have construction supervised by the architect.

In order to centralize responsibility, one architect's contract should, if practicable, be made covering all phases of the work rather than separate contracts for each phase. However, if the local authority wishes to make a separate contract with a landscape architect, or a consulting engineer, the USHA will have no objection to this procedure so long as the total architectural fee for the project does not exceed the schedule of fees meeting the approval of the USHA.

A copy of each proposed architect's contract and of each proposed engineer's contract should, pursuant to the "Terms and Conditions", be submitted to the USHA for approval prior to the signing thereof by the local authority.8/ Five conformed copies of the executed contracts should be forwarded promptly to the USHA.

(b) (1) Architect's Fee. As soon as practicable the local authority and the architect should determine, subject to the approval of the USHA, the amount of the fixed fee to be paid to the architect. The proposed fee should be submitted for approval promptly so that it may be established and prorated between dwelling and non-dwelling costs and be budgeted accordingly during the early stages of the development. The suggested forms of architect's contract provide that the fixed fee of the architect shall be computed by the local authority by applying a stated percentage to the Estimated Improvement Cost (excluding the items allowed for construction contingencies) and that the fee so determined shall be approved by the architect. The suggested forms of architect's contract also provide, in Section 3 (a) thereof, that this Estimated Improvement Cost shall be prepared by the architect and checked and approved by the local authority.

(2) In appropriate instances the USHA will approve architectural fees computed by the local authority and the architect on the basis of the estimated cost of improvements in the Application for Financial Assistance as approved for purposes of Loan Contract (excluding the items allowed for contingencies). At this stage the costs of mechanical items may be indeterminate because of uncertainties as to the type of heating to be used. Similar uncertainties may make it practicable to fix only the architectural fee, leaving some, or all, of the other fees open to future determination when better information is available. However, any agreement providing for the computation of the architect's fee on the basis of the Application should be predicated on the assumption that the number of dwelling units contemplated by the final plans and specifications will be approximately the same as the number contemplated by the Loan Contract. If there should be any material change, plus or minus, between the number of dwelling units contemplated by the Loan Contract and the number contemplated by the final plans and specifications, the architect's fee should be adjusted as provided in Sections 3 (h) and 14 of the suggested forms of architect's contract.

8/ Terms and Conditions, Part III, Paragraph 1 (a) (8)

(3) The USHA has prepared, and will furnish upon request, a schedule of suggested architect's fees applicable to contracts providing for general supervision of construction by the architect and a similar schedule applicable to contracts providing for general supervision by persons other than the architect. In these schedules the architect's fee is designed to apply to the total estimated cost of the project, including landscaping and engineering work. Fees for the landscape and engineering work are allowable in addition to the architect's fee.

(4) In its submittal of the architect's fixed fee, the local authority should indicate how the fee was computed and the items excluded from the Estimated Improvement Cost in determining its amount. After the clearance of any points at issue, the USHA will indicate its approval of the fixed fee.

(5) Occasionally, the question may arise as to whether the architect is entitled to a payment on account prior to the determination and approval of the exact amount of the fixed fee. In such instances, the local authority will be guided by the particular circumstances involved. The local authority may, in justifiable situations, make such payments in the form of equitable lump sums to be deducted from the percentage amounts provided in the contracts and to be paid at progressive stages of the work. In no case, however, should such payments exceed the value of the work or service performed to the date of such payment.

(c) (1) Schedule of Fees and Wages to be Paid by the Architect. At the time the proposed contract is submitted to the USHA for comment or approval, and prior thereto if practicable, there should also be submitted to the USHA a schedule of the fees and wages which the architect proposes to pay to the various classes of architects, technical engineers, draftsmen, technicians, laborers and mechanics to be employed by him under his contract. This schedule should be supported by any available evidence obtained by the architect or the local authority which tends to establish such fees and wages as the fees and wages prevailing in the locality concerned. All contracts between the local authority and the architects should contain provisions requiring the architects to submit certified pay rolls as prescribed in the Manual of Accounting Procedure for Local Housing Authorities, Part II. The submittals specified in this sub-paragraph (c) (1) are necessary to enable the USHA to determine that the fees and wages to be paid are the fees and wages prevailing in the locality concerned as required by the United States Housing Act and the "Terms and Conditions".9/

(2) The schedule of prevailing fees and wages approved by the USHA shall be effective as of the date of the Loan Contract and the architect shall, accordingly, adjust to the approved schedule any fees or wages paid after the date of the Loan Contract which are less than those appropriate under the approved schedule. All overtime shall be paid for on the basis of not less than time and one-half.

9/ Terms and Conditions, Part III, Paragraph 1 (a) (2)

The whole question of the system of bidding and alternate bids is discussed in considerable detail in Bulletin No. 13, Revised. Local authorities are particularly urged to give this discussion full and careful consideration.

Physical Improvements after Partial or Complete Occupancy. The local authority should bear in mind that funds may be available for physical improvements to the project during the one-year period subsequent to the date on which the project is ready for complete occupancy, since any bonds within the maximum authorized amount of the bond issue which prove unnecessary to meet development costs already incurred may be issued for necessary additions and improvements during this one-year period. The local authority may, accordingly, find it advisable to omit certain items from the plans and specifications until the need for them has been established during a short period of operation. However, additional expenditures, if any, applicable to dwelling facilities must always be restricted to the extent necessary to keep total dwelling facilities cost within the maximum limitations prescribed in the United States Housing Act.

Submission of Plans and Specifications. The final plans and specifications will generally be reviewed in the field, while they are being prepared, by staff members of the USHA and working agreements will be reached from time to time to avoid delays in completion. In addition, when necessary and upon request of the local authority, any part or parts of the final plans may be submitted to the USHA in Washington for review, comment and advice during this period.

The plans and specifications will not be given a final review in Washington prior to their acceptance for bidding purposes. Tentative agreements will, however, be reached in the field as to the appropriateness of the plans, specifications and other contract documents for bidding purposes. Such tentative agreements will be confirmed by the USHA, subject to such qualifications as may be necessary, at the time authorization to advertise for bids is granted.

Ordinarily, the final review of plans and specifications will be made by the USHA in Washington after advertisement for bids and any comments and advices based on such review will be transmitted to the local authority in time for incorporation in addenda issued during the period of bidding. The local authority should, accordingly, schedule a period of advertising for bids long enough to permit the issuance of any such addenda which prove necessary or appropriate.

XI. Preparation and Submission of Final Estimates of Total Development Cost.

After the preparation of the construction plans and specifications has been completed, the local authority shall submit to the USHA an itemized estimate of the total development cost of the project based upon the and definite as soon as practicable so that the architect may proceed with the final plans and specifications on an established basis. The following items should usually be considered and provided for in the development of the plans for the project: (a) water service; (b) sewer connections, both storm and sanitary; (c) street lighting; (d) construction of new streets or the repairing or resurfacing of existing ones; (e) fire protection, including new fire lines and hydrants; (f) rerouting of transportation lines and (g) educational and playground facilities. Any necessary changes in zoning laws and building regulations should also be initiated at an early date.

<u>Insurance</u>. In the preparation of plans and specifications, and in determining the proposed type of construction, the architect should take the prevailing insurance rates into consideration. The USHA is conducting negotiations with insurance rating bureaus and is prepared to advise the local authority as to the insurance rates applicable to the various types of construction. This information will aid the architect in developing a design that will be economical from the standpoint not only of original cost but also from that of operation and maintenance.

<u>Site and Unit Plans</u>. Bulletin No. 11, entitled "Site Planning", contains detailed suggestions concerning site planning, and Bulletin No. 12, entitled "Dwelling Unit Planning", contains similar information as to unit planning. These suggestions as to site and unit planning are designed to serve primarily as guides in the development of the project. The USHA will, of course, encourage each local authority and each architect to exercise their skill and ingenuity in developing new ideas as to site and unit plans.

<u>Construction Contracts</u>. Bulletin No. 9, entitled "Construction Contracts", considers the question of splitting the general construction work of a project into two or more sections and suggests that consideration be given to such procedure. A related question is that of separate contracts segregated as to types of construction. The local authority should endeavor wherever possible to put all of the related construction work under one contract and to avoid segregated contracts. However, it is recognized that in many instances this will be impracticable, and that more than one contract will be necessary. For example, in some cases it will be advisable to let a separate contract for landscaping. Again, the applicable state statutes may require that a segregated contract be let for each phase of the construction work, such as electrical, heating and ventilating, plumbing, and the like. If split or segregated contracts are to be let, the several contracts should be drawn so as to provide for full co-ordination and reduce interference to a minimum. Bulletin No. 9 contains a suggested form of construction contract for the use and guidance of the local authority. This form contains all the applicable requirements of the United States Housing Act and of Part III of the "Terms and Conditions".

The whole question of the system of bidding and alternate bids is discussed in considerable detail in Bulletin No. 13, Revised. Local authorities are particularly urged to give this discussion full and careful consideration.

Physical Improvements after Partial or Complete Occupancy. The local authority should bear in mind that funds may be available for physical improvements to the project during the one-year period subsequent to the date on which the project is ready for complete occupancy, since any bonds within the maximum authorized amount of the bond issue which prove unnecessary to meet development costs already incurred may be issued for necessary additions and improvements during this one-year period. The local authority may, accordingly, find it advisable to omit certain items from the plans and specifications until the need for them has been established during a short period of operation. However, additional expenditures, if any, applicable to dwelling facilities must always be restricted to the extent necessary to keep total dwelling facilities cost within the maximum limitations prescribed in the United States Housing Act.

Submission of Plans and Specifications. The final plans and specifications will generally be reviewed in the field, while they are being prepared, by staff members of the USHA and working agreements will be reached from time to time to avoid delays in completion. In addition, when necessary and upon request of the local authority, any part or parts of the final plans may be submitted to the USHA in Washington for review, comment and advice during this period.

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XI. Preparation and Submission of Final Estimates of Total Development Cost.

After the preparation of the construction plans and specifications has been completed, the local authority shall submit to the USHA an itemized estimate of the total development cost of the project based upon the final plans and specification, the actual costs incurred to date for all items (such as land, demolition, cost of preparing plans and specifications), the latest estimates of overhead costs and of all other costs relating to the project. This Final Estimate of Total Development Cost shall be submitted to the USHA at the time when final plans and specifications are submitted.

The Final Estimate of Total Development Cost should be submitted in a form generally similar to that provided in the outline of the Job Program, plus supplementary information on estimates of alternates to be taken and also on the local authority's preference as to the alternates to be accepted. Any part of an item in the estimate form not included in the bids to be taken should appear under the same item number, separately from the parts on which bids are to be taken, with the estimated cost of each such separated part. Throughout the Estimate those items on which bids are being taken should be specially designated. At the end of the Estimate there should also appear an estimated total of the amount of the construction contract on which bids are being taken, with notations of the alternates. It may be advantageous to arrange for staff members of the USHA to collaborate with the local authority in the field in the preparation of this Final Estimate of Total Development Cost.

The USHA has prepared, and will furnish upon request, a suggested form of Final Estimate of Total Development Cost (Form USHA-614). This form should facilitate the preparation of the Estimate.

Four copies of the Final Estimate of Total Development Cost should be submitted by the local authority to the USHA.

XII. Advertising for Bids and Award of Contracts.11/

(a) As soon as the plans and specifications and other contract documents have been completed and, when so authorized by the USHA, the local authority should advertise for bids. The local authority shall advise the USHA as to the time and place fixed for receiving bids. A representative of the USHA will ordinarily attend the bid opening and be available to the local authority for advice and counsel with respect to any questions which may arise. Upon receipt of the bids, the local authority will study them and, before awarding a contract, submit to the USHA the original and four copies of a statement as to the award or awards it proposes to make, including the disposition of alternates. With this statement there should be included the following:

(1) Four copies of a tabulation of bids and an analysis thereof on the basis of the proposed award.

11/ See Bulletin No. 9 for suggested forms of advertisements, bids, and related matters.

(2) Four copies of a comparison of the Final Estimate of Total Development Cost as earlier submitted and modified, with the computation of Total Development Cost and of Dwelling Facility Costs per room and per unit as contemplated in the proposed contracts. This comparison shall be based upon the proposed awards and the estimated (or actual) costs of items not included in the proposed awards.

(3) Four copies of all addenda and other information, including drawings, issued during the bidding period.

(4) One original and three conformed copies of all bids, including all forms in connection therewith.

(5) Four copies of other pertinent information which may have been prepared and is considered useful in reaching a determination with regard to the award of contracts and disposition of alternates.

The materials specified in sub-paragraphs (a) (1) through (a) (5), above, shall be furnished to the Construction Adviser for delivery or forwarding to the USHA in Washington.

(b) The USHA will check the bid figures against the Final Estimate of Total Development Cost and against the provisions of the United States Housing Act and the Loan Contract and will then notify the local authority that the proposed award is (1) acceptable, (2) acceptable subject to certain qualifications, or (3) not acceptable for specified reasons. If the proposed award is acceptable to the USHA, the local authority may execute the construction contract with the successful bidder.

(c) One executed counterpart of the construction contract (including accompanying plans and specifications) and four conformed copies of the executed contract (but including only <u>two</u> sets of plans) shall be furnished promptly to the USHA. If these copies are all in good order, the USHA will return one set to the local authority with an indication that they are approved for construction. Upon receipt of such approval by the USHA, the local authority will, ordinarily, advise the contractor to commence work under his contract and the actual construction of the project will begin.

Nathan Straus

NATHAN STRAUS,
Administrator.

May 26, 1939.

APPENDIX

EXHIBIT I - SPECIMEN SUPPORTING SCHEDULE FOR ACCOUNT NO. 7-20.1.

7-20.1 Carrying Charges-Interest During Development

Total Estimated Development Cost		$2,496,200.00
Less: Interest During Development (20.1)	55,500.00	
Donated Land (40.2)	10,000.00	65,500.00
Base for Computation of Interest		2,430,700.00
Computed on Basis of 1/2 of Base Amount		1,215,350.00
Rate 3% Period-18 Months		
$1,215,350.00 X 4.5		54,790.75
Budgeted at		55,500.00

EXHIBIT II - SUGGESTED FORMS OF DOCUMENTS.

For the convenience of the local authority, the USHA has prepared and has available suggested forms of documents relating to:

Recording and Reporting Equivalent Elimination.

Local cooperation and local contributions in the form of tax exemption.

Public sale of local authority bonds.

Local capital donations.

Surveys, title information, title certificates, appraisals and options.

Architect's services.

Construction contracts, and related documents.

Deposit of Loan Proceeds in Development Fund.

Accounting Procedure.

Preliminary and Final Budgets.

Advance Loan Notes, and Proceedings authorizing same.

Housing Authority Bonds, Resolution securing same and proceedings authorizing issuance thereof.

Other matters involved in the financing or development of projects.

In each case these forms will be adapted to the local law and furnished to the local authority upon request.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 15 ON POLICY AND PROCEDURE
(Revised May 26, 1939)

Addendum No. 1
(August 15, 1939)

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS OF LOAN AND ANNUAL CONTRIBUTION.

Two of the most important steps to be taken by a local authority are the securing of bids and the awarding of contracts. An adequate number of bids must be secured and these must be on such a basis as to insure that there has been open and competitive bidding for each and every construction, equipment and material contract as required by the Terms and Conditions of each USHA loan contract. Contract awards must be made on a basis that is fair and above criticism from every point of view.

This addendum to Bulletin No. 15 discusses these problems in general, offers suggestions whereby local authorities may secure wide competitive bidding, and includes certain USHA requirements which are necessary in order to effect compliance with certain applicable provisions of the United States Housing Act of 1937, as amended, and of USHA loan contracts in connection with advertising for bids and awarding contracts.

I.

Open and Competitive Bidding

Any restriction as to the source of materials, equipment, supplies, bonds, or insurance involved in the execution of a contract obviously operates to limit open and competitive bidding and hence to increase costs. Therefore, except to the extent required by the laws of the state in which the public housing agency is located, no such restrictions should be included in any of the documents upon which bids are based.

The technical specifications upon which contracts are based should be so drafted as to secure the widest competition possible and should not discriminate against any materials, supplies or equipment suitable for the purposes intended. To that end, and consistent with the objective of low capital costs as required by the Act, local authorities should, to the fullest extent possible, allow contractors the option of using one of two or more specified materials, supplies or items of equipment. While it is realized that this procedure is not always feasible and that it cannot fully supplant the practice of taking alternate bids, it is, nevertheless, generally productive of securing lower bids. The disadvantages of alternate bids are discussed hereinafter.

excessive number of bids being taken in one general locality during the same period of time. This is a problem which individual local authorities might not readily perceive since they are primarily concerned with their own projects, nevertheless, each authority may be adversely affected by poorly considered timing of bid dates over the country as a whole.

The USHA, working with each local authority, schedules, well in advance, the dates when bids are to be received and local authorities agree with the USHA to work to these schedules. Since these schedules contemplate the widest feasible spread of bid opening dates in a given locality, it becomes highly necessary, for the benefit of the work as a whole, that each authority adhere closely to its own dates in the schedule. Therefore, local authorities, before committing themselves to a specified date, should feel quite sure that this can be met, and thereafter, should make every possible effort to meet its commitments; the USHA will cooperate with the local authority to that end.

There may be occasions when the USHA will find it desirable, for the benefit of the program in its entirety, to suggest to a local authority that it modify the date of bid opening; local authorities are requested to cooperate in such procedure.

V.

Period of Bidding

Local authorities should allow not less than 30 calendar days for bidding on any major construction work and if the plans and specifications are not ready for delivery on the date of advertising this period should be increased so that bidders may have the plans and specifications in their possession for a full 30 days. While it is true that three or even two weeks may be an adequate time for the actual work of taking off quantities and preparing bids, a longer period permits a more thorough combing of the market; moreover it often happens that contractors who would otherwise be interested are limited for time because of bidding on other work and in such cases they will not bid unless a generous time is allowed.

VI.

Breaking Down Large Projects

While the USHA has cautioned local authorities as to certain difficulties incident to breaking a project down into a large number of relatively small construction contracts (see Bulletin No. 13, revised), due consideration should be given to the fact that a large number of housing projects going on the market during a comparatively short period of time may limit the number of bidders who are able and willing to contract for large projects. Thus, in many cases, it may be found increasingly necessary to divide large projects into two or more general construction parts in order to appeal to a wider range of contractors.

However, the precautions referred to in Bulletin No. 13 should continue to receive consideration; particularly the sub-division should not be too great, complicating alternate bids should be avoided, but one overall bid for the whole work must, in all cases, be taken unless prohibited by applicable state or local law.

VII.

Publicity

The usual process of advertising for bids cannot always be depended upon to secure the necessary publicity and for that reason local authorities are urged to make every possible effort in order to secure the maximum number of bidders. The following are suggested as steps which would be advisable to take in each case:

(1) Wherever there are local or nearby agencies maintaining plan rooms, plans and specifications should be furnished to these without charge or on the basis of refundable deposits. While this does not ordinarily produce a larger number of general contractors, such a procedure will frequently result in a greater number of sub-contract bids to the general contractors, which, of course, tends to produce lower figures. The deposit required on sets of Plans and Specifications should always be reasonably consistent with their reproduction value.

(2) Normally it is advisable for local authorities to contact representative organizations of contractors and of construction bond companies; these latter may often obtain the interest of contractors in other cities through their branch offices.

(3) If the local authorities will furnish to the USHA a number of copies, preferably about 12, of the advertisement for bids immediately upon its publication, the USHA will arrange for quick dissemination of this information to national contractor organizations.

(4) It is desirable that the advertisement for bids be published in adjacent cities in addition to publication through the local press.

VIII.

Withdrawal or Modification of Bids

There have been cases where low bidders have sought to withdraw or increase their bids after the bids have been opened. The usual reason which is given in such cases is that an error has been made and that as a result the contractor could not fulfill his contract for the amount stipulated in the bid without suffering a loss. When such a question arises it warrants the most careful consideration, since, on the one hand, general experience has proven that unsatisfactory results derive from construction contracts below actual costs or even without opportunity for a reasonable profit, while, on the other hand, bidders are under bond to execute contracts for the amounts named in their bids and it seems reasonable to believe that experienced contractors will exercise the utmost care in preparing and checking their figures.

Section X of this addendum sets forth the USHA requirements which local authorities should follow in determining whether or not it is equitable to permit the withdrawal of a bid after the bids have been opened. Under no circumstances should a bidder be permitted to increase his bid after it has been opened; if such a proposed increase is based upon proven errors the bid should be rejected instead, subject to the USHA requirements set forth below.

IX.

Rejection of Bids

Local authorities will often be confronted with low bids from contractors whom they do not believe are financially, technically, or otherwise qualified to perform the work. Such situations are somewhat similar to those mentioned in the preceding section and merit the same careful consideration before action is taken, and local authorities should be guided by the USHA requirements included in Section X in reaching their determinations.

X.

USHA Requirements

The following requirements must be met by local authorities in order to comply with the provisions of USHA loan contracts relating to competitive bidding and award of contracts and to comply with the provisions of the United States Housing Act of 1937, as amended, requiring that USHA-aided projects shall not be of elaborate or expensive design or materials and that economy will be promoted in construction:

(1) All contracts, except those involving personal services requiring specialized skill or training, or where the amount involved is less than $300, for the furnishing of labor, labor and materials or any materials, supplies or equipment shall be publicly advertised.

(2) The specifications for all such contracts shall be drafted to insure the widest competition possible and no materials, supplies or equipment suitable for the purposes intended shall be discriminated against, nor shall the specifications designate any preference for local materials, equipment, supplies, bonds or insurance involved in the execution of such contracts unless required by the laws of the state in which the public housing agency is located.

(3) Local authorities shall contract for labor, labor and materials, or materials, equipment and supplies in a manner best suited to secure the development of the project in the most economical manner possible. Unless otherwise required by state laws, and, except for demolition work, landscaping and the furnishing of those materials, supplies and equipment which are usually not included in normal construction contracts, a bid for the entire work in connection with the development of the project shall be requested even though bids are also requested for the same work in parts. The work in connection with the development of the project shall not be so divided as to place an unreasonable administrative burden on the local authority nor which would intend to encourage possible collusion among bidders.

(4) Alternate bids shall be limited to the minimum required for economical and sound construction.

(5) Every contract shall be awarded to the lowest responsible bidder as soon as practicable after the opening of bids, unless such bid is in excess of the estimated cost of such work or is otherwise considered to be for an unreasonable amount.

(6) Bidders shall not be permitted to withdraw their bids subsequent to the time of opening because of an alleged mistake in the amount of their bids unless the amount of the bids are such as to place a reasonable man on notice that an error has been committed by the bidder and further that an award, under such circumstances, would be inequitable. Where a bidder claims that a mistake has been made, the local authority to which the bid was submitted shall require, before taking action in regard to any request for the withdrawal of a bid, the submittal by the bidder of his original estimating sheets from which the bid was computed, a sworn statement to the effect that an error has been made by the bidder and all evidence in the possession of the bidder tending to corroborate the claim of error.

(7) No bidder shall be permitted by a local authority to withdraw his bid unless the bid submitted is at least 10% lower than the estimated cost of the work included in the contract, as prepared by the local authority and approved by the USHA.

(8) No bid shall be rejected by a local authority because of lack of responsibility of the bidder unless it is plainly evident that the bidder is either:

(a) not financially qualified to carry out his contract; or

(b) not technically fitted to carry out the proposed work either through lack of experience, adequate personnel and equipment; or

(c) has refused or failed to accept the award of a contract tendered to him in accordance with a bid submitted by him; or

(d) unless his record in the performance of other contracts is such as would plainly show that the bidder is not responsible.

(9) Before rejecting any low bidder on the basis of irresponsibility, the local authority shall make definite findings of the facts upon which its conclusion of irresponsibility is based and shall submit the same to the USHA. Mere matters of opinion unsupported by any facts evidencing the lack of responsibility of the contractor will not be accepted as a basis for rejecting a low bidder.

(10) No contract for equipment, supplies, or materials shall be awarded to other than the low bidder in the interest of standardization of equipment or materials, ultimate economy or expeditious development of the project unless:

(a) prior to the opening of bids the local housing authority submits to the USHA notice of its intention to take these factors into consideration in awarding bids; (such notice shall set forth the differential to be used by the local authority in determining the bidder to whom the contract is to be awarded); and

(b) the USHA has approved, in advance of the award, the procedure to be followed and the differential or formula for determining the same.

(11) The USHA has the right to refuse to lend further financial assistance in the way of the purchase of bonds or the making of annual contributions or both, either as to the entire project or as to the amount of the contract involved, in the event of a violation by a local authority of the requirements of this Section X.

Nathan Straus

NATHAN STRAUS,
Administrator.

August 15, 1939

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BULLETIN NO. 15

Steps in the Development of a Low-Rent Housing Project

SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS FOR LOAN AND ANNUAL CONTRIBUTIONS

MARCH 21, 1940

FEDERAL WORKS AGENCY

UNITED STATES HOUSING AUTHORITY • NATHAN STRAUS, *Administrator*

Steps In Project Development Through the Award of Construction Contracts

BULLETIN No. 15 ON POLICY AND PROCEDURE
Revised March 21, 1940

Steps in the Development of a Low-Rent Housing Project

SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS FOR LOAN AND ANNUAL CONTRIBUTIONS

The progressive steps in the development of a low-rent housing project from the beginning of local activity through the execution of the Contracts for Loan and Annual Contributions are described in Bulletin No. 5. This Bulletin No. 15 describes the succeeding progressive steps which begin, ordinarily, with the organization of the permanent staff of the local authority and conclude with the award of the principal construction contracts. Thus, Bulletins Nos. 5 and 15 cover the progressive steps in the development of a low-rent housing project from the initiation of local activity to the beginning of actual construction. In addition, paragraph XIII of this Bulletin No. 15 discusses the securing of bids on construction, equipment, and material contracts and the award of all such contracts, and paragraph XIV specifies the information which is to be submitted by the local authority in connection with the award and execution of all contracts in excess of $2,000.

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
Washington

CONTENTS

CONTENTS—Continued

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS FOR LOAN AND ANNUAL CONTRIBUTIONS

SCOPE AND CONTENT.

This Bulletin describes (I) organization of permanent staff of local authority; (II) adoption of accounting procedure; (III) performance of conditions in Loan Contract; (IV) execution of Development Fund Agreement; (V) application for Advance Loan; (VI) preparation of Development Cost Budgets; (VII) preparation of site; (VIII) negotiation, preparation, and approval of contracts for architectural services; (IX) preparation and submission of preliminary plans; (X) preparation and submission of construction plans and specifications; (XI) preparation and submission of final estimate of Total Development Cost; (XII) submittals and procedure in connection with award of construction contracts; (XIII) securing bids on construction, equipment, and material contracts and making award thereof; and (XIV) information to be submitted in connection with the award and execution of all contracts in excess of $2,000. The procedural steps specified in (I) through (XII) should ordinarily be taken in the order indicated. Occasionally, however, the local authority may find it possible and advisable to expedite the program by proceeding with two or more steps simultaneously.

The attention of local housing authorities is invited to the fact that some of the matters covered generally by this Bulletin have been discussed more fully in other Bulletins. The related Bulletins are indicated at the appropriate points in this Bulletin.

I. ORGANIZATION OF PERMANENT STAFF OF LOCAL AUTHORITY.

The successful development of a low-rent housing project requires a permanent clerical and technical staff under competent supervision. Accordingly, one of the first steps to be taken by the local authority after the signing of the Contracts for Loan and Annual Contributions is to organize a permanent staff and arrange for the necessary office space and equipment. The USHA is prepared, upon request, to make suggestions as to the size, character, and economical management of the staff required.

The attention of local authorities is invited particularly to the fact that the salaries of the members of its permanent staff should be commensurate with their respective responsibilities and with the size of the local program.

II. ADOPTION OF ACCOUNTING PROCEDURE.

In order that all transactions relating to the receipt and expenditure of funds in the development of the project may be properly recorded, the local authority should promptly establish an acceptable accounting procedure. A satisfactory procedure is outlined in the "Manual of Instructions of Accounting Procedure for Local Housing Authorities" and the adoption thereof will expedite the approval of requisitions by the USHA and facilitate the auditing of the local authority's books. The "Manual" will be forwarded to the local authority when the Loan and Annual Contributions contracts are in process of execution. The USHA will also, upon request, send a Project Auditor to assist in opening the local authority's books.

III. Performance of Conditions in Loan Contract.

The local authority will not ordinarily be able to make substantial progress with its program until an advance loan has been obtained from the USHA. Accordingly, all the conditions precedent to the advance of funds contained in the Loan Contract and related documents should be performed promptly. The performance of these conditions may entail negotiations with local municipal officials with respect to (*a*) equivalent elimination (see Bulletin No. 3), (*b*) local contributions or other forms of local aid to achieve low rents (see Bulletin No. 6, Revised), or (*c*) assurances that at least 10 percent of the development cost of the project can be obtained from sources other than the USHA. All such negotiations should be completed expeditiously so that an advance loan may be obtained promptly when funds are needed.

IV. Execution of Development Fund Agreement—Provisions of the Agreement.

The "Terms and Conditions" incorporated in the Loan Contract provide that the funds received by the local authority from the USHA shall be deposited in a separate account, to be known as the "Development Fund," in a bank or banks acceptable to the USHA.[1] To insure the application of this Fund to the development of the project and, at the same time, to facilitate its use, the USHA requires the execution of a "Development Fund Agreement." This Agreement provides for withdrawals from the Development Fund upon the basis of checks and supporting vouchers. Such vouchers must indicate the purposes for which the checks are drawn and must, ordinarily, be accompanied by certificates which certify that the checks are drawn to pay development costs. The Agreement does not, however, require separate approval of each withdrawal by the USHA. The depositary bank is authorized to honor, upon receipt, checks of the local authority supported by the appropriate vouchers and certificates.

Prompt selection of the depositary bank, and prompt execution of the Development Fund Agreement, will expedite the advance of funds by the USHA. The name of the proposed depositary bank should be submitted to the USHA for approval and, upon obtaining such approval, two executed copies and two certified copies of the Development Fund Agreement, together with three certified copies of the proceedings authorizing the execution thereof, should be forwarded promptly to the USHA.

The procedure contemplated by the Development Fund Agreement is simple and expeditious and familiar to most banks. In addition, the USHA has prepared, and will furnish upon request, a suggested form of Development Fund Agreement (Form USHA-425) which contains suggested forms of the certificates required. A suggested form of Accounts Payable Voucher is contained in Part II of the Manual of Accounting Procedure referred to in paragraph II, above.

V. Application for Advance Loan.[2]

Funds should be obtained in time to meet costs as they accrue in the development of the project. The Loan Contract provides that upon a satisfactory showing of a need for funds which cannot otherwise be met, and upon the performance of the conditions precedent embodied in the Loan Contract, the USHA may make an advance to the local authority on account of the loan. As soon as the need arises and the conditions have been performed, the local authority should file an Advance Loan Requi-

[1] Terms and Conditions, Part II, Paragraph 3.

[2] See Bulletin No. 7, Revised, for a detailed description of the Advance Loan Requisition Procedure.

sition with the USHA, together with the necessary supporting documents. Additional requisitions may be filed from time to time as funds are needed. However, no request for funds for Account No. 1440.1, Land Purchase Price, shall be submitted unless options have been acquired by the local authority on at least 50 percent of the parcels involved and such options have been approved by the USHA. All requisitions supported by the required data will be promptly honored. However, it is requested that, insofar as practicable, requisitions for advance of funds be filed at least twenty (20) days prior to the date on which the funds will be needed.

The advance loan may be used to pay architectural, engineering, and planning fees; costs of preparation of plans, specifications, and other forms of proposed contract documents; costs of acquiring land; and other expenses to be incurred prior to the sale of definitive bonds, provided the contracts for the services or items involved have been previously submitted to the USHA and approved by it. In determining the amount of any advance loan necessary, the local authority should remember that definitive bonds will not ordinarily be sold until the site has been acquired and the construction contracts have been awarded.

The local authority shall not use any of the funds advanced by the USHA to reimburse itself or others for expenditures made *prior* to the date of the Loan Contract until a Project Auditor from the staff of the USHA has examined the particular items of expenditure involved, and the USHA has determined that such items are eligible for inclusion in development costs.[8]

VI. Preparation of Development Cost Budgets.

In order to provide the local authority with a means of controlling the nature and extent of expenditures in the development of the project, the USHA has prepared a form of Development Cost Budget (Form USHA–512). There shall be a Preliminary and a Final Development Cost Budget for each project. These Budgets shall be prepared and used as provided in this paragraph VI.

(*a*) *Preliminary Development Cost Budget.* The Preliminary Budget guides the local authority in making expenditures and in requisitioning funds from the time of execution of the Loan Contract until this Budget is superseded by the Final Budget at the commencement of construction. The Preliminary Budget will, necessarily, be based primarily upon the estimate of "Proposed Development Cost" submitted by the local authority as Item 410, Part IV, of its Application for Financial Assistance, as modified and approved for purposes of the Loan Contract. The local authority need not resubmit this estimate to the USHA for budget purposes. The USHA will transpose the approved estimate to the Budget Form (USHA–512) and the original copy of the estimate, as transposed, will be transmitted to the local authority as soon as practicable after the Loan Contract is forwarded for execution. The transposed estimate will constitute the Preliminary Budget.

The attention of local authorities is invited to the fact that the amounts set forth in the various principal account classifications (i. e., Principal Account Nos. 1420, 1430, 1440, 1450, and so on) are net figures representing the actual estimate or commitment, as the case may be. The amount shown under Principal Account No. 1480, Contingencies, will (unless determined otherwise necessary by the USHA) equal 5 percent of the total of all the items set forth under Principal Account Nos. 1410 through 1470 and is for the purpose of providing normal latitude for changes, extras, and overruns during project development.

(*b*) *Final Development Cost Budget.*

(1) The Final Development Cost Bud-

[8] See Bulletin No. 4, Revised, for a detailed statement of items of expenditure eligible for inclusion in development cost.

get will be prepared by the USHA and submitted to the local authority for concurrence. To insure completion of the Final Budget on schedule and the prompt approval of Loan Requisitions after construction work has started, the local authority should submit to the USHA budgets for legal fees and expenses and informational expenses and obtain approval of such fees and expenses prior to the advertisement for bids on the construction contracts. The Budget will be prepared on Form USHA–512 and will be arranged so as to conform to the Standard Classifications of Accounts set forth in the Manual of Instructions of Accounting Procedure for Local Housing Authorities, Part I (Revised), approved by the Administrator December 20, 1939.

(2) The Final Budget will reflect contract amounts wherever contracts have been awarded and, as to other items, will represent the latest estimate developed in connection with the completion of final plans and specifications and bids received. The amounts included will be distributed among the appropriate principal account classifications; i. e., 1410, Administrative; 1420, Carrying Charges; and so on. The amounts shown under the various principal account classifications will be net figures representing the actual estimate or commitment, as the case may be. The amount shown under Principal Account No. 1480, Contingencies, will (unless determined otherwise necessary by the USHA) be equal to 5 percent of the total of all the items set forth under the Principal Account Nos. 1410 through 1470 and is for the purpose of providing normal latitude for changes, extras, and overruns during development. (If the cost of site acquisition has been definitely determined at the time of preparation of the Final Development Cost Budget, the amount represented by this item will be excluded from the total upon which the 5 percent for contingencies is calculated. In such case, no part of the amount provided for contingencies will be prorated against the item of site acquisition.) The total anticipated development cost of the project will be the total of the principal accounts less the amounts, if any, set forth under Principal Account No. 1490, Development Cost Credits. After the Budget has been prepared by the USHA and concurred in by the local authority, all variations of costs from the items therein shall be treated as underruns or overruns, as the case may be. Overruns in subaccounts which are compensated by underruns within the same principal account do not require USHA approval except for items with respect to which specific limits have been previously approved by the USHA. In general, the following items are limited by the specific approval of the USHA: legal services; land purchase price; base fees; and contract amounts. If the local authority finds it necessary to exceed the total of any one principal account, the approval of the USHA must be obtained prior to the making of the commitments resulting in such excess.

(3) Form USHA–512 will contain a summary of the principal accounts, broken down to reflect the division between dwelling and nondwelling costs. Form USHA–512 also requires that certain items of the estimated development cost be supported by detailed schedules indicating the basis of the estimate for such items. The local authority should submit to the USHA the data necessary for the preparation of such supporting schedules prior to the date scheduled for the advertisement for bids. If the administrative elements of any subaccount under Principal Account No. 1410, or any of the other principal accounts, are proratable for two or more projects under one Loan Contract, the data submitted for the preparation of these supporting schedules should reflect the total cost of all such elements to all such projects collectively and the percentage applicable to each project individually.

(4) The Final Development Cost Budget procedure makes it imperative that the Final Estimate of Total Develop-

ment Cost (Form USHA–614) be submitted by the local authority with the Final Plans and Specifications prior to advertising for bids. Any items submitted by the local authority on Form USHA–614 but not acceptable to the USHA *must* be resolved with the local authority during the bidding period in order to insure prompt completion of the final draft of the Budget and concurrence therein by the local authority within 15 days after USHA authorization of award of construction contracts.

VII. Preparation of Site.

In the preparation of the site, the following steps should be taken as promptly as practicable so there will be no delay when construction contracts are awarded: (*a*) the acquisition of land, (*b*) the relocation and rights of tenants, (*c*) the closing of streets and relocation of utilities, (*d*) the obtaining of easements and rights-of-way, (*e*) the investigation of subsoil conditions, and (*f*) the demolition of existing buildings.

(*a*) *Land Acquisition.*[5] As soon as the site has been selected by the local authority and approved by the USHA, both of which should be done promptly after the execution of the Contracts for Loan and Annual Contributions or prior thereto, the local authority should proceed immediately with the acquisition of land.

(*b*) *Relocation and Rights of Tenants.*[6] During the period of land acquisition, the status of the tenants in the area should be investigated. Their status will, in large measure, be revealed in gathering the title information. The final title papers should be accompanied by an affidavit setting forth the names of the parties in possession and their status.

In the case of many built-up sites, it will be advisable to make a survey of the existing buildings and the families occupying them for use (1) in determining which of the dwelling units to be demolished are substandard and to be credited as "equivalent elimination" and (2) in relocating the dispossessed families and rehousing them in the project as far as practicable. The USHA is prepared to assist in the formulation of such surveys.

Steps should be taken to relocate all tenants in ample time to permit demolition of the buildings as soon as title to the property is acquired.

(*c*) *Street Closings and Utilities.* In addition to the acquisition of the privately owned property within the proposed project area, the site plans for the project may entail the closing of designated streets and alleys and the relocation of existing utilities. In all such cases, the local municipal authorities and the utility companies concerned should be consulted promptly in order to avoid delay in working out the cooperative procedures necessary. To the full extent consistent with proper site planning, the local authority and the architects should plan to use existing utilities and streets and to keep the relocation of utilities and the closing of streets to a minimum in order that maximum speed and economy may be attained.

(*d*) *Easements and Rights-of-Way.* All necessary rights-of-way and easements over the property of others (including existing streets to be vacated and new streets to be dedicated) for the carrying of water lines, sewers, or other utilities should be obtained, or granted, as the case may be, simultaneously with the acquisition of the site of the project.

(*e*) *Subsoil Investigation.* During the period of land acquisition, full and complete information should be obtained concerning the type of soil involved and its bearing value and any unusual conditions with respect to it which might affect construction. In securing land options, it may be advisable, in some instances, to include in the options covering land as to which such information is not known or readily available in the offices of the City Engineer or elsewhere, a clause giving the local au-

[5] See Bulletin No. 8 for a detailed statement of the requirements of the USHA and the procedure to be followed by the local authority in connection with land acquisition.
[6] See Paragraph II of Bulletin No. 10 for the procedure to be followed in relocating tenants.

thority the right to enter on and inspect the premises and to make topographical surveys, test pits, and borings in order to obtain such information.

(*f*) *Demolition.* As soon as a sufficient portion of the site has been acquired to permit an orderly demolition program, bids should be invited for the demolition of the buildings on the site. If the demolition contract is let before title to the entire site is acquired, the local authority should protect itself against any delays which may develop in the acquisition of the remaining parcels of the site. The value of the salvage rights accruing to the contractor will in some instances make the actual cash consideration, if any, passing to or from the local authority under the demolition contract virtually negligible. Accordingly, the size of the performance bond to be required of the contractor by the local authority should be determined on the basis of an advance estimate of the cost to the contractor of demolishing or removing the buildings and structures from the project site, without any allowance for the value of salvaged materials. Unless there are local laws to the contrary, the amount of the bond should not be less than 50 percent of this estimated cost. If the value of the salvage material which is easily removable without demolishing the building is considerable, the amount of the bond should be increased accordingly.

The attention of local authorities is invited to Bulletin No. 9 which contains considerable general information applicable to demolition contracts. The USHA has also prepared, and will furnish upon request, a suggested form of demolition contract.

VIII. Negotiation, Preparation, and Approval of Contracts for Architectural Services.

(*a*) *General.* Immediately after the execution of the Contracts for Loan and Annual Contributions, the local authority should begin contract negotiations with the architect or group of architects selected for the project. The USHA has prepared, and will furnish upon request, a suggested form of architect's contract providing for general supervision of construction by the architect (Form USHA–426) and a suggested form providing for general supervision by persons other than the architect (Form USHA–427). A decision should be made at an early date as to whether the architect, or an appropriate staff of the local authority, will supervise construction. Many local authorities are finding it advisable to have construction supervised by the architect.

In order to centralize responsibility, one architect's contract should, if practicable, be made covering all phases of the work rather than separate contracts for each phase. However, if the local authority wishes to make a separate contract with a landscape architect, or a consulting engineer, the USHA will have no objection to this procedure so long as the total architectural fee for the project does not exceed the schedule of fees meeting the approval of the USHA.

A copy of each proposed architect's contract and of each proposed engineer's contract should, pursuant to the "Terms and Conditions," be submitted to the USHA for approval prior to the signing thereof by the local authority.[7] Five conformed copies of the executed contracts should be forwarded promptly to the USHA.

(*b*) *Architect's Fee.*

(1) As soon as practicable the local authority and the architect should determine, subject to the approval of the USHA, the amount of the fixed fee to be paid to the architect. The proposed fee should be submitted for approval promptly so that it may be established and prorated between dwelling and nondwelling costs and be budgeted accordingly during the early stages of the development. The suggested forms of architect's contract provide that the fixed fee of the architect shall be computed by the local authority by applying a stated percentage to the Estimated Improvement

[7] Terms and Conditions, Part III, Paragraph 1 (*a*) (8).

Cost (excluding the items allowed for construction contingencies) and that the fee so determined shall be approved by the architect. The suggested forms of architect's contract also provide, in Section 3 (*a*) thereof, that this Estimated Improvement Cost shall be prepared by the architect and checked and approved by the local authority.

(2) In appropriate instances the USHA will approve architectural fees computed by the local authority and the architect on the basis of the estimated cost of improvements in the Application for Financial Assistance as approved for purposes of the Loan Contract (excluding the items allowed for contingencies). At this stage the costs of mechanical items may be indeterminate because of uncertainties as to the type of heating to be used. Similar uncertainties may make it practicable to fix only the architectural fee, leaving some, or all, of the other fees open to future determination when better information is available. However, any agreement providing for the computation of the architect's fee on the basis of the Application should be predicated on the assumption that the number of dwelling units contemplated by the final plans and specifications will be approximately the same as the number contemplated by the Loan Contract. If there should be any material change, plus or minus, between the number of dwelling units contemplated by the Loan Contract and the number contemplated by the final plans and specifications, the architect's fee should be adjusted as provided in Sections 3 (*h*) and 14 of the suggested forms of architect's contract.

(3) The USHA has prepared, and will furnish upon request, a schedule of suggested architect's fees applicable to contracts providing for general supervision of construction by the architect and a similar schedule applicable to contracts providing for general supervision by persons other than the architect. In these schedules the architect's fee is designed to apply to the total estimated cost of the project, including landscaping and engineering work. Fees for the landscape and engineering work are allowable in addition to the architect's fee.

(4) In its submittal of the architect's fixed fee, the local authority should indicate how the fee was computed and the items excluded from the Estimated Improvement Cost in determining its amount. After the clearance of any points at issue, the USHA will indicate its approval of the fixed fee.

(5) Occasionally, the question may arise as to whether the architect is entitled to a payment on account prior to the determination and approval of the exact amount of the fixed fee. In such instances, the local authority will be guided by the particular circumstances involved. The local authority may, in justifiable situations, make such payments in the form of equitable lump sums to be deducted from the percentage amounts provided in the contracts and to be paid at progressive stages of the work. In no case, however, should such payments exceed the value of the work or service performed to the date of such payment.

(*c*) *Schedule of Fees and Wages to be Paid by the Architect.*

(1) At the time the proposed contract is submitted to the USHA for comment or approval, and prior thereto if practicable, there should also be submitted to the USHA a schedule of the fees and wages which the architect proposes to pay to the various classes of architects, technical engineers, draftsmen, technicians, laborers, and mechanics to be employed by him under his contract. This schedule should be supported by any available evidence obtained by the architect or the local authority which tends to establish such fees and wages as the fees and wages prevailing in the locality concerned. All contracts between the local authority and the architects should contain provisions requiring the architects to submit certified payrolls as prescribed in the Manual of Accounting

Procedure for Local Housing Authorities, Part II. The submittals specified in this subparagraph (*c*) (1) are necessary to enable the USHA to determine that the fees and wages to be paid are the fees and wages prevailing in the locality concerned as required by the United States Housing Act and the "Terms and Conditions." [8]

(2) The schedule of prevailing fees and wages approved by the USHA shall be effective as of the date of the Loan Contract and the architect shall, accordingly, adjust to the approved schedule any fees or wages paid after the date of the Loan Contract which are less than those appropriate under the approved schedule. All overtime shall be paid for on the basis of not less than time and one-half.

IX. Preparation and Submission of Preliminary Plans.

The suggested forms of contract for architectural services provide, under Section 3 (*a*) thereof, for certain preliminary documents including drawings, outline specifications, and estimates of cost. Bulletin No. 13, Revised, contains detailed information as to the preparation of these preliminary documents and discusses the use of the Job Program form as a check list. Since this procedure differs from that suggested in the previous issues of Bulletins Nos. 13 and 15, local authorities are urged to study and follow the new procedure which is designed to expedite the problems arising in the preparation of preliminary plans and specifications.

X. Preparation and Submission of Construction Plans and Specifications.

The attention of local authorities is invited particularly to Bulletin No. 13, Revised, entitled "Preparation of Drawings and Specifications," which covers the preparation of plans and specifications in considerable detail. In this connection, the following items are of especial importance:

Compliance with State and Local Laws. The local authority should, in the development of the plans, consult the necessary State and local officials to insure that the plans will conform to applicable local ordinances and State laws and should obtain the requisite approvals of the State and local officials having jurisdiction. If exceptions to the applicable local ordinances and State laws are necessary, assurances should be obtained that such exceptions can and will be made.

Utilities.[9] In the development of the plans and specifications, it will be necessary to consult with the appropriate utility companies as to available facilities and as to the terms and conditions and rates at which any new utilities required will be provided. The comparative costs of the several alternative services, such as gas, electricity, and steam, should be obtained so that the least expensive, not only as to development cost but also as to operating cost, may be adopted.

In negotiating with utility companies as to estimated rates, the local authority should make full use of the services of the USHA representatives who are specially trained and qualified as advisers on such matters.

Municipal Services. Prior to the preparation of plans and specifications, the local authority will usually have made at least tentative arrangements with the local municipality regarding any improvements or extensions of municipal services that are to be furnished to the project by the municipality. Such tentative arrangements should be made final and definite as soon as practicable so that the architect may proceed with the final plans and specifications on an established basis. The following items should usually be considered and provided for in the development of the plans for the project: (*a*) water service; (*b*) sewer connections, both storm and sanitary; (*c*) street lighting; (*d*) construction

[8] Terms and Conditions, Part III, Paragraph 1 (*a*) (2).

[9] See Bulletin No. 19 for complete and detailed information as to planning utility services and rate negotiations.

of new streets or the repairing or resurfacing of existing ones; (*e*) fire protection, including new fire lines and hydrants; (*f*) rerouting of transportation lines; and (*g*) educational and playground facilities. Any necessary changes in zoning laws and building regulations should also be initiated at an early date.

Insurance. In the preparation of plans and specifications, and in determining the proposed type of construction, the architect should take the prevailing insurance rates into consideration. The USHA is conducting negotiations with insurance rating bureaus and is prepared to advise the local authority as to the insurance rates applicable to the various types of construction. This information will aid the architect in developing a design that will be economical from the standpoint not only of original cost but also from that of operation and maintenance.

Site and Unit Plans. Bulletin No. 11, entitled "Planning the Site," contains detailed suggestions concerning site planning, and Bulletin No. 12, entitled "Dwelling Unit Planning," contains similar information as to unit planning. These suggestions as to site and unit planning are designed to serve primarily as guides in the development of the project. The USHA will, of course, encourage each local authority and each architect to exercise their skill and ingenuity in developing new ideas as to site and unit plans.

Construction Contracts. Bulletin No. 9, entitled "Construction Contracts," considers the question of splitting the general construction work of a project into two or more sections and suggests that consideration be given to such procedure. A related question is that of separate contracts segregated as to types of construction. The local authority should endeavor wherever possible to put all of the related construction work under one contract and to avoid segregated contracts. However, it is recognized that in many instances this will be impracticable, and that more than one contract will be necessary. For example, in some cases it will be advisable to let a separate contract for landscaping. Again, the applicable State statutes may require that a segregated contract be let for each phase of the construction work, such as electrical, heating and ventilating, plumbing, and the like. If split or segregated contracts are to be let, the several contracts should be drawn so as to provide for full coordination and reduce interference to a minimum. Bulletin No. 9 contains a suggested form of construction contract for the use and guidance of the local authority. This form contains all the applicable requirements of the United States Housing Act and of Part III of the "Terms and Conditions."

The whole question of the system of bidding and alternate bids is discussed in considerable detail in Bulletin No. 13, Revised. Local authorities are particularly urged to give this discussion full and careful consideration.

Physical Improvements after Partial or Complete Occupancy. The local authority should bear in mind that funds may be available for physical improvements to the project during the 1-year period subsequent to the date on which the project is ready for complete occupancy, since any bonds within the maximum authorized amount of the bond issue which prove unnecessary to meet development costs already incurred may be issued for necessary additions and improvements during this 1-year period. The local authority may, accordingly, find it advisable to omit certain items from the plans and specifications until the need for them has been established during a short period of operation. However, additional expenditures, if any, applicable to dwelling facilities must always be restricted to the extent necessary to keep the total dwelling facilities cost within the maximum limitations prescribed in the United States Housing Act.

Submission of Plans and Specifications. The final plans and specifications will generally be reviewed in the field, while they are being prepared, by staff members of the USHA and working agreements will be reached from time to time to avoid delays in completion. In addition, when necessary and upon request of the local authority, any part or parts of the final plans may be submitted to the USHA in Washington for review, comment, and advice during this period.

The plans and specifications will not be given a final review in Washington prior to their acceptance for bidding purposes. Tentative agreements will, however, be reached in the field as to the appropriateness of the plans, specifications, and other contract documents for bidding purposes. Such tentative agreements will be confirmed by the USHA, subject to such qualifications as may be necessary, at the time authorization to advertise for bids is granted.

Ordinarily, the final review of plans and specifications will be made by the USHA in Washington after advertisement for bids and any comments and advices based on such review will be transmitted to the local authority in time for incorporation in addenda issued during the period of bidding. The local authority should, accordingly, schedule a period of advertising for bids long enough to permit the issuance of any such addenda which prove necessary or appropriate.

XI. Preparation and Submission of Final Estimate of Total Development Cost.

After the preparation of the construction plans and specifications has been completed, the local authority shall submit to the USHA an itemized estimate of the total development cost of the project based upon the final plans and specifications, the actual costs incurred to date for all items (such as land, demolition, cost of preparing plans and specifications), the latest estimates of overhead costs and of all other costs relating to the project. This Final Estimate of Total Development Cost shall be submitted to the USHA at the time when final plans and specifications are submitted.

The Final Estimate of Total Development Cost should be submitted in a form generally similar to that provided in the outline of the Job Program, plus supplementary information on estimates of alternates to be taken and also on the local authority's preference as to the alternates to be accepted. Any part of an item in the estimate form not included in the bids to be taken should appear under the same item number, separately from the parts on which bids are to be taken, with the estimated cost of each such separated part. Throughout the Estimate those items on which bids are being taken should be specially designated. At the end of the Estimate there should also appear an estimated total of the amount of the construction contract on which bids are being taken, with notations of the alternates. It may be advantageous to arrange for staff members of the USHA to collaborate with the local authority in the field in the preparation of this Final Estimate of Total Development Cost.

The USHA has prepared, and will furnish upon request, a suggested form of Final Estimate of Total Development Cost (Form USHA-614). This form should facilitate the preparation of the Estimate.

Four copies of the Final Estimate of Total Development Cost should be submitted by the local authority to the USHA.

XII. Submittals and Procedure in Connection with Award of Construction Contracts.[10]

(*a*) As soon as the plans and specifications and other contract documents have been completed, and when so authorized by the USHA, the local authority should advertise for bids. The local authority shall advise the USHA as to the time and place fixed for receiving bids. A representative of the USHA will ordinarily attend the bid opening and be available to the local authority for advice and counsel with respect to any questions which may arise.

[10] See Bulletin No. 9 for suggested forms of advertisements, bids, and related matters.

Upon receipt of the bids, the local authority will study them and, before awarding a contract, submit to the USHA the original and four copies of a statement as to the award or awards it proposes to make, including the disposition of alternates. With this statement there should be included the following:

(1) Four copies of a tabulation of bids and an analysis thereof on the basis of the proposed award.

(2) Four copies of a comparison of the Final Estimate of Total Development Cost as earlier submitted and modified, with the computation of Total Development Cost and of Dwelling Facility Costs per room and per unit as contemplated in the proposed contracts. This comparison shall be based upon the proposed awards and the estimated (or actual) costs of items not included in the proposed awards.

(3) Four copies of all addenda and other information, including drawings, issued during the bidding period.

(4) One original and three conformed copies of all bids, including all forms in connection therewith.

(5) Four copies of other pertinent information which may have been prepared and is considered useful in reaching a determination with regard to the award of contracts and disposition of alternates.

The materials specified in subparagraphs (*a*) (1) through (*a*) (5), above, shall be furnished to the Construction Adviser for delivery or forwarding to the USHA in Washington.

(*b*) The USHA will check the bid figures against the Final Estimate of Total Development Cost and against the provisions of the United States Housing Act and the Loan Contract and will then notify the local authority that the proposed award is (1) acceptable, (2) acceptable subject to certain qualifications, or (3) not acceptable for specified reasons. If the proposed award is acceptable to the USHA, the local authority may execute the construction contract with the successful bidder.

(*c*) One executed counterpart of the construction contract (including accompanying plans and specifications) and four conformed copies of the executed contract (but including only *two* sets of plans) shall be furnished promptly to the USHA. If these copies are all in good order, the USHA will return one set to the local authority with an indication that they are approved for construction. Upon receipt of such approval by the USHA, the local authority will, ordinarily, advise the contractor to commence work under his contract and the actual construction of the project will begin.

XIII. Securing Bids on Construction, Equipment, and Material Contracts and Making Award Thereof.

Two of the most important steps to be taken by a local authority are the securing of bids and the awarding of contracts. An adequate number of bids must be secured and these must be on such a basis as to insure that there has been open and competitive bidding for each and every *construction, equipment,* and *material contract* as required by the Terms and Conditions of the Loan Contract. Contract awards must be made on a basis that is fair and above criticism from every point of view.

This paragraph XIII discusses these problems in general, offers suggestions whereby local authorities may secure wide competitive bidding, and includes certain USHA requirements which are necessary in order to effect compliance with certain applicable provisions of the United States Housing Act of 1937, as amended, and of the Loan Contract in connection with the advertising for bids on, and the awarding of, construction, equipment, and material contracts.

(*a*) *Open and Competitive Bidding.* Any restriction as to the source of materials, equipment, supplies, bonds, or insurance involved in the execution of a contract obviously operates to limit open and competitive bidding and hence to increase costs. Therefore, except to the extent required by the laws of the State in which the public housing agency is located, no such restrictions should be included in any of the documents upon which bids are based. The technical specifications upon which contracts are based should be so drafted as to secure the widest competition possible and should not discriminate against any materials, supplies, or equipment suitable for the purposes intended. To that end, and consistent with the objective of low capital costs as required by the Act, local authorities should, to the fullest extent possible, allow contractors the option of using one of two or more specified materials, supplies, or items of equipment. While it is realized that this procedure is not always feasible and that it cannot fully supplant the practice of taking alternate bids, it is, nevertheless, generally productive of securing lower bids. The disadvantages of alternate bids are discussed hereinafter.

(*b*) *Alternate Bids.* Since the United States Housing Act in effect requires that projects be of the lowest initial cost consistent with low rents, base bids must contemplate construction on that basis and the acceptance of alternate bids calling for increased expenditures cannot be justified by the USHA in approving contract awards.

The introduction of a large number of alternate bids tends to discourage bidding and hence, in effect, may increase costs. Therefore, even alternate bids believed to be deductive should not be invited unless there is doubt as to whether the low base proposal will be within the Loan Contract or statutory limitations applicable to the project. A deductive alternative bid will generally involve the use of cheaper materials or methods which in turn will normally result in a higher maintenance or operating cost, or both, and therefore construction costs should be substantially reduced in order to justify the acceptance of such an alternate.

For the above reasons, the USHA is opposed to approving acceptance of alternate bids unless the basis for such acceptance has been determined prior to the opening of bids. Local authorities are therefore requested to determine, prior to the opening of bids, the amount by which the construction cost, as evidenced by the lowest responsible base proposal, will be reduced in order to justify the acceptance of such alternate bids. Local authorities should advise the USHA, prior to the opening of bids, of the amounts so determined.

(*c*) *Unusual Local Conditions.* Occasionally there exists a combination of circumstances under which contractors from other localities are reluctant to compete in the bidding, or which will limit competition between local contractors or subcontractors. These conditions are not always openly recognized or well understood but are vaguely known to exist and are accepted as insurmountable. The USHA believes that such difficulties may often be met if they are recognized at a time well in advance of advertising for bids. Local authorities are urged to bring to the attention of the USHA, for open and frank discussion, any circumstance or combination of circumstances which the local authority believes to be opposed to free and open competitive bidding and the USHA will cooperate to the fullest extent with the local authority in meeting each such problem.

(*d*) *Timing of Bids.* With such a large volume of projects going on the market for bids it is highly important that the spread be as wide as possible in order to avoid an excessive number of bids being taken in one general locality during the same period of time. This is a problem which individual local authorities might not readily perceive since they are primarily concerned with their own projects. Nevertheless, each authority may be adversely affected by poorly considered timing of bid dates over the country as a whole.

The USHA, working with each local authority, schedules, well in advance, the dates when bids are to be received and local authorities agree with the USHA to work to these schedules. Since these schedules contemplate the widest feasible spread of bid opening dates in a given locality, it becomes highly necessary, for the benefit of the work as a whole, that each authority adhere closely to its own dates in the schedule. Therefore, local authorities, before committing themselves to a specified date, should feel quite sure that this can be met, and thereafter should make every possible effort to meet its commitments. The USHA will cooperate with the local authority to that end.

There may be occasions when the USHA will find it desirable, for the benefit of the program in its entirety, to suggest to a local authority that it modify the date of bid opening. Local authorities are requested to cooperate in such procedure.

(*e*) *Period of Bidding.* Local authorities should allow not less than 30 calendar days for bidding on any major construction work and if the plans and specifications are not ready for delivery on the date of advertising this period should be increased so that bidders may have the plans and specifications in their possession for a full 30 days. While it is true that 3 or even 2 weeks may be an adequate time for the actual work of taking off quantities and preparing bids, a longer period permits a more thorough combing of the market; moreover it often happens that contractors who would otherwise be interested are limited for time because of bidding on other work and in such cases they will not bid unless a generous time is allowed.

(*f*) *Breaking Down Large Projects.* While the USHA has cautioned local authorities as to certain difficulties incident to breaking down a project into a large number of relatively small construction contracts (see Bulletin No. 13, Revised), due consideration should be given to the fact that a large number of housing projects going on the market during a comparatively short period of time may limit the number of bidders who are able and willing to contract for large projects. Thus, in many cases, it may be found increasingly necessary to divide large projects into two or more general construction parts in order to appeal to a wider range of contractors.

However, the precautions referred to in Bulletin No. 13 should continue to receive consideration; particularly the subdivision should not be too great, complicating alternate bids should be avoided, but one overall bid for the whole work must, in all cases, be taken unless prohibited by applicable State or local law.

(*g*) *Publicity.* The usual process of advertising for bids cannot always be depended upon to secure the necessary publicity and for that reason local authorities are urged to make every possible effort in order to secure the maximum number of bidders. The following are suggested as steps which would be advisable to take in each case:

(1) Wherever there are local or nearby agencies maintaining plan rooms, plans and specifications should be furnished to these without charge or on the basis of refundable deposits. While this does not ordinarily produce a larger number of general contractors, such a procedure will frequently result in a greater number of subcontract bids to the general contractors, which, of course, tends to produce lower figures. The deposit required on sets of Plans and Specifications should always be reasonably consistent with their reproduction value.

(2) Normally it is advisable for local authorities to contact representative organizations of contractors and of construction bond companies; these latter may often obtain the interest of contractors in other cities through their branch offices.

(3) If the local authorities will furnish to the USHA a number of copies, preferably about 12, of the advertisement for bids immediately upon its publication, the USHA will arrange for quick dissemination of this information to national contractor organizations.

(4) It is desirable that the advertise-

ment for bids be published in adjacent cities in addition to publication through the local press.

(*h*) *Withdrawal or Modification of Bids.* There have been cases where low bidders have sought to withdraw or increase their bids after the bids have been opened. The usual reason which is given in such cases is that an error has been made and that as a result the contractor could not fulfill his contract for the amount stipulated in the bid without suffering a loss. When such a question arises it warrants the most careful consideration, since, on the one hand, general experience has proved that unsatisfactory results derive from construction contracts below actual costs or even without opportunity for a reasonable profit, while, on the other hand, bidders are under bond to execute contracts for the amounts named in their bids and it seems reasonable to believe that experienced contractors will exercise the utmost care in preparing and checking their figures.

Subparagraph (*j*) below sets forth the USHA requirements which local authorities should follow in determining whether or not it is equitable to permit the withdrawal of a bid after the bids have been opened. Under no circumstances should a bidder be permitted to increase his bid after it has been opened; if such a proposed increase is based upon proved errors the bid should be rejected instead, subject to the USHA requirements set forth below.

(*i*) *Rejection of Bids.* Local authorities will often be confronted with low bids from contractors whom they do not believe are financially, technically, or otherwise qualified to perform the work. Such situations are somewhat similar to those mentioned in the preceding section and merit the same careful consideration before action is taken, and local authorities should be guided by the USHA requirements included in subparagraph (*j*) below in reaching their determinations.

(*j*) *USHA Requirements.* The following requirements must be met by local authorities in order to comply with the provisions of Loan Contracts relating to competitive bidding and award of contracts and to comply with the provisions of the United States Housing Act of 1937, as amended, requiring that USHA-aided projects shall not be of elaborate or expensive design or materials and that economy will be promoted in construction:

(1) "All contracts for the furnishing of (i) labor, (ii) labor and materials, or (iii) materials, supplies, or equipment, shall conform to the applicable laws and/or regulations for such contracts in effect at the time the contracts are signed. In addition to this requirement, all such contracts involving an amount in excess of $500 shall be publicly advertised (except those involving personal services requiring specialized skill and training) and the specifications for the work involved in the contracts advertised shall be submitted to the USHA for review at least 3 weeks prior to the date for advertising."

(2) The specifications for all such contracts shall be drafted to insure the widest competition possible and no materials, supplies, or equipment suitable for the purposes intended shall be discriminated against, nor shall the specifications designate any preference for local materials, equipment, supplies, bonds, or insurance involved in the execution of such contracts unless required by the laws of the State in which the public housing agency is located.

(3) Local authorities shall contract for labor; labor and materials; or materials, equipment, and supplies in a manner best suited to secure the development of the project in the most economical manner possible. Unless otherwise required by State laws, and, except for demolition work, landscaping, and the furnishing of those materials, supplies, and equipment which are usually not included in normal construction contracts, a bid for the entire work in connection with the development of the project shall be requested even though bids are also requested for the same work in parts. The work in connection with the development of the project shall

not be so divided as to place an unreasonable administrative burden on the local authority nor which would intend to encourage possible collusion among bidders.

(4) Alternate bids shall be limited to the minimum required for economical and sound construction.

(5) Every contract shall be awarded to the lowest responsible bidder as soon as practicable after the opening of bids, unless such bid is in excess of the estimated cost of such work or is otherwise considered to be for an unreasonable amount.

(6) Bidders shall not be permitted to withdraw their bids subsequent to the time of opening because of an alleged mistake in the amount of their bids unless the amount of the bids are such as to place a reasonable man on notice that an error has been committed by the bidder and further that an award, under such circumstances, would be inequitable. Where a bidder claims that a mistake has been made, the local authority to which the bid was submitted shall require, before taking action in regard to any request for the withdrawal of a bid, the submittal by the bidder of his original estimating sheets from which the bid was computed, a sworn statement to the effect that an error has been made by the bidder, and all evidence in the possession of the bidder tending to corroborate the claim of error.

(7) No bidder shall be permitted by a local authority to withdraw his bid unless the bid submitted is at least 10 percent lower than the estimated cost of the work included in the contract, as prepared by the local authority and approved by the USHA.

(8) No bid shall be rejected by a local authority because of lack of responsibility of the bidder unless it is plainly evident that the bidder is either:

(i) not financially qualified to carry out his contract; or

(ii) not technically fitted to carry out the proposed work either through lack of experience, adequate personnel and equipment; or

(iii) has refused or failed to accept the award of a contract tendered to him in accordance with a bid submitted by him; or

(iv) unless his record in the performance of other contracts is such as would plainly show that the bidder is not responsible.

(9) Before rejecting any low bidder on the basis of irresponsibility, the local authority shall make definite findings of the facts upon which its conclusion of irresponsibility is based and shall submit the same to the USHA. Mere matters of opinion unsupported by any facts evidencing the lack of responsibility of the contractor will not be accepted as a basis for rejecting a low bidder.

(10) No contract for equipment, supplies, or materials shall be awarded to other than the low bidder in the interest of standardization of equipment or materials, ultimate economy or expeditious development of the project unless:

(i) prior to the opening of bids the local housing authority submits to the USHA notice of its intention to take these factors into consideration in awarding bids (such notice shall set forth the differential to be used by the local authority in determining the bidder to whom the contract is to be awarded); and

(ii) the USHA has approved, in advance of the award, the procedure to be followed and the differential or formula for determining the same.

(11) The USHA has the right to refuse to lend further financial assistance in the way of the purchase of bonds or the making of annual contributions or both, either as to the entire project or as to the amount of the contract involved, in the event of a violation by a local authority of the requirements of this subparagraph (*j*).

XIV. Information to be Submitted in Connection with the Award and Execution of All Contracts in Excess of $2,000.

In some instances the USHA has discovered that it does not have available all the information which it needs to assist local authorities in making certain that their construction and other contracts in excess of $2,000 are awarded and executed in a manner which makes them binding agreements. In order to make its assistance more effective in this connection, the USHA is, accordingly, inviting the attention of local authorities to the following:

(*a*) *Award.* The local authority should submit to the USHA two certified copies of the proceedings authorizing the award of contracts in excess of $2,000.

(*b*) *Execution.* The local authority should also submit to the USHA information supporting the execution of contracts in excess of $2,000. The proceedings authorizing the award of a contract may, of course, also designate an officer to execute the contract and, in such case, the proceedings submitted pursuant to subparagraph (*a*) above should cover the execution as well as the award of the contract and no additional information supporting the execution of the contract need be submitted. However, the bylaws of the local authority or a *general* resolution thereof may designate an officer to execute contracts. If a contract in excess of $2,000 is executed pursuant to such a bylaw, the material submitted in connection with the execution of such contract should include merely a citation of the applicable bylaw. If, on the other hand, a contract in excess of $2,000 is executed pursuant to a *general* resolution designating an officer to execute contracts, the information submitted in connection with the execution of such contract should include two certified copies of the proceedings by which such resolution was adopted, unless two or more certified copies of such proceedings have previously been submitted to the USHA. Proceedings previously submitted need merely be identified.

(*c*) If information corresponding to that required by this paragraph XIV has been, or will be, submitted with respect to a contract in excess of $2,000 pursuant to other USHA requirements, the provisions of this paragraph XIV shall be deemed inapplicable to such contract and no additional information is required by subparagraphs (*a*) and (*b*) above.

Administrator.

March 21, 1940.

APPENDIX

SUGGESTED FORMS OF DOCUMENTS

For the convenience of the local authority, the USHA has prepared and has available suggested forms of documents relating to:

Recording and reporting Equivalent Elimination.

Local cooperation and local contributions in the form of tax exemption.

Public sale of local authority bonds.

Local capital donations.

Surveys, title information, title certificates, appraisals, and options.

Architect's services.

Construction Contracts and related documents.

Deposit of loan proceeds in Development Fund.

Accounting procedure.

Preliminary and Final Budgets.

Advance Loan Notes and proceedings authorizing same.

Housing Authority Bonds, Resolution securing same, and proceedings authorizing issuance thereof.

Other matters involved in the financing or development of projects.

In each case these forms will be adapted to the local law and furnished to the local authority upon request.

BULLETIN No. 15

Steps in the Development *of a* Low-Rent Housing Project

SUBSEQUENT TO THE EXECUTION
OF THE CONTRACTS FOR LOAN
AND ANNUAL CONTRIBUTIONS

ADDENDUM

1

OCTOBER 1, 1940

FEDERAL WORKS AGENCY • UNITED STATES HOUSING AUTHORITY

Tie Low Bids on Construction, Equipment, and Material Contracts

ADDENDUM 1

to

BULLETIN No. 15 ON POLICY AND PROCEDURE

(Revised March 21, 1940)

entitled

Steps in the Development of a Low-Rent Housing Project Subsequent to the Execution of the Contracts for Loan and Annual Contributions

This Addendum has been prepared in response to inquiries from local housing authorities as to how tie low bids on construction, equipment, and material contracts should be handled. The Addendum states the policy of the USHA in this connection and outlines a procedure which will make this policy effective.

FEDERAL WORKS AGENCY

UNITED STATES HOUSING AUTHORITY

Washington

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT

ADDENDUM 1

Tie Low Bids on Construction, Equipment, and Material Contracts

SCOPE AND CONTENT.

This Addendum sets forth policy and procedure with respect to tie low bids on construction, equipment, and material contracts.

I. STATEMENT OF POLICY.

Experience has shown that construction, equipment, and material contracts on which tie low bids are received from responsible bidders [1] should not be "split" or awarded between the bidders submitting the tie low bids. If the amount of the tie low bid is reasonable and the local authority wishes to recommend the award of the contract at such figure, the local authority should arrange a *public drawing* of the names of all responsible bidders submitting tie low bids and recommend the award of the entire contract to the bidder whose name is drawn. The USHA is compelled to disapprove the proration of a contract among responsible tie low bidders because of the effect such a proration might have upon bidding practices.

II. PROCEDURE TO BE FOLLOWED IN CASES OF TIE LOW BIDS.

(*a*) If the local authority receives from responsible bidders two or more tie low bids on any construction, equipment, or material contract, and determines that the amount of such tie low bid is reasonable and should be accepted, the local authority shall arrange a public drawing of the names of all responsible bidders submitting tie low bids and recommend the award of the entire contract to the bidder whose name is drawn. The drawing may be witnessed by the tie low bidders or their representatives. If so requested by any tie low bidder, the time of the drawing shall be set in advance and due notice thereof given to all such bidders.

(*b*) If the local authority finds that the tie low bids were submitted as a result of collusion between any of the tie low bidders, the local authority shall advise the USHA of such finding at the time the local authority makes its recommendation of award.

(*c*) The USHA may, in the event of tie low bids, require the rejection of all bids and the readvertisement of the contract involved.

Nathan Straus
Administrator.

October 1, 1940.

[1] See paragraph XIII–(j)–(8) of Bulletin No. 15 for criteria to be used by local authorities in determining whether a bidder is "responsible."

U. S. GOVERNMENT PRINTING OFFICE 265558

BULLETIN NO. 15

Steps in the Development *of a* Low-Rent Housing Project

SUBSEQUENT TO THE EXECUTION OF THE CONTRACTS FOR LOAN AND ANNUAL CONTRIBUTIONS

ADDENDUM

2

NOVEMBER 16, 1940

FEDERAL WORKS AGENCY • UNITED STATES HOUSING AUTHORITY

Award of Contracts to the Lowest Bidder

ADDENDUM 2

to

BULLETIN No. 15 ON POLICY AND PROCEDURE

(Revised March 21, 1940)

entitled

Steps in the Development of a Low-Rent Housing Project Subsequent to the Execution of the Contracts for Loan and Annual Contributions

This Addendum is being issued to restate the USHA policy that all contracts shall be awarded on the basis of the lowest bid received from responsible bidders, and to explain the meaning of the term "lowest bid received" as used in this connection. As the Addendum points out, the USHA policy with respect to contract awards is designed to assure that bids are not evaluated on any basis other than the cost of procuring the necessary labor or materials, or both. The USHA cannot approve any contract awards which are not made on a basis which will provide the items specified at the lowest initial cost. Similarly, the USHA cannot advance funds for payments on any contracts which may be subsequently awarded on any other basis.

FEDERAL WORKS AGENCY

UNITED STATES HOUSING AUTHORITY

Washington

STEPS IN THE DEVELOPMENT OF A LOW-RENT HOUSING PROJECT

ADDENDUM 2

Award of Contracts to the Lowest Bidder

SCOPE AND CONTENT.

This Addendum clarifies the meaning of the term "lowest bid received" as the only approved basis for awarding contracts, and sets forth the general principles governing USHA approval of contract awards.

I. EXPLANATION OF THE TERM "LOWEST BID RECEIVED."

The USHA policy that all contracts shall be awarded on the basis of the *lowest bid received* from responsible bidders is set forth in many USHA policy documents. Paragraph XIII of Bulletin No. 15, for example, provides that all contracts shall be awarded on this basis. Some local authorities have interpreted the term "lowest bid received" so as to permit the evaluation of bids on a basis other than the cost of procuring labor or material, or both. This interpretation cannot be approved by the USHA. The term "lowest bid received," as used in the requirement that all contracts shall be awarded on the basis of the lowest bid received, means the bid which will provide the items described in the specifications at the lowest initial cost.

II. PRINCIPLES GOVERNING USHA APPROVAL OF CONTRACT AWARDS.

To assure the award of all construction, equipment, and material contracts on the basis explained above, the USHA will henceforth follow the general principles outlined below in passing on proposed contract awards:

(*a*) The USHA will not approve any specifications or bid documents which contain clauses permitting an evaluation of bids on any basis other than the cost of procuring the labor or materials involved, or both, and will not approve any specifications containing a multiplicity of alternates which will permit the switching of bidders by the selection of a particular alternate.

(*b*) If the local authority deems it necessary or advisable to ask for alternate bids, the USHA requires (1) that a definite understanding be reached by the USHA and the local authority involved, prior to the USHA's approval of the specifications, as to the basis and order of accepting or rejecting alternates and (2) that all bidders be informed of this understanding. If the local authority requests alternates but does not set up *in advance* any basis or order to determine the selection of alternates, the USHA will not approve any contract award which is not made on the basis of the lowest initial cost obtainable under the bids received. Furthermore, to receive USHA approval of the award in such a case, all alternates which deduct from the base bid, without reducing the number of dwelling units, must be accepted in determining the lowest initial cost.

(*c*) In short, the USHA will not approve any contract or contract award which is not made on the basis of the lowest bid received (i. e., the bid which will provide the item or items involved at the lowest initial cost).

No funds of the USHA will hereafter be advanced to cover payments on any contract which may subsequently be awarded by any local authority in a manner inconsistent with this Addendum.

Nathan Straus
Administrator.

November 16, 1940.

U. S. GOVERNMENT PRINTING OFFICE 276851

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UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 16 ON POLICY AND PROCEDURE Aug. 31, 1938

PLANNING FOR LOW RENTS

INTRODUCTION

Ultimate annual costs of housing projects - and consequent rents - depend in large part on the initial architectural and site planning of a project, and on the administrative setup, which must be considered in relation to the physical scheme. This bulletin is intended to bring the factors which influence the rent in housing projects to the attention of the local authorities and their technical staffs, and to suggest principals of planning that will lead to lower rents through lower management costs.

It is recommended that this bulletin be used in conjunction with United States Housing Authority Bulletins Nos. 11 and 12, on Site Planning and Dwelling Unit Planning, respectively. Thorough consideration of the suggestions contained in all the technical bulletins should lead to more efficient planning.

This bulletin includes the following sections:

Annual Expenses of Project Management

A. Administrative Expenses

B. Operating Expenses

C. Maintenance, Repairs, and Replacement Expenses

D. Heating

E. Utility Expense

F. Insurance

G. Bad Debts and Vacancy

* * *

Appendix

Rental Chart

Summary of Major Annual Expense Items from which Shelter Rents are Derived.

I. MARKET AND RENTABILITY

Who is to be Housed?

The United States Housing Act of 1937 declares it to be the policy of the United States to employ its funds and credit "to... remedy the unsafe and insanitary housing conditions and the acute shortage of decent, safe, and sanitary dwellings for families of low income," throughout the country.

"Low-rent housing" is defined in the Act as "decent, safe, and sanitary dwellings within the financial reach of families of low income". "The dwellings in low-rent housing...shall be available solely for families whose net income at the time of admission does not exceed five times the rental (including the value of cost to them of heat, light, water, and cooking fuel) of the dwellings to be furnished such families, except that in the case of families with three or more minor dependents, such ratio shall not exceed six to one" "Families of low income" are "families who are in the lowest income group and who cannot afford to pay enough to cause private enterprise in their locality or metropolitan area to build an adequate supply of decent, safe and sanitary dwellings for their use."

Thus the Act definitely indicates that the market from which tenants are selected shall be limited so that projects will not be in competition with legitimate private enterprise. On the other hand, eventual eradication of slums is contemplated, and tenants will be chosen from families living in substandard or overcrowded dwellings.

A top limit on tenants' incomes is thus set at the level for which private enterprise supplies an adequate number of standard dwellings. Under the present terms of the Act, however, soundly financed projects cannot be set up if families without stable ability to pay rent are admitted.

The group of families constituting the market is to be found between these two income levels, and should be determined at the outset. Projects must be planned so as to achieve the rents that can be afforded by this group. The practice of planning a development and then determining the rents and allowing the project to attract the market that can afford them cannot accomplish the objectives set forth by the Act.

Even though the construction of adequate dwellings for families of low income is in itself a worth while objective, the social possibilities of the program should be recognized and planned for. Projects should not, however, be considered either as show places, or as having an institutional character. They should be planned as normal units in the community in which they are built. Paternalistic management is not contemplated. Supervision should not extend beyond that necessary for the protection and maintenance of property, and for reasonable service to the tenants.

Analysis of the Market as it Relates to Rentability

The size of a market - i.e., the number of families eligible for a particular project - can be determined only by a study of incomes and budgets of families now living in substandard houses, related to family size. The distribution of units according to rooms-per-unit should take into account the number of families eligible for units of each size.

After the minimum space standards required by the United States Housing Authority are met, the number of rooms per family and the design of the dwelling unit should be based on the income and the needs of the specific group which the project is to reach.

Prevailing space standards in the community for dwellings renting for about the same amount as those in the project must be taken into consideration. If the space provided is less than that in substandard dwellings at equivalent rents, tenants may prefer to stay where they are despite the better construction or equipment offered in the projects, where they may not be able to use the household furniture they have. The United States Housing Authority's minimum requirements must not be allowed to become the standard.

In order that preference may be given to families having children, the project should have as high a proportion of large units as will be rentable, and as is feasible within the cost limitations of the Act.

Rentability will be enhanced if units are designed for maximum occupancy without overcrowding. For example, a three-room unit consisting of bedroom, living room and kitchen, will be adequate for three people <u>only</u> if the plan is such as to provide privacy for sleeping in the living room.

Influence of Project Size and Type on Management Costs

The size of projects is a derivative of the market defined above. It should be borne in mind, however, that the efficiency of project management may vary with the size of the project and the amenities provided. In general it is true that large projects allow for some economies in operation that cannot be achieved in very small projects. The final decision as to size should therefore result not only from demonstrated demand but also from a careful analysis of efficient operation. The desirability of providing services which improve standards of living should be weighed against the ability of the tenant to pay for these services, with careful consideration of their relative efficiency and economy in relation to the size of the project.

Comparison of rents formerly paid by tenants and those available in new projects must be based upon consideration of gross rents rather than shelter rents. In many instances families living in substandard dwellings pay much more for extra services (ice, fuel, etc.) which they buy in small quantities, than similar services cost in new projects if purchased through the management, which is usually able to obtain wholesale rates.

Site Selection and Rentability

The site selected for a project has a definite relation to rentability of the completed development. Obviously a site without the convenience of nearby schools, churches, shops, cheap public transportation, and recreation facilities may prove difficult to rent. A site which is subject to nuisances, such as noise, smoke, chemical fumes, or odors, is undesirable not only from the point of view of renting but also because it may result in high annual costs due to the excess painting, repairing, cleaning, and landscape maintenance required.

It is important to consider the total cost of living of the resident in a housing project. The cost (if any) of transportation to and from the project to his place of employment should be small. The site should be so located that without undue expense the residents can get to shopping, amusement and recreational centers.

II. ELEMENTS WHICH MAKE UP RENTS

Financing and Subsidy as they Affect Rents and Capital Costs

A. Federal Subsidy and Its Relation to Rents and Capital Costs

Under the present Act, because of the subsidy which the United States Housing Authority is authorized to make, the debt service on capital cost may become a very small part of the total rent. It is, therefore, possible to use durable materials and methods of construction which require a minimum of operating, maintenance, replacement, and insurance cost without causing any material increase in debt service to be met from rents. At the same time projects are not to be of "elaborate or expensive design or materials."

The following illustration indicates the relationship between annual financing charges and annual United States Housing Authority subsidy based on the retirement of the bonds purchased by parties other than the United States Housing Authority prior to the retirement of those purchased by the United States Housing Authority:

With a 15 year local loan of 10 per cent of the development cost retired in 13 payments at 3 per cent interest, and a 60 year Federal loan of 90 per cent of the development cost retired after the amortization of the local loan in 45 payments at $3\frac{1}{4}$ per cent interest (which on the date of this bulletin is the going Federal rate plus ½ of one per cent), the average annual debt service is about 3.85 per cent of the total development cost. With a maximum subsidy of 3-3/4 per cent (which on the date of this bulletin is the going Federal rate plus 1 per cent) the net annual debt service (that is, the debt service not payable from Federal annual contributions) becomes approximately 1/10 of 1 per cent of the total development cost. Each $100 increase in capital cost per room will increase the rent per room per month only one cent, but may require an additional contribution by the United States Housing Authority of thirty-one cents per room per month. The cost limitations of the Act both as to capital expenditures, materials, and administration must, of course, be adhered to.

It is obvious that considerable variation in capital expenditure will not materially affect the net debt service to be made up from rents. Experience of the USHA has shown that lower rents can often be achieved in group house developments than in those of apartment type in the same locality and of the same size, even though the former may result in slightly higher per unit costs. This is partly due to the greater amount of tenant maintenance which is possible for group houses.

B. The Effect of Interest Rates on Rents

The interest rate on the bonds to be issued for the development of the project has a material effect upon the rents to be charged. By decreasing the proposed interest rate on these bonds, the annual debt service will be decreased and become a smaller charge against the rent. Thus, if the interest rate on the bonds can be reduced to a rate which will permit the annual contributions to more than cover debt service, part of the annual contributions may be available to meet costs of operation and administration and thus to reduce rents.

The interest rate on any part of the bond issue to be purchased by parties other than the USHA is not fixed. The local authority, therefore, has the opportunity of obtaining a very low interest rate on these bonds. The sale of these bonds at public sale will help insure that the best possible price is obtained for such bonds.

C. The Effect of Local Capital and Annual Contributions on Rents

Local capital and annual contributions (in addition to tax exemption) will result in material reductions in the rents. In a number of cities, local capital donations have been made in the form of grants of land, material, facilities, or work or services in connection with the construction of projects. Such capital donations make it unnecessary to issue bonds for the donated portion of the development cost and this results in the elimination from the rents of any annual charges for debt service on these items. Since Federal annual contributions are made on the basis of the development cost including these donated items, a reduction in the rents can be effected.

In a number of cities, local annual contributions have been made in the form of city maintenance of grounds (handled through the local parks department at no cost to the project), reductions in rates for utility services, or the provision of certain utility services without charge. Planning of streets and service drives should contemplate their dedication to the municipality in order to relieve the project of their maintenance. All such local annual contributions reduce the charges which must be met from the project income and result in lower rentals.

D. Tax Exemption and Payments (if any) in Lieu of Taxes

Complete exemption from taxation with no payments in lieu of taxes should be provided in order to assist the achievement of rents which families in the lowest income groups can pay. Payments in lieu of taxes result in increased rents and such payments should be avoided unless there are special circumstances which justify a payment, such as substantial local capital donations having an annual value which offsets the amount of the proposed payments. Local authorities should not make commitments for payments in lieu of taxes except with the approval of the United States Housing Authority.

Annual Expenses of Project Management

Annual management expenses are discussed below with reference to how each can be kept to a minimum. Such costs are subject to variation because of size, design, location, and tenantry. It is not intended that the suggestions contained in this section be considered inflexible. They do however, represent opinions based on extensive experience. It should be understood that the United States Housing Authority has no desire to discourage originality on the part of the local authorities. The ultimate solution to specific problems must develop from local needs and sound experience.

A list of major annual expense items which may be used in studying rental structure is attached. All the items contained in the list will not apply to each project. A full list is included here only as a general guide.

Attention is called to the chart in the appendix which shows estimates of operating costs for certain non-Federal projects typical of various situations.

A. Administrative Expenses:

Management salaries constitute the major part of administrative expenses. Careful planning of administrative methods is needed to keep the personnel to a minimum. In cities where there is more than one project, the relative efficiency of centralizing office functions in one office as compared with self-contained management offices on the project sites should be determined on the basis of maximum economy, and the office space so designed. In general, design should contemplate individual operation with supervision of a minimum staff. If, however, a central office system is anticipated there should be no duplication of functions which must of necessity be performed in the project office. It follows that local authorities may properly charge their overhead to an individual project only to the extent that their employees actually perform services necessary and directly attributable to the administration of that project.

After a project is in operation, it will not generally be consistent with achieving low rents to pay the full salary of an Executive Director, as well as Housing Manager, from project income. A large part of the administrative salaries of a local authority, and other overhead charges not directly attributable to the operation of a particular occupied project, will have to be met by other means - usually by city appropriations or by additional projects in the development stage.

A simple project with a minimum of space and services requiring administrative attention is desirable. Administrative expenses may be reduced by providing a strategically located office on the project site, convenient to as many of the public, service and storage spaces in the project as possible. It should be arranged so that the personnel can work without undue disturbance. In a small project the office should be planned so as to permit a limited personnel to perform the various duties required.

Under careful management the necessity for legal services in connection with the operation of projects should be infrequent. In general, it should be possible for authorities to use the services of the city legal staff without cost. No retainer fee for such service is contemplated.

Although it is desirable for projects to have some money available for recreational purposes, estimates of annual cost should not include maintenance of extensive community facilities. Such additions to projects are often highly desirable and may be included if definite commitments for the annual cost of their operation have been entered into with independent sponsoring agencies. For example, in considering the advisability of including a nursery school in a project, decision should be based on a study of the advantages to the tenants weighed against the cost in terms of rent. In large projects the cost may be so nominal as to make inclusion feasible even without the assistance of independent sponsoring agencies. However, every effort should be made to obtain definite and binding agreements for the provision of such facilities by independent sponsoring agencies.

B. Operating Expenses:

The cost of cleaning and maintaining public spaces such as common stairways and hallways, office, community, and service spaces (laundry, storage, shop, etc.) is an important item in the operating expense. Consequently, it is advisable to reduce such spaces to a minimum.

All public spaces in buildings should be constructed of durable and easily cleaned materials. Corners, especially in stairways, should be rounded to facilitate cleaning. Skirting should be so designed that when floors are wet mopped the dampness will not come in contact with plaster surfaces.

Wherever possible, it is important that a system of garbage and trash removal be devised which does not require the employment of project labor, but which instead allows the tenant to place garbage at a point of disposal from which city collection is made. If incinerators are feasible, the possibility of locating them centrally to serve as many families as possible should be considered. It is important that city regulations and practice in regard to garbage and trash collection be thoroughly studied prior to the determination of a site plan. Failure to simplify the methods of complying with local regulations may result in excessive service costs.

In selection of construction materials and details of design, the question of vermin control should be given consideration. Extermination is particularly expensive where natural breeding places are provided in structures.

Possible reductions in the labor cost of operating, maintenance, repair, and replacement expenses may be effected by careful planning of these functions so as to eliminate the necessity of employing "extra" help on an hourly basis. The time of a minimum maintenance staff should be efficiently budgeted and the personnel employed insofar as possible on an annual basis. This does not mean, however, that seasonal or job employment can or should always be avoided. Caution should be exercised not to burden a project with an excessive personnel on annual salaries. Whether the staff is employed on an annual or on an hourly basis prevailing wage rates for certain types of employees must be adhered to in compliance with Section 16 of the Act, and estimates of operating costs should be made on the basis of rates prevailing in the locality. For person's employed on an annual basis the prevailing annual rate will usually be somewhat below the prevailing hourly rate.

C. Maintenance, Repair, and Replacement Expenses:

The cost of maintenance, repair, and replacements is the largest single annual expense item and amounts to approximately 45 per cent of the shelter rent. It is a direct reflection of the serviceability and the durability of the component parts of the project. Therefore, it is essential that materials and equipment be analyzed carefully to establish in the process of design the lowest possible total annual maintenance, repair, and replacement cost consistent with low operating expense and the development cost limitations of the Act.

During the early years of operation, disbursements from the reserve for maintenance, repair, and replacement should be required only for routine maintenance and minor repairs. The balance should be set aside so that funds will be available during the subsequent years when requirements for repair and replacement become greater.

* * *

Landscape spaces, which must be maintained by the project, should be kept to a minimum since areas which are not tenant maintained are extremely expensive. Elaborate planting should be avoided and shrubbery which requires cultivation should be kept to a minimum. Choice of plant material should be made with cost and ease of care in view. It is advisable to keep trees away from pipe and utility lines.

A maximum amount of tenant maintained space should be provided and clearly defined without, however, overloading the tenants to an unreasonable degree or expecting them to keep up space not in sensible relation to their dwellings.

Paths should be of ample width, carefully studied to provide easy access in and around the project. The grounds, however, should not be unnecessarily cut up, a practice in planning which tends to increase project maintained areas. Paths should be located along the natural lines of traffic flow to reduce the amount of "cutting across" lawns.

Play spaces are important in reducing landscape maintenance costs because they consolidate recreation in locations where no harm can be done to the grounds. Frequent small areas may be provided for the young children. A larger area for older children may be supplied if supervision is available. Recreation and welfare experts counsel that in some localities gravel has proven impractical as a surfacing material for play and parking areas because it is easily scattered and thrown, resulting in breakage and extra expense in garden and building maintenance.

Playground equipment should be very simple and durable, and in the smaller play areas should be such that it is safe for children to use it without supervision.

The painting and decorating expense in most projects will represent a sizable portion of the ultimate rent. Careful application of all available experience, and examination of what is considered good practice in the locality, will prove of great advantage. The possible use of inexpensive paints such as casein or cement base paint should be weighed against the ease with which other paints may be washed by management or by the tenants themselves.

Frequency of the necessity of redecorating is largely affected by atmospheric conditions of the locality in which a project is constructed, a factor which should be borne in mind at the time of site selection. Possible use of tenant labor in redecorating should be considered in the light of local custom and experience. Stained trim and millwork is usually cheaper to maintain than painted, and trim of indestructible material may reduce the difficulties of vermin control. Choice should be determined on the basis of local experience. Interior window sills of indestructible materials may be advantageous.

Possible rent savings may be effected through the use of materials which require a minimum of maintenance, for example: floors of smooth hard surfaced concrete treated to prevent dusting, and waxed, not painted; glazed tile walls which may be washed down and require no finish or painting; concrete ceilings of smooth surface acquired by lining the forms. Materials which in themselves form the wall, floor, and ceiling finish without need of painting should be considered. When consistent with cost requirements, glazed tile block or brick, or similar material, is recommended for use in public spaces. It should be light in color in order that the use of electricity during the day will not be required in places where window areas are of necessity limited.

Where casement windows are used, window shades should be installed in such a way that they will not be damaged when windows or screens are opened. It is often advantageous to provide curtain brackets, so that the tenant will not damage the window frames or adjacent plaster. It will usually result in an economy to purchase window shades substantially longer than the window opening, in order to permit reversing the shade on the roller and thereby prolong its use.

So far as it is consistent with economy of construction costs, the exterior of buildings should be designed in such a way as to reduce to a minimum the amount of exterior painting required.

Unless definitely assigned for such use, roofs should not be accessible to tenants, with the exception of the restricted spaces that may be required by fire regulations. Parapets are often a source of trouble and should be avoided where possible. Basements should be kept to a minimu, but where provided, should be waterproof, verminproof, and adequately ventilated.

Leaks in walls cause extremely high maintenance costs. Every effort should be made to render walls leakproof and dampproof. Methods of wall construction which have proven unsatisfactory in local experience should not be employed. Doors of dwellings directly in the weather should be designed in such a way as to prevent leakage.

Hardware should be simple, economical to maintain, durable, and reduced to a minimum in quantity. Interior door locks should be so designed that children cannot lock themselves in bathrooms or bedrooms without it being possible to unlock the doors from the outside.

Where exterior doors to public spaces are required to swing out, care should be taken in their design in order to protect them from wind damage.

Where glass panels are used in public spaces or doors they should be placed high enough to prevent damage and preferably should be made of wire glass.

D. Heating.

Heating costs are subject to wide variations depending on the locality. In determining the type of heating system to be installed a comparison based on annual costs of each system under consideration should be made. The annual cost for a central system is derived from estimated fuel comsumption, wages, annual reserve for maintenance, repairs and replacements, and debt service. For instance, in comparing the choice of a high pressure steam system to a low pressure steam system not only fuel, efficiency, and size of operating crew should be considered, but also local regulations in regard to wages, supervision, etc. In studying the use of individual family-unit heater systems as compared to a project-operated system, the ultimate cost to the tenant, including the cost of fuel he purchases independently of the project, must be considered. In some projects where central services are not available, wholesale or co-operative purchase of fuel has resulted in considerable saving to tenants. Where group plants are used, the possibility of interconnection, in order to reduce labor costs for off-peak operation, should be considered. The analysis of heating costs requires careful individual study which can be made only by persons technically trained in operating as well as design practice, and thoroughly conversant with the individual problem. The United States Housing Authority is prepared to assist local authorities in determining the most advantageous type of heating.

E. Utility Expense.

The problem of selection of the utilities that will provide the most economical service is dependent upon thorough analysis of utility rate structures - not merely those prevailing, but also those which it may be possible to obtain. Cost comparisons should be based on an analysis of annual costs, including the cost of fuel or energy, of debt service on the investment, and of maintaining and replacing equipment. Definite commitments and agreements should be avoided prior to consultation with the United States Housing Authority, which is prepared to assist the local authorities in their negotiations with utility companies. In many cities, the local authorities, with the aid of the United States Housing Authority, already have been able to obtain low utility rates because utility services are purchased at wholesale through master meters and because housing projects are recognized as resulting in the creation of a new and increased market for utility services. It is sometimes possible and advantageous to secure agreements with utility companies which provide for maintenance service for equipment. Before final drawings are made, the effect on rents of the type of utility selected should have been thoroughly investigated, and the design should be such that it will be possible to achieve low utility rates.

It is usually advantageous to purchase electricity, gas and water through master meters at wholesale or institutional rates. If it is not feasible to provide one master meter, arrangements should be made to have the combined readings of all meters applied as one to the rate schedule. For water, the latter procedure is usually preferable since it does not involve building a separate distributing system and is therefore more economical in first cost. In most projects fire hydrants should not be on metered lines.

Equipment such as stoves, light fixtures, kitchen cabinets, and plumbing fixtures, etc. should be efficient, simple, and easy to repair and maintain.

F. Insurance.

Insurance costs should be given consideration at the time the project is being planned. Before final drawings are made, the effect of construction on insurance rates should have been thoroughly investigated, and the design should make low rates possible. The most important of the various types of insurance necessary are workmen's compensation, public liability, fire and windstorm. Sometimes small changes in the design of projects can effect material savings in insurance costs; for example, the placing of kitchen ranges so that there is no possibility of window shades or curtains being ignited. Low rents cannot be achieved if insurance costs are high; the importance of reducing this item to a minimum cannot be overemphasized. In one case an insurance estimate of $.70 per room per month was submitted, although some of the Federal projects now in operation obtained fire and supplemental insurance at a rate of about $.07 per room per month, and it is not unlikely that arrangements can be made in some sections of the country for rates at or lower than $.05 per room per month on projects designed and constructed with due consideration of insurance requirements.

A study of insurance problems in each locality is now being made by the United States Housing Authority in an endeavor to ascertain the best classification and the lowest rates available for housing projects. Local authorities should not make any commitments in regard to insurance coverage without first securing the approval of the United States Housing Authority which is prepared to assist them in the handling of insurance problems. The chart in the appendix demonstrates the extent to which insurance rates may affect the rentals in projects.

G. Bad Debts and Vacancy.

In properly planned projects there should be little difficulty with the problem of vacancy. It is normally safe to figure a maximum vacancy allowance of 5 per cent of the total annual income from rents.

For bad debts a figure of 3 per cent of the total annual income from rents has usually proven adequate. During normal times virtually 100 per cent collection should be possible. If it is anticipated that the type of tenants in a particular project will be unable to pay consistently, the allowance for bad debts may have to be increased. It is important that rental budgets permit a fairly flexible rent policy for delinquents over a short period of time. In localities where employment is subject to violent fluctuations it may be advisable to build up a reserve from rents to cover rent delinquencies during extended periods of unemployment. A rent insurance plan operated by a tenants' association or credit union is worth consideration in lieu of excessive reserves established through rents.

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The planning of a housing project is like an immense equation with numerous variables. The answer to the equation is to be found through careful consideration of every item of which it is composed. The answer must be low rents in a project that conforms to standards of planning and provides amenities consistent with the objectives of the United States Housing Act. The problem is not an easy one. Only by the most diligent efforts can the best solution be achieved.

Nathan Straus

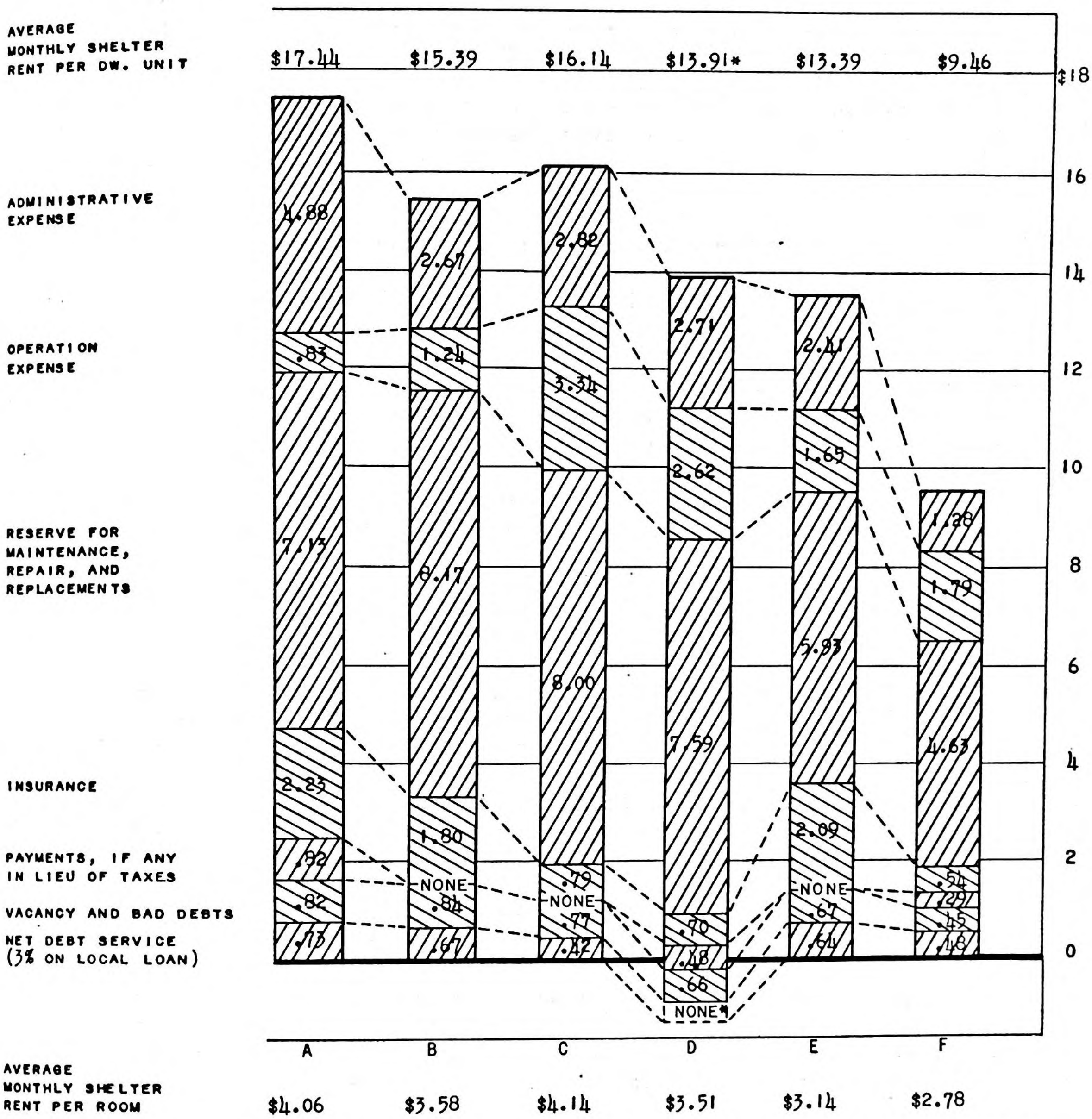
NATHAN STRAUS,
Administrator.

August 31, 1938.

RENTAL CHART

MONTHLY SHELTER RENT (INCLUDING WATER) AS CALCULATED FOR CERTAIN PROJECTS NOW UNDER LOAN AND ANNUAL CONTRIBUTIONS CONTRACTS

(FIGURES FOR EACH SEPARATE ITEM OF EXPENSE ENTERING INTO TOTAL DWELLING UNIT RENTAL ARE SHOWN WITHIN THE BARS. A DESCRIPTION OF EACH SPECIFIC PROJECT FOR WHICH A BAR IS SHOWN IS INCLUDED ON THE FOLLOWING PAGE, AS WELL AS REMARKS PERTINENT TO THE RENTAL CALCULATIONS.)



*THERE IS NO DEBT SERVICE INCLUDED IN RENT FOR THIS PROJECT AND PART OF USHA ANNUAL CONTRIBUTION IS AVAILABLE AS A CREDIT TOWARD REDUCING RENTALS BECAUSE OF THE SUBSTANTIAL LOCAL DONATIONS TOWARD CAPITAL COSTS.

NOTE: FIGURES SHOWN ON THIS CHART ARE IN NO SENSE TO BE CONSIDERED AS GUIDES OR STANDARDS FOR RENTAL CALCULATIONS. THEY ARE INCLUDED HERE MERELY TO INDICATE A WIDE RANGE IN VARIOUS CLASSIFICATIONS OF ANNUAL COSTS. IT IS ANTICIPATED THAT RENTS EVEN LOWER THAN THE LOWEST SHOWN ON THIS CHART CAN BE REACHED. FOR EXAMPLE, THE NECESSARY LOWER RENTS CAN BE ACHIEVED BY ELIMINATING PAYMENTS IN LIEU OF TAXES, BY PROVIDING SUBSTANTIAL LOCAL CAPITAL DONATIONS AND LOCAL ANNUAL CONTRIBUTIONS.

EXPLANATION OF RENTAL CHART

Bars A and B - 1 and 2-story group house development in southern coastal city; concrete block construction, wood roof framing, unit heaters; 969 rooms - 224 dwelling units; average rooms per dwelling unit, 4.3; coverage, 11.5 per cent. Bar B shows a revised estimate of annual costs after more thorough study of the various items. Note the high administrative expense and low operation and reserve expenses shown in Bar A. A study of the original estimates shows excess personnel and reveals that the estimate of operation and reserve expenses was too low. Insurance costs are high on this project partly because of a higher rate due to location in the tornado zone. In order to achieve lower rents these costs will have to be reduced. Bar B shows the omission of payments in lieu of taxes and refiguring of debt service on the local loan at a lower rate of interest than originally contemplated, both in order to achieve low rents.

Bar C - 2-story group houses and 3-story apartments in the north; semifireproof construction in group houses, apartments completely fireproof; central heating. 2,449 rooms - 627 dwelling units; average rooms per dwelling unit, 3.9; coverage, 27 per cent. As the site is in a downtown slum area where there is a good deal of smoke and dirt, the operation and maintenance figures are higher than for other projects. Also, there is a high proportion of 3-story apartments for which janitor service is at present contemplated. The low figure for debt service is due to substantial capital donations by the city.

Bar D - 2-story group houses and 3-story apartments in northern city; fireproof construction; group heating; 2756 rooms - 696 units; average rooms per dwelling unit 3.96; coverage, 22 per cent. Note that the item for debt service results in a credit since a city donation has been made great enough actually to eliminate any charge for debt service in the rent and to permit part of the subsidy to be applied as a credit toward annual operation.

Bar E - 1 and 2-story group house development in the south; nonfireproof construction; heating by unit heaters; 1490 rooms - 350 dwelling units; average rooms per dwelling unit 4.26; coverage, 18.5 per cent. Almost complete maintenance of grounds by tenants is possible in this project, resulting in a substantial decrease in the maintenance expense. Here again the insurance rates are high because of location in south and nonfireproof construction.

Bar F - 1 and 2-story group houses and flats in the southwest for very low income group, minimal type of fireproof construction; gas space heaters to be purchased by tenant. 639 rooms - 186 dwelling units; average rooms per dwelling unit, 3.4; coverage, 14 per cent. Note the low figure for reserve for maintenance, repair and replacements due to the use of simple indestructible materials which require a minimum of maintenance. Administrative expense has been reduced by careful planning of administrative functions.

SUMMARY OF MAJOR ANNUAL EXPENSE ITEMS FROM WHICH SHELTER RENTS ARE DERIVED

A. Administrative Expense

1. Management Salaries
   (Includes parts of salaries of operating personnel chargeable to administrative duties.)

2. Renting Expense
   (Includes advertising, printing, credit rating reports, etc. This expense is not to be confused with initial occupancy expense.)

3. Recreation and Social Expense
   (Supplied and expendable material.)

4. Office Expense
   (Postage, supplies, express, etc.)

5. Telephone and Telegraph

6. Professional Services
   (Legal and auditing.)

7. Miscellaneous
   (Includes trustee's fees.)

B. Operating Expense (Excluding heat and utilities except water, and services for public spaces and project office.)

1. Utilities - Public spaces only.
   Heat and hot water
   Water
   Electricity and gas

2. Water for Dwellings

3. Janitorial Cleaning
   (Payroll and supplies)

4. Exterminating and Disinfecting

5. Rubbish and Garbage Removal
   (Ordinarily included in municipal services without cost to project.)

6. Miscellaneous
   (Includes watchman, if any; storeroom expense, if any; operating equipment and tools, lamps and fuses, etc.)

C. Maintenance, Repair and Replacement

1. Care of Grounds

2. Decorating and Renovating
(Includes exterior and interior work, shades, etc.)

3. Repairs and Replacement of Structure
(Includes such items as roofing and sheet metal work, carpentry, masonry, tile, glazing, plastering, etc.)

4. Repairs and Replacement of Fixed Mechanical System
(Includes heating plant and distribution system, plumbing, gas, and electrical systems.)

5. Repairs and Replacement of Dwelling Equipment
(Ranges, refrigerators, space heaters, etc.)

6. Miscellaneous
(Includes office and playground equipment, etc.)

D. Insurance

1. Fire Insurance

2. Public Liability

3. Workmen's Compensation

4. Other

E. Payments in Lieu of Taxes (Such payments to be made only where special circumstances, such as substantial local capital donations, justify them.)

F. Net Debt Service

G. Miscellaneous

H. Vacancy and Bad Debts

I. Total Expense

J. Income from Non-Dwelling Facilities
(If any are provided in project, deduct from Item I.)

K. Shelter Rent

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 16 ON POLICY AND PROCEDURE

Revised February 8, 1939
(Substitute for Bulletin No. 16, dated
August 31, 1938)

PLANNING FOR LOW RENTS

Ultimate annual costs of housing projects and the rents which these costs reflect, depend in large part on the initial architectural and site planning of a project. These costs and rents are affected as well by the administrative setup, which may be considered in relation to the physical scheme.

The purpose of this bulletin is to bring to the attention of the local housing authorities and their technical staffs those factors which influence the rents in housing projects. It proposes also to suggest principals of planning that will lead to lower rents through lower management costs.

We recommend that this bulletin be used in connection with United States Housing Authority Bulletins on Policy and Procedure Nos. 11 and 12 on Site Planning and Dwelling Unit Planning, respectively. Thorough consideration of the suggestions included in the various technical bulletins, we believe, will lead to more efficient planning.

CONTENTS

I. MARKET AND RENTABILITY

A. Who is to be Housed?

The United States Housing Act of 1937 declares it to be the policy of the United States to employ its funds and credit "to ... remedy the unsafe and insanitary housing conditions and the acute shortage of decent, safe, and sanitary dwellings for families of low income," throughout the country.

"Families of low income" are families who are in the lowest income group and who cannot afford to pay enough to cause private enterprise in their locality or metropolitan area to build an adequate supply of decent, safe and sanitary dwellings for their use.

"Low-rent housing" is defined in the Act as "decent, safe, and sanitary dwellings within the financial reach of families of low income."

"The dwellings in low-rent housing...shall be available solely for families whose net income at the time of admission does not exceed five times the rental (including the value or cost to them of heat, light, water, and cooking fuel) of the dwellings to be furnished such families, except that in the case of families with three or more minor dependents, such ratio shall not exceed six to one."

The Act definitely indicates that the market from which tenants are selected shall be limited so that projects will not be in competition with legitimate private enterprise. Eventual eradication of slums is contemplated - tenants will be chosen from families living in substandard or overcrowded dwellings.

A top limit on tenants' incomes is thus set at the level for which private enterprise supplies an adequate number of standard dwellings. Under the present terms of the Act, however, soundly financed projects cannot be set up if families without ability to pay rent are admitted.

The group of families constituting the market is to be found between these two income levels, and should be determined at the outset. Projects must be planned so as to achieve the rents that this group can afford. The practice of planning a housing project without carefully checking each step in the development of the plans for its effect on rents may result in rents which do not meet the market described above, and therefore fail to accomplish the objectives set forth in the Act.

Even though the construction of adequate dwellings for families of low income is in itself a worthwhile objective, the social possibilities of the program should be recognized and planned for. In no event should projects be considered either as show places, or as having an institutional character. They should be planned as normal units in the community in which they are built. Paternalistic management is not contemplated. Supervision should not extend beyond that necessary for the protection and maintenance of property, and for reasonable service to the tenants.

B. <u>Analysis of the Market as it Relates to Size and Design of Dwelling Units</u>

The size of a market - i.e., the number of families eligible for a particular project - can be determined only by a study of incomes and budgets of families now living in substandard houses, related to family size. The distribution of units according to rooms-per-unit should take into account the number of families eligible for units of each size.

After the minimum space standards required by the United States Housing Authority are met, the number of rooms per family and the design of the dwelling unit should be based on the income and the needs of the specific group which the project is to reach.

Careful consideration should be given to prevailing space standards in the community for dwellings renting for about the same amount as those in the project. If the space provided is less than that in substandard dwellings at equivalent rents, tenants may prefer to stay where they are despite the better construction or equipment offered in the projects, where they may not be able to use the household furniture they have. The United States Housing Authority's minimum requirements must not be allowed to become the standard.

In order that preference may be given to families having children, the project should have as high a proportion of large units as will be rentable, and as is feasible within the cost limitations of the Act.

Rentability will be enhanced if units are designed for maximum occupancy without overcrowding. For example, a three-room unit consisting of bedroom, living room and kitchen, will be adequate for three people <u>only</u> if the plan is such as to provide privacy for sleeping in the living room.

C. Influence of Project Size and Type on Management Costs and Facilities to be Supplied

The size of projects is a derivative of the market defined above. It should be borne in mind, however, that the efficiency of project management may vary with the size of the project and the amenities provided. In general it is true that large projects allow for some economies in operation that cannot be achieved in very small projects. The final decision as to size should therefore result not only from demonstrated demand but also from a careful analysis of efficient operation. The desirability of providing services which improve standards of living should be weighed against the ability of the tenant to pay for these services, with careful consideration of their relative efficiency and economy in relation to the size of the particular project.

Comparison of rents formerly paid by tenants and those available in new projects must be based upon consideration of gross rents rather than shelter rents. In many instances families living in substandard dwellings pay much more for extra services (ice, fuel, etc.) which they buy in small quantities, than similar services cost in new projects if purchased through the management, which is usually able to obtain wholesale rates.

D. Site Selection and Rentability

The site selected for a project has a definite relation to rentability of the completed development. Obviously a site without the convenience of nearby schools, churches, shops, cheap public transportation, and recreation facilities may prove difficult to rent. A site which is subject to nuisances, such as noise, smoke, chemical fumes, or odors, is undesirable not only from the point of view of renting but also because it may result in high annual costs due to the excess painting, repairing, cleaning, and landscape maintenance required.

It is important to consider the total cost of living of the resident in a housing project. The cost (if any) of transportation to and from the project to his place of employment should be small. The site should be so located that without undue expense the residents can get to shopping, amusement and recreational centers.

II. FINANCING AND SUBSIDY AS THEY AFFECT RENTS AND CAPITAL COSTS

A. Federal Subsidy

Under the present Act, because of the subsidy which the United States Housing Authority is authorized to make, the debt service on capital cost may become a very small part of the total rent. It is therefore possible to use durable materials and methods of construction which require a minimum of operating, maintenance, replacement, and insurance cost without causing any material increase in debt service to be met from rents. At the same time projects are not to be of "elaborate or expensive design or materials."

The following illustration indicates the relationship between annual financing charges and annual United States Housing Authority subsidy based on the retirement of the bonds purchased by parties other than the United States Housing Authority prior to the retirement of those purchased by the United States Housing Authority:

With a 15 year local loan of 10 per cent of the development cost retired in 13 payments at 3 per cent interest, and a 60 year Federal loan of 90 per cent of the development cost retired after the amortization of the local loan in 45 payments at $3\frac{1}{4}$ per cent interest (which on the date of this bulletin is the going Federal rate plus $\frac{1}{2}$ of one per cent), the average annual debt service is about 3.85 per cent of the total development cost. With a maximum subsidy of 3-3/4 per cent (which on the date of this bulletin is the going Federal rate plus 1 per cent) the net annual cost of financing charges (that is, the debt service not payable from Federal annual contributions) becomes approximately 1/10 of 1 per cent of the total development cost. Each $100 increase in capital cost per room will increase the rent per room per month only one cent, but may require an additional contribution by the United States Housing Authority of thirty-one cents per room per month. The cost limitations of the Act both as to capital expenditures, materials, and administration must, of course, be adhered to.

It is obvious that considerable variation in capital expenditure will not materially affect the net annual cost of financing charges to be made up from rents. Experience of the USHA has shown that lower rents can often be achieved in group house developments than in those of apartment type in the same locality and of the same size, even though the former may result in slightly higher per unit costs. This is partly due to the greater amount of tenant maintenance which is possible for group houses.

B. The Effect of Interest Rates on Rents

The interest rate on the bonds to be issued by the local authority for the development of the project has a material effect upon the rents to be charged. By decreasing the proposed interest rate on these bonds, the annual debt service will be decreased and become a smaller charge against the rent. Thus, if the interest rate on the bonds can be reduced to a rate which will permit the annual contributions to more than cover debt service, part of the annual contributions may be available to meet cost of management and operation and thus to reduce rents.

The interest rate on any part of the bond issue to be purchased by parties other than the USHA is not fixed. The local authority, therefore, has the opportunity of obtaining a very low interest rate on these bonds. The sale of these bonds at public sale will help insure that the best possible price is obtained.

C. <u>The Effect of Local Capital and Annual Contributions on Rents</u>

Local capital and annual contributions (in addition to tax exemption) will result in material reductions in the rents. In a number of cities, local capital donations have been made in the form of grants of land, material, facilities, or work or services in connection with the construction of projects. Such capital donations make it unnecessary to issue bonds for the donated portion of the development cost and this results in the elimination from the rents of any annual charges for debt service on these items. Since Federal annual contributions are made on the basis of the development cost including these donated items, a reduction in the rents can be effected.

In a number of cities, local annual contributions have been made in the form of city maintenance of grounds (handled through the local parks department at no cost to the project), reductions in rates for utility services, or the provision of certain utility services without charge. Planning of streets and service drives should contemplate their dedication to the municipality in order to relieve the project of their maintenance. All such local annual contributions reduce the charges which must be met from the project income and result in lower rentals.

D. <u>Tax Exemption and Payments (if any) in Lieu of Taxes</u>

Complete exemption from taxation with no payments in lieu of taxes should be provided in order to assist the achievement of rents which families in the lowest income groups can pay. Payments in lieu of taxes result in increased rents and such payments should be avoided unless there are special circumstances which justify a payment, such as substantial local capital donations having an annual value which offsets the amount of the proposed payments. Local authorities should not make commitments for payments in lieu of taxes except with the approval of the United States Housing Authority.

III. <u>ANNUAL EXPENSES OF PROJECT ADMINISTRATION</u>

Annual administrative expenses are discussed below with reference to how each can be kept to a minimum. Such costs are subject to variation because of size, design, location, and tenantry. It is not intended that the suggestions contained in this section be considered inflexible. They do, however, represent opinions based on extensive experience. It should be understood that the United States Housing Authority has no desire to discourage originality on the part of the local authorities. The ultimate solution to specific problems must develop from local needs and sound experience.

Attention is called to the chart in the appendix which shows estimates of operating costs for certain USHA projects typical of various situations.

A. Management Expense

(1) Management salaries constitute the major part of management expense. Careful planning of administrative methods is needed to keep the personnel to a minimum. In cities where there is more than one project, the relative efficiency of centralizing office functions in one office as compared with self-contained management offices on the project sites should be determined on the basis of maximum economy, and the office space so designed. In general, design should contemplate individual operation with supervision of a minimum staff. If, however, a central office system is anticipated there should be no duplication of functions which must of necessity be performed in the project office. It follows that local authorities may properly charge their overhead to an individual project only to the extent that their employees actually perform services necessary and directly attributable to the administration of that project.

After a project is in operation, it will not generally be consistent with achieving low rents to pay the full salary of an Executive Director, as well as Housing Manager, from project income. A large part of the administrative salaries of a local authority, and other overhead charges not directly attributable to the operation of a particular occupied project, will have to be met by other means -- usually by city appropriations or by additional projects in the development stage.

A simple project with a minimum of space and services requiring attention from the management staff is desirable. Management expense may be reduced by providing a strategically located office on the project site, convenient to as many of the public, service and storage spaces in the project as possible. It should be arranged so that the personnel can work without undue disturbance. In a small project the office should be planned so as to permit a limited personnel to perform the various duties required.

(2) Legal services in connection with the operation of projects should not often be necessary under careful management. In general, it should be possible for authorities to use the services of the city legal staff without cost. No retainer fee for such service is contemplated.

B. Operating Expenses

Possible reductions in the labor cost of operating, as well as repair, maintenance, and replacement expenses may be effected by careful planning of these functions so as to eliminate the necessity of employing "extra" help on an hourly basis. Staff should be efficiently budgeted and the personnel employed insofar as possible on an annual basis. This does not mean, however, that seasonal or job employment can or should always be avoided. Caution should be exercised not to burden a project with an excessive personnel on annual salaries. Whether the staff is employed on an annual or on an hourly basis prevailing wage rates for certain types of employees must be adhered to in compliance with Section 16 of the Act, and estimates of operating costs should be made on the basis of rates prevailing in the locality. For persons employed on an annual basis the prevailing annual rate will usually be somewhat below the prevailing hourly rate.

(1) Janitorial expense for the cleaning of public spaces such as common stairways and hallways, office, community, and service spaces (laundry, storage, shop, etc.) is an important item in the operating expense. Consequently, it is advisable to reduce such spaces to a minimum.

All public spaces in buildings should be constructed of durable and easily cleaned materials. Corners, especially in stairways, should be rounded to facilitate cleaning. Skirting should be so designed that when floors are wet mopped the dampness will not come in contact with plaster surfaces.

(2) Vermin control should be given consideration in selection of construction materials and details of design. Extermination is particularly expensive where natural breeding places are provided in structures.

(3) Refuse removal should be planned in such a way that it does not require the employment of project labor, but instead allows the tenant to place garbage and trash at a point of disposal from which city collection is made. If incinerators are feasible, the possibility of locating them centrally to serve as many families as possible should be considered. It is important that city regulations and practice in regard to garbage and trash collection be thoroughly studied prior to the determination of a site plan. Failure to simplify the methods of complying with local regulations may result in excessive service costs.

C. Dwelling Utilities

The problem of selection of the utilities that will provide the most economical service is dependent upon thorough analysis of utility rate structures - not merely those prevailing, but also those which it may be possible to obtain. Cost comparisons should be based on an analysis of annual costs, including the cost of fuel or energy, of debt service on the investment, and of maintaining and replacing equipment. Definite commitments and agreements should be avoided prior to consultation with the United States Housing Authority, which is prepared to assist the local authorities in their negotiations with utility companies. In many cities, the local authorities, with the aid of the United States Housing Authority, already have been able to obtain low utility rates because utility services are purchased at wholesale through master meters and because housing projects are recognized as resulting in the creation of a new and increased market for utility services. It is sometimes possible and advantageous to secure agreements with utility companies which provide for maintenance service for equipment. Before final drawings are made, the effect on rents of the type of utility selected should have been thoroughly investigated, and the design should be such that it will be possible to achieve low utility rates.

(1) Electricity, gas, and water usually may be advantageously purchased through master meters at wholesale or institutional rates. If it is not feasible to provide one master meter, arrangements should be made to have the combined readings of all meters applied as one to the rate schedule. For water, the latter procedure is usually preferable since it does not involve building a separate distributing system and is therefore more economical in first cost. Fire hydrants should not be on metered lines unless arrangement on separate lines is shown to involve excessive costs.

Equipment such as stoves, light fixtures, kitchen cabinets, and plumbing fixtures, etc. should be efficient, simple, and easy to repair and maintain.

(2) Heating costs are subject to wide variations depending on the locality. In determining the type of heating system to be installed a comparison based on annual costs of each system under consideration should be made. The annual cost for a project operated system is derived from estimated fuel consumption, wages, annual reserve for maintenance, repairs and replacements, and debt service. For instance, in comparing the choice of a high pressure steam system to a low pressure steam system not only fuel, efficiency, and size of operating crew should be considered, but also local regulations in regard to wages, supervision, etc. Where group plants are used, the possibility of interconnection, in order to reduce labor costs for off-peak operation, should be considered.

In studying the use of individual family-unit heater system as compared to a project-operated system, the ultimate cost to the tenant, including the cost of fuel he purchases independently of the project, must be considered. In some projects where central services are not available, wholesale or cooperative purchase of fuel has resulted in considerable saving to tenants.

The analysis of heating costs requires careful individual study which can be made only by persons technically trained in operating as well as design practice, and thoroughly conversant with the individual problem. The United States Housing Authority is prepared to assist local authorities in determining the most advantageous type of heating.

D. Repairs, Maintenance and Replacements

The cost of maintenance, repair, and replacements is the largest single annual expense item and constitutes from 45 to 55 per cent of the shelter rent. It is a direct reflection of the serviceability and the durability of the component parts of the project. Therefore, it is essential that materials and equipment be analyzed carefully to establish in the process of design the lowest possible total annual maintenance, repair, and replacement cost consistent with low operating expense and the development cost limitations of the Act.

During the early years of operation, disbursements from the reserve for maintenance, repair, and replacement should be required only for routine maintenance and minor repairs. The balance should be set aside so that funds will be available during the subsequent years when requirements for repair and replacement become greater.

(1) Grounds which must be maintained by the project, should be kept to a minimum since areas which are not tenant maintained are extremely expensive. Elaborate planting should be avoided and shrubbery which requires cultivation should be kept to a minimum. Choice of plant material should be made with cost and ease of care in view. It is advisable to keep trees away from pipe and utility lines.

A maximum amount of tenant maintained space should be provided and clearly defined without, however, overloading the tenants to an unreasonable degree or expecting them to keep up space not in sensible relation to their dwellings.

Paths should be of ample width, carefully studied to provide easy access in and around the project. The grounds, however, should not be unnecessarily cut up, a practice in planning which tends to increase project maintained areas. Paths should be located along the natural lines of traffic flow to reduce the amount of "cutting across" lawns.

Play spaces are important in reducing landscape maintenance costs because they consolidate recreation in locations where no harm can be done to the grounds. Frequent small areas may be provided for the young children. A larger area should also be provided for older children if adequate playground facilities for them are not available in the immediate vicinity of the project. Recreation and welfare experts counsel that in some localities gravel has proven impractical as a surfacing material for play and parking areas because it is easily scattered and thrown, resulting in breakage and extra expense in garden and building maintenance.

Playground equipment should be very simple and durable. Arrangements for some supervision of such equipment should always be made before it is installed.

(2) Structure: So far as it is consistent with economy of construction costs, the exterior of buildings should be designed in such a way as to reduce to a minimum the amount of exterior painting required.

Unless definitely assigned for such use, roofs should not be accessible to tenants, with the exception of the restricted spaces that may be required by fire regulations. Parapets are often a source of trouble and should be avoided where possible. Basements should be kept to a minimum, but where provided, should be waterproof, verminproof, and adequately ventilated.

Leaks in walls cause extremely high maintenance costs. Every effort should be made to render walls leakproof and dampproof. Methods of wall construction which have proven unsatisfactory in local experience should not be employed. Doors of dwellings directly in the weather should be designed in such a way as to prevent leakage.

Hardware should be simple, economical to maintain, durable, and reduced to a minimum in quantity. Interior door locks should be so designed that children cannot lock themselves in rooms without it being possible to unlock the doors from the outside.

Where exterior doors to public spaces are required to swing out, care should be taken in their design in order to protect them from wind damage.

Where glass panels are used in public spaces or doors they should be placed high enough to prevent damage and preferably should be made of wire glass.

(3) Painting and decorating in most projects will represent a sizable portion of the ultimate rent. Careful application of all available experience, and examination of what is considered good practice

in the locality, will prove of great advantage. The possible use of inexpensive paints such as casein or cement base paint should be weighed against the ease with which other paints may be washed by management or by the tenants themselves.

Frequency of the necessity of redecorating is largely affected by atmospheric conditions of the locality in which a project is constructed, a factor which should be borne in mind at the time of site selection. Possible use of tenant labor in redecorating should be considered in the light of local custom and experience. Stained trim and mill-work is usually cheaper to maintain than painted, and trim of indestructible material may reduce the difficulties of vermin control. Choice should be determined on the basis of local experience. Interior window sills of indestructible materials may be advantageous.

Possible rent savings may be affected through the use of materials which require a minimum of maintenance, for example: floors of smooth hard surfaced concrete treated to prevent dusting, and waxed, not painted. Material for use in public spaces should be light in color in order that the use of electricity during the day will not be required in places where window areas are of necessity limited.

Where casement windows are used, window shades should be installed in such a way that they will not be damaged when windows or screens are opened. It is often advantageous to provide curtain brackets, so that the tenant will not damage the window frames or adjacent plaster. It will usually result in an economy to purchase window shades substantially longer than the window opening, in order to permit reversing the shade on the roller and thereby prolong its use.

E. Community Facilities

Experience shows that some community space should be provided in practically every housing project. Before designing such space, however, every effort should be made to obtain definite and binding agreements from independent agents to: (1) Sponsor various activities that are considered essential to the well being of the project community. (2) Provide the facilities necessary for these activities either on the site or in close proximity to it.

The decision as to which facilities should be included within a project will be determined in large measure by the character of the sponsorship secured, but it should also be based upon a study of the advantages which will result to the tenants from the inclusion of such facilities, weighed against their maintenance cost in terms of rent.

For example, in considering the advisability of providing space for a Nursery School the annual cost of utilities and other expenditures necessary for its maintenance should be compared with the value to the children, the parents, and to the project as a whole of a pre-school and parental education program.

All space intended for general use should be so planned that it can be used equally well for a variety of pursuits. It should also be so designed that it can be used for tenant-initiated activities as well as for a program conducted under trained leadership.

As projects can only assume responsibility for nominal expenditures for recreational purposes, the design of all community space should be planned with a view to minimizing all maintenance and operating costs, including utilities and service charges as well as supervision.

F. Vacancy and Collection Losses

In properly planned and carefully managed projects there should be little difficulty with the problem of vacancy and collection losses. It is normally safe to figure a maximum allowance of 5 per cent of the total annual income from rents.

During normal times virtually 100 per cent rent collection should be possible. If it is anticipated that the type of tenants in a particular project will be unable to pay consistently, the allowance for bad debts may have to be increased. It is important that rental budgets permit a fairly flexible rent policy for delinquents over a short period of time. In localities where employment is subject to violent fluctuations it may be advisable to build up a reserve from rents to cover rent delinquencies during extended periods of unemployment. A rent insurance plan operated by a tenants' association or credit union is worth consideration in lieu of excessive reserves established through rents.

G. Insurance

Insurance costs should be given consideration at the time the project is being planned. Before final drawings are made, the effect of construction on insurance rates should have been thoroughly investigated, and the design should make low rates possible. The most important of the various types of insurance necessary are Fire, Public Liability, Workmen's Compensation, Boiler and Windstorm or Catastrophe. Sometimes small changes in the design of projects can effect material savings in insurance costs; for example, the placing of kitchen ranges so that there is no possibility of window shades or curtains being ignited. Low rents cannot be achieved if insurance costs are high; the importance of reducing this item to a minimum cannot be overemphasized.

A study of insurance problems in each locality is now being made by the United States Housing Authority in an endeavor to ascertain the best classification and the lowest rates available for housing projects.

Local authorities should not make any commitments in regard to insurance coverage without first securing the approval of the United States Housing Authority which is prepared to assist them in the handling of insurance problems.

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The planning of a housing project is like an immense equation with numerous variables. The answer to the equation is to be found through careful consideration of every item of which it is composed. The answer must be low rents in a project that conforms to standards of planning and provides amenities consistent with the objectives of the United States Housing Act. The problem is not an easy one. Only by the most diligent efforts can the best solution be achieved.

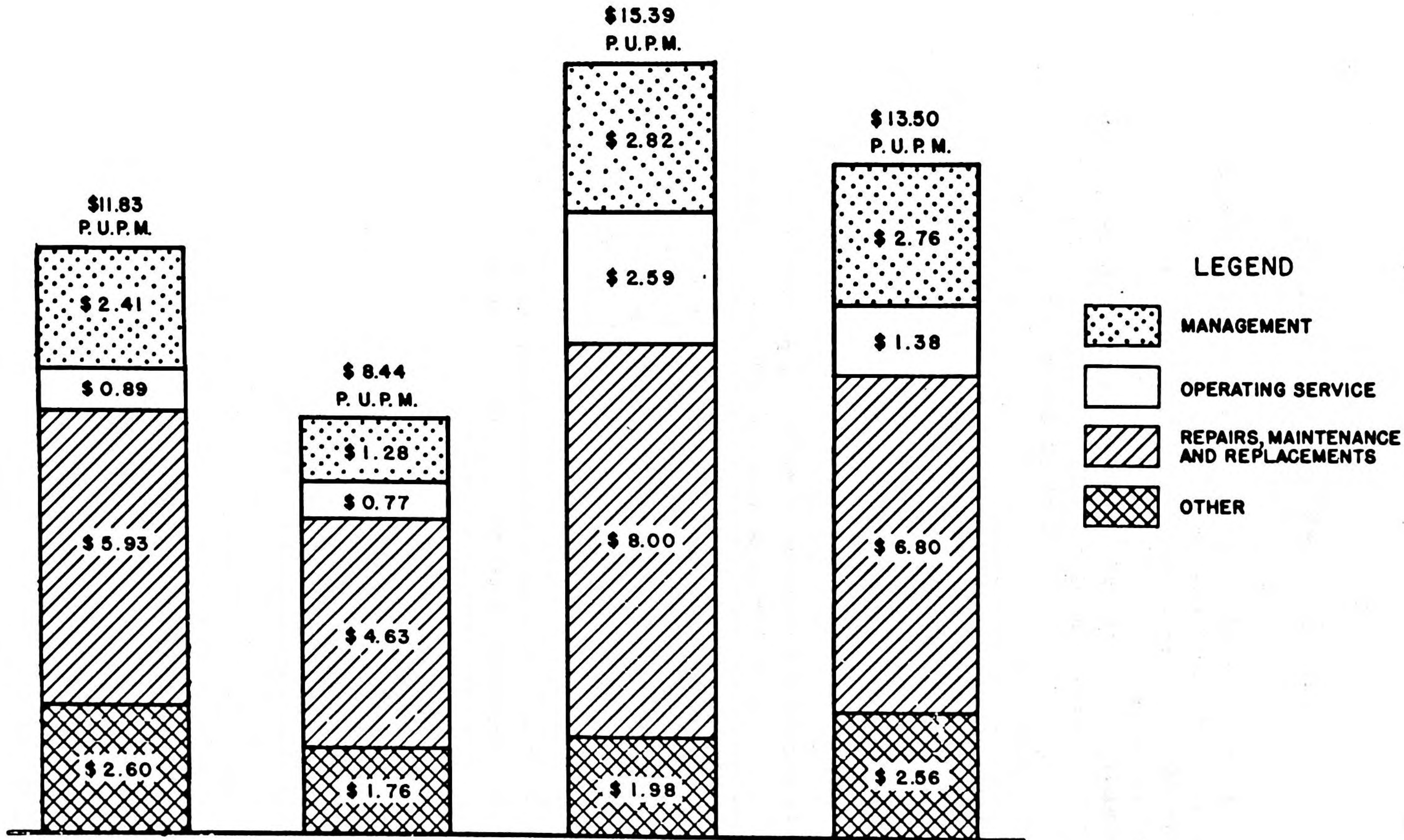
Nathan Straus

NATHAN STRAUS,
Administrator.

February 8, 1939.

UNITED STATES HOUSING AUTHORITY
WASHINGTON, D. C.

DISTRIBUTION OF MONTHLY SHELTER RENT PER DWELLING UNIT FOR SEVERAL U.S.H.A. PROJECTS



	A SOUTH	B SOUTH	C NORTH	D NORTH
DESCRIPTION:	HOUSES	HOUSES AND FLATS	HOUSES AND APARTMENTS	HOUSES AND APARTMENTS
NO. OF ROOMS:	1,490	639	2,449	2,756
NO. OF UNITS:	350	186	627	696

DESIGNED IN DIVISION OF FINANCE AND ACCOUNTS
BUDGETS AND STATISTICAL SECTION

EXPLANATION OF RENTAL CHART

Bar A - 1 and 2-story group house development in the south; nonfireproof construction; heating by unit heaters; average rooms per dwelling unit 4.26; coverage 18.5 per cent. Almost complete maintenance of grounds by tenants is possible in this project, resulting in savings in maintenance expense. The insurance expense (included in "Other" expense on the chart) is high for this project because of location in the tornado belt and because of nonfireproof construction.

Bar B - 1 and 2-story group houses and flats in the southwest for very low income group, minimal type of fireproof construction; gas space heaters to be purchased by tenant. Average rooms per dwelling unit, 3.4; coverage, 14 per cent. Note the low figure for reserve for maintenance, repair and replacements due to the use of simple indestructible materials which require a minimum of maintenance.

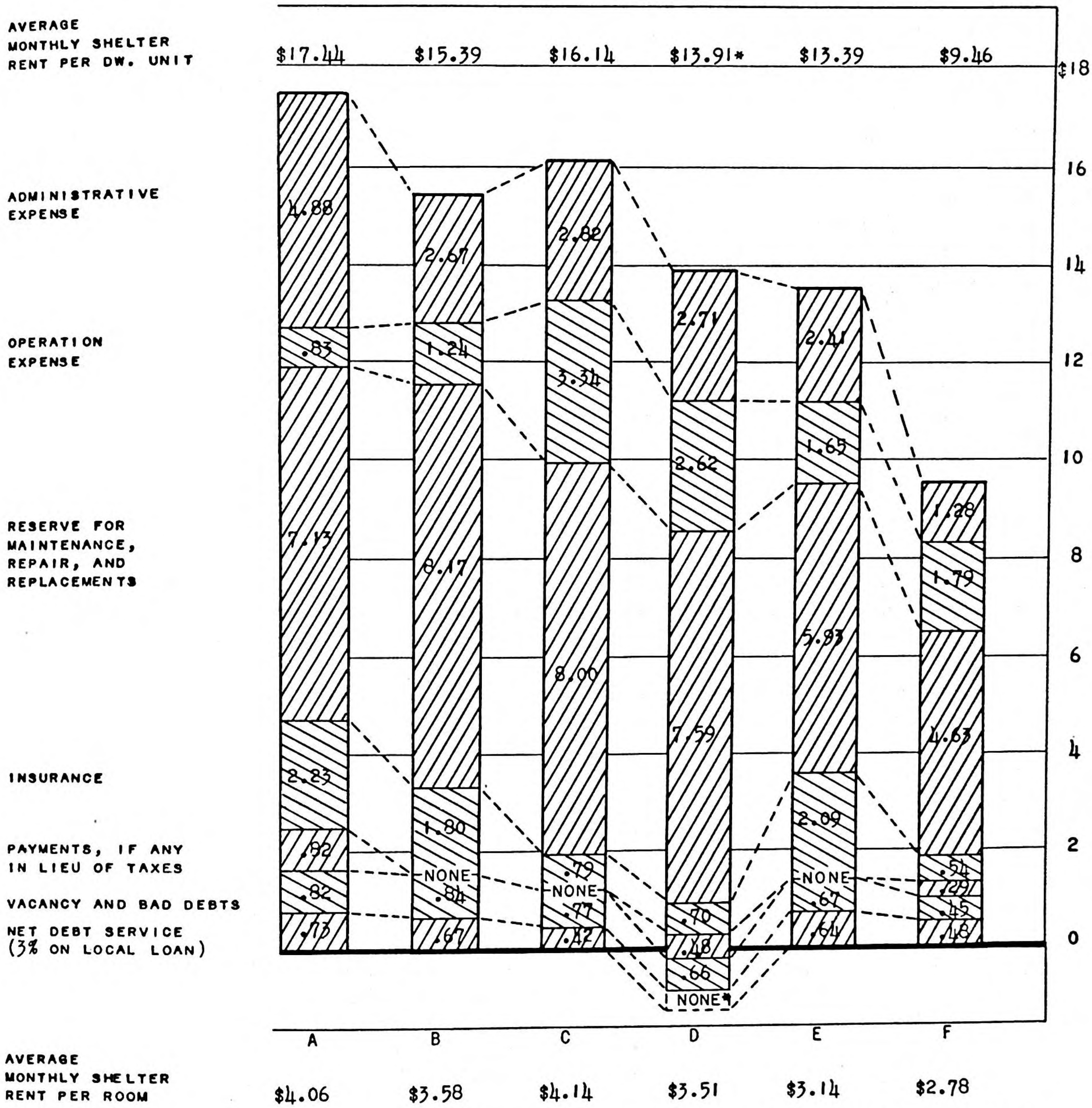
Bar C - 2-story group houses and 3-story apartments in the north; semi-fireproof construction in group houses, apartments completely fireproof; central heating; average rooms per dwelling unit, 3.9; coverage, 27 per cent. As the site is in a downtown slum area where there is a good deal of smoke and dirt, the operation and maintenance figures are higher than for other projects. There is a high proportion of 3-story apartments for which janitor service is at present contemplated which tends to increase the cost of operating services.

Bar D - 2-story group houses and 3-story apartments in northern city; fireproof construction; group heating; average rooms per dwelling unit 3.96; coverage, 22 per cent.

RENTAL CHART

MONTHLY SHELTER RENT (INCLUDING WATER) AS CALCULATED FOR CERTAIN PROJECTS NOW UNDER LOAN AND ANNUAL CONTRIBUTIONS CONTRACTS

(FIGURES FOR EACH SEPARATE ITEM OF EXPENSE ENTERING INTO TOTAL DWELLING UNIT RENTAL ARE SHOWN WITHIN THE BARS. A DESCRIPTION OF EACH SPECIFIC PROJECT FOR WHICH A BAR IS SHOWN IS INCLUDED ON THE FOLLOWING PAGE, AS WELL AS REMARKS PERTINENT TO THE RENTAL CALCULATIONS.)



*THERE IS NO DEBT SERVICE INCLUDED IN RENT FOR THIS PROJECT AND PART OF USHA ANNUAL CONTRIBUTION IS AVAILABLE AS A CREDIT TOWARD REDUCING RENTALS BECAUSE OF THE SUBSTANTIAL LOCAL DONATIONS TOWARD CAPITAL COSTS.

NOTE: FIGURES SHOWN ON THIS CHART ARE IN NO SENSE TO BE CONSIDERED AS GUIDES OR STANDARDS FOR RENTAL CALCULATIONS. THEY ARE INCLUDED HERE MERELY TO INDICATE A WIDE RANGE IN VARIOUS CLASSIFICATIONS OF ANNUAL COSTS. IT IS ANTICIPATED THAT RENTS EVEN LOWER THAN THE LOWEST SHOWN ON THIS CHART CAN BE REACHED. FOR EXAMPLE, THE NECESSARY LOWER RENTS CAN BE ACHIEVED BY ELIMINATING PAYMENTS IN LIEU OF TAXES, BY PROVIDING SUBSTANTIAL LOCAL CAPITAL DONATIONS AND LOCAL ANNUAL CONTRIBUTIONS.

EXPLANATION OF RENTAL CHART

Bars A and B - 1 and 2-story group house development in southern coastal city; concrete block construction, wood roof framing, unit heaters; 969 rooms - 224 dwelling units; average rooms per dwelling unit, 4.3; coverage, 11.5 per cent. Bar B shows a revised estimate of annual costs after more thorough study of the various items. Note the high administrative expense and low operation and reserve expenses shown in Bar A. A study of the original estimates shows excess personnel and reveals that the estimate of operation and reserve expenses was too low. Insurance costs are high on this project partly because of a higher rate due to location in the tornado zone. In order to achieve lower rents these costs will have to be reduced. Bar B shows the omission of payments in lieu of taxes and refiguring of debt service on the local loan at a lower rate of interest than originally contemplated, both in order to achieve low rents.

Bar C - 2-story group houses and 3-story apartments in the north; semifireproof construction in group houses, apartments completely fireproof; central heating. 2,449 rooms - 627 dwelling units; average rooms per dwelling unit, 3.9; coverage, 27 per cent. As the site is in a downtown slum area where there is a good deal of smoke and dirt, the operation and maintenance figures are higher than for other projects. Also, there is a high proportion of 3-story apartments for which janitor service is at present contemplated. The low figure for debt service is due to substantial capital donations by the city.

Bar D - 2-story group houses and 3-story apartments in northern city; fireproof construction; group heating; 2756 rooms - 696 units; average rooms per dwelling unit 3.96; coverage, 22 per cent. Note that the item for debt service results in a credit since a city donation has been made great enough actually to eliminate any charge for debt service in the rent and to permit part of the subsidy to be applied as a credit toward annual operation.

Bar E - 1 and 2-story group house development in the south; nonfireproof construction; heating by unit heaters; 1490 rooms - 350 dwelling units; average rooms per dwelling unit 4.26; coverage, 18.5 per cent. Almost complete maintenance of grounds by tenants is possible in this project, resulting in a substantial decrease in the maintenance expense. Here again the insurance rates are high because of location in south and nonfireproof construction.

Bar F - 1 and 2-story group houses and flats in the southwest for very low income group, minimal type of fireproof construction; gas space heaters to be purchased by tenant. 639 rooms - 186 dwelling units; average rooms per dwelling unit, 3.4; coverage, 14 per cent. Note the low figure for reserve for maintenance, repair and replacements due to the use of simple indestructible materials which require a minimum of maintenance. Administrative expense has been reduced by careful planning of administrative functions.

SUMMARY OF MAJOR ANNUAL EXPENSE ITEMS FROM WHICH SHELTER RENTS ARE DERIVED

A. Administrative Expense

1. Management Salaries
(Includes parts of salaries of operating personnel chargeable to administrative duties.)

2. Renting Expense
(Includes advertising, printing, credit rating reports, etc. This expense is not to be confused with initial occupancy expense.)

3. Recreation and Social Expense
(Supplied and expendable material.)

4. Office Expense
(Postage, supplies, express, etc.)

5. Telephone and Telegraph

6. Professional Services
(Legal and auditing.)

7. Miscellaneous
(Includes trustee's fees.)

B. Operating Expense (Excluding heat and utilities except water, and services for public spaces and project office.)

1. Utilities - Public spaces only.
   Heat and hot water
   Water
   Electricity and gas

2. Water for Dwellings

3. Janitorial Cleaning
(Payroll and supplies)

4. Exterminating and Disinfecting

5. Rubbish and Garbage Removal
(Ordinarily included in municipal services without cost to project.)

6. Miscellaneous
(Includes watchman, if any; storeroom expense, if any; operating equipment and tools, lamps and fuses, etc.)

C. Maintenance, Repair and Replacement

1. Care of Grounds

2. Decorating and Renovating
(Includes exterior and interior work, shades, etc.)

3. Repairs and Replacement of Structure
(Includes such items as roofing and sheet metal work, carpentry, masonry, tile, glazing, plastering, etc.)

4. Repairs and Replacement of Fixed Mechanical System
(Includes heating plant and distribution system, plumbing, gas, and electrical systems.)

5. Repairs and Replacement of Dwelling Equipment
(Ranges, refrigerators, space heaters, etc.)

6. Miscellaneous
(Includes office and playground equipment, etc.)

D. Insurance

1. Fire Insurance

2. Public Liability

3. Workmen's Compensation

4. Other

E. Payments in Lieu of Taxes (Such payments to be made only where special circumstances, such as substantial local capital donations, justify them.)

F. Net Debt Service

G. Miscellaneous

H. Vacancy and Bad Debts

I. Total Expense

J. Income from Non-Dwelling Facilities
(If any are provided in project, deduct from Item I.)

K. Shelter Rent

X

UNITED STATES HOUSING AUTHORITY

Bulletin No. 16 on Policy and Procedure Sept 21, 1939

Planning for Low Rents

Addendum No. 1 - Achieving Even Lower Management, Operation and Maintenance Costs.

Scope and Content of Addendum. This Addendum indicates the need for achieving even lower management, operation and maintenance costs in order to carry out more effectively the policies of the United States Housing Act of 1937 and suggests methods of effecting still further reductions in the cost of certain major items of management expense, operating services, and repairs, maintenance and replacements. In general, the method of treatment followed in this Addendum is to indicate some of the difficulties which have been encountered in reducing such costs and to point out methods of overcoming or minimizing these difficulties.

I. The Need for Achieving Lower Costs

Definite progress has and is being made by local authorities in achieving low management operation and maintenance costs. In fact it is being found possible to set rents well within the financial reach of families in the lowest income group. However, this result has only been achieved through the use of the maximum federal subsidy permitted by the Act and through total or substantially total local tax exemptions. The USHA is firmly convinced that if the public housing program is to proceed to its logical end, that is if all rather than a small proportion of the lowest income group is to be rehoused, ways and means must be found of achieving low rents and at the same time reducing the federal and local subsidies now required.

Only the major items of expense are included in the following discussions and no attempt has been made to cover these completely. However, it is hoped that these discussions may prove of value in pointing the way toward lower costs.

II. Management Expense

The largest item in management expense is salaries. To achieve efficiency and low costs qualified and trained personnel is required. Because public housing management is such a new field there are few persons who are qualified without further training and experience to hold responsible management positions. The solution lies first in carefully analyzing the duties to be required of each staff member to determine what field of experience and training requires skills best approximating those which will be utilized in the position; second, in selecting the best qualified person;

and third, in training the persons selected in the aspect of management which is to be their particular responsibility. The National Association of Housing Officials, the USHA, and other agencies, such as schools and universities, have already taken active steps toward assisting local authorities in this important question of personnel selection and training.

The growth of the program has created a major problem in public administration especially where there are several projects being administered by one authority. In fact, in several instances there has been a tendency for management costs per dwelling unit to be greater in the larger projects. Thorough study must be given to the administrative organization to prevent duplication of functions, unnecessary forms and procedures and other types of red tape which create unproductive work. The USHA is taking active steps to assist local authorities to do away with unnecessary administrative work by simplifying and eliminating to the maximum extent possible the various reports and records required to be submitted by local authorities.

III. Operating Services

The major item in operating services is janitorial expense. This is especially true in the case of apartment buildings which include common service areas such as stairhalls, laundries and storage, and perambulator rooms, the care and cleaning of which are by tradition customarily the responsibility of the landlord. The most natural solution to this problem lies in building the row house type of dwelling where common areas (both interior and exterior) are largely confined to playgrounds, club rooms and other facilities for community activities. Unfortunately, due to high land costs and other reasons it is often necessary to construct apartments. In this case ways must be found to overcome tradition so that it will not be necessary for management to provide services which it is reasonable and practicable for tenants to provide for themselves.

For example, it seems reasonable that families living in apartment buildings will be able to clean the public stairhalls leading to their dwellings. The cleaning of each stairhall will be done by several families working cooperatively. To secure this cooperative relationship requires skilled guidance on the part of management but it also requires a feeling of responsibility and participation on the part of the families. If tenants through their resident association or through other democratic means determine the details of any arrangement such as this, cooperation is much more apt to result. In other words, tenant participation in the maintenance of common service areas must be considered in terms of the community relations program.

In determining what services are to be performed by tenants, careful consideration must be given to what is reasonable and practicable. For example, in the case of public stairhalls, there are frequently windows which are located so that they are difficult to reach and it would not be reasonable to ask the tenants to clean them. Another example can be found in the problem of keeping the grounds free of loose papers and other debris. By providing trash receptacles at convenient locations, it is made handy for the tenants not only to avoid dropping loose papers but also to pick up papers which others may have dropped.

Waste receptacles also provide an example of the relationship of tenant participation in maintenance to a community relations program. In one project after trash receptacles had been installed, a contest was held among the children for naming each receptacle. Names were submitted such as "fill me up" and "let me have it". The winning children were rewarded by having their names printed under the slogan which was attached to the receptacle they named.

Because tenant participation in project upkeep presents such challenging possibilities the USHA is particularly anxious to be advised of the experiences of local authorities in order that these may be passed on as suggestions to other authorities.

IV. Repair, Maintenance and Replacement

The care of grounds, as far as tenant participation in maintenance is concerned, is in some ways similar to janitorial expense. In other words the row house type of dwellings presents the most conducive setting. In addition, however, the care of grounds presents creative and esthetic possibilities to the families in the project. A neat and attractive appearance, especially when achieved through family and community effort, will have a wholesome and beneficial effect on the attitudes and character of the project residents.

The item of redecorating is one of the largest single items in most budgets. To find ways and means of achieving lower redecorating costs deserves particular attention on the part of local authorities. One way toward this end is by providing wall surfaces which do not mar and soil readily and which are easy for the tenants to keep clean. The possibility of painting by tenants is being considered by some authorities. This will obviously require the careful working out of all the details such as the type of paint, the provision of brushes and equipment and instructions to tenants in its use. Where tenants perform such major and unusual items of maintenance, it may be desirable to consider a system of rebates or other form of direct compensation. Any inducements offered should always be in the form of rewards rather than penalties.

There has been a tendency in some projects to redecorate when no real need existed. In determining when interiors are to be repainted, the local authority should carefully establish the minimum standard necessary to provide a decent and attractive appearance.

The expense for the repair, maintenance and replacement of heating, plumbing and electrical systems and equipment depends to a large degree on the type of equipment. Simple equipment should be used unless there is a definite saving in costs when expense for dwelling utilities is considered. For example, in row house developments the individual gas or coal fired furnace is being found preferable to a central heating system in more and more instances.

Nathan Straus

NATHAN STRAUS,
Administrator.

September 21, 1939.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 17 ON POLICY AND PROCEDURE

DEFINITION OF TERMS

The purpose of language is to reach the mind of the other man as easily and clearly as possible. Towards this end the following definitions have been established for use in connection with the public housing program of the USHA.

PROJECTS

USHA Projects means projects initiated under the United States Housing Act of 1937 (Wagner-Steagall Housing Act).

PWA Housing Division Projects means public housing projects constructed by the Housing Division of the PWA and transferred by Executive Order No. 7732 to the USHA, whether or not they have been subsequently leased by the USHA to a public housing agency. This term must not be used for the projects constructed by limited dividend corporations with the aid of loans from the PWA.

PWA Limited Dividend Projects means housing projects constructed by limited dividend corporations with the aid of loans from the PWA.

Project (when referring to a USHA project as defined above) means that portion of a public housing agency's low-rent housing undertaking which is covered by one annual contributions contract with the USHA. A "Project" may include developments on one or more sites. The USHA will assign a separate number for development on each separate site. Each site will, in general, also have a name chosen by the local authority or a geographic designation. Names such as "White Project," "Negro Project" or "Mexican Project" should never be used.

USEFUL LIFE OF A PROJECT

Useful Life of a Project means the period of physical usefulness of a project for the purpose of providing dwelling accommodations, but in no event less than the number of years during which any of the obligations issued to aid in financing the development of the project remain outstanding.

ROOMS

(See Bulletin No. 2 on Policy and Procedure)

Room means a space containing a window opening to the outside air and having at least the following area for the use designated:

Living Room -	150 square feet
Dining Room -	100 square feet
Kitchen -	60 square feet either as a separate space or added to a living or dining room. If separate and less than 70 square feet, it must be not less than 7 feet wide.
1st Bedroom -	120 square feet
2nd Bedroom -	90 square feet
3rd Bedroom -	80 square feet

Half-Room means

(1) A dining space not less than 60 square feet in area in addition to the minimum required area of the living room or kitchen to which it is added, or

(2) A kitchenette, being either a separate space or a space added to another room, having adequate kitchen equipment and at least three feet of passage clearance in front of such equipment. Space required for such equipment and passage clearance is in addition to the minimum required area of the living room or dining room to which it is added.

Room-Count is the total of all rooms and half-rooms, half-rooms being counted as one-half each. Bathrooms, halls, closets, laundries, utility rooms, storage rooms and community or recreation rooms are not counted as rooms.

RENTS AND RENTAL VALUES

Shelter Rent means the charge established (or estimated) for the use of a dwelling excluding the furnishing of any utilities (i.e., water, heat, heating of water, light, cooking fuel, or refrigeration energy).

Rent including Utilities means "Shelter Rent" as defined above, plus the charge established (or estimated) for the furnishing of such utilities (i.e., water, heat, heating of water, light, cooking fuel, or refrigeration energy) as are supplied by the project without additional charge.

In the case of specific projects and in all tabulations, care must be taken to show what utilities are included in "Rent including Utilities."

Statutory Rental Value means "Rent including Utilities" plus the value or cost of any of the following which are not included in "Rent including Utilities", viz., water, heat, heating of water, light, and cooking fuel.

Statutory rental values will be established for all dwellings, and will serve in determining the upper limit of income for tenant admission as provided in Sec. 2 (1) of the Act. Note that when the furnishing of refrigeration energy is not included in "Rent including Utilities" it may not be added to "Rent including Utilities" in establishing "Statutory Rental Value."

ANNUAL CONTRIBUTIONS AND CAPITAL DONATIONS
(See Bulletin No. 6 on Policy and Procedure)

USHA Annual Contributions means annual grants made by the United States Housing Authority to a public housing agency to assist it in achieving and maintaining the low-rent character of a housing project, in accordance with the terms of annual contributions contracts entered into between the United States Housing Authority and the public housing agency.

Local Contributions means aids given by the State, city, county, or other political subdivision in which a housing project is situated, to a public housing agency to assist it in achieving and maintaining the low-rent character of the project, and made in any of the following forms:

(1) Tax exemption. Complete exemption from taxes will be considered as providing a local contribution of a value equal to the total amount of all taxes which would otherwise be levied against the project by all taxing agencies, less the amount of payments in lieu of taxes, if any, made by the local authority.

(2) Remission of general or special taxes.

(3) Cash Payments.

Local contributions made to a project before its physical completion and which are admitted as part of the development cost of the project may also be counted as "Capital Donations" (see definition herein).

The Act requires (Sec. 10 (a)) as a condition for the making of USHA annual contributions that local contributions be received in an amount equal to at least 20 per centum of the USHA annual contribution.

Though the above are the only forms of local aid which are defined as "Local Contributions" and which count towards the requirement of local contributions equal to 20 per centum of the USHA annual contributions, it should be noted that there are many other forms of local aid (including "Capital Donations") which will be of great value in reducing rents, and which should be secured whenever possible. For a full discussion of these see Bulletin No. 6 on Policy and Procedure.

Capital Donations means outright aids of a monetary value (other than capital grants made to the USHA pursuant to Sec. 11 of the Act) given to a public housing agency and which are admitted as part of the development cost of a project.

Capital donations to development cost may include such items as:

(1) Cash Payments.

(2) Value of tax exemption on property included in the project from the date of its acquisition to the date of physical completion.

(3) Remission of taxes or special assessments levied on property to be included in the project and which are delinquent or unpaid at the time of its acquisition.

(4) Remission of taxes or special assessments on property included in the project which are levied after the date of its acquisition but before physical completion.

(5) Waiver of building permit, inspection or other similar fees.

(6) Technical, professional or administrative services in the development of a project furnished without cost.

(7) Land, including the net areas obtained by the vacating of streets and alleys.

(8) New improvements (such as grading, street paving, sidewalks, sewers, water mains, landscaping, etc.) furnished without cost to a project.

"Capital Donations" in the form of items (1) to (4) inclusive when made by the State, city, county, or other political subdivision in which a project is situated, may also be counted as "Local Contributions" (see definition herein).

Nathan Straus

NATHAN STRAUS
Administrator.

December 2, 1938.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 17 ON POLICY AND PROCEDURE

Revised January 31, 1939
(Substitute for Bulletin No. 17, dated December 2, 1938.
The two revised sections are PROJECTS and RENTS AND
RENTAL VALUES.)

DEFINITION OF TERMS

The purpose of language is to reach the mind of the other man as easily and clearly as possible. Towards this end the following definitions have been established for use in connection with the public housing program of the USHA.

PROJECTS

USHA Projects means projects initiated under the United States Housing Act of 1937 (Wagner-Steagall Housing Act).

PWA Housing Division Projects means public housing projects constructed by the Housing Division of the PWA and transferred by Executive Order No. 7732 to the USHA, whether or not they have been subsequently leased by the USHA to a public housing agency. This term must not be used for the projects constructed by limited dividend corporations with the aid of loans from the PWA.

PWA Limited Dividend Projects means housing projects constructed by limited dividend corporations with the aid of loans from the PWA.

Project (when referring to a USHA project as defined above) means that portion of a public housing agency's low-rent housing undertaking to which the USHA has assigned a separate project number. Ordinarily this will mean a development on one site. Each project will, in general, also have a name or geographic designation chosen by the local authority. Names such as "White Project", "Negro Project" or "Mexican Project" should never be used.

Statutory Project is a project or group of projects covered by one loan or annual contributions contract.

USEFUL LIFE OF A PROJECT

Useful Life of a Project means the period of physical usefulness of a project for the purpose of providing dwelling accommodations, but in no event less than the number of years during which any of the obligations issued to aid in financing the development of the project remain outstanding.

ROOMS
(See Bulletin No. 2 on Policy and Procedure)

Room means a space containing a window opening to the outside air and having at least the following area for the use designated:

Living Room -	150 square feet
Dining Room -	100 square feet
Kitchen -	60 square feet either as a separate space or added to a living or dining room. If separate and less than 70 square feet, it must be not less than 7 feet wide.
1st Bedroom -	120 square feet
2nd Bedroom -	100 square feet
3rd Bedroom -	70 square feet

Half-Room means

(1) A dining space not less than 60 square feet in area in addition to the minimum required area of the living room or kitchen to which it is added, or

(2) A kitchenette, being either a separate space or a space added to another room, having adequate kitchen equipment and at least three feet of passage clearance in front of such equipment. Space required for such equipment and passage clearance is in addition to the minimum required area of the living room or dining room to which it is added.

Room-Count is the total of all rooms and half-rooms, half-rooms being counted as one-half each. Bathrooms, halls, closets, laundries, utility rooms, storage rooms and community or recreation rooms are not counted as rooms.

RENTS AND RENTAL VALUES

Shelter Rent means the charge established (or estimated) for the use of a dwelling excluding the furnishing of any utilities (i. e., water, heat, heating of water, light, cooking fuel, or refrigeration energy).

Shelter Rent plus Utility Charge means "Shelter Rent" as defined above, plus the charge established (or estimated) for the furnishing of such utilities (i. e., water, heat, heating of water, light, cooking fuel, or refrigeration energy) as are supplied by the project and which are included in the stipulated periodic payments by the tenant.

In the case of specific projects and in all tabulations, care must be taken to show what utilities are included in "Shelter Rent plus Utility Charge."

Statutory Rental Value means "Shelter Rent plus Utility Charge" less any charge included therein for refrigeration energy, plus the value or cost to the tenant of any of the following which are not included in "Shelter Rent plus Utility Charge": water, heat, heating of water, light, and cooking fuel.

Statutory rental values will be established for all dwellings, and will serve in determining the statutory upper limit of income for tenant admission as provided in Sec. 2(1) of the Act. They do not include the value or cost of refrigeration energy.

ANNUAL CONTRIBUTIONS AND CAPITAL DONATIONS
(See Bulletin No. 6 on Policy and Procedure)

USHA Annual Contributions means annual grants made by the United States Housing Authority to a public housing agency to assist it in achieving and maintaining the low-rent character of a housing project, in accordance with the terms of annual contributions contracts entered into between the United States Housing Authority and the public housing agency.

Local Contributions means aids given by the State, city, county, or other political subdivision in which a housing project is situated, to a public housing agency to assist it in achieving and maintaining the low-rent character of the project, and made in any of the following forms:

(1) Tax exemption. Complete exemption from taxes will be considered as providing a local contribution of a value equal to the total amount of all taxes which would otherwise be levied against the project by all taxing agencies, less the amount of payments in lieu of taxes, if any, made by the local authority.

(2) Remission of general or special taxes.

(3) Cash Payments.

Aids in any of the above three forms made to a project before its physical completion will be allowed as a local contribution; if admitted as part of the development cost of the project, they will also be counted as "Capital Donations" (see definition herein).

The Act requires (Sec. 10(a)) as a condition for the making of USHA annual contributions that local contributions be received in an amount equal to at least 20 per centum of the USHA annual contribution.

Though the above are the only forms of local aid which are defined as "Local Contributions" and which count towards the requirement of local contributions equal to 20 per centum of the USHA annual contributions, it should be noted that there are many other forms of localaid (including "Capital Donations") which will be of great value in reducing rents, and which should be secured whenever possible. For a full discussion of these see Bulletin No. 6 on Policy and Procedure.

Capital Donations means outright aids of a monetary value (other than capital grants made by the USHA pursuant to Sec. 11 of the Act) given to a public housing agency and which are admitted as part of the development cost of a project.

Capital donations to development cost may include such items as:

(1) Cash Payments.

(2) Value of tax exemption on property included in the project from the date of its acquisition to the date of physical completion.

(3) Remission of taxes or special assessments levied on property to be included in the project and which are delinquent or unpaid at the time of its acquisition.

(4) Remission of taxes or special assessments on property included in the project which are levied after the date of its acquisition but before physical completion.

(5) Waiver of building permit, inspection or other similar fees.

(6) Technical, professional or administrative services in the development of a project furnished without cost.

(7) Land, including the net areas obtained by the vacating of streets and alleys.

(8) New improvements (such as grading, street paving, sidewalks, sewers, water mains, landscaping, etc.) furnished without cost to a project.

"Capital Donations" in the form of items (1) to (4) inclusive when made by the State, city, county, or other political subdivision in which a project is situated, may also be counted as "Local Contributions" (see definition herein).

Nathan Straus

NATHAN STRAUS,
Administrator.

January 31, 1939.

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UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 17 ON POLICY AND PROCEDURE

ADDENDUM NO. 1

DEFINITION OF TERMS

Bulletin No. 17 on Policy and Procedure includes on page 1, under the section entitled "PROJECTS", the definition of the term "USHA Projects". This definition reads:

"USHA Projects means projects initiated under the United States Housing Act of 1937 (Wagner-Steagall Housing Act of 1937)."

The purpose of this addendum is to substitute the term "USHA-Aided Projects" for the term "USHA Projects" in this definition. The definition as amended reads:

"USHA-Aided Projects means projects initiated under the United States Housing Act of 1937 (Wagner-Steagall Housing Act)."

Leon H. Keyserling
LEON H. KEYSERLING,
Acting Administrator.

February 28, 1939.

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
Washington

DEFINITION OF TERMS

Bulletin No. 17 on Policy and Procedure
(Revised January 21, 1939)

Addendum No. 2

REVISED DEFINITION OF CAPITAL DONATIONS

This revised definition conforms to the policy as to Development Cost expressed in Bulletin No. 4 on Policy and Procedure (revised June 30, 1939). The attached restatement of the definition of "Capital Donations" differs from the definition originally appearing in Bulletin No. 17 in that: (a) the value of tax exemption on property included in the project from the date of its acquisition to the date of physical completion may not be included as a Capital Donation; (b) remission of taxes or special assessments on property included in the project which are levied after the date of its acquisition but before physical completion may not be included as a Capital Donation; and (c) the net areas obtained by the vacating of streets and alleys may not be included as a Capital Donation.

October 17, 1939

80031 H

I.

REVISED DEFINITION OF CAPITAL DONATIONS

This addendum revises the definition of Capital Donations contained on page 4 of Bulletin No. 17. The definition is hereby revised to read as follows:

Capital Donations means outright aids of a monetary value (other than capital grants made by the USHA pursuant to Sec. 11 of the Act) given to a public housing agency and which are admitted as part of the development cost of a project.

Capital donations to development cost may include such items as:

(1) Cash payments.

(2) Remission of taxes or special assessments levied on property to be included in the project and which are delinquent or unpaid at the time of its acquisition.

(3) Waiver of building permit, inspection or other similar fees.

(4) Technical, professional or administrative services in the development of a project furnished without cost.

(5) Land other than the net areas obtained by the vacating of streets and alleys.

(6) New improvements (such as grading, street paving, sidewalks, sewers, water mains, landscaping, etc.) furnished without cost to a project other than improvements, if any, which are (or customarily would be) furnished to private property owners without cost to them.

Capital Donations in the form of items (1) and (2) when made by the State, city, county, or other political subdivision in which a project is situated, may also be counted as Local Contributions.

Nathan Straus

NATHAN STRAUS
Administrator

October 17, 1939

80031 H

BULLETIN NO. 17

Definition of TERMS

DECEMBER 22, 1939

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY • NATHAN STRAUS, *Administrator*

This Bulletin Brings
USHA Definitions Up To Date

BULLETIN NO. 17 ON POLICY AND PROCEDURE

Revised December 22, 1939

(Substituted for Bulletin No. 17, Revised January 31, 1939, and Addenda No. 1 and No. 2 Thereto)

Definition of Terms

This Bulletin has been revised in order (*a*) to place the Bulletin in a form which will facilitate reference to specific definitions, (*b*) to revise the definitions relating to "rooms," (*c*) to add definitions relating to "density and coverage," and (*d*) to incorporate the two Addenda to the Bulletin in the appropriate paragraphs thereof.

Addendum No. 1 revised the definition of "USHA projects" to "USHA-aided projects." The revised definition is incorporated as paragraph I-(*a*). Addendum No. 2 revised the definition of "capital donations." The revised definition is incorporated as paragraph IV-(*c*). The revised definitions relating to "rooms" appear as paragraph II of the Bulletin and the definitions relating to "density and coverage" comprise paragraph V.

Federal Works Agency
UNITED STATES HOUSING AUTHORITY
Washington

CONTENTS

DEFINITION OF TERMS

SCOPE AND CONTENT.

This Bulletin sets forth certain definitions for use in connection with the USHA-aided program. The definitions relate to (I) projects; (II) rooms; (III) rents and rental values; (IV) USHA annual contributions, local contributions, and capital donations; and (V) density and coverage. The list of definitions contained in this Bulletin is, of course, not all-inclusive. Certain other definitions have been adopted for special aspects of the program. These special definitions appear in the Bulletins dealing with such special features of the program. This Bulletin contains merely the definitions of more general application.

I. PROJECTS.

(*a*) The term "USHA-aided project" means a project initiated under the United States Housing Act of 1937 (Wagner-Steagall Housing Act).

(*b*) The term "PWA Housing Division project" means a public housing project constructed by the Housing Division of the PWA and transferred by Executive Order No. 7732 to the USHA, whether or not such public housing project has been subsequently leased by the USHA to a local housing authority. (This term must *not* be used for a project constructed by a limited dividend corporation with the aid of a loan or loans from the PWA.)

(*c*) The term "PWA Limited Dividend project" means a housing project constructed by a limited dividend corporation with the aid of a loan or loans from the PWA.

(*d*) The term "project" (when referring to a "USHA-aided project" as defined in subparagraph (*a*) above) means that portion of a local housing authority's low-rent housing undertaking to which the USHA has assigned a separate project number. (Ordinarily, this portion will be a development on one site. Each project will, in general, also have a name or geographic designation chosen by the local authority. Names such as "White Project," "Negro Project," or "Latin American Project" should never be used.)

(*e*) The term "statutory project" means a project or group of projects covered by one Loan or Annual Contributions Contract.

(*f*) The term "useful life of a project" means the period of physical usefulness of a project for the purpose of providing dwelling accommodations, but in no event less than the number of years during which any of the obligations issued to aid in financing the development of the project remain outstanding.

II. ROOMS.

(*a*) The term "room" means a space containing a window opening to the outside air and having at least the following area for the use designated:

Living room—150 square feet.
Kitchen—50 square feet, containing equipment adequate for cooking purposes.
Principal bedroom—120 square feet.
Two-person bedroom—100 square feet.
One-person bedroom—65 square feet.

(*b*) The term "half-room" means:

(1) A space added to the living room, to the kitchen, or distributed between them, which is arranged so as to be useful for dining purposes and which makes the total aggregate net area of living room and kitchen not less than 260 square feet.

(2) A space added to another room and having (*i*) kitchen equipment adequate for cooking purposes and (*ii*) a floor area in addition to the minimum required area of the room to which such space is added. (Such space is sometimes designated as a "kitchenette.")

(*c*) The term "room count" means the total of all rooms and half-rooms, half-rooms being counted as one-half each. Bathrooms, halls, closets, laundries, utility rooms, storage rooms, and community or recreation rooms are not counted as rooms.

III. Rents and Rental Values.

(*a*) The term "shelter rent" means the charge established (or estimated) for the use of a dwelling unit excluding the furnishing of any utilities (i. e., water, heat, heating of water, light, cooking fuel, or refrigeration energy).

(*b*) The term "shelter rent plus utilities" means "shelter rent" (as defined in subparagraph (*a*) above) plus the charge established (or estimated) for the furnishing of such utilities (i. e., water, heat, heating of water, light, cooking fuel, or refrigeration energy) as are supplied by the project and which are included in the stipulated periodic payments by the tenant. (In the case of specific projects and in all tabulations, care must be taken to show what utilities are included in "shelter rent plus utilities.")

(*c*) The term "statutory rental value" means "shelter rent plus utilities" less any charge included therein for refrigeration energy, plus the value or cost to the tenant of any of the following which are not included in "shelter rent plus utilities": Water, heat, heating of water, light, and cooking fuel. (Statutory rental values will be established for all dwelling units, and will serve in determining the statutory upper limit of income for tenant admission as provided in Sec. 2 (1) of the Act. They do not include the value or cost of refrigeration energy.)

IV. USHA Annual Contributions, Local Contributions, and Capital Donations.

(*a*) The term "USHA annual contributions" means annual grants made by the USHA to a local housing authority to assist it in achieving and maintaining the low-rent character of a housing project, in accordance with the terms of the annual contributions contract entered into between the USHA and the local housing authority.

(*b*) The term "local contributions" means aids given by the State, city, county, or other political subdivision in which a housing project is situated, to a local housing authority to assist it in achieving and maintaining the low-rent character of the project, and made in any of the following forms:

(1) Tax exemption. Complete exemption from taxes will be considered as providing a local contribution of a value equal to the total amount of all taxes which would otherwise be levied against the project by all taxing agencies, less the amount of payments in lieu of taxes, if any, made by the local authority.

(2) Remission of general or special taxes.

(3) Cash payments.

Aids in any of the above three forms made to a project before its physical completion will be allowed as a local contribution; if admitted as part of the development cost of the project, they will also be counted as "capital donations" (see definition in subparagraph (*c*) below).

The Act requires (Sec. 10 (*a*)) as a condition for the making of USHA annual contributions that local contributions be received in an amount equal to at least 20 per centum of the USHA annual contribution.

Though the above are the only forms of local aid which are defined as "local contributions" and which count toward the requirement of local contributions equal to 20 per centum of the USHA annual contributions, it should be noted that there are many other forms of local aid (including "capital donations") which will be of great value in reducing rents and which should be secured whenever possible. For a full discussion of these, see Bulletin No. 6 on Policy and Procedure.

(*c*) The term "capital donations" means outright aids of monetary value (other than capital grants made by the USHA pursuant to Sec. 11 of the Act) given to a local housing authority and which are admitted as part of the development cost of a project.

"Capital donations" to development cost may include such items as:

(1) Cash payments.

(2) Remission of taxes or special assessments levied on property to be included in the project and which are delinquent or unpaid at the time of its acquisition.

(3) Waiver of building permit, inspection or other similar fees.

(4) Technical, professional, or administrative services in the development of a project furnished without cost.

(5) Land other than the net areas obtained by the vacating of streets and alleys.

(6) New improvements (such as grading, street paving, sidewalks, sewers, water mains, landscaping, and the like) furnished without cost to a project other than improvements, if any, which are (or customarily would be) furnished to private property owners without cost to them.

Capital donations in the form of items (1) and (2) when made by the State, city, county, or other political subdivision in which a project is situated, may also be counted as local contributions.

V. Density and Coverage.

(*a*) The term "gross density" means the number of dwelling units per acre of gross area of land. The gross area shall be the area of the project within property lines (to be used for immediate development) plus the area of all streets which traverse the site, plus the area to the center line (not measured beyond 40 feet) of all boundary streets and one-quarter the area of all boundary intersections (not figured over 1,600 square feet), plus the area, to a maximum distance of 40 feet, of any adjoining public park, playground, or any other adjoining open or unbuilt-on area which may reasonably be assumed to be permanently open. Where the project abuts property other than a public park, permanent open space, or streets, no area beyond the property lines shall be included. Gross area shall not include the area of land reserved for future development nor the area of streets traversing such land, nor any area of streets or other open areas adjoining such land.

(*b*) The term "net density" means the number of dwelling units per acre of net area of land. The net area shall be the area within property lines (to be used for immediate development) including narrow service drives, small play spaces, sitting-out areas, laundry drying yards, and automobile parking areas, but *excluding* all public boundary streets and public streets which traverse the site (whether existing or to be dedicated), land reserved for future development, unbuildable land, major recreation or park areas or major automobile parking spaces which are additional to the over-all project pattern of open spaces, and the land covered by and immediately associated with community buildings, central or group heating plants, commercial buildings, and other nonresidential structures.

(*c*) The term "net coverage" means the ratio of the ground area of dwelling structures to the net area of land (as defined in connection with "net density" in subparagraph (*b*) above). The ground area of dwelling structures shall be the area at grade level of all dwelling buildings, including bays, chimneys, and enclosed porches to the outside surfaces of exterior walls. Outside stoops, steps, terraces, and footings shall not be included.

Nathan Straus

NATHAN STRAUS,
Administrator.

December 22, 1939.

U. S. GOVERNMENT PRINTING OFFICE 202557

SITE SELECTION.

February 13, 1939

FEDERAL WORKS AGENCY - UNITED STATES HOUSING AUTHORITY

A DISCUSSION OF THE FUNDAMENTAL FACTORS INVOLVED IN SELECTING SITES FOR USHA-AIDED PROJECTS

BULLETIN NO. 18 ON POLICY AND PROCEDURE

SITE SELECTION

This Bulletin discusses the basic factors which Local Housing Authorities should consider in selecting sites for USHA-aided projects. Thus, the Bulletin discusses site selection and its relationship to city planning, the factors determining the size of the site necessary for a particular project, and also the racial considerations involved in site selection. The general principles governing the determination of whether a vacant or a slum site should be selected for a particular project are likewise outlined. The Bulletin also contains a detailed check list of the various items to be considered in site selection.

The attention of Local Authorities is invited particularly to the advisability of making a careful comparative analysis of several alternative sites before selecting a site for a particular USHA-aided project. The Bulletin explains the items which should be considered in such a comparative analysis. Among them are the comparative costs of street construction and utilities, the comparative transportation costs to the different sites, the possibility of eliminating through traffic, and the presence or absence of natural site boundaries. Such a comparative analysis will indicate whether cheaper land cost for a particular site, or other obvious factors making a particular site initially attractive, will actually result in ultimate economy and ultimate desirability.

FEDERAL WORKS AGENCY

UNITED STATES HOUSING AUTHORITY

Washington

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CONTENTS

SITE SELECTION

After a local housing authority has obtained an earmarking of funds, but before a formal application for financial assistance can be considered by the USHA, the local authority must have selected a site or sites for its proposed housing project. Because of the large number of variables which enter into the problem of site selection and because deciding factors will be different in each locality, it is not possible to lay down definite rules to govern this procedure; only general suggestions which may be helpful to the local authority in approaching this very difficult and highly important part of its work may be set forth in this bulletin. But certain fundamentals will be discussed.

In facing this task, the full responsibility must be assumed locally, but the local housing authority may avail itself of the advice and assistance of the USHA advisers who are assigned to its territory and of the members of the USHA staff in Washington.

Site Selection in Its Relationship to City Planning

The problem of site selection should be approached with a full realization of the importance of the relationship of the low-rental housing program to city planning, city building and city rebuilding in the locality concerned. Where such a program is being undertaken with the financial cooperation of the USHA, it must immediately assume more of a long-term aspect than can possibly be assured for the usual type of residential community development. This is apparent because of the policies of the USHA. These policies require:

(1) that the planning and design of housing projects to which it gives financial assistance shall be such that their useful life shall be at least the term of its loan, which is usually not less than 60 years, with the prospect of a much longer life, and

(2) that maintenance, including provision for replacements, shall be such that living conditions on the site, insofar as they may be affected by the physical state of the property itself, shall remain unimpaired during this entire period.

Permanency as to character is necessarily an idea inherent in any housing plans based upon these policies.

In the development of American cities in the past, permanency of character for residential areas has not often been attained. The people who, acting individually, have been responsible for the piecemeal and haphazard building of urban residential areas, have either not given sufficient thought to the idea of permanency of character or have naively invested their money, their efforts and their hopes in the belief that such permanency was assured.

There havebeen expedients applied in the hope of insuring stability of character for at least a reasonably long period for specific residential areas. But they have not been effective in forestalling the apparently inevitable change, which in the vast majority of cases takes the final form of complete deterioration. And the end products of this deterioration are the slums. Among such expedients are deed restrictions of various kinds; but the protection from these is at best transitory and they cannot prevent the creeping mutations in the character of the surrounding community which follow in the footsteps of the passing years. Likewise, the latter-day instrumentality of zoning, essential as it is as a method of protection and stability, cannot be relied upon to hold back, by itself, these inevitable changes.

How, then, may there be for a new housing project assurance as to a continuingly satisfactory environment and a proper position in the city structure? There is no infallible formula for the attainment of these ends. But this question leads us logically to the main theme of this part of the discussion, which is the essential inseparability of housing planning from city planning. The sad picture of decay and disintegration which almost every city presents should be enough to prove the fact of this inseparability. But the long-term provisions under which housing projects are built with the aid of USHA funds make mandatory the application of this principle.

As has been indicated above, the long-term character of housing projects sponsored by the USHA is to be insured, insofar as the property within the boundaries of the project is concerned, through the design and maintenance policies to be followed. But this internal protection must be supplemented by the protection of initial appropriateness of the position of the site within the city structure. The city planning aspect of site location for low-rental housing (and, in fact, for residential development of any type) is double-edged in its implications: first, there is the effect of the location within the city plan upon the future of the housing project; second, the effect of the project's location upon the city plan. The latter is as important as the former, - from the standpoint of the broader interests of the city, perhaps more important.

City planning implies the visualization of a pattern for the city's structural and functional elements. Among these elements are the system of major highways; the supplementary system of secondary and of local streets; the areas of specialized land use, including areas allotted to industry, commerce, and residence; the system of local passenger transportation facilities, including street car and rapid transit lines, stations for suburban commuters, and existing or possible bus routes; the railroads and railroad facilities, including passenger stations, freight stations, switching yards, repair shops, etc.; the parks and parkways; the cemeteries; the public and parochial schools; the universities and institutions of higher education; the civic and governmental centers; the permanent stadiums, ball parks, athletic fields, race tracks, and fairgrounds; the playgrounds, swimming pools, and minor recreational system; the libraries; the hospitals, medical centers, and correctional institutions; the waterfront facilities; the airports; the major system of utility mains and utility plants, including water supply, gas works, and sanitary sewage disposal; the permanent plant for such municipal services as garbage and refuse disposal and fire protection; etc.

These are the elements which form the complex physical structure of a city. The pattern as a whole must necessarily change as time goes on; no American city has reached a static condition in its physical development. But the uncontrolled and unguided changes to which our cities have been subject in the past have left a trail of heart-breaking economic and aesthetic loss; and the resulting burden of inconvenience and economic hardship must be borne not only by the present generation but by generations to come. It is the object of city planning to reduce to a minimum this loss and burden through a rational guidance and control of these inevitable changes in the community's structure.

It is obvious that the housing program must be properly fitted into this city pattern, both existing and as projected into the future. Its relationship to all of these constituent elements must be considered. Among the items of most vital importance to housing projects for low-income families, however, is assurance of the continuance of ample opportunities for employment within reasonable distances. The relationship of the site, not only to industrial areas and other fields of employment, but also to the transportation system is therefore very important. The housing authority should take into account any trends affecting employment opportunities such, for example, as the tendency of industries to move to the suburbs along certain favored lines of transportation. Reference will be made in other sections of this bulletin to numerous other items which should be considered during the process of site selection; some of these are inherently associated with city planning.

The local housing authority then, with a full realization of the importance of the relationship between the task with which it is charged and the broader phases of city planning and regional planning, is confronted with the problem of bringing into play such planning instrumentalities as may be available. If there is an active and technically competent city planning commission, so much the better. Its advice and, if possible, its services should be enlisted. But the housing authority, must itself do sufficient city planning to insure the proper integration of its program with the city structure, particularly if the local planning body is not active or technically competent. In such case, it will do well to stimulate the interest of the local planning body and to encourage it to improve its technical competence. Where no planning agency whatever exists in the community, there is a wonderful opportunity for a group so strategically placed as a housing authority to take the lead in bringing into being an effective movement to establish city and regional planning as an active and permanent force in its locality. Because of the fact that housing and city planning are so closely inter-related, such promotional activity is certainly a legitimate interest of a local housing authority.

If there is an active city or county planning commission, the local housing authority should endeavor to obtain from it definite and official approval for its selection of sites. The timing of the announcement of such approval may be subject, sometimes, to the question of expediency as to when the selection should be made public. Even in communities where the local planning body is not active, or where there is doubt as to its technical competency, the housing authority will strengthen its position and lessen the danger of future attack upon its choice of sites by bringing the official planning agency into its deliberations.

In the city planning aspects of its work, as well as in all other aspects, whether technical, legal, social, economic or financial, the advice and services of the USHA are available to the local housing authority to the extent to which it may wish to make use of them.

Zoning

An adjunct and instrumentality of city planning is zoning. As has been indicated above, the mere zoning of the project or its immediate neighborhood, without relation to the more permanent elements of city planning and without integration with a broad plan of city-wide zoning, can be by itself little more than a temporary protection. Even so, such zoning protection as may be available is necessary for each housing project. The protection of the site through proper zoning should be considered one of the essentials.

Not only should the surrounding areas be so zoned as to insure continued protection for the project, but the site itself must be appropriately zoned for the type of structures which are to be built upon it.

Where there is not an adequate plan of zoning in the community, adequately enforced, there is the opportunity for the local housing authority, as in the field of city planning discussed above, to take the leadership in promoting an effective zoning program by sponsoring a comprehensive zoning ordinance.

Rezoning of adjacent areas for the protection of the project is frequently a requirement written into the contract under which the USHA extends financial assistance to the local housing authority. Rezoning is sometimes difficult to bring about, as is also the elimination of objectionable nonconforming uses under existing zoning. The matter of zoning technique and zoning procedure, including the legal problems involved in the establishment of zoning, is frequently outside of the experience of the local housing authority. A separate bulletin of this series will deal with this subject. On all matters related to zoning protection for housing projects there is available to the local housing authorities the advice of the special city planning consultants of the USHA, as well as of its legal and project planning advisers.

Preliminary Determination of Minimum Size of Site Required

Before beginning its search for a site the local authority should have determined, at least in a general way, the principal characteristics and the approximate size and racial composition of the market for the type of housing which it is proposed to build, and from this information a tentative determination should have been made of the number of residence units which are to be constructed. The services of the USHA advisers, and particularly of its Research Division, are available in this essential preliminary investigation. If the conditions in a given locality call for special consideration of major racial elements in the market and if the needs, customs and preferences of racial groups should properly enter into the question of site selection and occupancy assignment, it would be well to have, at this point, a fairly well-defined idea as to the distribution of the total number of units to be built among the racial groups which are to be served. Racial policy in its relationship to site selection is discussed in another section of this bulletin.

Although the number of units to be built will influence the question of the amount of ground which must be obtained and will establish a minimum limit to the size of the buildable area of the site, this factor will not necessarily fix the maximum size of the site. The advisability in a given case of obtaining presently land for future enlargement of the project will be influenced by the availability and the cheapness of additional suitable land. In certain cases the purchase of more land than may ever be needed for the housing project itself may be desirable for purposes of protection to the project, provided that the cost is not too great. (On the matter of the purchase of excess land, see Bulletin No. 1 on Policy and Procedure.)

There are many cases, particularly in the more congested cities, where there is no single site available at a reasonable cost which is large enough, without overcrowding, for the number of units which it may be desired to build on a single site in the city as a whole or in an approximately defined section of the city. In such cases study should be given to the possibility of dividing the desired number of units among more than one site, and sites which fulfill the requirements of the project in respects other than size should be sought; but the reduced number of units to be built on any site must not be below the minimum necessary for operating efficiency.

Size of Site in Relation to Site Density

Although the foregoing discussion of the influence of the number of units on the size of the site suggests an aspect of the site selection problem which the local housing authority should have in mind when it begins the search for sites, actual experience shows that among projects which have been approved by the USHA there has been the widest variation in the relationship of the size of site to the number of units. The average condition as to density for a group of 72 of the sites which have been approved is 21 units per net acre. (Net acreage is the area of the developed portion of the site after public thoroughfares have been deducted.) Certain projects with exceptionally high densities, such as those in New York City and Boston, are not included in this group. The range of density in this group of 72 sites is from 39.8 to 5.4 units per net acre. The median figure for this group is 19.7 units per net acre. The principal significance of these figures is that they show the wide range of density and indicate that there can be no rule of thumb whereby the size of the site required for a given number of units can be figured with complaisant exactitude. The existence of this wide range shows that a large degree of individuality has been used in site planning and the provision of open spaces, recreation areas, and types of dwelling and non-dwelling buildings.

The density will be influenced materially by the type of structures which are built. During the development of the plans, but not necessarily at the time of site selection, there must be a decision as to the dwelling types or combination of types. These types may be apartment buildings, either of the walk-up kind or of the multi-story elevator kind, one-story or two-story row houses, flats, "twin" houses, or single detached houses. It is obvious that site density which may be appropriate for one type of housing may not be appropriate for some other type. The fundamental consideration is that density must not be so great as to jeopardize the admittance of sunlight and air, privacy, and other amenities of living for the tenants, or as to be inconsistent with the characteristics of the community and the neighborhood in which the project is located.

In thinking of the matter of site density and of the types of buildings we must not forget the objective of our program, namely, the building of housing for the lowest income groups. We must restrain our enthusiasm for the ideal and accept solutions which, while fulfilling the requirements of good housing for these people, are nevertheless within the limits imposed by the necessity of careful economy both in first cost and in subsequent operating cost. Under ordinary conditions a decrease in density will increase the cost per unit for land, utilities and site improvements, and, in most cases, the cost of operation thereafter. This is one of the considerations which has caused the widespread adoption of the row house plan of development, frequently in cases where it was the original desire of the local housing authority to fulfill the ideal of the detached house on an individual lot.

Although the economic factors of site density must be carefully considered, there are other factors for the influencing of density and the type of buildings which must not be neglected. Among these are the geographical location of the city, which influence its climate and the habitation customs of its inhabitants, the size of the city, and the location of the site in the city in its relationship to existing densities or densities which may be contemplated by an established city plan or zoning plan. The details of the site plan will finally determine the density. The principles of site planning are discussed in Bulletin No. 11 of this series.

In the matter of appropriate densities, as in other problems of the local housing program, the advice of the local city planning body should be sought at the very beginning of the search for possible sites.

Sectional Distribution of Housing Projects Within the City

In many cases the total market as determined for the community as a whole should not be the sole basis for the determination of the number of units for which a site must be selected. Sectional influences within the community may tend to prevent freedom of movement of families from one part of the community to another. The total market may be divided into geographic segments between which there may be but little hope of interchange of families. Such sectionalization of the market may result from the existence of various employment concentration points, together with transportation difficulties and distance or topographic barriers; or from a determined preference of special groups, racial or otherwise, for certain sections of the community in which they have long been established. The question of site selection, as affected by the number of units to be built, should therefore be studied in its relationship to the geographical distribution of the total market, insofar as such distribution may be considered as being set in a somewhat permanent pattern.

Racial Considerations in Site Selection

The second prerequisite assumption with which the local authority should begin its search for a site is that concerning the racial distribution of the total number of families to be served - that is, if the authority has decided that local conditions indicate that there should be any distribution along racial lines. This subject has been mentioned briefly above. Where it has been decided that a project should be built to serve families who are predominantly of a given race, care must be exercised in selecting a site which will not do violence to the preferences and established habits of members of that race or to the community life of which they may be a part. The aim of the authority should be the preservation rather than the disruption of community social structures which best fit the desires of the groups concerned.

Particular care should be exercised in site selection to safeguard the interests of minority groups which may be affected. Although it is the responsibility of the local housing authority to decide its own racial policy, certain desirable principles may be suggested for application in this connection. Some of these may be enumerated as follows:

(1) The development of public housing projects for white occupancy in areas now occupied by Negroes or other minority racial groups is undesirable. This is particularly true where a considerable amount of home ownership or existing community facilities indicate that an integrated community of Negro, Mexican, or other minority composition is established.

(2) Whenever exceptions are to be made to this general policy, the local authority should demonstrate the circumstances which it believes justify the exception and there should be obtained, if possible, a statement of concurrence in the program from representative spokesmen of the racial group to be displaced.

(3) Any local program which involves the demolition of a number of houses available to minority racial groups which is considerably greater than the total to be provided for these groups in the new project is undesirable. In many sections of the country the supply of housing available to minority groups - Mexicans and Negroes particularly - is artificially limited by racial restrictions. If houses in which these groups are now living are demolished, houses in other sections of the city evacuated by tenants moving into the new projects are seldom available to these displaced minority groups. In the case of home owners of the minority groups there will generally be great difficulty in acquiring comparable homes elsewhere in the city.

(4) If it is decided to develop sites which are either inhabited now by members of more than one race or, in the case of vacant sites, are contiguous to neighborhoods which are inhabited by different races, local authorities should plan projects open to the members of these different groups.

Study of Alternative Site Possibilities

Having arrived at a fairly well-defined decision as to the number of units for which a site or sites must be found and bearing in mind the racial implications of the problem, as discussed above, if any should exist, the local authority will do well to examine the possibilities and the suitability of as many different sites as may have a reasonable claim to attention and, by a process of elimination, to narrow its examination to a few which appear to be worthy of a more intensive study. The practice, which occasionally is followed by a local housing authority, of jumping to a conclusion in the selection of a site without having thoroughly explored the possibility of there being a superior alternative, is to be condemned.

It is strongly recommended that a tabulation be prepared to show side by side the characteristics of the various sites which are worthy of consideration. Frequently a site which may receive little attention as a possibility at first will appear in a more favorable light after a detailed comparison with other possible sites. It is to be remembered that in making such comparisons, as elsewhere in the development of the local authority's program, the services of the legal and project planning advisers and of other specialists of the USHA are available. In the following pages some of the additional factors which should be considered in connection with site selection will be discussed. The check list which is included hereafter in this bulletin may be used as a basis for rating alternative site possibilities.

Vacant or Slum Sites

Although the objectives of the U. S. Housing Act of 1937 include slum clearance as well as the building of homes for the lowest income groups, it will be well for the local housing authority to begin its site selection study without a predetermined decision as between a slum-site program and the use of vacant or partly vacant land. The availability of properly placed sites of each type should be explored and the comparative advantages, economic and otherwise, of each type should be examined.

A slum clearance site which may in other respects seem very desirable may, upon investigation, prove to be too expensive to acquire; or the problem of relocating present residents may present serious difficulties. A further analysis of the racial situation may show unexpected complications. As slum sites are generally held by a large number of individual owners, the difficulty of acquisition or the danger of delay may, upon investigation, appear to be serious. Above all, a check of land uses, both existing and trends, in the vicinity of the site under consideration, either with the assistance of the City Planning Commission (if there is one), or as undertaken by the local authority, may show that the site is better suited to other than residential uses or that it is definitely unsuitable for continued use as a residential neighborhood.

On the other hand, a vacant site may at first arouse enthusiasm because of its cheapness or its ease of acquisition, or because of its excellent topography or beautiful surroundings. But a more careful examination may show that it should not be selected because it is not properly located with respect to employment opportunities for the low-income families which would be its tenants; or because school facilites or transit facilities are inadequate and the prospect of such lack being corrected is remote; or because utilities are lacking and cannot be extended to the site without considerable expense to the project or to the city; or because its location within the city structure is such that it should logically be put to other than residential use, such as industry or perhaps a public park; or because the site is more suitable for residential development by private industry for a higher income group.

These are a few of the faults which may appear when the local authority undertakes a careful evaluation of sites to which its attention may in the beginning be hopefully directed. They are cited here in order to emphasize the desirability of making a careful comparative analysis of the merits of a number of sites, before any off-hand decision is made either as to a particular site or as between a slum-site and a vacant land program.

Where the relocation problem would be serious under a slum-site program, and particularly in communities where it may be expected that more than one project will be built, either presently or within the near future, it may be advisable to choose a vacant land site for the first development. If the slum clearance part of the program is deferred until the new housing on the first project is available or nearly available, the relocation difficulties will be alleviated.

Natural Boundaries of the Site

It is well to bear in mind the fact that it is desirable, other things being equal, that a site have natural boundaries, at least on a portion of its periphery. This is both in the interest of the protection of the project and in the interest of a logical future extension of the housing or slum clearance program. Such natural boundary may be a park, a cemetery, the grounds of a large public institution, a river or stream, a ravine or a bluff, a railroad, an important street or highway, or a well-defined boundary of a commercial or light industrial area. In a slum district or blighted area a first project will seldom clean up all of the blight. It is therefore sensible to locate such project in a position from which it can be readily expanded step by step. Should the project be set down in the middle of a slum area which may be considered as appropriate for future reclamation and residential use, the chances of spotty industrial and commercial encroachment are increased. If, on the other hand, the reclamation program should begin with a site adjacent to a natural boundary of this area, the danger of such uncontrolled spotty development would be lessened.

There are, of course, various considerations, including that of cost, which may make it necessary to select a first site without regard to this question of natural boundaries. In such cases it would be well to locate the site so that it may eventually be expanded outwardly to reach some natural boundary. This is especially true for slum clearance sites, but it may sometimes be equally true for a site in open territory. In the case of a site in open territory it is well to remember that population density on the first site should not be established at such a high level that it will tend to make more difficult the later acquisition of the adjacent land.

A somewhat different but related matter is the situation where certain street frontage is too expensive for use for low-rental housing but may to advantage be acquired and leased to private developers for commercial or other uses as a measure of protection to the project, in order to eliminate a "business slum" along its border, or in order to provide for street widening, or in order to insure desired points of access to the project. The introduction of this subject is not to be interpreted as establishing any general policy of the USHA under which the acquisition of land for commercial purposes is authorized. Any such plan must be justified by the special circumstances peculiar to a given project. But it is mentioned here because it may, in certain cases, have a bearing on the question of site boundaries.

Exclusion of Through Streets from the Project

If possible a site should be selected which will permit the exclusion of through traffic from streets within the project. The optimum condition is where there are no streets within the project except those which are necessary for the service of the project itself. It will also be in the interest of safety for children and of quietness if there are no streets which carry heavy traffic on its boundaries. It is especially desirable that the site should not be split by a major traffic artery. It is true, of course, that in some cases other circumstances affecting site selection make the avoidance of this condition impossible. In general, the objections to the inclusion of a major thoroughfare decrease as the size of the project increases.

The closing of even minor streets which may be so located as to encourage the through movement of traffic is also most desirable. This possibility is sometimes complicated by the existence of utilities under the streets which should not be moved. Even so, it is often possible to close the streets and arrange the position of buildings so that the utility lines are left under the project open spaces. The attitude of the city government and the city planning commission on desirable street closing should be determined before a decision on site selection is made.

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Comparison of Costs of Street Construction and Utilities for Various Sites

Land values are obviously governed to some degree by the extent of public improvements already built and for which the property owners have been assessed. In comparing propsective sites, it will frequently be desirable to make comparative estimates on the probable cost to the project of street construction or reconstruction and of utility installation. For comparative purposes, such costs must be added to the cost of the land.

For example, it may be found that for a vacant tract the cost of land plus the cost of site improvement items such as street paving, storm and sanitary sewer mains, and water and gas mains, will be more per acre than for a slum-clearance site where such improvements are, for the most part, already built and in usable condition.

Approximate, comparative estimates can be prepared readily and will present the facts in a concrete manner. The figures should obviously not include work which it may be safely assumed will be donated by the municipality. The cost of service roads, utility services, etc., within the project property will generally be much the same for sites of comparable size and therefore may not be particularly significant for the purpose of site comparison.

Such evaluations may be extended to cover differences in costs resulting from varying physiographic conditions, if these differences are significant; - for example, excess grading and foundation costs of one site as compared with another.

Transportation Costs

As we are considering housing for the lowest income groups only, the effect of site selection on the cost of transportation for the tenants is of great importance. Added transportation costs are virtually equivalent to added rents. The USHA is to pay subsidies in connection with these projects over a long term of years in order to reduce rents. It would therefore be illogical to select a site on the merits only of its lower first cost if its location is such that the additional transportation cost to the tenants would in part nullify the advantages of the subsidy. Sometimes there may be an approximate theoretical economic balance between the additional first cost of one site as compared with the additional continuing transportation expense which the selection of another site would impose upon the tenants. Even so, there should be compelling reasons other than first cost for the choosing of the cheaper of two sites if the resulting transportation cost to the tenants is materially increased thereby. Even where there is a theoretical balance of the economic factors it should be remembered that the policies of our present program call for greater consideration being given to the continuing expenses of the tenant than to the first costs of the project.

Consideration should be given to the possibility, however, that a present unfavorable transportation cost condition will tend to change for the better. For example, an outlying site may be justified if it is thought that within a reasonable time industry will move either near to it or beyond it and thus place it in a more favorable position as to transportation to a large field of employment.

In comparing the merits of sites from the standpoint of transportation costs, due consideration may be given to the probability that a certain percentage of the tenants will use automobiles, either individually or in a cooperative way, as their regular means of transportation. This percentage will vary in different parts of the country. There are cities where a large proportion of even the poorest families manage to own some kind of automobile. The future trend in this matter cannot be predicted.

Check List of Items to Be Considered in Site Selection

In the preceding paragraphs there have been discussed some of the factors which the local housing authority should have in mind when it approaches the problem of site selection, including some of the fundamentals of that problem. In the following list are various points which should be considered in the comparative analysis of the sites which are being investigated. The order in which they appear is not to be taken as being indicative of their relative importance. This list is not necessarily all-inclusive, since under local circumstances there may be items not mentioned here which should have an important influence upon site selection. It is suggested that in rating sites the following items be considered:

1. Present and Future Land Uses in the Neighborhood and in the City as a Whole.

   (a) Effect of present neighboring land uses, such as heavy industry, light industry, commerce, or railroads, upon suitability of the site for residential use.

   (b) Present zoning of the neighborhood for land use.

   (c) Discernible trends or reasonable predictions as to changes in land use in the neighborhood and in the city as a whole as such changes may affect the suitability of the site for residential use or the permanency of the residential character of the neighborhood.

   (d) Effect of any particularly harmful land uses or environmental factors, such as may produce, in an objectionable degree, noise, odors, smoke, dust, flies, mosquitoes, etc.

(e) Zoning changes which should be obtained for the protection of the project.

(f) The prospects as to the possibility, from a practical standpoint, of bringing about zoning changes which may be essential for the protection of the site.

(g) Suitability of the neighborhood for the type of structures (apartments, row houses, etc.) which it may be intended to build.

2. Population Factors.

(a) Suitability of the site from the racial standpoint.

(b) Population density of the neighborhood, or prospective density, as it may have a bearing upon the type of housing project proposed.

(c) Population trends in the city as a whole as they may have a bearing upon the future population of the neighborhood and its continuing stability as a residential district.

3. Accessibility to Employment.

(a) Accessibility of the site to centers of employment or to fields of scattered employment in which the low-income tenants of the project may be expected to be engaged, either by walkable routes or by transportation facilities which are reasonable both as to cost and as to time of travel.

(b) Adequacy of the employment opportunities to which the site is easily accessible to meet the needs of the number of families to be tenanted on the site.

(c) Stability or seasonal character of the employment to which the site is considered accessible.

4. Transportation Facilities.

(a) Existing transportation facilities within a reasonable distance from the site which can furnish satisfactory service to tenants in going to employment and to commercial or other community centers.

(b) Prospects for the establishment of needed transportation facilities where adequate facilities do not exist.

(c) Adequacy of service and schedules of existing transportation facilities or prospects as to obtaining adequate service.

(d) Cost to tenants of necessary transportation service.

5. School Facilities.

(a) The distance by walkable routes to grade schools both public and parochial.

(b) The distance by walkable routes or by transportation routes to junior high schools and to high schools.

(c) The capacity of appropriately located schools of all grades to absorb the children of the project.

(d) Where conveniently located schools of adequate capacity do not exist, the prospects as to proper facilities being provided, either through the building or enlargement of schools or through the provision of transportation to existing schools.

6. Recreational and Social Facilities.

(a) Accessibility to existing parks, playgrounds, or other recreational facilities, with due consideration to whether these facilities will be available to the tenants of the project.

(b) Prospect as to future public recreational facilities to be available to the tenants.

(c) Accessibility to religious and social facilities for the tenants.

(d) Necessity for the construction of supplementary recreational and social facilities as a part of the project if the site under consideration is chosen, and the probable effect upon first cost and operating cost of the project.

7. Accessibility to Stores and Other Commercial Services.

   (a) Accessibility of the site to existing commercial centers or to commercial centers which may be expected to be developed by private enterprise outside of the site.

   (b) Need for the provision of commercial facilities on the site as a part of the project development.

8. Topography and Physiographic Features of the Site.

   (a) Topography of the site as it affects the percentage of buildable area and the possibility of an acceptable site plan, considering its aesthetic aspects, its livability and convenience for the tenants, and its economy of maintenance.

   (b) Topography of the site as it affects cost of building construction and of site improvements.

   (c) Topography of the site as it affects vehicular and pedestrian access to the project and connections with the external thoroughfare system.

   (d) Grading requirements in general.

   (e) Rock excavation to be encountered in grading or in building construction, particularly if cellars are deemed desirable.

   (f) Underground conditions with respect to old mines which may cause "sinks," or with respect to burning coal seams.

   (g) Liability to flooding from rivers, streams or "tidal back up," and present or prospective protective measures against flood.

   (h) Ground water conditions as they may affect cellar dampness or foundation stability and possibilities as to drainage of swampy areas or lowering of ground water level.

   (i) Character of the ground as it affects its bearing capacity for foundations, as, for example, in the case of alluvial deposit requiring piling for adequate support of structures.

   (j) Conditions as to filled ground or old refuse dumps, upon which buildings could not safely be placed without expensive foundation work.

9. Availability and Adequacy of Utilities.

(a) Water supply and character of the water available (water softening expense, effect of acidity on piping, etc.), including information from qualified engineers as to the adequacy of the supply mains and of the source of supply for the number of families proposed and for fire protection for the project, and including information as to approximate cost to the project, if any, of providing adequate supply mains.

(b) Sanitary sewage disposal provisions, including information as to measures necessary for disposal, the adequacy of existing mains, and the cost to the project, if any, of providing adequate mains.

(c) Storm water disposal, including positive information on the adequacy of existing storm sewers and the cost to the project, if any, of providing adequate drainage facilities; also information on the question of the responsibility for taking care of storm water which flows from the site into adjoining streets and properties, and including any legal question arising from the need of diverting storm water from natural channels.

(d) Electric current supply, including proximity of adequate power lines and any question of cost which may be involved in the extension of service to the project, and including any question of differential rates as they may be affected by the location of the site.

(e) Gas supply (if the use of gas is to be considered), including proximity and adequacy of the mains from which the supply must be taken and including any question of cost to the project for the extension of the mains to the project boundaries.

10. Community Services.

(a) Disposal of garbage and refuse, including the responsibility for its performance and the method of disposal as affected by the site location.

(b) Fire protection, as affected by the site location and by street access, and the possible influence upon insurance rates.

(c) Police protection, snow removal, street lighting, street tree planting and maintenance, and other municipal services as affected by site location.

11. Relation to the Thoroughfare System and Condition of Streets.

(a) Accessibility to the site by way of paved streets of the prospects for the building or paving of access streets by the municipality.

(b) Condition and extent of present improvements on streets within, bounding, or leading to the site which are to remain open, and cost to the project, if any, of their paving or other needed improvement.

(c) Position of the site in the general street or highway plan of the community as it may affect the character of the project or as it may affect the carrying out of the street or highway plan by the municipality or county.

(d) Relationship of the site to major thoroughfares which may be objectionable from the standpoint of noise or hazard, either because they pass through or are adjacent to the site.

(e) The street or highway system in the neighborhood of the site as it may affect the safety or convenience of children in going to schools or commercial centers.

(f) The possibilities as to the closing of existing streets within the site, taking into account utility lines in existing streets.

12. Possibility of Later Enlargement of the Project.

(a) Possibility of future acquisition of suitable adjacent vacant or built up land at reasonable cost.

(b) Adjacent barriers to future extension of the project.

13. Cost of the Site and Acquisition Problems.

(a) The probable cost of land to be purchased.

(b) The possibility of the donation of land, either by private owners or by the municipality.

(c) The prospect of serious acquisition difficulties which may block delay assemblage of the tract.

(d) The existence of easements for underground or overhead utilities or of mineral rights, water rights, or riparian rights, which may complicate site acquisition or interfere with the project in any way.

(e) The inclusion within the site of historical land marks or monuments, which it would be to the public interest to preserve, or the destruction or removal of which might cause public resentment.

(f) The inclusion within the site of a considerable number of good houses, or of stores, churches, industrial plants, or other structures, the destruction of which would be hard to justify.

14. Relocation Problems.

(a) The racial aspect of the problem of relocating present residents of the site (as discussed hereinbefore).

(b) The relocation problem caused by the removal of present residents, in its relation to an existing housing shortage.

The preceding discussion of site selection may be supplemented to advantage through the reading of some of the other bulletins of this series, especially Bulletin No. 1 on Excess Land, Bulletin No. 5 on Progressive Steps in the Initiation of a Low-Rent Housing Project, Bulletin No. 11 on Site Planning, and Bulletin No. 14 on Site Engineering Design. An examination of the form provided for the use of local housing authorities in making formal application to the USHA for financial assistance will also be of value at the beginning of the site selection task by indicating the items of information concerning proposed sites which must be presented to the USHA and also the factors of need, market, and racial policy which must justify the selection of sites.

Site Selection and Publicity

The entire procedure of site selection must be conditioned by the necessity of avoiding premature publicity as to sites which are being considered or have been chosen. In the normal case publicity is generally not advisable until a certain stage in the progress of the work has been reached. Sometimes this is not until the taking of options is under way. Premature publicity may result in increased prices and in obstructive measures of various kinds. On the other hand, unnecessary secretiveness may result in public resentment. Each local housing authority should use due discretion as to the proper time for publicity concerning its choice of site.

Conclusion

The foregoing discussion is intended to bring out emphatically the principle that the proper selection of sites constitutes the foundation upon which a housing program must be built to be successful. The full realization of this fact on the part of the members of local housing authorities and of their responsible technical advisers will go far toward insuring the success of local housing programs.

Nathan Straus

NATHAN STRAUS,
Administrator.

February 13, 1939.

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 19 ON POLICY AND PROCEDURE

PLANNING UTILITY SERVICES AND RATE NEGOTIATIONS

In planning for low rents, a basic consideration is the cost imposed on the tenant, in addition to the shelter rent, for the use of those utility services which must be provided in order that his dwelling shall be "decent, safe, and sanitary". These services may include water, heat, heating of water, light, cooking fuel, or refrigeration energy. The cost of these services must be carefully considered in relation to both shelter rent and the total budget allowance for rent and household operation of eligible families. It is obvious that it is this relationship between the budget allowance and the combined cost of shelter and utility services in the new housing, and not the relative cost of any one item, which must be the guide to planning for utility services.

The large-scale planning and centralized operation and maintenance which characterize all housing projects make possible combinations of services and types of purchase not ordinarily applicable to individual dwellings or dwellings in multiple ownership. A housing project, by an arrangement of services which realizes fully its group characteristics, may be expected to achieve lower costs of utility services per dwelling unit than a scattered collection of dwelling units.

In planning utility services, the various types of fuel and energy, types of service, and types of purchase which may be combined should be studied from the viewpoint of initial costs of equipment and installation, repairs, maintenance, and replacements, and charges to tenants for fuel or energy consumed, in order to arrive at a comparative analysis of total monthly charges to the tenants for the various feasible types of service.

The costs and uses of electricity and gas are the primary consideration of this bulletin. Where economy will justify its use, electricity may be considered for lighting, refrigeration, cooking, power, occasionally for water heating, and, in warm climates, for space heating. However, gas should be given full consideration for all services other than lighting and power. Where the costs of supplying these services by means of electricity or gas, or both, are not satisfactory, consideration should be given to any substitute fuels which will give adequate service at a reasonable cost.

Space heating and water heating will be discussed in another bulletin. However, in some cases the choice of a single type of energy or fuel for all of the utility services including space and water heating will result in the greatest relative economy, and consideration should therefore be given to the effect of various methods of providing space and water heating on the total costs of utility services.

The costs of water do not affect the comparative costs of the other utility services. For the greatest economy, water should generally be provided on a wholesale basis. Where water mains exist or may economically be extended to supply service to a project at more than one point, meter readings at the various points of taking service should be totalized, and the rate based on the total consumption. Because of the importance to health of an adequate supply of water at a cost so low that it will be freely used, water rates should be low enough to add no appreciable amount to the shelter rent.

This bulletin discusses the United States Housing Authority's cooperation in negotiating for the best possible utility rates; and presents a recommended method for analyzing the comparative economy of various utility services which may be combined, and for estimating the overall cost to the tenants of various combinations of service. It includes data on the various factors and quantities assumed in such analysis, and presents a complete sample analysis for a particular project.

PART I. RATE NEGOTIATION

Large-scale, low-rent projects which provide for the wholesale purchase of energy and fuel for lighting, cooking, refrigeration, and, in some cases, water heating and space heating, and which are equipped for ample utilization of these facilities, will generally result in increased per capita consumption, and due to their size, improved diversity factor and load factor. Further, they will realize the economy of single meter reading, single billing, and collection.

Utility rate schedules are set up to take into account the effect of these factors on the costs to the utility company. To be fair to both the tenants of a project and the utility company (or the municipality, if utility is publicly owned), the particular cost factors should be determined in each case, and every rate schedule which may be applicable should be analyzed to find that schedule which is most appropriate and most economical for the particular project. Where no rate schedule exists which seems to fit the particular situation, negotiations may be required to set up a new rate schedule.

There are various ways in which rate schedules are set up, viz. by city ordinance or charter, by city franchises or contracts, by a state utility commission, by a city or county utility commission. The schedules are usually set up to take into consideration wholesale or retail purchase, characteristics and costs of energy or fuel at the point of taking service, use of energy or fuel in various combinations, requirements of peak loading, diversity factors, and load factors. There must be a careful examination of the schedules already set up, and other possible contracts, to discover in which category the project consumption with respect to these factors will fall. In various places, the schedule in use for municipal consumption should be studied with a view of applying that rate to the project.

In general, any new rate schedule must be based on load characteristics which differ from existing loads and demands. This does not imply, however, the setting up of a special rate for one housing project. Any new rate schedule which may be set up for a particular project should be based on its general characteristics, and should apply wherever comparable characteristics occur. Generally the best rate will be obtained by (1) complete analysis of all the basic factors, (2) study of rates obtained by other large consumers, and (3) a carefully worked out estimate, based on preliminary sketch plans and outline specifications, of the alternate methods of supplying service.

In some cases it may appear that the only available method of supplying energy requirements at a sufficiently low cost is by means of a project generating plant. In such cases, the expediency of generating electricity in conjunction with space heating and water heating, or in conjunction with water heating through the utilization of cooling water of internal combustion engines, should be examined.

Rate studies should be undertaken early enough in the program to establish the types of service and equipment which may be employed. It is desirable to have the negotiations for the various utility services well under way prior to the execution of the loan contract between the local authority and the United States Housing Authority.

In view of the data relative to utility services in the possession of the United States Housing Authority, it is urged that a conference of the representatives of the local authority and of the United States Housing Authority be held <u>before</u> utility companies are approached concerning rates, conditions of service, etc. The United States Housing Authority includes on its staff engineers and attorneys with experience in rate analyses and rate negotiations whose services are available to local authorities.

PART II - INITIAL COSTS

The initial costs of the systems which would be used in connection with various feasible types of utility services should be compared with a view to keeping the capital cost of the project at the lowest possible level consistent with economy in operation. The initial cost will be a determining factor in making a decision between two types of utility services which show almost equal operating expenses.

Because USHA annual contributions with respect to any element of development cost are substantially equal to the debt service on the same element of cost, it is not necessary to include any item for net debt service in the computation of operating expense.

The expense of repairs, maintenance and replacements will, however, be related to the initial cost of the installation. A method of computing the expense of repairs, maintenance and replacements is presented hereinafter.

Comparison of Initial Costs.

Initial costs of exterior and interior distribution systems, metering and equipment will vary widely with the type of services and purchase and local conditions. Under retail purchase of electricity or gas, the utility company will ordinarily provide the exterior distribution system with services to the individual family units, furnishing and installing the meters. Under wholesale purchase, however, the utility company's share of the exterior distribution system may terminate at the master meter. In this case, additional check metering facilities and the major portion of the exterior distribution system will, in general, have to be provided by the project, although utility companies sometimes bear a share of this cost.

When water heating and a small amount of space heating are supplied by electricity and imposed as an off-peak load, the investment in transformers and distribution system should not increase materially, and this use should reduce the initial investment chargeable to lighting, refrigeration and equipment. The additional costs of equipment and wiring will be offset by savings in the cost of other means of providing equivalent service.

Exterior Distribution System.

Wherever feasible, exterior distribution systems should be designed in accordance with the usual practice of the local utility companies, using similar equipment and materials in order to facilitate service or replacement by the utility company.

The choice between an overhead or underground distribution system should be based on careful consideration of:

(1) The type of existing systems in the areas surrounding the project.

(2) The trend of the city in the replacement of overhead systems by underground systems.

(3) The contour of the project and the extent to which trees and playgrounds may interfere with an overhead system.

(4) Severity and frequency of electric storms.

(5) Sleet and ice formations and wind velocities.

(6) Soil conditions. Where much rock is encountered, the cost of underground work is naturally increased and soil of low-bearing value and high water content may present difficulties in connection with underground transformer vaults and manholes.

(7) Comparative costs. Usually, an underground distribution system will cost more than an overhead distribution system. The actual difference depends, to a great extent, on specific local conditions.

Where the site lends itself to an underground system of distribution and the difference in initial cost between an underground and an overhead system is relatively small, consideration should be given to the use of an underground system. Among the many advantages of an underground system are: (1) appearance and (2) ease of repair and maintenance. The equipment in an underground system is generally readily accessible to an operating engineer, whereas equipment installed on pole structures necessitates the services of "linemen".

Interior Distribution System.

Costs of interior distribution systems should be included in the total estimated initial costs of the various combinations.

Check Meters.

Under wholesale purchase and unmetered distribution to tenants on the basis of a pro-rata charge, provision for check meters should be made and a number of meters equal to 25% of the number of dwelling units may have to be provided. If provided by the project, the cost of these meters must be included in the total estimated initial costs.

In addition, the costs of wholesale purchase, based on 100% metering, should be figured since the project may decide at some future date to install complete metering facilities. Electric wiring should, therefore, be planned to provide for separate metering of each dwelling unit and for metering project light and power.

Under retail purchase of energy and fuel, where individual meters are supplied by the utility company, the cost of meters is not a factor of initial cost.

Equipment.

Costs of all items of equipment - ranges, refrigerators, laundry hot plates, lighting fixtures and standards, hot water and space heaters, etc. - should be included in the total estimated initial costs of the various combinations. Care should be exercised to assume comparable standards of quality in the various items of equipment in order not to weight the comparison of total costs unfairly.

Fuel Storage.

Where fuel which requires storage is considered, the cost of the storage space should be included in the initial cost.

PART III - DETERMINATION AND COMPARISON OF OPERATING EXPENSE OF DIFFERENT UTILITY COMBINATIONS

The operating expense of various types of utility services or combinations falls into three categories, viz:

1. Fuel and energy expenses.
2. Repairs, maintenance and replacement.
3. Vacancy and collection losses.

The operating expense in connection with various utility combinations arrived at in the manner described hereafter is for the purpose of comparing the desirability of the various combinations and is not for use in establishing final rents.

Fuel and Energy Expenses.

Consumption - A careful study should be made of consumption in each project, based on consideration of location; type of project, whether urban or suburban; type of tenants and family size, occupation and habits; and the plan of the project and its disposition of open areas, public spaces, play areas, streets and walks as they affect its requirements with respect to street and yard lighting.

Fuel and Energy - The expense of fuel and energy is the most important factor in determining the monthly utility charge. This expense in general comprises the following:

(a) Quantity charges based on consumption by tenants.

(b) Demand charges for electricity based on maximum consumption per stipulated time unit (15, 30 or 60 minutes, etc.) This applies usually to wholesale purchase.

(c) Minimum charges based on estimated demand and consumption.

(d) Expense of line and transformer losses. This applies usually only to wholesale purchase.

(e) Pro-rata expense of energy or fuel consumed for project services (yard and play area lighting; lighting of public spaces in buildings; fuel or energy for laundry hot plates; power for electrically driven pumps, fans, etc.) In general, the City should provide, maintain and supply electricity for all lighting on project streets and other areas used by the general public, as a part of its usual municipal service and without charge to the project.

Gas rates are generally competitive in all localities and should receive full consideration for refrigeration and cooking, and for water heating and space heating where the conditions are favorable.

The cost of ice, coal, kerosene and any other fuels available locally should be given full consideration for their appropriate uses in the analysis of comparative costs.

Where fuel which requires storage and handling is considered, the expense of handling, including the handling of all residue, should be included in the operating expense.

Repairs, Maintenance and Replacements.

The complete expense of repairs, maintenance, and replacements, including both materials and labor, for all items of installation and equipment must be included in a comparative analysis of the expense of the various proposed systems.

For the purpose of such computations, repairs and maintenance are distinguished from the expense of replacement, although in the actual operation of a project, all of these items will be kept together under one expense account heading.

The amount to be included for repairs and maintenance should be the estimated annual expense averaged over the life of the project (in general, 60 years).

The amount to be included for replacements should be the level annual amount to be credited to reserve, which amount, together with interest on the amount held in reserve, will produce a capital amount sufficient to replace the various items so covered at the end of their estimated useful life.

The amounts assumed for repairs and maintenance must be checked carefully against local experience, wage rates, etc., and adjusted for any variables which may exist in the locality. In this connection, the possibility of having the utility company supply, repair, maintain and insure the exterior distribution system as a whole or in part should be investigated, as cooperation of this nature will result in a reduced operating expense to the project.

If meters are provided to check the fuel and energy consumption, the expense of repairing, maintaining and replacing, together with that of reading and billing, should be included.

Vacancy and Collection Losses.

In addition to the fuel and energy expense, and the repair, maintenance and replacement expense, a factor should be added as a reserve for vacancy and collection losses on the cost of such utility services as are supplied by the project and charged for in rent. Five per cent (5%) of the total annual operating expense is considered adequate for this purpose.

APPENDIX MATERIAL

The attached exhibits present (1) data on fuel and energy consumption and demands, (2) data on capital costs and operating expenses and (3) forms for the recording of data regarding utility services and for the computation of the complete cost of such services under various alternative schemes.

Exhibit 1 gives data and factors in connection with the computation of capital costs and the expense for repairs, maintenance and replacement for utility systems and equipment. The first three columns of this exhibit are concerned with the reserve for replacement. The third column gives a percentage factor which, when applied to the total initial cost will give the annual amount to be set up as a reserve to cover replacements. The fourth column gives a percentage factor which, when applied to the total initial cost, will give the estimated amount for repairs and maintenance. The fifth column gives the total of the percentage factors covering replacements and covering repairs and maintenance. The last column gives estimating data for the computation of the initial cost.

Exhibits 2 to 6 present estimates of consumption for electrical energy in kilowatt hours and of maximum demands in kilowatts and gas consumption in therms for various combinations of services and various sizes of dwelling units. These estimates are based on averages of consumption derived from the operating records of various utility and manufacturing companies throughout the country. These have been checked against the experience records of existing large-scale and low-rental projects.

Exhibit 7 gives supplementary data in connection with utility services.

Exhibit 8 is a form for computing "Consumption Data". The exhibit has been filled out to show the use of the material in the earlier exhibits in such computations.

Exhibit 9 (A, B & C) is a form for "Analysis of Utility Schemes" including investment costs and operating expense data. A separate form should be filled out for each alternative scheme to be considered. Exhibits 9A, 9B and 9C show the same form filled out for three alternative schemes.

Exhibit 10 is a form for "Final Summary" including comparative investment cost and operating expense data. The first part of this form provides a summary of the analysis of the various utility schemes (Exhibit 9). The second portion is a summary of analysis for space heating and heating water. The third part presents the total cost of all utilities including lighting, refrigeration, cooking, space heating and heating of water.

Exhibits 8, 9A, 9C and 10 have been completely filled in for a hypothetical project to indicate clearly the application of the data given in Exhibits 1 to 7.

Blank copies of Exhibits 8, 9 and 10 are available to local authorities upon request to the USHA.

Nathan Straus
NATHAN STRAUS,
Administrator.

February 24, 1939

EXHIBIT 1

DATA FOR COMPUTING CAPITAL COSTS AND EXPENSE
FOR REPAIRS, MAINTENANCE AND REPLACEMENTS

System or Equipment	Reserve for Replacement: % of System Cost for which Reserve is Provided	Reserve for Replacement: Estimated Life Years	Reserve for Replacement: Annual Reserve % of Total System Cost	Annual Repairs and Maintenance % of Total System Cost	Total Annual Repairs, Maintenance and Replacements % of Total System Cost	Estimated Initial Cost per Dwelling Unit (Relative Values for preliminary calculations only)
ELECTRICAL SYSTEM						
DISTRIBUTION						
Substation	100	40	1.66	1.5	3.16	$16 - Ltg. & Ref. $23 - Ltg. Ref. Cook.
Overhead Exterior	95	27	2.69	1.16	3.85	$35 - Ltg. & Ref. $45 - Ltg. Ref. Cook.
Underground Exterior	75	31	1.77	1.24	3.01	$50 - Ltg. & Ref. $75 - Ltg. Ref. Cook.
INTERIOR WIRING	19	37	.35	1.82	2.17	$95 to $125 - Ltg. & Ref. (non-fireproof) $140 - Ltg. & Ref. (fireproof) $165 - Ltg. Ref. Cook. (fireproof) $185 - Ltg. Ref. Cook. W.H. (fireproof)
GAS SYSTEM						
DISTRIBUTION						
Exterior	25	40	.415	.5	.914	$15 - Cook. & Ref. $25 - Cook. Ref. W.H. $25 - Cook. Ref. space htg. & W.H.
Interior	25	40	.415	1.0	1.415	$15 - Cook. $20 - Ref. & Cook. $25 - Cook. Ref. space htg. & W.H.
Separate Range or Heater Vents	-	60	-	1.0	1.0	$10

IMPORTANT NOTE:

The percentages listed above for repairs, maintenance and replacements are assumed to be applicable only to equipment and materials of the highest grade. Equipment and materials having a shorter life will require an increased reserve for replacements and a larger allowance for repairs and maintenance. The percentages are applicable to the total estimated initial cost (100%) in every case. - - - - The estimated initial costs given above, in the extreme right-hand column, are *not* applicable to a particular project but may be used in a preliminary analysis to arrive at the *comparative* economy of various combinations of service. Estimates of actual costs for a particular project must be based on breakdowns of costs gathered in the particular locality which are applicable at the time and under the conditions of construction.

(Continued)

EXHIBIT 1 (Continued)

DATA FOR COMPUTING CAPITAL COSTS AND EXPENSE
FOR REPAIRS, MAINTENANCE AND REPLACEMENTS

System or Equipment	Reserve for Replacement: % of System Cost for Which Reserve is Provided	Reserve for Replacement: Estimated Life Years	Reserve for Replacement: Annual Reserve % of Total System Cost	Annual Repairs and Maintenance: Expense in Dollars Per Unit	Total Annual Repairs, Maintenance and Replacements: % of Total System Cost	Estimated Initial Cost per Dwelling Unit (Relative values for preliminary calculations only)
EQUIPMENT						
REFRIGERATORS						
Ice	100	10	9.13	$1.00 each	13.13	$25
Electric	100	12	7.46	2.50 each	10.47	$83
Gas	100	12	7.46	2.00 each	9.87	$83
Oil	100	12	7.46	2.50 each	9.46	$125
RANGES						
Coal	100	15	5.78	1.00 each	7.7	$32, plus $8 for waterback, plus $12 for tank
Kerosene or oil	100	10	9.13	2.00 each	15.38	$32
Electric	100	15	5.78	3.00 each	11.44	$53
Gas	100	15	5.78	2.00 each	10.68	$41
Coal & Gas	100	10	9.13	2.50 each	14.94	$43
HOT PLATES						
Electric	100	5	19.22	1.00 each	23.56	$23
Gas	100	5	19.22	1.00 each	29.22	$10
Kerosene or oil	100	5	19.22	1.00 each	24.22	$20
METERS						
Electric	100	25	3.12	1.60 each	(19.12 (11.12 (9.04	$10 (no elec.cooking) $20 (with elec.cooking) $27 (larger loads)
Gas	100	25	3.12	1.60 each	13.78	$15
WATER HEATERS						
Electric	100	30	2.46	2.25 each	7.14	$48
Gas	100	30	2.46	2.75 each	9.33	$40
Kerosene or oil	100	30	2.46	3.00 each	8.46	$50
SPACE HEATERS						
Electric	100	20	4.12	1.00 to 3.00	10.82	$15 to $45
Gas	100	20	4.12	1.00 to 3.00	10.82	$15 to $45
Kerosene or oil	100	20	4.12	1.50 to 4.50	14.12	$15 to $50
Coal	100	15	5.78	2.00 each	15.78	$20

IMPORTANT NOTE:

The percentages and expenses listed above for repairs, maintenance and replacements are assumed to be applicable only to equipment of the highest grade. Equipment having a shorter life will require an increased reserve for replacement and a larger allowance for repairs and maintenance. - - - - The estimated initial costs per unit of equipment given in the extreme right hand column are *not* applicable to a particular project but may be used in a preliminary analysis to arrive at the *comparative* economy of various combinations of service. Estimates of actual costs of equipment for a particular project must be based on costs gathered in the particular locality which are applicable at the time of bidding.

EXHIBIT 2

ESTIMATED CONSUMPTION OF ELECTRICITY IN KWH PER DWELLING UNIT PER MONTH

		ROOM RATIO				
		2.0 to 2.9	3.0 to 3.9	4.0 to 4.9	5.0 to 5.9	6.0 to 6.9
ELECTRIC LIGHTING AND REFRIGERATION						
TENANT						
Check Metering 25% or more of Dwelling Units	(Lighting	28	33	38	43	48
	(Refrigeration	26	30	33	35	39
	(Dwelling Unit Total	54	63	71	78	87
	(Ironing in Dwelling Unit)	5	5	6	7	7
Check Metering Less than 25% of Dwelling Units	(Lighting	35	41	47	53	60
	(Refrigeration	26	30	33	35	39
	(Dwelling Unit Total	61	71	80	88	99
	(Ironing in Dwelling Unit)	6	6	7	8	8
PROJECT SERVICES						
1. General lighting and power		8	9	10	11	12
2. Community Laundry, including ironing only		5	5	6	7	7
3. Energy for distribution of central or group heating		9	9	9	9	9
4. Energy for generation of central or group heating (coal fired)		9	10	10	10	11
5. Energy for generation of central or group heating (oil fired)		5	6	6	6	7
6. Energy for generation of central or group heating (gas fired)		1	2	2	2	3

IMPORTANT NOTE:

Add to the total energy consumption and demand from 2 to 4% to cover transformer and distribution losses.

EXHIBIT 3

ESTIMATED CONSUMPTION OF ELECTRICITY IN KWH PER DWELLING UNIT PER MONTH

		ROOM RATIO				
		2.0 to 2.9	3.0 to 3.9	4.0 to 4.9	5.0 to 5.9	6.0 to 6.9
ELECTRIC LIGHTING, REFRIGERATION AND COOKING						
TENANT						
Check Metering 25% or more of Dwelling Units	(Lighting	28	33	38	43	48
	(Refrigeration	24	27	30	32	35
	(Cooking	71	83	96	109	122
	(Dwelling Unit Total	123	143	164	184	205
	(Ironing and Clothes Boiling (in Dwelling Unit)	10	11	13	15	16
Check Metering Less than 25% of Dwelling Unit	(Lighting	35	41	47	53	60
	(Refrigeration	24	27	30	32	35
	(Cooking	88	104	120	136	152
	(Dwelling Unit Total	147	172	197	221	247
	(Ironing and Clothes Boiling (in Dwelling Unit)	12		16	19	20
PROJECT SERVICES						
1. General lighting and power		8	9	10	11	12
2. Community laundry, including ironing and hot plates for clothes boiling		12	14	16	19	20
3. Energy for distribution of central or group heating		9	9	9	9	9
4. Energy for generation of central or group heating (coal fired)		9	10	10	10	11
5. Energy for generation of central or group heating (oil fired)		5	6	6	6	7
6. Energy for generation of central or group heating (gas fired)		1	2	2	2	3

IMPORTANT NOTE:

Add to the total energy consumption and demand, from 2 to 5% to cover transformer and distribution losses.

EXHIBIT 4

ESTIMATED DEMANDS OF ELECTRICITY IN KW PER DWELLING UNIT (30 MINUTES INTEGRATED)

		Number of Dwelling Units				
		1 to 500	501 to 1000	1001 to 1500	1501 to 2000	Above 2000
TENANT						
Check Metering 25% or more of Dwelling Units	(Lighting	.162	.156	.150	.144	.138
	(Refrigeration (Electric Cooking)	.064	.062	.060	.058	.056
	(Refrigeration (Gas Cooking)	.070	.068	.066	.064	.062
	(Cooking	.570	.555	.540	.525	.510
Check Metering Less than 25% of Dwelling Units	(Lighting	.171	.166	.161	.156	.151
	(Refrigeration (Electric Cooking)	.064	.062	.060	.058	.056
	(Refrigeration (Gas Cooking)	.070	.068	.066	.064	.062
	(Cooking	.620	.608	.596	.584	.572
PROJECT SERVICES						
1. General lighting and power		.060	.058	.056	.054	.053
2. Demand on distribution of central or group heating		.024	.023	.022	.022	.021
3. Demand on generation of central or group heating (gas fired)		None	None	None	None	None
4. Demand on generation of central or group heating (coal or oil fired)		.024	.023	.022	.021	.021

(The demands listed under "PROJECT SERVICES" are based on the use of a)
(time clock on community laundry electric loads, to permit removing this)
(load at peak periods)

EXHIBIT 5

ESTIMATED DEMANDS OF ELECTRICITY IN KW PER DWELLING UNIT (60 MINUTES INTEGRATED)

		Number of Dwelling Units				
		1 to 500	501 to 1000	1001 to 1500	1501 to 2000	Above 2000
TENANT						
Check Metering 25% or more of Dwelling Units	(Lighting	.154	.148	.142	.136	.130
	(Refrigeration (Electric Cooking)	.062	.060	.058	.056	.054
	(Refrigeration (Gas Cooking)	.068	.066	.064	.062	.060
	(Cooking	.550	.535	.520	.505	.490
Check Metering Less than 25% of Dwelling Units	(Lighting	.159	.154	.149	.144	.139
	(Refrigeration (Electric Cooking)	.062	.060	.058	.056	.054
	(Refrigeration (Gas Cooking)	.068	.066	.064	.062	.060
	(Cooking	.570	.558	.546	.534	.522
PROJECT SERVICES						
1. General lighting and power		.057	.055	.053	.051	.050
2. Demands on distribution of central or group heating		.023	.022	.021	.021	.021
3. Demands on generation of central or group heating (gas fired)		None	None	None	None	None
4. Demands on generation of central or group heating (coal or oil fired)		.023	.022	.021	.020	.019

(The demands listed under "PROJECT SERVICES" are based on the use)
(of a time clock on community laundry electric loads to permit re-)
(moving this load at peak periods)

EXHIBIT 6

ESTIMATED CONSUMPTION OF GAS IN THERMS PER DWELLING UNIT PER MONTH

		ROOM RATIO 2.0 to 2.9	3.0 to 3.9	4.0 to 4.9	5.0 to 5.9	6.0 to 6.9
TENANT						
Check Metering 25% or more of Dwelling Units	(Cooking . . .	5.33	6.23	7.21	8.18	9.16
	(Refrigeration . . .	7.90	9.11	10.00	10.63	11.86
	(Dwelling Unit Total . . .	13.23	15.34	17.21	18.81	21.02
	(Clothes boiling) (in Dwelling Unit) . . .	.32	.40	.45	.53	.58
Check Metering Less than 25% of Dwelling Units	(Cooking . . .	6.61	7.81	9.01	10.21	11.41
	(Refrigeration . . .	7.90	9.11	10.00	10.63	11.86
	(Dwelling Unit Total . . .	14.51	16.92	19.01	20.84	23.27
	(Clothes boiling) (in Dwelling Unit) . . .	.40	.53	.58	.71	.77
PROJECT						
Community Laundry Hot Plates		.45	.57	.64	.76	.83

IMPORTANT NOTES:

1. Figures for cooking consumption are based on an energy ratio for electric to gas cooking of 1:2.2. This is an average figure between the claims of the gas industry, which range from 1:2.0 downward, and the claims of the electric appliance manufacturers, which range from 1:2.4 upward.

2. In determining maximum hourly gas demand for cooking, assume .06 therms per dwelling unit; for water heating, assume .03 therms per dwelling unit.

EXHIBIT 7

SUPPLEMENTARY DATA

1. Consumption of electric energy for stores should be estimated on the basis of available local data with respect to sizes and types of stores.

2. The estimated consumption of electrical energy of rentable areas, for office purposes, - 80 KWH per 400 square feet per month.

3. To convert cubic feet of gas to therms, or vice versa, use:

$$\text{Cu. ft.} = \frac{\text{Therms}}{\text{B.T.U.}} \times 100{,}000 \qquad \text{Therms} = \frac{\text{Cu. ft.} \times \text{B.T.U.}}{100{,}000}$$

4. To convert therms to KWH, or vice versa, use:

$$\text{Therms} = \frac{\text{KWH} \times 3413}{100{,}000} \qquad \text{KWH} = \frac{\text{Therms} \times 100{,}000}{3413}$$

5. For individual hot water generators in each dwelling unit, the fuel consumed must be added to the consumption per dwelling unit per month. The following formulae may be used:

ELECTRIC

$$\text{KWH} = \frac{\text{Gals. per day} \times 8.3 \text{ (BTU per degree rise)} \times 100^{\circ} \text{ (rise)} \times 30 \text{ (days)}}{3413 \text{ (BTU per KWH)} \times .77 \text{ efficiency}}$$

GAS

$$\text{CU. FT.} = \frac{\text{Gal. per day} \times 8.3 \times 100 \times 30}{\text{BTU per cu. ft. of gas} \times \begin{array}{l} .55 \text{ (efficiency for recovery flue type heaters with insulated tank)} \\ .35 \text{ (efficiency for side arm heaters with insulated tank)} \end{array}}$$

KEROSENE OR #1 OIL

$$\text{GAL.} = \frac{\text{Gal. per day} \times 8.3 \times 100 \times 30}{\text{BTU per gal. of oil} \times \begin{array}{l} .55 \text{ (efficiency for recovery flue type heaters with insulated tank)} \\ .30 \text{ (efficiency for straight burner type with insulated tank)} \end{array}}$$

EXHIBIT Nº 8.

· CONSUMPTION DATA ·

PROJECT: Typical LOCATION: ______ PROJECT NUMBER: ______

Nº. DWELLING UNITS: 400 Nº. ROOMS: 1600 ROOM RATIO: 4.0

ELECTRIC ENERGY

WITH 25% OR MORE CHECK METERS.

	SERVICE	K.W.H. PER D.U./MONTH	K.W.D PER D.U.	TRANS. LOSS	TOTAL KWH/MONTH	TOTAL K.W.D.
TENANT	LTG.	38	.162	3%	15,656.	67
	REF.					
	COOK.					
	LTG.-REF.	71	.232	3%	29,252.	96
	LTG.-REF. COOK.	164	.796	5%	68,880.	334
	LTG.-REF. HOME LAUND'G.	77	.232	3%	31,724.	96
	LTG. REF COOK. HOME LAUND'G.	177	.796	5%	74,340.	334
PROJ. SERV.	GENERAL LTG.-POWER	10	.060	3%	4,120.	25
	LAUNDRY: IRONING & HOT PLATES	16	–	3%	6,592.	–
	LAUNDRY: IRONING	6	–	3%	2,472.	–
	HTG. DISTR.	9	.024	3%	3,708.	10
	HTG. PLANT	10	.024	3%	4,120.	10

WITH LESS THAN 25% CHECK METERS.

	SERVICE	K.W.H. PER D.U./MONTH	K.W.D PER D.U.	TRANS. LOSS	TOTAL KWH/MONTH	TOTAL K.W.D.
TENANT	LTG.	47	.171	3%	19,364.	70.
	REF.					
	COOK.					
	LTG.-REF.	80	.241	3%	32,960.	99.
	LTG.-REF. COOK.	197	.855	5%	82,740.	359.
	LTG.-REF. HOME LAUND'G.	87	.241	3%	35,844	99
	LTG. REF COOK. HOME LAUND'G.	213	.855	5%	89,460.	359.
PROJ. SERV.	GENERAL LTG.-POWER	10	.060	3%	4,120.	25
	LAUNDRY: IRONING & HOT PLATES	16	–	3%	6,592	–
	LAUNDRY: IRONING	6	–	3%	2,472.	–
	HTG. DISTR.	9	.026	3%	3,708.	10
	HTG. PLANT.	10	.024	3%	4,120.	10.

GAS FUEL

HEATING VALUE 1000. B.T.U.

WITH 25% OR MORE CHECK METERS

	SERVICE	THERMS PER D.U./MONTH	TOTAL/MO. THERMS	TOTAL/MO. M. CU. FT.
TENANT	COOK.	7.21	2884.	288.4
	REF.	10.00	4,000.	400.0
	COOK-REF.	17.21	6884.	688.4
	COOK.-HOME LAUND'G	7.66	3064	306.4
	COOK.-REF. HOME LAUND'G	17.66	7064.	706.4
PROJ./SERV.	LAUNDRY HOT PLATES	.64	256.	25.6

WITH LESS THAN 25% CHECK METERS

	SERVICE	THERMS PER D.U./MONTH	TOTAL/MO. THERMS	TOTAL/MO. M. CU. FT.
TENANT	COOK.	9.01	3604.	360.4
	REF.	10.00	4,000.	400.0
	COOK-REF.	19.01	7604	760.4
	COOK.-HOME LAUND'G	9.59	3836.	383.6
	COOK.-REF. HOME LAUND'G	19.59	7836.	783.6
PROJ./SERV.	LAUNDRY HOT PLATES	.64	256.	25.6

OTHER UTILITIES: FUEL FOR SPACE AND WATER HEATING BY PROJECT THROUGH WHOLESALE PURCHASE

E.D.R. 6130 °DAYS 5794 DES.T. 50

FUEL	HTG VALUE B.T.U.	FUEL FACTOR	EFF.	ANNUAL CONSUMPTION: COAL IN TONS	OIL IN GALS.	GAS IN M.CU.FT.	STEAM IN M.POUNDS
COAL	11,500.	.0078	.65	1900.			
OIL	148,000.	.0006	.75		259,000		
GAS	1,000.	.096	.75			38,000.-	
STEAM							29,600.
EFFECTIVE LINE LOSS				190.	25,700.		2,900.
EFFECTIVE TEMP. REG.							
TOTAL SPACE HEATING				2090.	284700.	38000.	32,500
WATER HEATING				805.			
EFFECTIVE LINE LOSS				40.			
TOTAL WATER HEATING				845			
TOTAL SPACE & WATER HEATING				2935.-			

OTHER UTILITIES: PURCHASED RETAIL BY TENANTS. PER DWELLING UNIT PER MONTH.

SERVICE	ELECTRICITY	GAS	COAL	KEROSENE	ICE
LTG.	38 kwh.				
REF.					400# @ .50
COOK.				10 gal. @.12	
WATER HTG.					
SPACE HTG.					

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION – UTILITY SECTION

COMPUTED BY ______ DATE: ______
CHECKED BY ______ DATE: ______

EXHIBIT Nº 9-A.

UTILITY SCHEME Nº. 1		
SERVICE	FUEL ENERGY	RETAIL WHOLESALE
LIGHTING	Electric	wholesale
REFRIGERATN	Electric	wholesale
COOKING	Electric	wholesale

• ANALYSIS OF UTILITY SCHEME •

• INCLUDES INVESTMENT COST AND OPERATING EXPENSE DATA •

PROJECT: Typical LOCATION: ______ PROJECT NUMBER: ______

Nº. DWELLING UNITS: 400 Nº ROOMS: 1600. ROOM RATIO: 4.0

INVESTMENT COST – REPAIRS, MAINTENANCE & REPLACEMENT EXPENSE.

SYSTEM EQUIPMENT		INVESTMENT COST UNIT	INVESTMENT COST TOTAL	REPLACEMENT FACTOR	REPLACEMENT TOTAL/ANNUAL	REPAIRS, MAINT'CE. FACTOR	REPAIRS, MAINT'CE. TOTAL/ANNUAL	TOTAL EXPENSE FACTOR	TOTAL EXPENSE TOTAL/ANNUAL
ELECTRIC	SUB-STATION								
	DISTRIBUTION	75.	30,000.					.0301	903.00
	INTERIOR WIR'G.	165.	66,000.					.0217	1432.20
GAS	EXT. DISTR.								
	INT. DISTR.								
REFRIGERATORS		83.	33,200.					.1047	3476.04
RANGES		53.	21,200.					.1144	2425.28
HOT PLATES	Nº 1/2	23	920.					.2356	216.75
SUB TOTAL			151,320.						8453.27
ELEC. METERS Nº/100		20.	2000.					.1112	222.40
GAS METERS Nº.									
GRAND TOTAL			153,320.						8675.67

RATE COMPUTATIONS – TO DETERMINE FUEL AND ENERGY EXPENSE.

DATE: 12/1 RATE: H.T.P	DATE: ____ RATE: ____	DATE: ____ RATE: ____	DATE: ____ RATE: ____	DATE: ____ RATE: ____
Demand 379 Kw Consumption 87,420 KWH 100 Kw @ 1.50 = 150.00 279 " @ 1.00 = 279.00 10,000 KWH @ .01 = 100.00 25,000 " @ .008 = 200.00 52,420 " @ .005 = 262.10 $ 991.10 Less 10% prompt pay – 99.11 net / month = $ 891.99 net / year = $ 10,703.88 $\frac{891.99}{87420}$ = $.0102/KWH	Demand = 404 Kw Consumption = 101,280 KWH 100 Kw @ 1.50 = $ 150.00 304 " @ 1.00 = 304.00 10,000 KWH @ .01 = 100.00 25,000 " @ .008 = 200.00 66,280 " @ .005 = 331.40 $ 1085.40 108.54 net / mo. = $ 976.86 net / year = 11,622.32 $\frac{976.86}{101,280}$ = .0096/KWH			

SUMMARY OF TOTAL OPERATING EXPENSE

ITEM		DATE: 12/1/38 RATE: H.T.P. — 25% OR MORE CHECK METERS. ANNUAL	PER D.U./MO.	PER R./MO.	LESS THAN 25% CHECK METERS ANNUAL	PER D.U./MO.	PER R./MO.	DATE: ____ RATE: ____ — 25% OR MORE CHECK METERS. ANNUAL	PER D.U./MO.	PER R./MO.	LESS THAN 25% CHECK METERS ANNUAL	PER D.U./MO.	PER R./MO.	DATE: ____ RATE: ____ — 25% OR MORE CHECK METERS. ANNUAL	PER D.U./MO.	PER R./MO.	LESS THAN 25% CHECK METERS. ANNUAL	PER D.U./MO.	PER R./MO.
FUEL AND ENERGY	ELEC.	$ 10,703.88			$ 11,622.32														
	GAS	—																	
SUB TOTAL 1		$ 10,703.88	$ 2.23	$ .558	$ 11,622.32	2.42	.60												
REPAIRS, MAINT. & REPLACEMENTS		8,675.67	1.81	.452	8453.27	1.76	.44												
SUB TOTAL 2		19,379.55	4.04	1.010	20,075.59	4.18	1.04												
VACANCY AND COLLECTION LOSS		968.45			1003.78														
TOTAL EXPENSE TO PROJECT		20348.00	4.24	1.06	21079.37	4.39	1.09												
TENANT DIRECT PURCHASE		—																	
GRAND TOTAL		20,348.00	4.24	1.06	21,079.37	4.39	1.09												

TENANT DIRECT PURCHASE

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION – UTILITY SECTION

COMPUTED BY: ______ DATE: ______
CHECKED BY: ______ DATE: ______

EXHIBIT No. 9-B

UTILITY SCHEME No. 2.		
SERVICE	FUEL ENERGY	RETAIL WHOLESALE
LIGHTING	Electric	wholesale
REFRIGERAT'N	gas	wholesale
COOKING	gas	wholesale

• ANALYSIS OF UTILITY SCHEME •

• INCLUDES INVESTMENT COST AND OPERATING EXPENSE DATA •

PROJECT: Typical LOCATION: ______ PROJECT NUMBER: ______

No. DWELLING UNITS: 400. No. ROOMS: 1600 ROOM RATIO: 4.0.

INVESTMENT COST — REPAIRS, MAINTENANCE & REPLACEMENT EXPENSE.

SYSTEM EQUIPMENT		INVESTMENT COST: UNIT	INVESTMENT COST: TOTAL	REPLACEMENT: FACTOR	REPLACEMENT: TOTAL/ANNUAL	REPAIRS, MAINT'CE.: FACTOR	REPAIRS, MAINT'CE.: TOTAL/ANNUAL	TOTAL EXPENSE: FACTOR	TOTAL EXPENSE: TOTAL/ANNUAL
ELECTRIC	SUB-STATION	—							
	DISTRIBUTION	50.	20,000.					.0301	602.00
	INTERIOR WIR'G.	140.	56,000.					.0217	1215.20
GAS	EXT. DISTR.	20.	8,000.					.00914	73.12
	INT. DISTR.	15.	6,000.					.01415	84.90
REFRIGERATORS		83	33,200.					.0987	3276.57
RANGES		41.	16,400.					.1066	1747.91
HOT PLATES	No. 10	10	400.					.2922	116.88
SUB TOTAL									
ELEC. METERS	No. 100	10	1000					.1912	191.20
GAS METERS	No. 100	15	1500.					.1378	206.70
GRAND TOTAL			142,500						7514.42

RATE COMPUTATIONS — TO DETERMINE FUEL AND ENERGY EXPENSE.

DATE: 2/1/38 RATE: CLP (ELEC.)	DATE: 12/1/38 RATE: C (GAS)	DATE: RATE:	DATE: RATE:	DATE: RATE:
15,656 KWH. .4420 30,076 " 100 KWH. @ .038 = $ 3.80 150 " @ .028 = 4.20 4300 " @ .025 = 107.50 25,526 " @ .02 = 510.52 626.02 10% primary disc. 62.60 563.42 10% prompt pay 56.34 net/month 507.08 net/year = $ 6,084.96 $\frac{507.08}{30,076} = \$.0169$/KWH.	714,000 cuft $ 10,000 @ .90 M = 9.00 40,000 @ .80 " = 72.00 664,000 @ .70 " = 429.80 per mo. = 510.80 per year = 6129.60 $\frac{510.80}{714} = \$.71$ per Mcuft or 7.1¢/THERM.			

SUMMARY OF TOTAL OPERATING EXPENSE

ITEM		DATE: 2/1/38 RATE: C.L.P. (ELEC.) & C (GAS) — 25% OR MORE CHECK METERS: ANNUAL	PER D.U./MO.	PER R./MO.	LESS THAN 25% CHECK METERS: ANNUAL	PER D.U./MO.	PER R./MO.	DATE: RATE: — 25% OR MORE CHECK METERS: ANNUAL	PER D.U./MO.	PER R./MO.	LESS THAN 25% CHECK METERS: ANNUAL	PER D.U./MO.	PER R./MO.	DATE: RATE: — 25% OR MORE CHECK METERS: ANNUAL	PER D.U./MO.	PER R./MO.	LESS THAN 25% CHECK METERS: ANNUAL	PER D.U./MO.	PER R./MO.
FUEL AND ENERGY	ELEC	6084.96																	
	GAS	6129.60																	
SUB TOTAL 1		12214.56	2.54	.635															
REPAIRS, MAINT. & REPLACEMENTS		7514.42	1.56	.390															
SUB TOTAL 2		19728.98	4.10	1.025															
VACANCY AND COLLECTION LOSS		986.44																	
TOTAL EXPENSE TO PROJECT		20715.42	4.31	1.077															
TENANT DIRECT PURCHASE		-																	
GRAND TOTAL		20,715.42	4.31	1.077															

TENANT DIRECT PURCHASE

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION — UTILITY SECTION

COMPUTED BY: ______ DATE: ______
CHECKED BY: ______ DATE: ______

EXHIBIT NO. 9-C

53563

• ANALYSIS OF UTILITY SCHEME •

• INCLUDES INVESTMENT COST AND OPERATING EXPENSE DATA •

PROJECT: Typical LOCATION: ______ PROJECT NUMBER: ______

NO. DWELLING UNITS: 400. NO. ROOMS: 1600. ROOM RATIO: 4.0.

UTILITY SCHEME NO. 3		
SERVICE	FUEL ENERGY	RETAIL WHOLESALE
LIGHTING	Electric	Retail
REFRIGERAT'N	gas	wholesale
COOKING	gas	wholesale

INVESTMENT COST – REPAIRS, MAINTENANCE & REPLACEMENT EXPENSE.									
SYSTEM EQUIPMENT		INVESTMENT COST		REPLACEMENT		REPAIRS, MAINT'CE		TOTAL EXPENSE	
		UNIT	TOTAL	FACTOR	TOTAL/ANNUAL	FACTOR	TOTAL/ANNUAL	FACTOR	TOTAL/ANNUAL
ELECTRIC	SUB-STATION								
	DISTRIBUTION								
	INTERIOR WIR'G.	140	56,000					.0217	1215.20
GAS	EXT. DISTR.	20	8,000					.00914	73.12
	INT. DISTR.	15	6,000					.01415	84.90
REFRIGERATORS		83	33,200.					.0987	3276.51
RANGES		41	16,400.					.1066	1747.91
HOT PLATES NO. 40		10	400.					.2922	116.88
SUB TOTAL									
ELEC. METERS NO. ___									
GAS METERS NO. 100		15	1500					.1378	206.70
GRAND TOTAL			121,500						6721.22

RATE COMPUTATIONS – TO DETERMINE FUEL AND ENERGY EXPENSE.

DATE: 12/1/38 RATE: L & P (Elec)	DATE: 12/1/38 RATE: C (Gas)	DATE: ___ RATE: ___	DATE: ___ RATE: ___	DATE: ___ RATE: ___
Project electricity. demand 45 kw. Consumption 14,420 kwh. 20 meters $\frac{14420}{20}$ = 721 kwh/meter 100 kwh @ .038 = 3.80 150 " @ .031 = 4.65 471 " @ .029 = 13.66 22.11 10% prompt pay. 2.21 per meter/mo. 19.90 20 per mo. = 398.00 per year = 4776.00 $\frac{398}{14420}$ = $.0276/kwh.	714,000 cuft. See scheme no. 2 for estimated gas fuel expense. $6,129.60/yr.			

SUMMARY OF TOTAL OPERATING EXPENSE																			
ITEM		DATE: 12/1/38 RATE: L&P (elec) – C (gas)						DATE: ___ RATE: ___						DATE: ___ RATE: ___					
		25% OR MORE CHECK METERS.			LESS THAN 25% CHECK METERS			25% OR MORE CHECK METERS.			LESS THAN 25% CHECK METERS			25% OR MORE CHECK METERS.			LESS THAN 25% CHECK METERS.		
		ANNUAL	PER DU/MO	PER R/MO	ANNUAL	PER DU/MO	PER R/MO	ANNUAL	PER DU/MO	PER R/MO	ANNUAL	PER DU/MO	PER R/MO	ANNUAL	PER DU/MO	PER R/MO	ANNUAL	PER DU/MO	PER R/MO
FUEL AND ENERGY	ELEC	4776.00																	
	GAS	6129.60																	
SUB TOTAL 1		10905.60	2.27	.568															
REPAIRS, MAINT. & REPLACEMENTS		6721.22	1.40	.350															
SUB TOTAL 2		17626.82	3.67	.918															
VACANCY AND COLLECTION LOSS		881.34																	
TOTAL EXPENSE TO PROJECT		18508.16	3.85	.964															
TENANT DIRECT PURCHASE		7104.00	1.48	.370															
GRAND TOTAL		25,612.16	5.33	1.334															

TENANT DIRECT PURCHASE

Tenant light (Rate 'R')
Consumption = 38 kwh/mo.
38 kwh. @ .039 = $1.48/mo.
400 dwelling units = $592.00/mo.
= $7104.00/yr.

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION – UTILITY SECTION

COMPUTED BY: ______ DATE: ______
CHECKED BY: ______ DATE: ______

EXHIBIT Nº 9-C

UTILITY SCHEME Nº. 3		
SERVICE	FUEL ENERGY	RETAIL WHOLESALE
LIGHTING	Electric	Retail
REFRIGERAT'N	gas	wholesale
COOKING	gas	wholesale

· ANALYSIS OF UTILITY SCHEME ·

· INCLUDES INVESTMENT COST AND OPERATING EXPENSE DATA ·

53553

PROJECT: Typical LOCATION: ______ PROJECT NUMBER: ______

Nº. DWELLING UNITS: 400. Nº ROOMS: 1600. ROOM RATIO: 4.0.

INVESTMENT COST – REPAIRS, MAINTENANCE & REPLACEMENT EXPENSE.

SYSTEM EQUIPMENT		INVESTMENT COST UNIT	INVESTMENT COST TOTAL	REPLACEMENT FACTOR	REPLACEMENT TOTAL/ANNUAL	REPAIRS, MAINT'CE. FACTOR	REPAIRS, MAINT'CE. TOTAL/ANNUAL	TOTAL EXPENSE FACTOR	TOTAL EXPENSE TOTAL/ANNUAL
ELECTRIC	SUB-STATION								
	DISTRIBUTION								
	INTERIOR WIR'G.	140	56,000					.0217	1215.20
GAS	EXT. DISTR.	20	8,000					.00914	73.12
	INT. DISTR.	15	6000					.01415	84.90
REFRIGERATORS		83	33,200.					.0987	3276.51
RANGES		41	16,400.					.1066	1747.91
HOT PLATES	NO. 40	10	400.					.2922	116.88
SUB TOTAL									
ELEC. METERS	NO. __								
GAS METERS	NO. 100	15	1500					.1378	206.70
GRAND TOTAL			121,500						6721.22

RATE COMPUTATIONS – TO DETERMINE FUEL AND ENERGY EXPENSE.

DATE: 12/1/38 RATE: L & P. (Elec)	DATE: 12/1/38 RATE: C. (Gas)	DATE: __ RATE: __	DATE: __ RATE: __	DATE: __ RATE: __
PROJECT ELECTRICITY. demand 45 kw. Consumption 14,420 kwh. 20 meters $\frac{14420}{20}$ = 721 kwh/meter 100 kwh @ .038 = 3.80 150 " @ .031 = 4.65 471 " @ .029 = 13.66 22.11 10% prompt pay. 2.21 per meter/mo. 19.90 20 per mo. = 398.00 per year = 4776.00 $\frac{398}{14420}$ = $.0276/kwh.	714,000 cu ft. See scheme no. 2 for estimated gas fuel expense. $6,129.60/yr.			

SUMMARY OF TOTAL OPERATING EXPENSE

ITEM		DATE: 12/1/38 RATE: L&P (Elec) – C (Gas)						DATE: __ RATE: __						DATE: __ RATE: __					
		25% OR MORE CHECK METERS			LESS THAN 25% CHECK METERS			25% OR MORE CHECK METERS			LESS THAN 25% CHECK METERS			25% OR MORE CHECK METERS			LESS THAN 25% CHECK METERS		
		ANNUAL	PER D.U./MO.	PER R./MO.	ANNUAL	PER D.U./MO.	PER R./MO.	ANNUAL	PER D.U./MO.	PER R./MO.	ANNUAL	PER D.U./MO.	PER R./MO.	ANNUAL	PER D.U./MO.	PER R./MO.	ANNUAL	PER D.U./MO.	PER R./MO.
FUEL AND ENERGY	ELEC	4776.00																	
	GAS	6129.60																	
SUB TOTAL 1		10905.60	2.27	.568															
REPAIRS, MAINT. & REPLACEMENTS		6721.22	1.40	.350															
SUB TOTAL 2		17626.82	3.67	.918															
VACANCY AND COLLECTION LOSS		881.34																	
TOTAL EXPENSE TO PROJECT		18508.16	3.85	.964															
TENANT DIRECT PURCHASE		7104.00	1.48	.370															
GRAND TOTAL		25,612.16	5.33	1.334															

TENANT DIRECT PURCHASE

Tenant light (Rate 'R')
Consumption = 38 kwh/mo.
38 kwh. @ .039 = $1.48/mo.
400 dwelling units = $592.00/mo.
= $7104.00/yr.

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION – UTILITY SECTION

COMPUTED BY: ______ DATE: ______
CHECKED BY: ______ DATE: ______

EXHIBIT Nº. 10

• FINAL SUMMARY •

INCLUDES COMPARATIVE INVESTMENTS COST AND OPERATING EXPENSE DATA FOR LIGHTING, REFRIGERATION, COOKING SPACE AND WATER HEATING.

PROJECT: Typical LOCATION: ____________ PROJECT NUMBER: ____________

Nº. DWELLING UNITS: 400. Nº. ROOMS: 1600. ROOM RATIO: 4.0.

SUMMARY OF ANALYSIS OF UTILITY SCHEMES

SCHEME Nº.	SERVICE: LTG.	SERVICE: REF.	SERVICE: COOK.				PURCHASE RETAIL / WHOLESALE	METERS A-25%+ B-25%-	INITIAL COST	EXPENSE TO PROJECT PER D.U./MO.	EXPENSE TO PROJECT PER R./MO.	TENANT DIRECT PURCHASE PER D.U./MO.	TENANT DIRECT PURCHASE PER R./MO.	TOTAL EXPENSE PER D.U./MO.	TOTAL EXPENSE PER R./MO.
1	Elec.	Elec.	Elec.				W.	A	153,320	4.24	1.06			4.24	1.06
								B	151,320	4.39	1.09			4.37	1.09
2	Elec.	Gas	Gas				W.	A	142,500	4.31	1.08			4.31	1.08
								B							
3.	Elec.	Gas	Gas.				El.-Retail	A	121,500	3.85	.96	1.48	.37	5.33	1.33
							Gas-W.	B							
								A							
								B							
								A							
								B							
								A							
								B							
								A							
								B							
								A							
								B							
								A							
								B							
								A							
								B							

SUMMARY OF ANALYSIS OF SPACE & WATER HEATING

SCHEME Nº.	SERVICE: HEATING	SERVICE: WATER HEATING	INITAL COST	EXPENSE TO PROJECT PER D.U./MO.	EXPENSE TO PROJECT PER R./MO.	TENANT DIRECT PURCHASE PER D.U./MO.	TENANT DIRECT PURCHASE PER R./MO.	TOTAL EXPENSE PER D.U./MO.	TOTAL EXPENSE PER R./MO.
1	Central Plant - Coal Fired.		121,000	4.62	1.16			4.62	1.16
2	- "do" -		121,000	4.62	1.16			4.62	1.16
3.	- "do" -		121,000.	4.62	1.16			4.62	1.16

TOTALS

SCHEME Nº.	METERS	INITIAL COST	EXPENSE TO PROJECT PER D.U./MO.	EXPENSE TO PROJECT PER R./MO.	TENANT DIRECT PURCHASE PER D.U./MO.	TENANT DIRECT PURCHASE PER R./MO.	GRAND TOTAL PER D.U./MO.	GRAND TOTAL PER R./MO.
1	A	274,320	8.86	2.22			8.86	2.22
	B	272,320	9.01	2.25			9.01	2.25
2	A	263,500	8.93	2.24			8.93	2.24
	B							
3.	A	242,500	8.47	2.12	1.48	.37	9.95	2.49
	B							

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION ~ UTILITY SECTION

COMPUTED BY: ____________ DATE: ______
CHECKED BY: ____________ DATE: ______

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
Washington

Gentlemen:

Attached herewith are revised exhibits 1R, 2R, and 3R for Policy and Procedure Bulletin No. 19, "Planning Utility Services and Rate Negotiations." These are to replace exhibits 1 through 6 in the original bulletin.

Will you please destroy the superseded sheets in your copy of this Bulletin and attach these revised forms.

Sincerely yours,

Jacob Crane
JACOB CRANE
Assistant Administrator

Attachment

102865 H

June 1, 1940.

EXHIBIT 1R

The figures enumerated in this Exhibit to be used only for the purpose outlined in Bulletin 19

Superseding Exhibit No. 1
issued February 24, 1939.

DATA FOR COMPUTING CAPITAL COSTS AND EXPENSE FOR REPAIRS, MAINTENANCE AND REPLACEMENTS

System or Equipment	Reserve for Replacement: % of System Cost for which Reserve is Provided	Reserve for Replacement: Estimated Life Years	Reserve for Replacement: Annual Reserve % of Total System Cost	Annual Repairs and Maintenance: % of Total System Cost	Total Annual Repairs, Maintenance and Replacements: % of Total System Cost	Estimated Initial Cost Per Dwelling Unit (Relative Values for Preliminary Calculations Only)		
ELECTRICAL SYSTEM:						Ltg-Ref	Ltg-Ref-Cook	
EXTERIOR DISTRIBUTION								
Substation (up to 200 D.U.)	100	40	1.66	1.5	3.16	$ 25	$ 32	
Substation (Above 200 D.U.)	100	40	1.66	1.5	3.16	$ 16	$ 23	
Overhead	95	27	2.69	1.16	3.85	($ 30	$ 40	(a)
						($ 22	$ 30	(b)
						($ 15	$ 20	(c)
Underground	75	31	1.77	1.24	3.01	($ 45	$ 65	(a)
						($ 35	$ 53	(b)
						($ 24	$ 35	(c)
INTERIOR WIRING	19	37	.35	1.82	2.17	($ 90-125	$110-150	
						((non-fireproof)		
						($130	$160	
						((fireproof)		
METERS	100	25	3.12	($ .80 (d)	(11.12	$ 10		
				(	(7.12		$ 20	
				($1.60 (e)	(19.12	$ 10		
				(	(11.12		$ 20	
GAS SYSTEM:						Cook.	Cook.-Ref.	
DISTRIBUTION								
Exterior	25	40	.415	.5	.914	$ 12	$ 12	(f)
Interior	25	40	.415	1.0	1.415	($ 25	$ 28	(g)
						($ 13	$ 15	(h)
						($ 8	$ 9	(i)
Vents (transite 4")	-	60	-	1.0	1.0	$ 20		
METERS	100	25	3.12	($ .80 (d)	8.45	$ 15	$ 15	
				($1.60 (e)	13.78	$ 15	$ 15	

(a) Includes complete system.
(b) Includes PRI. and SEC. systems only (excludes transformers).
(c) Includes SEC. system only (excludes PRI. system and transformers).
(d) Based on 100% check meters, read quarterly.
(e) Based on less than 100% check meters, and monthly readings.
(f) Based on from one to three master metering points.
(g) Based on facilities for centrally located check meters in building groups.
(h) Based on facilities for individual check meters within dwelling units.
(i) Based on no facilities for check metering.

IMPORTANT NOTE:

The percentages listed above for repairs, maintenance and replacements are assumed to be applicable only to equipment and materials of the highest grade. Equipment and materials having a shorter life will require an increased reserve for replacements and a larger allowance for repairs and maintenance. The percentages are applicable to the total estimated initial cost (100%) in every case. - - - - The estimated initial costs given above, in the extreme right hand column, are NOT applicable to a particular project but may be used in a preliminary analysis to arrive at the COMPARATIVE economy of various combinations of service. Estimates of actual costs for a particular project must be based on breakdowns of costs gathered in the particular locality which are applicable at the time and under the conditions of construction.

(Continued)

June 1, 1940.

The figures enumerated in this Exhibit to be used only for the purpose outlined in Bulletin 19

EXHIBIT 1R (Continued)

DATA FOR COMPUTING CAPITAL COSTS AND EXPENSE FOR REPAIRS, MAINTENANCE AND REPLACEMENT

System or Equipment	Reserve for Replacement: % of System Cost for Which Reserve is Provided	Reserve for Replacement: Estimated Life Years	Reserve for Replacement: Annual Reserve % of Total System Cost	Annual Repairs and Maintenance: Expense in Dollars Per Unit	Total Annual Repairs, Maintenance and Replacements: % of Total System Cost	Estimated Initial Cost Per Dwelling Unit (Relative Values for Preliminary Calculations Only)
REFRIGERATORS *						
Ice	100	12	7.46	$1.00 each	11.96 11.46 11.06	($ 22 - Room ratio 3.5 ($ 25 - Room ratio 4.0 ($ 28 - Room ratio 4.5
Electric	100	12	7.46	$2.50 each	11.19 11.13 11.09	($ 67 - Room ratio 3.5 ($ 68 - Room ratio 4.0 ($ 69 - Room ratio 4.5
Gas	100	12	7.46	$2.00 each	10.24 10.21 10.13	($ 72 - Room ratio 3.5 ($ 73 - Room ratio 4.0 ($ 75 - Room ratio 4.5
Oil	100	12	7.46	$2.50 each	9.56 9.46 9.36	($120 - Room ratio 3.5 ($125 - Room ratio 4.0 ($130 - Room ratio 4.5
RANGES						
Coal	100	15	5.78	$1.00 each	7.7	$ 32 plus $8 for waterback
Kerosene	100	15	5.78	$2.25 each	11.27	$ 41
Oil #1	100	15	5.78	$2.25 each	9.25	$ 65
Electric	100	15	5.78	$2.50 each	11.74	$ 42
Gas	100	15	5.78	$1.50 each	10.77	$ 30
Coal and Gas	100	10	9.13	$2.50 each	14.94	$ 43
HOT PLATES						
Electric	100	5	19.22	$1.00 each	23.56	$ 23
Gas	100	5	19.22	$1.00 each	29.22	$ 10
Kerosene or Oil	100	5	19.22	$1.00 each	24.22	$ 20

* The size of refrigerator is increased for larger dwelling units, resulting in increased unit price.

IMPORTANT NOTE:

The percentages and expenses listed above for repairs, maintenance and replacements are assumed to be applicable only to equipment of the highest grade. Equipment having a shorter life will require an increased reserve for replacement and a larger allowance for repairs and maintenance. - - - - The estimated initial costs per unit of equipment given in the extreme right hand column are NOT applicable to a particular project but may be used in a preliminary analysis to arrive at the COMPARATIVE economy of various combinations of service. Estimates of actual costs of equipment for a particular project must be based on costs gathered in the particular locality which are applicable at the time of bidding.

EXHIBIT 2R

> The figures enumerated in this Exhibit to be used only for the purpose outlined in Bulletin 19

June 1, 1940 — Superseding Exhibits Nos. 2, 3 and 6 issued February 24, 1939

ESTIMATED CONSUMPTIONS PER DWELLING UNIT PER MONTH

	Electric (KWH)			Gas (Therms)			Oil (Gals.)	Coal (Tons)
	Max.	Min.	Avg.	Max.	Min.	Avg.	Avg.	Avg.
TENANT:								
Room Ratio 3.5								
Ltg.	33	25	29					
Ref. (1)	23	17	20	7.0	5.2	6.1		
Ref. (2)	20	16	18					
Cook.	82	70	76	6.2	5.3	5.7	5.3	2.0 (Annual)
TOTALS:								
Ltg. Ref. (1)	56	42	49					
Ltg. Ref. (2)	53	41	47					
Ltg. Ref. Cook.	135	111	123					
Room Ratio 4.0								
Ltg.	35	26	31					
Ref. (1)	23	17	20	7.0	5.2	6.1		
Ref. (2)	20	16	18					
Cook.	100	74	87	7.5	5.6	6.5	6.0	2.0 (Annual)
TOTALS:								
Ltg. Ref. (1)	58	43	51					
Ltg. Ref. (2)	55	42	49					
Ltg. Ref. Cook.	155	116	136					
Room Ratio 4.5								
Ltg.	37	28	33					
Ref. (1)	30	20	25	9.1	6.1	7.6		
Ref. (2)	27	19	23					
Cook.	107	79	93	8.0	5.9	7.0	6.5	2.0 (Annual)
TOTALS:								
Ltg. Ref. (1)	67	48	58					
Ltg. Ref. (2)	64	47	56					
Ltg. Ref. Cook.	171	126	149					
PROJECT								
Gen. Lt. & Pr.	12	8	10					
Com. Laundry:								
Ironing	7	5	6					
Boiling	7	3	5	.42	.18	.30		
Proj. Ht. Plts.								
Coal Fired			19/DU or 35 KWH/ton of coal					
Oil Fired			15/DU or .2 KWH/gallon of oil					

(1) = With gas, oil or coal cooking

(2) = With electric cooking

(Continued)

June 1, 1940

The figures enumerated in this Exhibit to be used only for the purpose outlined in Bulletin 19

EXHIBIT 2R (Continued)

ESTIMATED CONSUMPTIONS PER DWELLING UNIT PER MONTH

IMPORTANT NOTES:

1. Add to the total energy consumption and demand 2% to 5% to cover transformer and distribution losses.

2. Figures for cooking consumption are based on an energy ratio for electric to gas cooking of 1:2.2. This is an average figure between the claims of the gas industry, which range from 1:2.0 downward, and the claims of the electric appliance manufacturers, which range from 1:2.4 upward.

102865 H

EXHIBIT 3R

The figures enumerated in this Exhibit to be used only for the purpose outlined in Bulletin 19

June 1, 1940

Superseding Exhibits Nos. 4 and 5 issued February 24, 1939.

ESTIMATED DEMANDS PER DWELLING UNIT PER MONTH

	ELECTRICAL - 30 MINUTE INTEGRATED					
	NUMBER OF DWELLING UNITS					
	Up to 100	101 to 250	251 to 500	501 to 1000	1001 to 1500	Above 1501
TENANT:						
Room Ratio 3.5						
Ltg.	.161	.158	.154	.148	.142	.137
Ref. (1)	.072	.070	.068	.066	.064	.062
Ref. (2)	.066	.064	.062	.060	.058	.056
Cook.	.605	.580	.556	.541	.526	.512
TOTALS:						
Ltg. Ref. (1)	.233	.228	.222	.214	.206	.199
Ltg. Ref. (2)	.227	.222	.216	.208	.200	.193
Ltg. Ref. Cook.	.832	.802	.772	.749	.726	.705
Room Ratio 4.0						
Ltg.	.170	.166	.162	.156	.150	.144
Ref. (1)	.074	.072	.070	.068	.066	.064
Ref. (2)	.068	.066	.064	.062	.060	.058
Cook.	.620	.595	.570	.555	.540	.525
TOTALS:						
Ltg. Ref. (1)	.244	.238	.232	.224	.216	.208
Ltg. Ref. (2)	.238	.232	.226	.218	.210	.202
Ltg. Ref. Cook.	.853	.827	.796	.773	.750	.727
Room Ratio 4.5						
Ltg.	.179	.174	.170	.164	.158	.151
Ref. (1)	.078	.076	.074	.072	.070	.068
Ref. (2)	.072	.070	.068	.066	.064	.062
Cook.	.651	.625	.599	.583	.557	.551
TOTALS:						
Ltg. Ref. (1)	.257	.250	.244	.236	.228	.219
Ltg. Ref. (2)	.251	.244	.238	.230	.222	.213
Ltg. Ref. Cook.	.902	.869	.837	.813	.779	.764
PROJECT						
Gen. Lt. & Pr.	.064	.062	.060	.058	.056	.054
Proj. Htg. Plts. Coal or Oil Fired	.052	.050	.048	.046	.044	.043

(1) = With gas, oil or coal cooking. (2) = With electric cooking.

NOTE: The demands listed under "PROJECT" are based on the use of a time clock on community laundry electric loads to permit removing this load at peak periods.

In determining maximum hourly gas demand for cooking, assume .06 therms per dwelling unit; for water heating, assume .05 therms per dwelling unit.

102865 H

UNITED STATES HOUSING AUTHORITY

POLICY AND PROCEDURE

BULLETIN

NO. 20

DESIGN OF LOW RENT HOUSING PROJECTS:

HEATING.

Technical material for information of architects and engineers.

March 8, 1939

CONTENTS

DESIGN OF LOW-RENT HOUSING PROJECTS : HEATING

INTRODUCTION

A. Objective

Heating systems for low-rent housing involve a variety of considerations, with one basic purpose - the provision of suitable heating at the least possible cost to the tenant. This objective is implied by the United States Housing Act of 1937, which requires rents (including the cost of heating) to be within the financial reach of families of low income. Since the heating expense may represent a very material portion of the total rent, or total expenditure for rent and household operation, economy in operating costs of the heating system is essential.

B. Selecting a Method of Heating

What method of heating and what type of heating system shall be used? Shall there be individual tenant operated heating units or shall heat be supplied from a central source outside the dwelling unit? These are questions which must be carefully considered. The choice should not be an arbitrary one. The advantages and disadvantages of each type and method should be carefully weighed. For example:

The individual unit places the responsibility for fuel consumption squarely on the tenant. It is obvious that when he pays directly for the fuel he consumes he will be more economical in his use of heat, adjusting his consumption to his actual need and to his capacity to pay. Moreover, the assumption of this responsibility tends to make him a more responsible tenant in his other relations with the project.

On the other hand, we nevertheless find that except in warm climates, the larger project operated plant will often cost less in operation, as it operates more efficiently, is usually equipped to burn cheaper grades of fuel, and fuel and supplies are purchased in larger quantities and hence at a much lower cost. Moreover flats and apartments do not readily lend themselves to individual tenant operated plants, except when gas is available at a low rate. In cold climates there is also the danger of freezing the plumbing if the tenant fails to keep the heating plant operating.

Thus there are many factors to be evaluated and various methods of heating to be considered before arriving at a decision. At the outset, a survey of the methods which are suitable to the climate should be made and as many as possible of the factors affecting choice should be evaluated in terms of dollars and cents. The wider the scope of the analysis, the greater the assurance that the ultimate decision will be the best one.

Because of the technical considerations involved it is usually important to have the services of a qualified heating engineer in the preparation of this analysis, and in the final choice and the design of the heating system. An initial investment in qualified technical advice may pay for itself many times over in more accurate and dependable operating and maintenance estimates, greater speed in the preparation of working drawings, and greater operating economy and efficiency.

C. Factors Affecting Choice

1. Initial Cost and its Effect on Annual Cost. (The added cost of providing space must not be forgotten).

2. Annual Cost: Operation, Maintenance, Repairs, Replacements. (The choice of fuel used for domestic water heating and the use of the same fuel for other purposes may affect this item).

3. Effect on Site and Building Plan.

4. Continued Availability of Fuel and Probable Trend of its Price.

5. Obsolescence and Adaptability to Change to overcome Obsolescence.

6. Ease, Safety, Quietness, and Cleanliness of Operation.

7. Effect on Tenant Responsibility.

8. Local Practice and Availability.

9. Climate.

Some of these factors relate to the type of system, some to the fuel, some to both. There may be other factors in particular cases.

D. Types of Systems:

1. Individual Tenant Operated Unit

In regions requiring only occasional heat, this should be the favored type. In climates more favorable to the project operated plant, the comparative economy of total fuel costs and the difficulties of fuel storage and handling must be considered.

Coal is usually considered impractical for use above the first floor since it requires storage space and means for ash disposal. Unless provision is made to enable the tenant to purchase it at close to the wholesale price, its use will often prove uneconomic except for the stove type of heater. Soft coal presents a smoke nuisance.

Gas presents no storage or handling difficulties and, when low enough in price, makes the individual unit available for any type of dwelling.

Oil causes storage difficulties due to the fire hazard involved, except when basements are provided.

The common types of individual units and characteristics which affect their use are:

(a) Fireplace or Circulator

When cold weather is occasional and not severe this is the only method of heating which is justified. Fireplaces may be the ordinary masonry type or may have a metal chamber to permit the warming and circulating of air, and may have ducts to other rooms. Circulators may burn any fuel depending upon local practice, availability, cost, and storage and handling facilities.

(b) Stove

Does not permit uniform heat distribution or temperature control but may be suitable where very low cost and very low rent are the aims.

(c) Gravity Warm Air

Low first cost; minimum of maintenance and adjustment; basement space required.

(1) Pipeless: Very low first cost; distribution only partially effective; basement space required.

(2) With Ducts: Distribution more effective; ducts require space and replacement.

(d) Forced Warm Air

Distribution most effective; no basement required; when gas or oil fired needs very little space; permits air filtering, humidification and automatic control at some increased cost and maintenance.

(e) One Pipe Steam with radiators: Slightly higher in cost than gravity warm air; requires basement space.

(f) Hot Water: Slightly higher in first cost than one pipe steam; very satisfactory in operation, particularly when a steady, moderate supply of heat is wanted; requires either basement or fire retarded utility room.

2. Central or Group Project Operated Plants

The major factors favorable to these types of plants are:

(a) Concentration of dwelling units in flats and apartments and to a lesser extent in row houses.

(b) Climate requiring nearly continuous heating for four or more months.

The decision between a single central plant and two or more plants, each serving a group of buildings, will be affected by:

(a) The size and arrangement of the development and its topography.

(b) The types of fuel available at low prices.

(c) Labor rates and related factors.

A large central plant will usually require a separate building and high chimney. Although this may be undesirable for aesthetic reasons, the delivery, storage, and handling of coal and the disposal of ashes can be efficiently handled in such a plant.

Group plants can usually be located in basements with chimneys related to the buildings; fuels such as oil or gas may be readily handled, regardless of the number, size and location of the plants. Group plants should be interconnected, wherever feasible, to permit more flexible operation and consequently greater economy in the low demand months. This is particularly important where coal is the fuel. The site plan should therefore be arranged to permit nearly uniform sizing of the group plants and their location for economical interconnection.

While these plants commonly distribute heat through radiators in each room, at least one housing project has successfully utilized the steam space heater, long used for non-residential heating. One unit heater, consisting of a steam coil over which air is blown by a motor driven fan, is used per dwelling unit. The cost for radiators, valves, and piping is reduced, but shorter life expectancy and motor repair for these heaters must be considered in comparing annual costs. Design factors will be found under "STEAM SPACE HEATERS."

Heating controls of the "continuous flow" and "on and off" and combination type used in group or central plants have resulted in savings of up to 25 per cent of fuel costs. Design factors are given under "SYSTEM OF HEATING CONTROLS."

PART I - ECONOMIC ANALYSIS

A. Comparative Cost Analysis

Several suitable methods of heating having been tentatively selected, a comparative cost analysis should be made in order to determine which will result in the least expense to the tenant. The underlying principles involved in this analysis are simple and require no explanation. There are, however, certain common errors concerning which a reminder may be helpful.

Perhaps the most prevalent mistake is to overlook items of expense which are indirectly involved in the use of a specific type of fuel or heating plant. If, for example, coal fired gravity warm air systems are being considered, the cost of a basement or other space, coal storage space, chimneys, and possibly additional roads for the delivery of coal and removal of ashes, should be included.

If individual, group and central plants are being compared, there should be included not only the costs of boilers, breeching, auxiliary equipment, and piping, but also fuel storage space or tankage, construction costs of boiler and storage rooms and smoke stack, and heat insulation of boiler room ceiling. There may also be the cost of supply and return mains, with their supports and heat insulation and trenches or tunnels to nearby buildings and lines to hot water heaters.

The central plant should be charged with its building and smoke stack, as well as complete plant, distribution and return systems, and possibly cost of land occupied if additional land has to be acquired to accommodate the central plant.

With respect to items such as maintenance and replacement, the expense for which may vary widely, the greatest care should be taken to avoid estimates which are either unfairly pessimistic or unduly hopeful.

In general, the present prevailing costs will form the basis of computations, but unusual price conditions should be discounted and the long range trend anticipated wherever possible.

B. Forms for Analysis

Convenient forms for preparing the economic heating analysis are attached hereto. These are designed to facilitate separate analysis of plant and fuel costs.

Following are the items which are included in the attached economic analysis charts to determine the initial costs and annual operating expense:

TABLE I - INITIAL COSTS

Central-Group-Building Plants

A. Radiation and/or Pipe; Unit Heaters, Ducts and Grilles-in Buildings. Cost of heating system within the buildings, exclusive of equipment, auxiliaries and piping within the boiler room. Radiation can be estimated by reference to Table III of the charts.

B. Distribution (Yard). Cost of underground piping installation.

C. Plant Equipment. Cost of equipment, auxiliaries and piping within the boiler room. Automatic firing and fuel handling equipment should be noted separately. Building plants might include one boiler room per building or one boiler room per two or three small buildings.

Unit Plants

D-E-F-G. Cost of heating equipment for individual plants only. Items D, E and F might apply to warm air systems or circulators. Vents under D include fresh air connections. Items E, F and G are applied to steam or hot water heating systems.

Central-Group-Building - Unit Plants (Related Items)

H. Plumbing Connections. Cost of water and drainage required for heating system.

I. Gas Piping. Cost of proportionate share of gas piping applied to heating system.

J. Electric Outlets. Cost of electrical work necessary for heating system.

K. Chimneys. Cost of masonry flues, stacks and foundations.

L. Structures. Cost of structures, additional to dwelling facilities, necessary to house boiler and auxiliary equipment for central, group or building plants; closets, utility rooms, partitions, etc., for individual dwelling unit plants.

M. Fuel Storage. Cost of facilities for storing fuel. Fuel oil tanks concerned with the immediate operation of the plant or plants need not be included here.

N. Extra Roads. Cost of extra roads required in the delivery of fuel or removal of ash.

O. Net Initial Cost (Heating). Total of above items, each of which should include the sub-contractors expense and profit. However, it should not include general contractor's added percentage.

P. Gross Heating Cost. Net initial cost plus general contractor's added percentage.

Domestic Hot Water

Q. to X. (inclusive): Costs of supplying domestic hot water. The same procedure should be followed as outlined heretofore for heating. It is necessary to note that when domestic hot water is supplied through generators deriving its source of heat from boilers used also for space heating, the cost of the extra boiler capacity and heating distribution should be included in items A, B and C.

Y. - Gross Cost (Heating plus Domestic Hot Water). The summation of items P. and X.

TABLE II. ANNUAL OPERATING EXPENSE

Heating and Domestic Hot Water

a. through d. Maintenance, Repair and Replacement. The product derived by multiplying the initial costs from Table I by the factors set up for the respective items in Table IV. Related items generally refer to plumbing connections, gas piping and electric outlets.

e. The total of all maintenance, repair and replacement expense.

f. Fuel. Formulae have been prepared for estimating fuel consumption which are incorporated in this Bulletin. The influence on the rate structure in the use of gas for space heating and domestic hot water in coordination with that required for cooking and refrigeration should be applied in the analysis. Where the electric consumption for the operation of auxiliary heating equipment is a substantial amount, its influence on the electric rate structure should be thoroughly considered.

g. Labor. In high pressure boiler plant operation it may be necessary to employ the services of a competent first class licensed engineer. Local regulations may require such services continuously while the plant is in operation or for supervisory purposes only. In the latter case a portion only of the engineer's time might be devoted to the plant. In any event, it might be advisable to charge at full time the services of second class licensed engineers.

In low pressure plant operation licensed men are generally not required unless stipulated by ordinance or labor organization.

ECONOMIC HEATING ANALYSIS
COMPARATIVE INITIAL AND
ANNUAL OPERATION COSTS

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY

PROJECT ______
LOCATION ______
STATUS ______

DWELLING UNITS ____ HEATED CUBE ____
NO. OF ROOMS ____ CUBE PER ROOM ____
ROOM RATIO ____

DESIGN TEMPERATURE ____
DEGREE DAYS ____

BUILDINGS
NO ____ STORY ____
NO ____ STORY ____
NO ____ STORY ____

COMPUTED BY ____
CHECKED BY ____

DOCKET NO. ____
SHEET NO. ____
FROM ____ TO ____
DATE ____ 19 ____

TABLE I - INITIAL COSTS			A	B.	C.	D.
ITEMS	SCHEME	HTG.				
		DOM. H.W.				
	SYSTEM - HTG.					
	NO. OF PLANTS					
	E.D.R.	HEATING				
		DOM. H.W.				
		TOTAL				
	B.H.P.	TOTAL				
	TYPE OF FUEL	HEATING				
		DOM. H.W.				
CEN-GROUP-BLDG-PLANTS	A	IN BLDGS. 1. RADIATION AND/OR PIPE				
		2. UNIT HEATERS-DUCTS-GRILLES				
	B	DISTRIBUTION (YARD)				
		1. INTERMEDIATE PRESSURE				
		2. LOW PRESSURE				
	C	PLANT EQUIPMENT				
		1. BOILERS, PUMPS, AUXILIARIES.				
		2. FUEL FIRING				
		3. FUEL HANDLING				
UNIT PLANTS	D	DUCTS, GRILLES AND VENTS				
	E	RADIATION AND PIPE				
	F	HEATER OR FURNACE				
	G	CONTROLS				
HEATING - RELATED ITEMS	H	PLUMBING CONNECTIONS				
	I	GAS PIPING				
		1- IN BUILDINGS				
		2- OUTSIDE BUILDINGS				
	J	ELECTRIC OUTLETS				
	K	CHIMNEYS				
	L	STRUCTURES				
		1- SEPARATE BUILDING				
		2- BASEMENT CONSTRUCTION				
		3- CLOSETS, PARTITIONS, ETC.				
	M	FUEL STORAGE				
	N	EXTRA ROADS				
	O	NET INITIAL COST (HEATING)				
	P	GROSS HTG. COST ("O"+ %) (GEN'L. CONTRS. EXP. AND PROFIT)				
DOMESTIC HOT WATER	Q	HEATER AND TANK				
	R	GENERATORS - PUMPS				
	S	HOT WATER PIPING				
	T	GAS PIPING				
	U	ELECTRIC OUTLETS				
	V	CHIMNEYS OR VENTS				
	W	NET INITIAL COST (DOM. H.W.)				
	X	GROSS DOM. H.W. COST ("W"+ %)				
	Y	GROSS COST=HTG.+DOM.H.W. (P+X)				

ECONOMIC HEATING ANALYSIS

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY

DOCKET NO. ______
SHEET NO. ______
FROM ______ TO ______
DATE ______ 19 ______

TABLE II - ANNUAL OPERATING EXPENSE			A.	B.	C.	D.
ITEMS	SCHEME	HEATING				
		DOM. H.W.				
	SYSTEM	HEATING				
	FUEL AND PRICE	HEATING				
		DOM. H.W.				
	HEAT VALUE-B.T.U.	HEATING				
		DOM. H.W.				
	FUEL CONSUMPTION	HEATING				
		DOM. H.W.				
	ELECTRIC POWER K.W.H.	HEATING				
		DOM. H.W.				
	EFFICIENCY OF FUEL AS FIRED	HEATING				
		DOM. H.W.				
HEATING	a MAINT. & REPAIR	1. FUEL FIRING & FUEL HANDLING (CENTRAL-GROUP-BUILDING PLANTS)				
		2. OTHER HEATING EQUIPMENT (CENTRAL-GROUP-BUILDING-PLANTS)				
		3. UNIT PLANTS				
		4. RELATED ITEMS				
		5. STRUCTURES				
	b REPLACEMENT	1. FUEL FIRING & FUEL HANDLING (CENTRAL-GROUP-BUILDING-PLANTS)				
		2. OTHER HEATING EQUIPMENT (CENTRAL-GROUP BUILDING-PLANTS)				
		3. UNIT PLANTS				
		4. RELATED ITEMS				
DOMESTIC HOT WATER	c MAINT-REP.	1. HEATER OR GENERATOR				
		2. PIPING - GAS & WATER				
		3. RELATED ITEMS				
	d REPLACE.	1 HEATER OR GENERATOR				
		2 PIPING - GAS & WATER				
		3 RELATED ITEMS				
HEATING AND DOMESTIC HOT WATER	e	TOTALS - MAINTENANCE - REPAIR REPLACEMENT ("a" THRU "d")				
	f FUEL	1. HEATING				
		2. DOMESTIC H.W.				
	g	LABOR	CHIEF Mo.@ MEN Mo.@ MEN Mo.@	CHIEF Mo.@ MEN Mo.@ MEN Mo.@	CHIEF Mo.@ MEN Mo.@ MEN Mo.@	CHIEF Mo.@ MEN Mo.@ MEN Mo.@
		1. HEATING (PLUS ____ % INSURANCE)				
		2. DOM. H.W. (PLUS ____ % INSURANCE)				
	h	ASH DISPOSAL				
	i	ELECTRIC POWER				
	j	WATER AND SUPPLIES				
	k	NET ANNUAL OPERATION ("e" THRU "j")				
	l	NET PER ROOM PER YEAR				
	m	NET PER ROOM PER MONTH				
	n	DEBT SERVICE (0.0017 X ____ - TABLE I)				
	o	GROSS ANNUAL OPERATION ("k" + "n")				
	p	GROSS PER ROOM PER MO.				

50427

ECONOMIC HEATING ANALYSIS

DEPARTMENT OF THE INTERIOR
UNITED STATES HOUSING AUTHORITY

DOCKET NO. ______
SHEET NO. ______
FROM ______ TO ______
DATE ______ 19 ______

TABLE-III CUBIC FEET OF USABLE SPACE PER SQUARE FOOT OF EQUIVALENT DIRECT STEAM RADIATION

DESIGN TEMP. DEG."F"	INSIDE TEMP. DEG."F"	TEMP. DIFF. DEG."F"	ONE STORY BUILDING	TWO STORY BUILDING	THREE STORY BUILDING	FOUR STORY BUILDING	SIX STORY BUILDING
+20	70	50	48	61	67	71	75
+15	70	55	46	58	63	67	70
+10	70	60	44	54	60	63	66
+5	70	65	41	51	56	60	62
0	70	70	38	47	52	55	58
-5	70	75	35	43	48	51	53
-10	70	80	32	41	44	47	49
-15	70	85	29	37	41	43	45
-20	70	90	26	33	37	39	42

TABLE-IV MAINTENANCE & REPAIR — REPLACEMENT FACTORS

		SCHEME	ITEMS	MAINTENANCE AND REPAIR UNDER 300 UNITS	MAINTENANCE AND REPAIR OVER 300 UNITS	REPLACEMENT AT 2% INTEREST	EXPECTED LIFE IN YEARS
HEATING	A	CENTRAL PLANT	FUEL FIRING & HANDLING / UNIT HEATERS	0.0225	0.02	0.0412	20
		HIGH PRESSURE.	OTHER HEATING EQUIPMENT	0.0225	0.02	0.0175	38
		STEAM OR FORCED	RELATED ITEMS	0.0175	0.015	0.01	55
		HOT WATER	STRUCTURES	0.0075	0.0075		
	B	GROUP PLANTS OR	FUEL FIRING & HANDLING / UNIT HEATERS	0.0225	0.02	0.0412	20
		CENTRAL PLANT	OTHER HEATING EQUIPMENT	0.0225	0.02	0.02	35
		(LOW PRESSURE)	RELATED ITEMS	0.0175	0.015	0.01	55
		STEAM OR FORCED HOT WATER	STRUCTURES	0.005	0.005		
	C	INDIVIDUAL BUILDING	FUEL FIRING & HANDLING / UNIT HEATERS	0.0225	0.02	0.0412	20
		PLANTS	OTHER HEATING EQUIPMENT	0.0225	0.02	0.0225	32
		(LOW PRESSURE)	RELATED ITEMS	0.0175	0.015	0.01	55
		STEAM OR HOT WATER	STRUCTURES	0.005	0.005		
	D	INDIVIDUAL DWELLING	GRAVITY WARM AIR	0.02	0.02	0.0578	15
		UNIT PLANT SYSTEMS	FORCED WARM AIR (GAS FIRED)	0.02	0.02	0.0412	20
			GRAVITY STEAM OR HOT WATER	0.02	0.02	0.0166	40
			CIRCULATORS	0.02	0.02	0.0913	10
			STRUCTURES	0.01	0.01		
	E	DOMESTIC	HEATER AND TANK	0.0225	0.02	0.0578	15
		HOT WATER	GENERATORS — PUMPS	0.0225	0.02	0.0412	20
			PIPING - GAS AND WATER	0.0125	0.01	0.01	35
			RELATED ITEMS	0.0175	0.015		

NOTES: THE STEAM RADIATION DERIVED FROM THE FACTORS IN TABLE III IS TO BE USED FOR PRELIMINARY PURPOSES ONLY IN PREPARING AN ECONOMIC ANALYSIS, AND NOT FOR INDIVIDUAL ROOM CALCULATIONS. HOT WATER HEATING RADIATION CAN BE TRANSPOSED FROM THE RESULTANT FIGURES. THE FACTORS IN TABLE IV ARE BASIC ONLY; THEY MAY BE VARIED TO SUIT LOCAL CONDITIONS AND THE TYPE AND QUALITY OF THE HEATING OR DOMESTIC HOT WATER SYSTEM. UNIT HEATERS UNDER "A", "B", AND "C" IN TABLE IV APPLY TO THE STEAM OR HOT WATER TYPE. GAS OPERATED HEATERS ARE INCLUDED UNDER D.

When a plant or plants necessitate a twenty-four daily operation, the personnel per shift (with the exception of the chief engineer if permitted by regulation) can be multiplied by 3-1/2 times, which should compensate for relief time. If, on the other hand, the plant or plants do not require operation on this basis, the staff could be reduced proportionately, with the necessary relief labor of approximately 16-2/3 per cent per man added. It is advisable that in preparing an analysis of different heating schemes before a selection is made, only that portion of the firemen actually required in the operation of the plant need be applied to it.

Labor during the non-heating season can be reduced commensurate with the scheme of heating domestic hot water and the tenant requirements.

h. Ash Disposal. The expense of removing the ash from the project.

i. Electric Power. The expense of kilowatt hour consumption of all electric motor driven equipment.

j. Water and Supplies. The expense of water incidental to plant operation and supplies such as waste, lubricating oil, etc.

k. Net Annual Operation. The total of all operating expense (items e through j).

l. Net per Room per Year. The net annual operation (item k) divided by the number of rooms.

m. Net per Room per Month. The net monthly operation divided by the number of rooms.

n. Debt Service. The product of 0.0017 (which is the difference between the annual subsidy of 3.5 per cent and the interest and amortization of 3.67 per cent) by the Gross Costs in Table I of Heating (item P), Domestic Hot Water (item X) or the total of Heating and Domestic Hot Water (item Y), dependent upon the nature of the analysis. No allowance has been made in the chart to compensate for any changes in these rates, since the influence of such fluctuations on the heating and/or domestic hot water per room per month operating expense would be negligible.

o. Gross Annual Operation. The summation of items k and n.

p. Gross per Room per Month. The gross monthly operation divided by the number of rooms.

C. Selecting the Fuel

Choice of fuel is dependent in a large measure on local availability and cost. Other considerations are cleanliness and ease of handling. As the choice of fuel may affect the site plan and the management policy, an early fuel cost analysis should be made. A recommended form for preparing such an analysis is included in the "Economic Heating Analysis" chart attached, additional copies of which may be obtained upon application to the United States Housing Authority at Washington, D. C.

Low fuel prices are generally required to make individual heating units practical. There are several ways in which retail fuel prices may be lowered: purchase by the project at wholesale prices and resale to the tenants; group purchase sponsored by a "Tenants Association"; or purchase through the department which makes municipal purchases of fuel. The cost of handling fuel, including storage, weighing, delivering and billing, must be considered in any study of fuel purchasing methods. Fuel storage by the tenant may constitute a problem.

In the selection of fuel, especially coal, consideration should be given to a possible rise in price. The price of coal today is lower than it has been in a number of years.

PART II - DESIGNING THE HEATING SYSTEM

Recommendations and suggestions for the design of heating plants are presented herein. The United States Housing Authority recognizes that there are various satisfactory methods of handling particular design features, and these suggestions are not to be considered the only acceptable ones.

A. The Central Plant

1. Boilers

Central plants: design to operate at 80 to 100 pounds pressure, with not less than three boilers; water tube boilers, at 150 percent of rating; portable fire box boilers, at 100 percent of rating. Normal rating should not exceed 500 H.P. except where more than four boilers are required.

Boilers up to 100 H.P.: fire box type.

Boilers 100 H.P. to 300 H.P.: either straight water tube, or low head three drum bent tube.

Boilers above 300 H.P.: either straight water tube, or high head four drum bent tube.

Insulation of settings on coal burning boilers 300 H.P. and over will be improved by providing air-cooled walls. For oil or gas fuel, settings may have solid walls and air-cooled floors. For straight tube boilers, provide solid end and side walls 22 inches thick with full floating bridge wall to take care of expansion. Provide for expansion in the setting walls as well as proper clearance between drums and settings and supporting structural members. Support boilers independently of brick setting.

Provide for easy cleaning of all water and fire surfaces. Provide soot blowers on water tube, horizontal return tubular, and portable type fire box boilers burning bituminous coal.

Include water treatment facilities where necessary.

Provide for easy removal of ashes; if pulverized coal firing is used, provide a method for trapping and removal of fly ash.

A clear space of 14'-0" minimum is recommended between boiler fronts and the wall of the building, not less than 6'-0" between the rear of the boilers and the wall of the building, and not less than 6'-0" between each boiler for air-cooled walls and 5'-0" for all others. Each boiler should have an individual setting.

Provide proper ventilation over the top of all boilers. This can best be accomplished by a monitor over each boiler with pivoted sash and extended operating device.

2. Steam Outlets

The steam outlet of each boiler carrying in excess of 15 pounds gauge pressure should have an automatic stop and check valve at the boiler, and globe or angle valve at the header. One or more openings for future flanged connections may be provided on boiler drums.

3. Cat Walks

Provide cat walks with ladders so that all points on boilers which must be serviced may be reached.

4. Stacks

Base peak boiler loads on a chosen minimum outside temperature.

Stack diameters should be the most economical size, calculated for peak load demand at 20° F. above design temperature with provisions for further extension if contemplated.

Design for fifty percent excess air under peak load demand for oil and 90 percent excess air for coal.

At least two-tenths of an inch of draft is needed in the combustion chamber for forced draft equipment when burning either coal or oil.

Specific recommendations for natural draft fuel oil burning equipment will be furnished by the United States Housing Authority on request.

Where either oil or gas is used, it is advisable to calculate the stack size on the basis of burning coal with and without cinder trap.

5. Overhead Bunkers

Overhead coal bunkers in central plants: design with a capacity of not less than 10 percent of the estimated maximum annual coal consumption.

Where more storage is desirable, provide outside storage spaces for an additional 5 to 10 percent. These may be surrounded by a masonry wall at least 6'-0" high.

In localities where the analysis of the coal shows a content of three percent or more of sulphur, use overhead bunkers either of concrete or metal coated on the inside with at least 1/8 inch of a bitumastic paint or a tile lining set in hot mastic.

6. Underground Coal Storage

Where underground storage is provided, the coal holes should be raised about four inches above the trucking grade. They should be sufficient in number and so located that at least two-thirds of the total volume of storage can be filled without hand trimming. Openings from these underground storage bins to the boiler rooms should have a metal door, to be closed when coal is being placed in the bin.

Underground storage is recommended only where the total annual consumption is less than 3500 tons.

7. Coal Handling Equipment

Traveling weigh larries, electrically operated, should have capacities of not less than 1,500 pounds for boilers up to 250 H.P., and 2,000 pounds for boilers above 250 H.P., and should be equipped with switches to limit the horizontal travel. Electric motors for weigh larries and other coal handling equipment should preferably be the fully enclosed, fan cooled type. The use of this equipment ought to be limited to projects where the total annual coal consumption exceeds 3500 tons.

Coal hoppers for stoker feeds: design for 1,000 pounds for boilers up to 250 H.P., and 1,500 pounds for boilers over 250 H.P. Stokers may be equipped with fully-enclosed, fan-cooled electric motors or steam turbines, or may be hydraulically operated.

Monorails may be supported from roof trusses of boiler rooms, but should be placed so that the bottom of bucket, when raised to its unloading position, will not be over 18 inches above the top of the stoker hopper, to limit the swinging of the bucket.

Hoists should have electric lift and travel, and two lifting cables placed on either side of the bucket to prevent the bucket from turning when being raised.

The bucket should have at least 1,000 pound capacity with a side bottom dump and gate of the clam shell type operated with a wheel, rack and pinion. The wheel should operate through a knuckle joint so that it can be reached when bucket is raised or lowered. Weighing sections should be placed in the monorails and the longitudinal travel of buckets limited to 50 feet per minute maximum.

Drums of hoist should be grooved for rope and not flat.

8. Ash Handling Equipment

When the annual coal consumption is up to 2,200 tons, consideration must be given to the method of ash disposal.

When the annual coal consumption is above 2,200 tons, a pneumatic or preferably a mechanical system of ash handling is desirable.

Where cinder traps are used, provide for disposal of fly ash through the ash handling system. Dispose of the fly ash from the rear hopper of the boiler through the ash handling system, or return into the boiler furnace for burning the combustibles.

9. Instrument Boards and Instruments

The following instrument boards are recommended for heating plants burning in excess of 2500 tons annually:

(a). One main instrument board located in the boiler room as directed. Instruments on this board may include:

(1) Electric clock, 6 inch diameter.
(2) Smoke density indicator and recorder where required.
(3) Recording and integrating steam flow meter, for yard distribution system only.
(4) Steam pressure gauge indicating boiler pressure.
(5) Steam pressure gauge indicating yard distribution system.

(b). An instrument board for each boiler, located adjacent to the boiler as directed. Instruments on this board may include:

(1) CO_2 Recorder.
(2) Exit gas recording pyrometer.
(3) Indicating and integrating steam flow meter.
(4) Steam pressure gauge furnished under boiler trimmings.
(5) Draft gauge that will comply with the draft requirements by having the requisite number of pointers.

10. Draft Control

Control of each boiler should be obtained independently through its own uptake damper.

Arrange main stack damper for hand control with locking quadrant.

11. Test Openings

It is well to provide insertion points in breeching at stack for pyrometers for taking test temperatures.

12. Feed Water Heaters

Use feed water heaters of the deaerating type, operating at not less than 215° F., with a reserve storage capacity of not less than five minutes between overflow and cold water make up inlet.

13. Condensate Receiving Tank

In all cases a condensate receiving or surge tank should be used having a capacity of thirty-minute storage between overflow and automatic float controlling make-up water.

Where space conditions will not permit the use of a receiving tank, the feed water heater should have not less than twenty minutes storage capacity between the overflow and float valve make-up.

A cold water bypass should be arranged on the boiler feed pump suction, for the purposes of boiler wash, for reducing feed water temperatures, and for the operation of hydraulic tube cleaners. The pumps should be arranged to maintain feed water service to any boiler, while another boiler is being given hydraulic service.

14. Boiler Feed Pumps for Central Plants

With installed boiler horse power up to 400 H.P., two pumps are recommended.

With installed boiler horse power from 400 to 1200 H.P., three pumps are recommended.

With installed boiler horse power over 1200 H.P., special consideration should be given to the number of pumps.

No pump should have a capacity greater than 75 percent of the peak demand and all pumps should be steam driven.

When three or more pumps are installed, one should be sized to take care of the summer load when operating normally.

Valve all equipment furnished in duplicate so that either or both may be operated singly or together.

15. Primary Pressure Reducing Valves

Mount the primary pressure reducing valve assembly in a horizontal position, on one of the side walls, rather than in a horizontal position near a ceiling. Provide platforms for servicing.

Experience has shown that three or more pressure reducing valves, arranged so that one valve can take care of the entire hot water load in the summer, provide a more flexible installation. As a basis for calculation, the following may be used as a guide:

Assume a heating load of 12,520 pounds of steam per hour, a hot water load of 4,550 pounds of steam per hour, equal to 17,070 pounds of steam per hour plus 10 percent for line losses,--a total of 18,777 pounds of steam per hour.

The pressure reducing valve to take care of the hot water load should be adequate for 4,550 pounds of steam per hour, plus 10 percent line loss, --a total of 5,000 pounds of steam per hour.

Subtracting this from 18,777 pounds of steam per hour leaves 13,777 pounds per hour to be taken care of by two pressure reducing valves, one valve to take care of 75 percent of this and the other to take care of the balance.

By this arrangement, the valves may be opened or closed to meet the increase or decrease of the demand steam load. In no case should these valves be larger than 8 inches.

Protect all pressure reducing valve stations by a battery of pop safety valves having a capacity of <u>60 percent</u> of the steam demand load.

B. <u>The Group Plant</u>

Group plants are usually preferable to individual building plants, although the latter may be practical for very large buildings. Design recommendations for group plants are generally applicable to individual building plants. Group plants should be located to allow economical interconnection to insure flexibility under mild weather and summer load operation.

Boilers in these plants should be of the portable fire box type sized at 100 percent of rated capacity. Each plant should have at least two boilers, with the capacity of each boiler not to exceed 12,000 square feet of direct radiation.

1. <u>Piping at Group Boiler Plants</u>

For single or two pipe gravity steam heating systems, equip boilers with regular Hartford loops, and valve so that any or all boilers may be operated or drained without interruption of service.

2. <u>Boiler Feed Pumps for Group Plants</u>

Whenever possible, arrange group plants carrying up to 15 pounds gauge pressure so that the vacuum pumps can discharge water of condensation directly to the boilers. Where this is impractical, use single stage motor driven boiler feed pumps.

3. <u>Steam Outlets on Boilers for Group Plants</u>

Equip steam outlet of each boiler carrying up to 15 pounds gauge pressure with one globe valve in each connection.

4. Motor Truck Scales

Where it is not possible to secure certified weights of coal deliveries, include motor truck scales of the beam type, installed in pits, if feasible.

The scales should have a capacity of not less than 70,000 pounds.

C. The Distribution Lines

The design of the heating distribution system should not be deferred until after the site plan has become set. Both the character and extent of the distribution system may be influenced by close cooperation between the heating engineer and the site planner from the beginning. Buildings arranged compactly will achieve economy in heating distribution. Where plenty of land is available, it is more economical to concentrate the area not needed for housing in a single large unit than to space the buildings widely over the entire site.

Underground steam and return distribution should be direct; design layouts to take care of expansion at the point of entrance into each building, where possible.

Reduce the number of steam drip traps, located in yard steam manholes to a minimum, and wherever possible provide for dripping yard steam mains by traps placed inside the nearest basement.

Where pipe expansion must be provided for underground lines, use welding fittings and straight pipe expansion bends, installed in minimum design non-accessible expansion chamber.

Underground piping should be installed in a simple type of conduit, consisting either of split-tile, built-up tile, pre-cast lightweight concrete with a continuous concrete base and gravel backing where required, sponge-felt asbestos pipe covering with integral waterproof jacket, or of a combination casing and covering conduit constructed of standard thickness 85 percent magnesia pipe covering without canvas wrap, sealed into an inner core by application of a uniformly thick layer of high melting point asphalt between the outer surface of the magnesia insulation and the outside metal jacket.

Any and all other types of conduit of equal or lesser cost should be given full consideration. All conduit installations should be specified to be substantially in accordance with the manufacturers' commercial standards.

D. Heating within the Buildings

1. Radiation and Risers

Supply and return risers: expose and arrange to serve two radiators on each floor wherever possible.

Arrange connections for both supply and return on same end of radiator, nearest to risers.

Install radiator supply and return branches above floor in fireproof floor construction.

Install radiator supply branches above floor, in wood joist floor construction, and return branches under flooring for stability. Floor joists may be notched near bearing for this purpose. All connections through floors, walls or partitions should have sleeves and escutcheons.

The amount of radiation for each radiator called for on the riser diagram or schedule should be the minimum required.

No radiator should be installed which does provide at least the amount of radiation called for on riser diagram or schedule. This is to be based on the manufacturers' catalog ratings for cast iron, except that the sizes given may vary slightly to suit manufacturers' standards, provided the total radiation specified for any one individual dwelling unit is not decreased.

Wherever possible, use exposed risers for heating kitchens and bathrooms.

E. Drying Room Heating

Construct clothes drying rooms in groups adjacent to laundries, locate as close as practical to hot water generator rooms, and equip with unit heaters delivering 120° air and supplied either with steam or with hot water from the domestic hot water supply system.

When steam is used, the supply should be taken from the hot side of the zone control valve so that heat may be available during the summer season. When hot water is used, the unit heaters may be supplied from the basement hot water mains.

Drying rooms should have exhaust fans capable of exhausting at least six changes per hour.

When laundries are adjacent to drying rooms, the exhaust fans may get the majority of their supply through the laundries. Insulate the ceiling of all drying rooms to protect the rooms above from the heat of the drying rooms.

Consideration should be given to the installation of cabinet type drying units in lieu of drying rooms, as substantial reductions in cost of such equipment have recently been effected through redesign. This type of drier, using either gas or electricity, requires much less basement space, and substantially increases available laundry facilities through more rapid clothes drying.

List of Recommended Authorities

Heat Loss Calculations: latest edition of the American Society of Heating and Ventilating Engineers' Code of Minimum Requirements of Heat for Buildings.

As a matter of practical application the following inside temperatures may be figured:

Living quarters	70° F.
Sleeping quarters	67° F.
Kitchens	67° F.
Bathrooms	67° F.

Cast Iron Radiator Sizes: manufacturer's catalog ratings.

Non-Ferrous Convector Sizes: Convector Manufacturer's Certified Ratings.

Cast Iron Convector Sizes: certified condensate tests, plus the allowable additional capacity based on thermal head interpolations in accordance with the Convector Manufacturer's Certified rating method.

Boilers: latest Boiler Code of the American Society of Mechanical Engineers, the Steel Heating Boiler Institute, and the A.S.H.V.E. Standard Code for Rating Heating Plants.

Warm Air Heating Design: Investigations of Warm Air Furnaces and Heating Systems made by the University of Illinois in Cooperation with the National Warm-Air Heating Association.

Symbols: the A.S.H.V.E. and the American Standards Association.

See also A.S.H.V.E. "Code of Minimum Requirements of Heat for Building," and "Instructions for the Operation, Care and Repair of Boilers," Navy Department, Bureau of Engineering.

PART III - PREPARING THE CONTRACT DOCUMENTS

JUN 20 1974

All heating plans and specifications should be in sufficient detail so that a minimum of shop drawings will be necessary.

A. The Working Drawings

Ample space should be provided for piping and particular care be taken to avoid structural interferences and conflicts between the different branches of the mechanical trades. Mechanical drawings should be generally diagrammatic, with all piping and equipment shown as nearly as possible in the location in which it is to be installed.

The use of a common trench for buried heating and hot water lines wherever possible should be encouraged.

Pipes should not be located in exterior walls where there is danger of freezing, unless proper protection is provided.

Pipe sleeves and openings should be shown on the structural or architectural drawings for all pipes passing through footings, masonry floors or exterior walls below grade. The elevations of sleeves need not be given except where passing through waterproofing finishes, which require special sleeve construction. In full basements there should be provided not less than 6'-3" clear head room under bottom of lowest pipe.

B. The Specifications: Materials

Black steel pipe: all steam mains and all dry returns.

Wrought iron pipe: all wet returns, all underground returns, and boiler feed and boiler blow-off lines.

Copper molybdenum alloy pipe: all wet returns, all underground returns, and boiler feed and boiler blow-off lines.

Extra strong steel pipe: all wet and underground returns.

Cast fittings: threaded or flanged cast iron or brass of cast iron steam pattern.

Welding fittings: wrought iron or copper molybdenum alloy may be used interchangeably for wrought iron or copper molybdenum pipe. Welding elbows should have a face to center dimension equal to not less than one and one half nominal diameters of the pipe to which they are connected.

Pipe joints: in buildings: joints 1-1/4 inch and smaller, screwed; 1-1/2 inch to 6 inches inclusive, screwed or welded; 8 inches and larger, flanged or welded; underground: 1-1/2 inch and larger, welded.

Valves: 3/4 inch and smaller, globe valves; 1 inch and larger, generally gate valves; 2 inches and smaller, brass; 2-1/2 inches and larger, iron body brass mounted; 5 inches and smaller, screwed; 6 inches and larger, flanged.

Brass metal for globe valves should have a minimum copper content of 80 percent and a maximum lead content of 5-1/2 percent.

C. Outline of a Typical Specification

1. General note - covering general conditions, and other sub-divisions of the specifications.
2. Correction of faulty materials and workmanship.
3. Work included, schedule of general requirements; work not included.
4. Drawings - schedule, correlation to specifications, and shop drawings.
5. Testing requirements, prior tests, inspections, guarantee.
6. Temporary heat requirements.
7. Removal of debris during and at completion of contract.
8. Coordination of work with other trades.
9. Permits, certificates of approval, etc.
10. Excavation and backfill, grades and elevations.
11. Description of installation and materials for heating system within building.
12. Description of installation and materials for heating system outside of building.
13. Description and installation of boilers; type, construction, capacity, meters, and controls.
14. Foundations, pits for boilers, and other concrete work for equipment.
15. Smoke breeching - dampers, supports.
16. Boiler trimmings and tools.
17. Refractory, sand, cement, lime, etc.
18. Chimney construction and draft available.
19. Oil burners.
20. Oil pumps - motors, controls, and description of piping.
21. Oil heaters, relief valves, oil tanks, meters.
22. Soot blowers, type and description.
23. Safety devices, for boilers, oil burners and water supply.
24. Exhaust heads.
25. Vacuum pumps, motors, controls.
26. Pressure reducing valves, strainers, safety valves.
27. System of heating controls.
28. Radiation.
29. Radiator valves, thermostatic traps, radiator hangers.
30. Heating supply mains.
31. Return mains - steam traps, combination float and thermostatic traps.
32. Pipe and fittings.
33. Joints.
34. Unions, gaskets, bolts and nuts.
35. Valves, escutcheons.

36. Metal U covers for pipes in fill.
37. Pipe nipples.
38. Open ends.
39. Pipe sleeves.
40. Trenches and covers.
41. Hangers, anchors-guides, inserts, etc.
42. Steam connections to hot water generators.
43. Expansion provisions.
44. Welding for pipe and fittings.
45. Insulation for boilers and other equipment.
46. Insulation for boiler room including hanging ceiling if necessary and ventilating equipment.
47. Painting.
48. Unit heaters, motors, controls.
49. Ventilating fans, motors, controls.
50. Exhaust fans, motors, controls.
51. Sheet metal work.
52. Grilles, registers.
53. Factory inspections.
54. Testing boilers, pumps, fans, etc.
55. Testing of piping within building.
56. Testing of underground distributions.
57. Special equipment, accessories.
58. Voltage and other characteristics of electrical service.

D. Steam Space Heaters

Include all necessary steam and return connections, thermostatic traps and shut-off valve, and an automatic controlled valve.

The heating element (of non-ferrous tubes and fins, with ferrous or non-ferrous headers) should be suitable for a steam working pressure of two pounds per square inch gauge with air entering at 67 degrees F. When operating at full speed and maximum capacity, the final temperature should not exceed 125 degrees; when operating at less than full speed and maximum capacities specified, the final temperature should be not less than 110 degrees F.

With the fan off, the space heater with the thermal head available should be capable of releasing approximately 25 percent of the total heat output. It should be of the blow through type with direct connected motor and fan assembly, consisting of one or more forward curved double inlet fans mounted on the extended shaft of a three speed motor. The motor must be quiet running regardless of the speed at which it operates.

Use standard air, measured at the inlet, for the cubic feet of air per minute to be recirculated through the space heaters.

Complete suggested specifications may be obtained upon application to the United States Housing Authority, Washington, D. C.

E. System of Heating Controls

The purpose of the heating control system is to provide a heating system in which the circulation of steam will be equalized either by an adjustable orifice made as an integral part of the radiator valve or as a properly sized removable regulating plate in each radiator valve assembly. Any other means may be used which will insure receipt of steam by all radiators at the same time, proportionately. The systems of zone control may be as follows:

1. Continuous Flow System

(a) Floating or throttling type.

(b) A valve which functions in progressive steps of opening and closing.

Description of Continuous Flow System.

(a) To be capable of circulating steam at variable sub-atmospheric steam pressures and steam temperatures by means of a floating or throttling type continuous flow electric or air operated control valve taking steam direct from supply at up to 15 pounds pressure above atmosphere.

(b) To be capable of controlling the quantity of steam supplied so as to heat the radiators fractionally to vary their heat output by means of a continuous flow electric or air operated control valve taking steam direct from supply at up to 15 pounds pressure above atmosphere.

Panel Boards.

(1) To be of the automatic type with heat balancer and selector or other suitable equipment.

(2) To be of the automatic type with outside thermostat and selector.

2. On and Off System

(a) A valve that is opened and closed periodically.

(b) A valve that functions to produce pulsating steam flow.

Description of On and Off System.

(a) To be capable of controlling automatically the quantity of steam supplied by intermittently opening and closing the control valve for fixed cycles during which the valve is opened, automatically selected by an outside thermostat, electric or air operated control valve taking steam from supply at up to 15 pounds pressure above atmosphere.

(b) To be capable of controlling automatically the quantity of steam supplied by intermittently opening and closing the control valve for periods of time with these periods automatically selected by a combination of outside and radiator temperatures or outside and inside temperatures, electric or air operated control valve taking steam from supply at up to 15 pounds above atmosphere.

Panel Boards for both (a) and (b) to be of the automatic type to synchronize the action of the several zones.

Manual Control should be provided to increase or decrease the heat flow variably, for producing continuous steam flow and for shutting off the steam flow entirely and provide means for automatically shutting off the steam flow when the outside temperature rises above 65 degrees F.

3. The Combination System will include the principal functions of both No. 1 and No. 2 described heretofore.

Requirements for all Systems.

Each of the above systems should be balanced to synchronize the action of the several zones so as to produce an even load curve on the boiler plant. Demonstration should show this when the steam flow varies less than 20 percent (10 percent above and 10 percent below the average demand) in an interval of 20 minutes.

Comments on all Three Systems: The heating system must be tight enough so that a 15" vacuum produced on a cold system will not be reduced to less than 10 inches within 60 minutes after the pump has been stopped.

The heating system must circulate noiselessly and each radiator must heat throughout to the trap with a pressure differential range of 2 inches to 6 inches of mercury between the steam supply and the return.

Furthermore the control system must be capable of preventing overheating within the range of temperature of 75 degrees to 68 degrees F.

Zone control valves should be located so that each valve will have about the same steam demand. The variation should not exceed 10 percent.

Risers: When exposed in rooms, should be considered as heating surface.

Supply and Return Mains: Should pitch down and be free of pockets, sags or lifts throughout their entire run.

Complete suggested specifications may be had upon application to the United States Housing Authority, Washington, D. C.

Nathan Straus

NATHAN STRAUS
Administrator

March 8, 1939

APPENDIX - FUEL CONSUMPTION FORMULAE

1. Explanatory Note: E.D.R. (Equivalent Direct Radiation) as used herein is the total heating surface used for space heating, including ferrous or non-ferrous radiators or convectors - pipe coils - exposed risers - unit heaters, etc; one square foot E.D.R. being equal to a heat emission of 240 B.T.U. per hour.

2. STEAM HEATING.

(a) Base formula for coal used for space heating:

$$\frac{\text{E.D.R. x Fuel Factor x Annual Degree Days}}{\text{2000 x Efficiency}} = \text{Tons per year}$$

For efficiencies in central or group plants, the following are suggested:

60% - Hand Firing
65% - Stoker Fired (low pressure)
70% - Stoker Fired (high pressure)

Fuel Factor = Pounds of coal per square foot radiation per degree day for corresponding design temperature and 100 per cent efficiency. (See Table No. 1)

(b) Base formula for gas used for space heating:

$$\frac{\text{E.D.R. x Fuel Factor x Annual Degree Days}}{\text{1000 x Efficiency (Use 75\%)}} = \text{M. cu. ft. gas per year.}$$

Fuel Factor = Cu. Ft. gas per sq. ft. Radiation per degree day for corresponding design temperature and 100% efficiency. (See Table No. 2)

(c) Base formula for oil used for space heating:

$$\frac{\text{E.D.R. x Fuel Factor x Annual Degree Days}}{\text{Efficiency (Use 75\%)}} = \text{Gas. oil per year.}$$

Fuel Factor = Gas. oil per sq. ft. Radiation per degree day for corresponding design temperature and 100% efficiency. (See Table No. 3)

(d) For formula for estimating district steam consumption; see paragraphs 9 (a), (b) and (c).

(e) For all space heating estimates during continuous operation, 20% should be added to the fuel consumption if zone control is omitted where the design temperature is 0° or higher Fahrenheit, and 15%

where the design temperature is less than 0° F. Twelve (12) per cent should then be added to the fuel consumption to compensate for line losses in high pressure central plants and ten (10) per cent in low pressure central or group plants.

(f) The same base formulae outlined hereinbefore can be applied to individual building and individual dwelling unit plants for space heating estimates. The individual building plants scheme can also include a boiler plant serving two or three small buildings. The following efficiencies are suggested:

Hand Firing, Bituminous Coal	- 44%
Hand Firing, Anthracite Coal	- 52%
Stoker Fired, Bituminous Coal	- 50%
Stoker Fired, Anthracite Coal	- 55%
Gas	- 70%
Oil	- 65%

(g) Five (5) per cent should then be added to the fuel consumption to compensate for line losses in individual building plants.

(h) The line loss percentages suggested herein should be used for preliminary calculations only.

3. HOT WATER HEATING.

(a) The E.D.R. should be transposed in terms of its equivalent in steam radiation. The base formulae including compensation for line losses and for omission of zone control or other regulation set forth in paragraph 2 can then be applied.

(b) Formula for transposing Hot Water E.D.R. to Steam E.D.R.

$$\frac{\text{E.D.R. (Hot Water)} \times \text{B.T.U. per sq.ft.(Hot Water)}}{240} = \text{E.D.R.(Steam)}$$

4. WARM AIR HEATING (Forced and Gravity)

(a) The B.T.U. loss per hour should be transposed in terms of its equivalent in steam equivalent direct radiation by dividing by 240 (see explanatory note paragraph 1). The base formulae as outlined in paragraph 2 can then be applied for the steam or hot water coiled forced warm air unit heater system, for the individually fired forced or gravity heater systems. In all cases compensation should be made for line losses, and for omission of zone control or other regulation.

5. (a) Examples of use of space heating formulae:

Assume 15,000 steam E.D.R. (Low Pressure - Control Plant - Zone Controlled)

5,000 Degree days (Annual)
- 10° to 70° F. Design Range
12,000 B.T.U. per lb. of Coal
1,000 B.T.U. per cu. ft. of Gas
140,000 B.T.U. per gal. of Oil

(b) Coal

$$\frac{15{,}000 \text{ E.D.R.} \times 5{,}000 \text{ D.D.} \times .007 \text{ (Fuel Factor from Table 1).}}{1300} = \text{404 Tons Coal Per Year.}$$

Plus 10% line losses - 404 + 40.4 = 444.4 Tons per year.

(c) Gas

$$\frac{15{,}000 \text{ E.D.R.} \times 5{,}000 \text{ D.D.} \times .084 \text{ (Fuel Factor from Table 2)}}{750} = \text{8,400 M. Cu. Ft. Gas per year.}$$

Plus 10% for Line Losses - 8,400 + 840 = 9,240 M. Cu. Ft. per year.

(d) Oil

$$\frac{15{,}000 \text{ E.D.R.} \times 5{,}000 \text{ D.D.} \times .0006 \text{ (Fuel Factor from Table 3)}}{75} = \text{60,000 Gals. oil per year.}$$

Plus 10% for Line Losses - 60,000 + 6,000 = 66,000 Gals. oil per year.

6. (a) Base formula for fuel used for domestic hot water heated through steam coiled generators. (No. of Dwelling units x 60 gals. per day x 1.1. lbs. steam per gallon x 365 days per year x 960 B.T.U. per lb. steam) all divided by B.T.U. per unit of fuel used x 0.50 (50% assumed efficiency) Units of Fuel used per year.

(b) Coal

$$\frac{\text{D.U.} \times 60 \times 1.1 \times 365 \times 960}{\text{B.T.U. per lb. coal} \times .50 \times 2{,}000 \text{ lbs. per ton}} = \text{Tons Coal Per Year.}$$

or in simplified form

$$\frac{\text{D.U.} \times 23{,}127}{\text{B.T.U. per lb. coal}} = \text{Tons coal per year}$$

(c) Gas

$$\frac{\text{D.U.} \times 60 \times 1.1 \times 365 \times 960}{\text{B.T.U. per cu. ft. gas} \times .50 \times 1{,}000} = \text{M. cu. ft. gas per year}$$

or in simplified form

$$\frac{\text{D.U.} \times 46{,}254}{\text{B.T.U. per cu. ft. Gas}} = \text{M. cu.ft. gas per year}$$

(d) Oil

$$\frac{D.U. \times 60 \times 1.1 \times 365 \times 960}{B.T.U. \text{ per gallon oil} \times .50} = \text{Gals oil per year.}$$

or in simplified form

$$\frac{D.U. \times 46,254,000}{B.T.U. \text{ per gallon oil}} = \text{Gals oil per year.}$$

(e) For domestic hot water heating fuel consumption where underground heat distribution for this purpose is required, the same compensation for line losses may be applied as noted in paragraph 2 (e). No heat line losses need be figured where hot water generators are installed in boiler plant buildings.

(f) The daily gallon consumption and line loss percentages suggested herein should be used for preliminary calculations only.

(g) For formulae for estimating district steam consumption, see paragraph 9 (d), (e) and (f).

7. (a) Examples of use of domestic water heating formulae:

Assume 100 Dwelling Units (Central Plant)
12,000 B.T.U. per lb. coal
1,000 B.T.U. per cu. ft. gas
140,000 B.T.U. per gallon oil
H. W. Generators are in boiler plant (no heat line losses figured).

(b) Coal

$$\frac{100 \times 23,127}{12,000} = 192.8 \text{ Tons per year.}$$

(c) Gas

$$\frac{100 \times 46,254}{1,000} = 4625.4 \text{ M. cu. ft. gas per year.}$$

(d) Oil

$$\frac{100 \times 46,254,000}{140,000} = 33038 \text{ Gals oil per year.}$$

8. (a) Base formula for fuel used for domestic hot water heating through individual heaters (No. of Dwelling Units x 40 gallons per day

x 8-1/3 lbs. of water per gallon x 100° F. temperature rise x 365 days per year, all divided by B.T.U. per unit of fuel used x efficiency = Units of Fuel used per year. The water temperature rise is basic only. Initial water temperatures may vary dependent upon locality.

(b) Coal

$$\frac{\text{D.U. x 40 x 3-1/3 x 100 x 365}}{\text{B.T.U. per lb. coal x Eff. x 2,000}} = \text{Tons Coal per year.}$$

Use 35% Efficiency,
or in simplified form

$$\frac{\text{D.U. x 17,381}}{\text{B.T.U. per lb. coal}} = \text{Tons Coal per year.}$$

(c) Gas

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per cu. ft. gas x Eff. x 1000}} = \text{M. cu. ft. gas per year}$$

Use 55% efficiency for flue type heater, or in simplified form

$$\frac{\text{D.U. x 22,120}}{\text{B.T.U. per cu. ft. gas}} = \text{M. cu. ft. gas per year.}$$

(d) Oil

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per gallon oil x Eff.}} = \text{Gals. oil per year.}$$

Use 50% Efficiency

or in simplified form

$$\frac{\text{D.U. x 24,332,300}}{\text{B.T.U. per gallon oil}} = \text{Gals. oil per year}$$

(e) Electricity

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per KW hr. x Eff.}} = \text{KW Hrs. per year}$$

Use 77% Efficiency; B.T.U. per KW Hr. = 3,412

or in simplified form

D.U. x 4,631 = K.W. Hrs. per year.

(f) The daily consumption suggested herein should be used for preliminary calculations only.

9. (a) Base formula for District Steam used for space heating:

$$\frac{\text{E.D.R. x 96 B.T.U. x monthly degree days x } 70^{\circ} \text{ Range}}{\text{960 B.T.U. x 1000 x Design Temp. Range}} = \text{M. lbs. steam}$$

for the particular month that the degree days are selected.

If no zone control is provided 20% should be added where the design temperature is 0° or higher Fahrenheit and 15% where the design temperature is less than 0° F. Twelve (12) per cent should be added for line losses, if these losses are to be absorbed by the project.

Note: The estimate for each month must be computed separately as District Steam Companies render bills monthly.

(b) Simplified Formula for District Steam (Space Heating)

$$\frac{\text{E.D.R. x monthly degree days x Factor (from table 4)}}{1000} = \text{M. lbs. steam per month}$$

Plus compensation for line losses and omission of zone control.

(c) The yearly total can be figured from this formula by substituting the annual degree days in lieu of the monthly degree days. Compensation for line losses and for omission of zone control should be made.

(d) Base Formula for District Steam used for domestic water heating.

$$\frac{\text{D.U. x 60 x 1.1 x 365}}{\text{12 x 1000}} = \text{M lbs. steam per mo.}$$

The same line losses as applied to heating should be added where underground heat distribution for this purpose is required.

(e) Simplified formula for District Steam for domestic hot water.

D.U. x 2.007 = M. lbs. steam per month;
plus compensation for line losses.

(f) Simplified formula for District Steam for domestic hot water (Annual consumption).

D.U. x 24.084 = M lbs. steam
plus compensation for line losses.

(g) Example: 604 D.U. 76,000 E.D.R. 0° - 70° Design Temp. Range - Zone Control - Hot water generators located in basement of certain buildings.

$$\text{Space Heating} - \frac{76{,}000 \times \text{Degree Days} \times .1}{1000} = \text{M. lbs. steam}$$

where .1 = fuel factor

M. lbs steam = 7.6 x Degree days (see following degree day tabulation)

Plus 12% for line losses.

Domestic Hot Water = 604 D.U. x 2.007 = 1212.2

Plus 12% for line losses

10. Note: Origin of Constant 96 Used in Tables 1, 2 and 3.

"About 1926 a large number of actual fuel consumption figures (in cubic feet of gas per degree-day per square foot of steam radiation) was collected by gas utilities. These figures, averaged, were reduced to a figure (at 0° to 70° design conditions of 0.218 cu. ft. of 535 B.t.u. per cubic foot gas per square foot of steam radiation per degree-day, or, in other words, an input of 116.6 B.t.u. per sq. ft. of steam radiation per degree-day. Here was a figure which was actually obtained in the field and from which could be calculated a theoretical figure at 100% efficiency. It was assumed that these gas heating plants were operating at an overall efficiency of 82.5%, so that if the plants had been operating at an efficiency of 100% they would have required only 116.6 x 0.825 or 96 B.t.u. per sq. ft. of steam radiation per degree-day."

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Consequently the constant 96 B.T.U. per square foot of steam radiation per degree day is the basis of all fuel constants used in the following tables.

EXAMPLE FOR DEGREE DAYS TABULATION

1	2	3	4	5	6	7	8
			HEATING - M LBS. STEAM		DOM.H.W.-M LBS. STEAM		
MONTH	DEGREE DAYS	% TOTAL		COL.4 PLUS 12% LINE LOSSES		COL.6 PLUS 12% LINE LOSSES	TOTAL M LBS STEAM COLS.5 PLUS 7
JANUARY	682	23.5	5180	5802	1212	1357	7159
FEBRUARY	557	19.0	4230	4738	1212	1357	6095
MARCH	388	13.5	2950	3304	1212	1357	4661
APRIL	132	4.5	1000	1120	1212	1357	2477
MAY					1212	1357	1357
JUNE					1212	1357	1357
JULY					1212	1357	1357
AUGUST					1212	1357	1357
SEPT					1212	1357	1357
OCT.	96	3.5	730	818	1212	1357	2175
NOV.	396	13.5	3000	3360	1212	1357	4717
DEC.	639	22.5	4860	5443	1212	1357	6800
TOTAL	2890	100.0	21950	24585	14544	16284	40869

TABLE - 1

FUEL FACTOR TABLE

COAL PER SQ. FT. PER D.D. @ 100% EFF.

Coal or Coke	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
11,000 B.T.U.	.00678	.00764	.00813	.00872	.00938	.01018	.01222
11,500 B.T.U.	.00648	.0073	.0078	.00835	.00899	.00975	.0117
12,000 B.T.U.	.00622	.007	.00746	.008	.00862	.00933	.0112
12,500 B.T.U.	.00596	.00672	.00716	.00767	.00826	.00896	.01075
13,000 B.T.U.	.00574	.00646	.00689	.00738	.00795	.00862	.01034
13,500 B.T.U.	.00562	.00622	.00664	.00712	.00767	.0083	.00996
14,000 B.T.U.	.00532	.006	.00639	.00685	.00737	.0080	.0096
14,500 B.T.U.	.00514	.00578	.00617	.00662	.00712	.00772	.00926

TABLE - 2

CU. FT. GAS - PER SQ. FT. PER D.D. 100% EFF.

GAS	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
500 B.T.U.	.14933	.168	.179	.192	.2065	.224	.2688
1000 B.T.U.	.07466	.084	.0896	.096	.1033	.112	.1344
1040 B.T.U.	.07180	.08077	.0862	.0923	.0994	.10769	.12923

TABLE 3

GAL OIL - PER SQ. FT. PER D.D. 100% EFF.

OIL	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
140,000 B.T.U.	.00533	.0006	.00064	.0006857	.000737	.0008	.00096
148,000 B.T.U.	.00505	.000568	.000606	.000649	.0007	.000757	.0009081

TABLE 4

POUNDS STEAM - PER SQ. FT. PER DEGREE DAY - 100% EFF.

	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
	.0778	.0875	.09334	.1	.1077	.11667	.14

UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 20 ON POLICY AND PROCEDURE

(Revised July, 1939)

(Substituted for Bulletin No. 20 dated March 8, 1939)

SELECTING A METHOD OF HEATING

A. Objective

Heating systems for low-rent housing involve a variety of considerations, with one basic purpose - the provision of suitable heating at the least possible cost. Economy of capital costs is mandatory under the United States Housing Act which states that "projects will not be of elaborate or expensive design or material and economy will be promoted both in construction and administration." The Act further requires that rents (including the cost of heating) shall be within the financial reach of families of low income. Since the heating expense may represent a very material portion of the total rent, or total expenditure for rent and household operation, economy in operating expense of the heating system is essential.

B. Determining a Heating Method

The individual tenant-operated heating unit should always be given consideration and, under conditions favorable to its use, this type should be the first tentative selection. As compared with the project-operated group or central plant, the individual tenant-operated unit has the following definite advantages:

1. The responsibility for fuel consumption is placed squarely on the tenant. It is obvious that when he pays directly for the fuel consumed, he will not be wasteful in his use of heat and will adjust it to his actual needs.

2. Tenant operation is substituted for the paid labor of others.

3. Simple, small individual plants are likely to be lower in first cost than large, frequently complex, project-operated plants. Under favorable climatic and fuel conditions the small heating units are likely to cost the tenant less in operating and maintenance expenses.

There are conditions, however, under which consideration must be given to the project-operated plant. In such cases, its capital cost and annual expense should be estimated and compared with the individual plant costs, and the advantages and disadvantages of the two types should be compared and weighed before a definite decision is made. For example, flats and apartments do not lend themselves readily to individual tenant-operated plants except when gas is available at a low rate. In very cold climates with a long heating season the more efficient performance of the larger project-operated plant may result in definitely lower operating expense. The project-operated plant or plants may have a distinct advantage in the anthracite regions (indicated in Zone 3 on the attached map) since such plants may often be operated with the smaller sizes of anthracite coal available locally in large quantities, whereas individual units may require the larger, more expensive sizes. The types of fuel available, possible methods of fuel purchase and distribution, the cost of project labor contingent upon different types of fuel, and other factors must be analyzed before making a final decision.

For purposes of general consideration the country may be roughly divided into three heating zones, as shown on the attached map. In the warmest of these, Zone 1, no heat other than that produced by the cooking stove should be needed. A water-heater may be provided in conjunction with the stove, or a separate water tank may be provided in the bathroom. In the next cooler area, Zone 2, a space heater in the living room should usually be sufficient and, except under unusual conditions, no consideration need be given to the project-operated plant. For two-story row houses, the space heater may be supplemented by a simple duct arrangement to direct the flow of heated air to the second floor.

In Zone 3, the most northerly, where a living room space heater may not be sufficient, various methods of heating may be considered and carefully compared. Preference, however, can generally be given to tenant-operated heating units except when analysis shows that costs strongly favor the project-operated plant.

Because of the technical considerations involved it is usually important to have the services of a qualified heating engineer in the preparation of this analysis, and in the final choice and the design of the heating system. An initial investment in qualified technical advice may pay for itself many times over in more accurate and dependable operating and maintenance estimates, greater speed in the preparation of working drawings, and greater operating economy and efficiency.

C. Factors Affecting Choice

1. Desirability of tenant responsibility.

2. Initial cost and its effect on annual expense. The comparative initial costs of providing space and chimneys for the individual dwelling heating unit or the project boiler plant or plants must not be forgotten.

3. Annual expense, including maintenance repairs and replacements: The choice of fuel used for domestic water-heating and the use of the same fuel for other purposes may affect this item.

4. Effect on site and building plan: The choice of tenant-operated heating units requiring delivery of fuel to the individual dwellings may control the layout of service drives, and consequently influence the cost of utilities. Similarly, the requirements of economical distribution for the project-operated plant may influence the layout of buildings.

5. Continued availability of fuel and probable trend of its price.

6. Local practice, acceptability, and availability.

7. Climate.

8. Labor rates and related factors.

9. Safety and cleanliness of operation.

10. Rate of obsolescence.

11. Effect on insurance rate.

Some of these factors relate to the type of system, some to the fuel, some to both. There may be other factors in particular cases.

D. Types of Systems

In the selection and design of the heating system consideration should be given to the fact that a continuous temperature of 70° F. in all rooms is not considered an absolute essential for health and comfort. Since outside design temperatures are reached for comparatively short periods of time during the average heating season, a temperature range (inside room temperature minus outside design temperature) 5° to 10° F. lower than that generally accepted for the locality may be used in calculating heat losses. For example, in cities where there is a generally accepted design temperature of 0° F., the project design range can be reduced (from 0° to 70° F.) to + 5° to 65° F. Local conditions must be considered carefully before reductions in the accepted range are established.

Consideration should also be given to the characteristics of fuels which affect the feasibility of a particular method of heating. Among these are:

Coal requires storage space and means for ash disposal, and this may restrict its use for individual dwelling unit plants above the first floor.

Gas involves no storage or handling difficulties and, when low enough in price, makes the individual unit available for any type of dwelling. One hundred percent check metering may be necessary, however, to insure economical operation and the initial costs and operating expense of individual gas-fired units with check metering should be weighed against the costs of an automatic project-operated gas-fired system.

Oil requires storage space. For the individual plant, a 50-gallon drum which is set on a stand outside the kitchen door, may be provided.

1. Individual Tenant-Operated Unit

In Zone 2 and frequently in Zone 3, this should be the favored type. In climates more favorable to the project-operated plant, the comparative economy of total fuel expense and the difficulties of fuel storage and handling must be considered.

The common types of individual units and characteristics which affect their use are:

(a) Fireplace or Circulator: When cold weather is occasional and not severe this is the only method of heating which is justified. Fireplaces may be the ordinary masonry type or may have a metal chamber to permit the warming and circulating of air, and may have ducts to other rooms. Circulators may burn any fuel depending upon local practice, availability, cost, and storage and handling facilities.

(b) Stove: This type does not permit uniform heat distribution or temperature control but may be considered generally suitable in Zone 1, and wherever very low cost and very low rent are the aims.

(c) Gravity Warm Air: This type is low in first cost, and requires a minimum of maintenance and adjustment. Basement space is required. The pipeless variety is very low in first cost, but only partially effective in distribution. More effective distribution may be obtained by the use of ducts.

(d) Forced Warm Air: Distribution is very effective in this type. No basement is required, and when it is gas or oil fired, very little space is necessary.

(e) One Pipe Steam with radiators: This type is slightly higher in cost than gravity warm air and requires basement space.

(f) Hot Water: This type is slightly higher in first cost than one pipe steam and is very satisfactory in operation, particularly when a steady, moderate supply of heat is wanted.

2. Central or Group Project-Operated Plants

These types may be justified usually only under the following conditions:

(a) Concentration of dwelling units in flats and apartments and, to a lesser extent, in row houses.

(b) Climate requiring nearly continuous heating for four or more months.

The decision between a single central plant and two or more plants, each serving a group of buildings, will be affected by:

(a) The size, arrangement and topography of the project.

(b) The types of fuel available at low prices.

(c) Labor rates and related factors.

Group plants are usually more desirable than a large central plant. They can ordinarily be located in basements with chimneys related to the buildings, thereby eliminating the high initial cost of a separate building and high chimney. Fuels such as oil or gas may be readily handled, regardless of the number, size and location of the plants. Group plants should be interconnected, wherever feasible, to permit more flexible operation which will result in greater economy in the low-demand months. This is particularly important where coal is the fuel used. The site plan should therefore be arranged to permit nearly uniform sizing of the group plants and their location for economical interconnection.

A large central plant will usually require a separate building and high chimney. This may be undesirable from a site planning point of view or for architectural reasons. The delivery, storage, and handling of coal and the disposal of ashes, however, may be efficiently handled in such a plant.

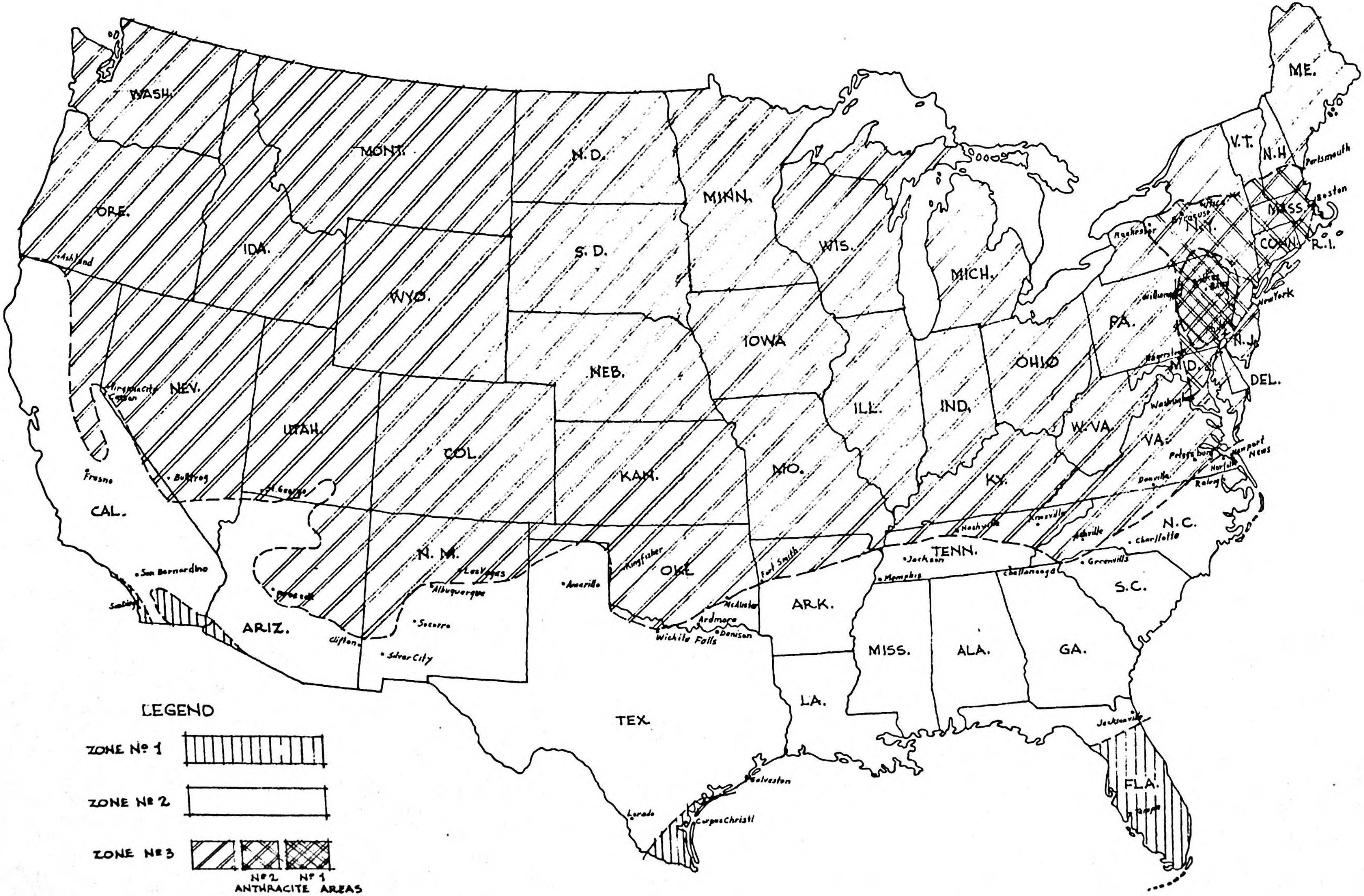
Economic Analysis, Design, and Contract Documents:

Recommendations for good practice in the preparation of an economic analysis and the design of project-operated heating systems are covered in the Appendix to this bulletin.

Nathan Straus

NATHAN STRAUS,
Administrator.

September 25, 1939



NOTES

AREA No 1 IS THE CENTER OF THE ANTHRACITE INDUSTRY

AREA No 2 EMBRACES THE BALANCE OF THE ANTHRACITE MARKET, HOWEVER PRICES WILL INCREASE DUE TO TRANSPORTATION COSTS.

APPENDIX

Economic Analysis of Heating Methods.

Design of Project-Operated
Central and Group Heating Plants.

Fuel Consumption Formulae.

The factors which influence the choice of a heating method are discussed in the foregoing Policy and Procedure Bulletin No. 20, "Selecting a Method of Heating." Important among these factors is the comparative economy of the various feasible methods.

The first part of this appendix to Bulleton No. 20 presents a detailed method of studying the comparative economy of various methods of heating. The second part makes recommendations on practices and methods in the design of project-operated group and central plants, for use by the designing engineer. The third part contains fuel consumption formulae. These recommendations apply only to central or group plants and should be considered only where careful analysis, as outlined in Bulletin No. 20, has clearly indicated the desirability of project-operated central and group plants.

PART I - ECONOMIC ANALYSIS

A. Comparative Cost Analysis

Several suitable methods of heating having been tentatively selected, a comparative cost analysis should be made in order to determine which will result in the least expense to the tenant. The underlying principles involved in this analysis are simple and require no explanation. There are, however, certain common errors concerning which a reminder may be helpful.

Perhaps the most prevalent mistake is to overlook items of expense which are indirectly involved in the use of a specific type of fuel or heating plant. If, for example, coal fired gravity warm air systems are being considered, the cost of a basement or other space, coal storage space, chimneys, and possibly additional roads for the delivery of coal and removal of ashes, should be included.

If individual, group and central plants are being compared, there should be included not only the costs of boilers, breeching, auxiliary equipment, and piping, but also fuel storage space or tankage, construction costs of boiler and storage rooms and smoke stack, and heat insulation of boiler room ceiling. There may also be the cost of supply and return mains, with their supports and heat insulation and trenches or tunnels to nearby buildings and lines to hot water heaters.

The central plant should be charged with its building and smoke stack, as well as complete plant, distribution and return systems, and possibly cost of land occupied if additional land has to be acquired to accommodate the central plant.

With respect to items such as maintenance and replacement, the expense for which may vary widely, the greatest care should be taken to avoid estimates which are either unfairly pessimistic or unduly hopeful.

In general, the present prevailing costs will form the basis of computations, but unusual price conditions should be discounted and the long range trend anticipated wherever possible.

B. Forms for Analysis

Convenient forms for preparing the economic heating analysis are attached hereto. These are designed to facilitate separate analysis of plant and fuel costs.

Following are the items which are included in the attached economic analysis charts to determine the initial costs and annual operating expense:

TABLE I - INITIAL COSTS

Central-Group-Building Plants

A. Radiation and/or Pipe; Unit Heaters, Ducts and Grilles-in Buildings. Cost of heating system within the buildings, exclusive of equipment, auxiliaries and piping within the boiler room. Radiation can be estimated by reference to Table III of the charts.

B. Distribution (Yard). Cost of underground piping installation.

C. Plant Equipment. Cost of equipment, auxiliaries and piping within the boiler room. Automatic firing and fuel handling equipment should be noted separately. Building plants might include one boiler room per building or one boiler room per two or three small buildings.

Unit Plants

D-E-F-G. Cost of heating equipment for individual plants only. Items D, E and F might apply to warm air systems or circulators. Vents under D include fresh air connections. Items E, F and G are applied to steam or hot water heating systems.

Central-Group-Building - Unit Plants (Related Items)

H. Plumbing Connections. Cost of water and drainage required for heating system.

I. Gas Piping. Cost of proportionate share of gas piping applied to heating system.

J. Electric Outlets. Cost of electrical work necessary for heating system.

K. Chimneys. Cost of masonry flues, stacks and foundations.

L. Structures. Cost of structures, additional to dwelling facilities, necessary to house boiler and auxiliary equipment for central, group or building plants; closets, utility rooms, partitions, etc., for individual dwelling unit plants.

M. Fuel Storage. Cost of facilities for storing fuel. Fuel oil tanks concerned with the immediate operation of the plant or plants need not be included here.

N. Extra Roads. Cost of extra roads required in the delivery of fuel or removal of ash.

O. Net Initial Cost (Heating). Total of above items, each of which should include the sub-contractors expense and profit. However, it should not include general contractor's added percentage.

P. Gross Heating Cost. Net initial cost plus general contractor's added percentage.

Domestic Hot Water

Q. to X. (inclusive): Costs of supplying domestic hot water. The same procedure should be followed as outlined heretofore for heating. It is necessary to note that when domestic hot water is supplied through generators deriving its source of heat from boilers used also for space heating, the cost of the extra boiler capacity and heating distribution should be included in items A, B and C.

Y. - Gross Cost (Heating plus Domestic Hot Water). The summation of items P. and X.

TABLE II. ANNUAL OPERATING EXPENSE

Heating and Domestic Hot Water

a. through d. Maintenance, Repair and Replacement. The product derived by multiplying the initial costs from Table I by the factors set up for the respective items in Table IV. Related items generally refer to plumbing connections, gas piping and electric outlets.

e. The total of all maintenance, repair and replacement expense.

f. Fuel. Formulae have been prepared for estimating fuel consumption which are incorporated in this Bulletin. The influence on the rate structure in the use of gas for space heating and domestic hot water in coordination with that required for cooking and refrigeration should be applied in the analysis. Where the electric consumption for the operation of auxiliary heating equipment is a substantial amount, its influence on the electric rate structure should be thoroughly considered.

g. Labor. In high pressure boiler plant operation it may be necessary to employ the services of a competent first class licensed engineer. Local regulations may require such services continuously while the plant is in operation or for supervisory purposes only. In the latter case a portion only of the engineer's time might be devoted to the plant. In any event, it might be advisable to charge at full time the services of second class licensed engineers.

In low pressure plant operation licensed men are generally not required unless stipulated by ordinance or labor organization.

USHA 637
4-18-39

68905

ECONOMIC HEATING ANALYSIS
COMPARATIVE INITIAL AND ANNUAL OPERATION COSTS

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY

PROJECT ______
LOCATION ______
STATUS ______

DWELLING UNITS ______ HEATED CUBE ______ DESIGN TEMPERATURE ______ BUILDINGS NO ____ STORY ____ COMPUTED BY ______ DOCKET NO. ______
NO. OF ROOMS ______ CUBE PER ROOM ______ DEGREE DAYS ______ NO ____ STORY ____ SHEET NO. ______
ROOM RATIO ______ NO ____ STORY ____ CHECKED BY ______ FROM ____ TO ____ DATE ____ 19 ____

TABLE I - INITIAL COSTS				A	B.	C.	D.
ITEMS		SCHEME	HTG.				
			DOM. H.W.				
		SYSTEM - HTG.					
		NO. OF PLANTS					
		E.D.R.	HEATING				
			DOM. H.W.				
			TOTAL				
		B.H.P. TOTAL					
		TYPE OF FUEL	HEATING				
			DOM. H.W.				
CEN-GROUP-BLDG-PLANTS	A	IN BLDGS.	1. RADIATION AND/OR PIPE				
			2. UNIT HEATERS-DUCTS-GRILLES				
	B	DISTRIBUTION (YARD)					
		1. INTERMEDIATE PRESSURE					
		2. LOW PRESSURE					
	C	PLANT EQUIPMENT					
		1. BOILERS, PUMPS, AUXILIARIES.					
		2. FUEL FIRING					
		3. FUEL HANDLING					
UNIT PLANTS	D	DUCTS, GRILLES AND VENTS					
	E	RADIATION AND PIPE					
	F	HEATER OR FURNACE					
	G	CONTROLS					
HEATING - RELATED ITEMS	H	PLUMBING CONNECTIONS					
	I	GAS PIPING					
		1- IN BUILDINGS					
		2- OUTSIDE BUILDINGS					
	J	ELECTRIC OUTLETS					
	K	CHIMNEYS					
	L	STRUCTURES					
		1- SEPARATE BUILDING					
		2- BASEMENT CONSTRUCTION					
		3- CLOSETS, PARTITIONS, ETC.					
	M	FUEL STORAGE					
	N	EXTRA ROADS					
	O	NET INITIAL COST (HEATING)					
	P	GROSS HTG. COST ("O"+ %) (GEN'L. CONTRS. EXP. AND PROFIT)					
DOMESTIC HOT WATER	Q	HEATER AND TANK					
	R	GENERATORS - PUMPS					
	S	HOT WATER PIPING					
	T	GAS PIPING					
	U	ELECTRIC OUTLETS					
	V	CHIMNEYS OR VENTS					
	W	NET INITIAL COST (DOM. H.W.)					
	X	GROSS DOM. H.W. COST ("W"+ %)					
	Y	GROSS COST=HTG.+DOM.H.W. (P+X)					

USHA 637-2
4-18-39
68905

ECONOMIC HEATING ANALYSIS

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY

DOCKET NO. ______
SHEET NO. ______
FROM ______ TO ______
DATE ______ 19______

TABLE II - ANNUAL OPERATING EXPENSE				A.	B.	C.	D.
ITEMS		SCHEME	HEATING				
			DOM. H.W.				
		SYSTEM	HEATING				
		FUEL AND PRICE	HEATING				
			DOM. H.W.				
		HEAT VALUE-BTU	HEATING				
			DOM. H.W.				
		FUEL CONSUMPTION	HEATING				
			DOM. H.W.				
		ELECTRIC POWER K.W.H.	HEATING				
			DOM. H.W.				
		EFFICIENCY OF FUEL AS FIRED	HEATING				
			DOM. H.W.				
HEATING	a MAINT. & REPAIR	1. FUEL FIRING & FUEL HANDLING (CENTRAL-GROUP-BUILDING PLANTS)					
		2. OTHER HEATING EQUIPMENT (CENTRAL-GROUP-BUILDING-PLANTS)					
		3. UNIT PLANTS					
		4. RELATED ITEMS					
		5. STRUCTURES					
	b REPLACEMENT	1. FUEL FIRING & FUEL HANDLING (CENTRAL-GROUP-BUILDING-PLANTS)					
		2. OTHER HEATING EQUIPMENT (CENTRAL-GROUP BUILDING-PLANTS)					
		3. UNIT PLANTS					
		4. RELATED ITEMS					
DOMESTIC HOT WATER	c MAINT-REPAIR	1. HEATER OR GENERATOR					
		2. PIPING - GAS & WATER					
		3. RELATED ITEMS					
	d REPLACE	1 HEATER OR GENERATOR					
		2 PIPING - GAS & WATER					
		3 RELATED ITEMS					
HEATING AND DOMESTIC HOT WATER	e	TOTALS - MAINTENANCE - REPAIR REPLACEMENT ("a" THRU "d")					
	f	FUEL	1. HEATING				
			2. DOMESTIC H.W.				
	g	LABOR		—CHIEF— Mo.@— —MEN— Mo.@— —MEN— Mo.@—	—CHIEF—Mo.@— —MEN —Mo.@— —MEN —Mo.@—	—CHIEF—Mo.@— —MEN —Mo.@— —MEN —Mo.@—	—CHIEF—Mo.@— —MEN—Mo.@— —MEN—Mo.@—
		1. HEATING (PLUS ___ % INSURANCE)					
		2. DOM. H.W. (PLUS ___ % INSURANCE)					
	h	ASH DISPOSAL					
	i	ELECTRIC POWER					
	j	WATER AND SUPPLIES					
	k	NET ANNUAL OPERATION ("e" THRU "j")					
	l	NET PER ROOM PER YEAR					
	m	NET PER ROOM PER MONTH					
	n	DEBT SERVICE (0.0017 X ___ - TABLE I)					
	o	GROSS ANNUAL OPERATION ("k" + "n")					
	p	GROSS PER ROOM PER MO.					

USHA 637-3
4-18-39

68905

ECONOMIC HEATING ANALYSIS

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY

DOCKET NO. ______
SHEET NO. ______
FROM ______ TO ______
DATE ______ 19 ______

TABLE-III CUBIC FEET OF USABLE SPACE PER SQUARE FOOT OF EQUIVALENT DIRECT STEAM RADIATION

DESIGN TEMP. DEG. "F"	INSIDE TEMP. DEG. "F"	TEMP. DIFF. DEG. "F"	ONE STORY BUILDING	TWO STORY BUILDING	THREE STORY BUILDING	FOUR STORY BUILDING	SIX STORY BUILDING
+20	70	50	48	61	67	71	75
+15	70	55	46	58	63	67	70
+10	70	60	44	54	60	63	66
+5	70	65	41	51	56	60	62
0	70	70	38	47	52	55	58
-5	70	75	35	43	48	51	53
-10	70	80	32	41	44	47	49
-15	70	85	29	37	41	43	45
-20	70	90	26	33	37	39	42

TABLE-IV MAINTENANCE & REPAIR — REPLACEMENT FACTORS

	SCHEME		ITEMS	MAINTENANCE AND REPAIR UNDER 300 UNITS	MAINTENANCE AND REPAIR OVER 300 UNITS	REPLACEMENT AT 2% INTEREST	EXPECTED LIFE IN YEARS
HEATING	A	CENTRAL PLANT HIGH PRESSURE. STEAM OR FORCED HOT WATER	FUEL FIRING & HANDLING / UNIT HEATERS	0.0225	0.02	0.0412	20
			OTHER HEATING EQUIPMENT	0.0225	0.02	0.0175	38
			RELATED ITEMS	0.0175	0.015	0.01	55
			STRUCTURES	0.0075	0.0075		
	B	GROUP PLANTS OR CENTRAL PLANT (LOW PRESSURE) STEAM OR FORCED HOT WATER	FUEL FIRING & HANDLING / UNIT HEATERS	0.0225	0.02	0.0412	20
			OTHER HEATING EQUIPMENT	0.0225	0.02	0.02	35
			RELATED ITEMS	0.0175	0.015	0.01	55
			STRUCTURES	0.005	0.005		
	C	INDIVIDUAL BUILDING PLANTS (LOW PRESSURE) STEAM OR HOT WATER	FUEL FIRING & HANDLING / UNIT HEATERS	0.0225	0.02	0.0412	20
			OTHER HEATING EQUIPMENT	0.0225	0.02	0.0225	32
			RELATED ITEMS	0.0175	0.015	0.01	55
			STRUCTURES	0.005	0.005		
	D	INDIVIDUAL DWELLING UNIT PLANT SYSTEMS	GRAVITY WARM AIR	0.02	0.02	0.0578	15
			FORCED WARM AIR (GAS FIRED)	0.02	0.02	0.0312	25
			GRAVITY STEAM OR HOT WATER	0.02	0.02	0.0166	40
			CIRCULATORS	0.02	0.02	0.0913	10
			STRUCTURES	0.01	0.01		
	E	DOMESTIC HOT WATER	HEATER AND TANK	0.0225	0.02	0.0578	15
			GENERATORS — PUMPS	0.0225	0.02	0.0412	20
			PIPING - GAS AND WATER	0.0125	0.01	0.01	55
			RELATED ITEMS	0.0175	0.015		

NOTES: THE STEAM RADIATION DERIVED FROM THE FACTORS IN TABLE III IS TO BE USED FOR PRELIMINARY PURPOSES ONLY IN PREPARING AN ECONOMIC ANALYSIS, AND NOT FOR INDIVIDUAL ROOM CALCULATIONS. HOT WATER HEATING RADIATION CAN BE TRANSPOSED FROM THE RESULTANT FIGURES. THE FACTORS IN TABLE IV ARE BASIC ONLY; THEY MAY BE VARIED TO SUIT LOCAL CONDITIONS AND THE TYPE AND QUALITY OF THE HEATING OR DOMESTIC HOT WATER SYSTEM. UNIT HEATERS UNDER "A", "B", AND "C" IN TABLE IV APPLY TO THE STEAM OR HOT WATER TYPE. GAS OPERATED HEATERS ARE INCLUDED UNDER D.

When a plant or plants necessitate a twenty-four daily operation, the personnel per shift (with the exception of the chief engineer if permitted by regulation) can be multiplied by 3-1/2 times, which should compensate for relief time. If, on the other hand, the plant or plants do not require operation on this basis, the staff could be reduced proportionately, with the necessary relief labor of approximately 16-2/3 per cent per man added. It is advisable that in preparing an analysis of different heating schemes before a selection is made, only that portion of the firemen actually required in the operation of the plant need be applied to it.

Labor during the non-heating season can be reduced commensurate with the scheme of heating domestic hot water and the tenant requirements.

h. Ash Disposal. The expense of removing the ash from the project.

i. Electric Power. The expense of kilowatt hour consumption of all electric motor driven equipment.

j. Water and Supplies. The expense of water incidental to plant operation and supplies such as waste, lubricating oil, etc.

k. Net Annual Operation. The total of all operating expense (items e through j).

l. Net per Room per Year. The net annual operation (item k) divided by the number of rooms.

m. Net per Room per Month. The net monthly operation divided by the number of rooms.

n. Debt Service. The product of 0.0017 (which is the difference between the annual subsidy of 3.5 per cent and the interest and amortization of 3.67 per cent) by the Gross Costs in Table I of Heating (item P), Domestic Hot Water (item X) or the total of Heating and Domestic Hot Water (item Y), dependent upon the nature of the analysis. No allowance has been made in the chart to compensate for any changes in these rates, since the influence of such fluctuations on the heating and/or domestic hot water per room per month operating expense would be negligible.

o. Gross Annual Operation. The summation of items k and n.

p. Gross per Room per Month. The gross monthly operation divided by the number of rooms.

C. Selecting the Fuel

Choice of fuel is dependent in a large measure on local availability and cost. Other considerations are cleanliness and ease of handling. As the choice of fuel may affect the site plan and the management policy, an early fuel cost analysis should be made. A recommended form for preparing such an analysis is included in the "Economic Heating Analysis" chart attached, additional copies of which may be obtained upon application to the United States Housing Authority at Washington, D. C.

Low fuel prices are generally required to make individual heating units practical. There are several ways in which retail fuel prices may be lowered: purchase by the project at wholesale prices and resale to the tenants; group purchase sponsored by a "Tenants Association"; or purchase through the department which makes municipal purchases of fuel. The cost of handling fuel, including storage, weighing, delivering and billing must be considered in any study of fuel purchasing methods. Fuel storage by the tenant may constitute a problem.

In the selection of fuel, especially coal, consideration should be given to a possible rise in price. The price of coal today is lower than it has been in a number of years.

PART II - DESIGNING THE PROJECT OPERATED GROUP AND CENTRAL PLANTS

Recommendations and suggestions for the design of heating plants are presented herein. The United States Housing Authority recognizes that there are various satisfactory methods of handling particular design features, and these suggestions are not to be considered the only acceptable ones.

A. The Central Plant

1. Boilers

Central plants; design to operate at 80 to 100 pounds pressure, with not less than three boilers; water tube boilers, at 150 percent of rating; portable fire box boilers, at 100 percent of rating. Normal rating should not exceed 500 H.P. except where more than four boilers are required.

Boilers up to 100 H.P.: fire box type.

Boilers 100 H.P. to 300 H.P.: either straight water tube, or low head three drum bent tube.

Boilers above 300 H.P.: either straight water tube, or high head four drum bent tube.

Insulation of settings on coal burning boilers 300 H.P. and over will be improved by providing air-cooled walls. For oil or gas fuel, settings may have solid walls and air-cooled floors. For straight tube boilers, provide solid end and side walls 22 inches thick with full floating bridge wall to take care of expansion. Provide for expansion in the setting walls as well as proper clearance between drums and settings and supporting structural members. Support boilers independently of brick setting.

Provide for easy cleaning of all water and fire surfaces. Provide soot blowers on water tube, horizontal return tubular, and portable type fire box boilers burning bituminous coal.

Include water treatment facilities where necessary.

Provide for easy removal of ashes; if pulverized coal firing is used, provide a method for trapping and removal of fly ash.

A clear space of 14'-0" minimum is recommended between boiler fronts and the wall of the building, not less than 6'-0" between the rear of the boilers and the wall of the building, and not less than 6'-0" between each boiler for air-cooled walls and 5'-0" for all others. Each boiler should have an individual setting.

Provide proper ventilation over the top of all boilers. This can best be accomplished by a monitor over each boiler with pivoted sash and extended operating device.

2. Steam Outlets

The steam outlet of each boiler carrying in excess of 15 pounds gauge pressure should have an automatic stop and check valve at the boiler, and globe or angle valve at the header. One or more openings for future flanged connections may be provided on boiler drums.

3. Cat Walks

Provide cat walks with ladders so that all points on boilers which must be serviced may be reached.

4. Stacks

Base peak boiler loads on a chosen minimum outside temperature.

Stack diameters should be the most economical size, calculated for peak load demand at 20° F. above design temperature with provisions for further extension if contemplated.

Design for fifty percent excess air under peak load demand for oil and 90 percent excess air for coal.

At least two-tenths of an inch of draft is needed in the combustion chamber for forced draft equipment when burning either coal or oil.

Specific recommendations for natural draft fuel oil burning equipment will be furnished by the United States Housing Authority on request.

Where either oil or gas is used, it is advisable to calculate the stack size on the basis of burning coal with and without cinder trap.

5. Overhead Bunkers

Overhead coal bunkers in central plants: design with a capacity of not less than 10 percent of the estimated maximum annual coal consumption.

Where more storage is desirable, provide outside storage spaces for an additional 5 to 10 percent. These may be surrounded by a masonry wall at least 6'-0" high.

In localities where the analysis of the coal shows a content of three percent or more of sulphur, use overhead bunkers either of concrete or metal coated on the inside with at least 1/8 inch of a bitumastic paint or a tile lining set in hot mastic.

6. Underground Coal Storage

Where underground storage is provided, the coal holes should be raised about four inches above the trucking grade. They should be sufficient in number and so located that at least two-thirds of the total volume of storage can be filled without hand trimming. Openings from these underground storage bins to the boiler rooms should have a metal door, to be closed when coal is being placed in the bin.

Underground storage is recommended only where the total annual consumption is less than 3500 tons.

7. Coal Handling Equipment

Traveling weigh larries, electrically operated, should have capacities of not less than 1,500 pounds for boilers up to 250 H.P., and 2,000 pounds for boilers above 250 H.P., and should be equipped with switches to limit the horizontal travel. Electric motors for weigh larries and other coal handling equipment should preferably be the fully enclosed, fan cooled type. The use of this equipment ought to be limited to projects where the total annual coal consumption exceeds 3500 tons.

Coal hoppers for stoker feeds: design for 1,000 pounds for boilers up to 250 H.P., and 1,500 pounds for boilers over 250 H.P. Stokers may be equipped with fully-enclosed, fan-cooled electric motors or steam turbines, or may be hydraulically operated.

Monorails may be supported from roof trusses of boiler rooms, but should be placed so that the bottom of bucket, when raised to its unloading position, will not be over 18 inches above the top of the stoker hopper, to limit the swinging of the bucket.

Hoists should have electric lift and travel, and two lifting cables placed on either side of the bucket to prevent the bucket from turning when being raised.

The bucket should have at least 1,000 pound capacity with a side bottom dump and gate of the clam shell type operated with a wheel, rack and pinion. The wheel should operate through a knuckle joint so that it can be reached when bucket is raised or lowered. Weighing sections should be placed in the monorails and the longitudinal travel of buckets limited to 50 feet per minute maximum.

Drums of hoist should be grooved for rope and not flat.

8. Ash Handling Equipment

When the annual coal consumption is up to 2,200 tons, consideration must be given to the method of ash disposal.

When the annual coal consumption is above 2,200 tons, a pneumatic or preferably a mechanical system of ash handling is desirable.

Where cinder traps are used, provide for disposal of fly ash through the ash handling system. Dispose of the fly ash from the rear hopper of the boiler through the ash handling system, or return into the boiler furnace for burning the combustibles.

9. Instrument Boards and Instruments

The following instrument boards are recommended for heating plants burning in excess of 2500 tons annually:

(a). One main instrument board located in the boiler room as directed. Instruments on this board may include:

(1) Electric clock, 6 inch diameter.
(2) Smoke density indicator and recorder where required.
(3) Recording and integrating steam flow meter, for yard distribution system only.
(4) Steam pressure gauge indicating boiler pressure.
(5) Steam pressure gauge indicating yard distribution system.

(b). An instrument board for each boiler, located adjacent to the boiler as directed. Instruments on this board may include:

(1) CO_2 Recorder.
(2) Exit gas recording pyrometer.
(3) Indicating and integrating steam flow meter.
(4) Steam pressure gauge furnished under boiler trimmings.
(5) Draft gauge that will comply with the draft requirements by having the requisite number of pointers.

10. Draft Control

Control of each boiler should be obtained independently through its own uptake damper.

Arrange main stack damper for hand control with locking quadrant.

11. Test Openings

It is well to provide insertion points in breeching at stack for pyrometers for taking test temperatures.

12. Feed Water Heaters

Use feed water heaters of the deaerating type, operating at not less than 215° F., with a reserve storage capacity of not less than five minutes between overflow and cold water make up inlet.

13. Condensate Receiving Tank

In all cases a condensate receiving or surge tank should be used having a capacity of thirty-minute storage between overflow and automatic float controlling make-up water.

Where space conditions will not permit the use of a receiving tank, the feed water heater should have not less than twenty minutes storage capacity between the overflow and float valve make-up.

A cold water bypass should be arranged on the boiler feed pump suction, for the purposes of boiler wash, for reducing feed water temperatures, and for the operation of hydraulic tube cleaners. The pumps should be arranged to maintain feed water service to any boiler, while another boiler is being given hydraulic service.

14. Boiler Feed Pumps for Central Plants

With installed boiler horse power up to 400 H.P., two pumps are recommended.

With installed boiler horse power from 400 to 1200 H.P., three pumps are recommended.

With installed boiler horse power over 1200 H.P., special consideration should be given to the number of pumps.

No pump should have a capacity greater than 75 percent of the peak demand and all pumps should be steam driven.

When three or more pumps are installed, one should be sized to take care of the summer load when operating normally.

Valve all equipment furnished in duplicate so that either or both may be operated singly or together.

15. Primary Pressure Reducing Valves

Mount the primary pressure reducing valve assembly in a horizontal position, on one of the side walls, rather than in a horizontal position near a ceiling. Provide platforms for servicing.

Experience has shown that three or more pressure reducing valves, arranged so that one valve can take care of the entire hot water load in the summer, provide a more flexible installation. As a basis for calculation, the following may be used as a guide:

Assume a heating load of 12,520 pounds of steam per hour, a hot water load of 4,550 pounds of steam per hour, equal to 17,070 pounds of steam per hour plus 10 percent for line losses,--a total of 18,777 pounds of steam per hour.

The pressure reducing valve to take care of the hot water load should be adequate for 4,550 pounds of steam per hour, plus 10 percent line loss, --a total of 5,000 pounds of steam per hour.

Subtracting this from 18,777 pounds of steam per hour leaves 13,777 pounds per hour to be taken care of by two pressure reducing valves, one valve to take care of 75 percent of this and the other to take care of the balance.

By this arrangement, the valves may be opened or closed to meet the increase or decrease of the demand steam load. In no case should these valves be larger than 8 inches.

Protect all pressure reducing valve stations by a battery of pop safety valves having a capacity of 60 percent of the steam demand load.

B. The Group Plant

Group plants are usually preferable to individual building plants, although the latter may be practical for very large buildings. Design recommendations for group plants are generally applicable to individual building plants. Group plants should be located to allow economical interconnection to insure flexibility under mild weather and summer load operation.

Boilers in these plants should be of the portable fire box type sized at 100 percent of rated capacity. Each plant should have at least two boilers, with the capacity of each boiler not to exceed 12,000 square feet of direct radiation.

1. Piping at Group Boiler Plants

For single or two pipe gravity steam heating systems, equip boilers with regular Hartford loops, and valve so that any or all boilers may be operated or drained without interruption of service.

2. Boiler Feed Pumps for Group Plants

Whenever possible, arrange group plants carrying up to 15 pounds gauge pressure so that the vacuum pumps can discharge water of condensation directly to the boilers. Where this is impractical, use single stage motor driven boiler feed pumps.

3. Steam Outlets on Boilers for Group Plants

Equip steam outlet of each boiler carrying up to 15 pounds gauge pressure with one globe valve in each connection.

4. Motor Truck Scales

Where it is not possible to secure certified weights of coal deliveries, include motor truck scales of the beam type, installed in pits, if feasible.

The scales should have a capacity of not less than 70,000 pounds.

C. The Distribution Lines

The design of the heating distribution system should not be deferred until after the site plan has become set. Both the character and extent of the distribution system may be influenced by close cooperation between the heating engineer and the site planner from the beginning. Buildings arranged compactly will achieve economy in heating distribution. Where plenty of land is available, it is more economical to concentrate the area not needed for housing in a single large unit than to space the buildings widely over the entire site.

Underground steam and return distribution should be direct; design layouts to take care of expansion at the point of entrance into each building, where possible.

Reduce the number of steam drip traps, located in yard steam manholes to a minimum, and wherever possible provide for dripping yard steam mains by traps placed inside the nearest basement.

Where pipe expansion must be provided for underground lines, use welding fittings and straight pipe expansion bends, installed in minimum design non-accessible expansion chamber.

Underground piping should be installed in a simple type of conduit, consisting either of split-tile, built-up tile, pre-cast lightweight concrete with a continuous concrete base and gravel backing where required, sponge-felt asbestos pipe covering with integral waterproof jacket, or of a combination casing and covering conduit constructed of standard thickness 85 percent magnesia pipe covering without canvas wrap, sealed into an inner core by application of a uniformly thick layer of high melting point asphalt between the outer surface of the magnesia insulation and the outside metal jacket.

Any and all other types of conduit of equal or lesser cost should be given full consideration. All conduit installations should be specified to be substantially in accordance with the manufacturers' commercial standards.

D. Heating within the Buildings

1. Radiation and Risers

Supply and return risers: expose and arrange to serve two radiators on each floor wherever possible.

Arrange connections for both supply and return on same end of radiator, nearest to risers.

Install radiator supply and return branches above floor in fireproof floor construction.

Install radiator supply branches above floor, in wood joist floor construction, and return branches under flooring for stability. Floor joists may be notched near bearing for this purpose. All connections through floors, walls or partitions should have sleeves and escutcheons.

The amount of radiation for each radiator called for on the riser diagram or schedule should be the minimum required.

No radiator should be installed which does not provide at least the amount of radiation called for on riser diagram or schedule. This is to be based on the manufacturers' catalog ratings for cast iron, except that the sizes given may vary slightly to suit manufacturers' standards, provided the total radiation specified for any one individual dwelling unit is not decreased.

Wherever possible, used exposed risers for heating kitchens and bathrooms.

E. <u>Drying Room Heating</u>

Construct clothes drying rooms in groups adjacent to laundries, locate as close as practical to hot water generator rooms, and equip with unit heaters delivering 120° air and supplied either with steam or with hot water from the domestic hot water supply system.

When steam is used, the supply should be taken from the hot side of the zone control valve so that heat may be available during the summer season. When hot water is used, the unit heaters may be supplied from the basement hot water mains.

Drying rooms should have exhaust fans capable of exhausting at least six changes per hour.

When laundries are adjacent to drying rooms, the exhaust fans may get the majority of their supply through the laundries. Insulate the ceiling of all drying rooms to protect the rooms above from the heat of the drying rooms.

Consideration should be given to the installation of cabinet type drying units in lieu of drying rooms, as substantial reductions in cost of such equipment have recently been effected through redesign. This type of drier, using either gas or electricity, requires much less basement space, and substantially increases available laundry facilities through more rapid clothes drying.

List of Recommended Authorities

Heat Loss Calculations: latest edition of the American Society of Heating and Ventilating Engineers' Code of Minimum Requirements of Heat for Buildings.

As a matter of practical application the following inside temperatures may be figured:

Living quarters	70° F.
Sleeping quarters	67° F.
Kitchens	67° F.
Bathrooms	67° F.

The small sizes of rooms in USHA projects make possible the placement of radiators on inside walls rather than under the windows. This practice is recommended for all rooms except living rooms, where radiators may be placed under the windows. It permits a simplified system of steam and return piping in the basement and, as a result, economies in the cost of the installation.

Cast Iron Radiator Sizes: manufacturer's catalog ratings.

Because of the many variables involved in the calculation of heat losses through walls, ceilings, floors and glass, in localities where the design temperature is 0° F to 70° F the heat loss can be figured on the basis of +5° F of the design temperature to 65° F. However, the boiler size should be figured on the basis of a heat loss of 0° F to 70° F. This also applies to other design temperatures, for example locations where the design temperature is -20° F to 70° F. Here the boilers can be sized at this calculation of heat loss, and the radiation sized on the basis of -15° F to 65° F.

Non-Ferrous Convector Sizes: Convector Manufacturer's Certified Ratings.

Cast Iron Convector Sizes: certified condensate tests, plus the allowable additional capacity based on thermal head interpolations in accordance with the Convector Manufacturer's Certified rating method.

Boilers: latest Boiler Code of the American Society of Mechanical Engineers, the Steel Heating Boiler Institute, and the A.S.H.V.E. Standard Code for Rating Heating Plants.

Warm Air Heating Design: Investigations of Warm Air Furnaces and Heating Systems made by the University of Illinois in Cooperation with the National Warm-Air Heating Association.

Symbols: the A.S.H.V.E. and the American Standards Association.

See also A.S.H.V.E. "Code of Minimum Requirements of Heat for Building," and "Instructions for the Operation, Care and Repair of Boilers," Navy Department, Bureau of Engineering.

PART III - PREPARING THE CONTRACT DOCUMENTS

All heating plans and specifications should be in sufficient detail so that a minimum of shop drawings will be necessary.

A. The Working Drawings

Ample space should be provided for piping and particular care be taken to avoid structural interferences and conflicts between the different branches of the mechanical trades. Mechanical drawings should be generally diagrammatic, with all piping and equipment shown as nearly as possible in the location in which it is to be installed.

The use of a common trench for buried heating and hot water lines wherever possible should be encouraged.

Pipes should not be located in exterior walls where there is danger of freezing, unless proper protection is provided.

Pipe sleeves and openings should be shown on the structural or architectural drawings for all pipes passing through footings, masonry floors or exterior walls below grade. The elevations of sleeves need not be given except where passing through waterproofing finishes, which require special sleeve construction. In full basements there should be provided not less than 6'-3" clear head room under bottom of lowest pipe.

B. The Specifications: Materials

Piping:

Steam piping	steel copper bearing steel
Dry return piping	steel copper bearing steel
Wet condensate piping	wrought iron charcoal iron copper molybdenum extra strong steel
Boiler feed piping	extra heavy wrought iron " " charcoal " for high pressure boilers standard weight wrought iron " " charcoal " for low pressure boilers

Cast fittings: threaded or flanged cast iron or brass of cast iron steam pattern.

Welding fittings: wrought iron or copper molybdenum alloy may be used interchangeably for wrought iron or copper molybdenum pipe. Welding elbows should have a face to center dimension equal to not less than one and one half nominal diameters of the pipe to which they are connected. Other kinds of piping to have welding fittings of the same material as the pipe.

Pipe joints: in buildings: joints 1-1/4 inch and smaller, screwed; 1-1/2 inch to 6 inches inclusive, screwed or welded; 8 inches and larger, flanged or welded; underground: 1-1/2 inch and larger, welded.

Valves: 3/4 inch and smaller, globe valves; 1 inch and larger, generally gate valves; 2 inches and smaller, brass; 2-1/2 inches and larger, iron body brass mounted; 5 inches and smaller, screwed; 6 inches and larger, flanged.

Brass metal for globe valves should have a minimum copper content of 80 percent and a maximum lead content of 5-1/2 percent.

C. Outline of a Typical Specification

1. General note - covering general conditions, and other subdivisions of the specifications.
2. Correction of faulty materials and workmanship.
3. Work included, schedule of general requirements; work not included.
4. Drawings - schedule, correlation to specifications, and shop drawings.
5. Testing requirements, prior tests, inspections, guarantee.
6. Temporary heat requirements.
7. Removal of debris during and at completion of contract.
8. Coordination of work with other trades.
9. Permits, certificates of approval, etc.
10. Excavation and backfill, grades and elevations.
11. Description of installation and materials for heating system within building.
12. Description of installation and materials for heating system outside of building.
13. Description and installation of boilers; type, construction, capacity, meters, and controls.
14. Foundations, pits for boilers, and other concrete work for equipment.
15. Smoke breeching - dampers, supports.
16. Boiler trimmings and tools.
17. Refractory, sand, cement, lime, etc.
18. Chimney construction and draft available.
19. Oil burners.
20. Oil pumps - motors, controls, and description of piping.
21. Oil heaters, relief valves, oil tanks, meters.
22. Soot blowers, type and description.

23. Safety devices, for boilers, oil burners and water supply.
24. Exhaust heads.
25. Vacuum pumps, motors, controls.
26. Pressure reducing valves, strainers, safety valves.
27. System of heating controls.
28. Radiation.
29. Radiator valves, thermostatic traps, radiator hangers.
30. Heating supply mains.
31. Return mains - steam traps, combination float and thermostatic traps.
32. Pipe and fittings.
33. Joints.
34. Unions, gaskets, bolts and nuts.
35. Valves, escutcheons.
36. Metal U covers for pipes in fill.
37. Pipe nipples.
38. Open ends.
39. Pipe sleeves.
40. Trenches and covers.
41. Hangers, anchors-guides, inserts, etc.
42. Steam connections to hot water generators.
43. Expansion provisions.
44. Welding for pipe and fittings.
45. Insulation for boilers and other equipment.
46. Insulation for boiler room including hanging ceiling if necessary and ventilating equipment.
47. Painting.
48. Unit heaters, motors, controls.
49. Ventilating fans, motors, controls.
50. Exhaust fans, motors, controls.
51. Sheet metal work.
52. Grilles, registers.
53. Factory inspections.
54. Testing boilers, pumps, fans, etc.
55. Testing of piping within building.
56. Testing of underground distributions.
57. Special equipment, accessories.
58. Voltage and other characteristics of electrical service.

D. Steam Space Heaters

Include all necessary steam and return connections, thermostatic traps and shut-off valve, and an automatic controlled valve.

The heating element (of non-ferrous tubes and fins, with ferrous or non-ferrous headers) should be suitable for a steam working pressure of two pounds per square inch gauge with air entering at 67 degrees F. When operating at full speed and maximum capacity, the final temperature should not exceed 125 degrees; when operating at less than full speed and maximum capacities specified, the final temperature should be not less than 110 degrees F.

With the fan off, the space heater with the thermal head available should be capable of releasing approximately 25 percent of the total heat output. It should be of the blow through type with direct connected motor and fan assembly, consisting of one or more forward curved double inlet fans mounted on the extended shaft of a three speed motor. The motor must be quiet running regardless of the speed at which it operates.

Use standard air, measured at the inlet, for the cubic feet of air per minute to be recirculated through the space heaters.

Complete suggested specifications may be obtained upon application to the United States Housing Authority, Washington, D. C.

E. System of Heating Controls

The purpose of the heating control system is to provide a heating system in which the circulation of steam will be equalized either by an adjustable orifice made as an integral part of the radiator valve or as a properly sized removable regulating plate in each radiator valve assembly. Any other means may be used which will insure receipt of steam by all radiators at the same time, proportionately. The systems of zone control may be as follows:

1. Continuous Flow System

(a) Floating or throttling type.

(b) A valve which functions in progressive steps of opening and closing.

Description of Continuous Flow System.

(a) To be capable of circulating steam at variable sub-atmospheric steam pressures and steam temperatures by means of a floating or throttling type continuous flow electric or air operated control valve taking steam direct from supply at up to 15 pounds pressure above atmosphere.

(b) To be capable of controlling the quantity of steam supplied so as to heat the radiators fractionally to vary their heat output by means of a continuous flow electric or air operated control valve taking steam direct from supply at up to 15 pounds pressure above atmosphere.

Panel Boards.

(1) To be of the automatic type with heat balancer and selector or other suitable equipment.

(2) To be of the automatic type with outside thermostat and selector.

2. On and Off System

(a) A valve that is opened and closed periodically.

(b) A valve that functions to produce pulsating steam flow.

Description of On and Off System.

(a) To be capable of controlling automatically the quantity of steam supplied by intermittently opening and closing the control valve for fixed cycles during which the valve is opened, automatically selected by an outside thermostat, electric or air operated control valve taking steam from supply at up to 15 pounds pressure above atmosphere.

(b) To be capable of controlling automatically the quantity of steam supplied by intermittently opening and closing the control valve for periods of time with these periods automatically selected by a combination of outside and radiator temperatures or outside and inside temperatures, electric or air operated control valve taking steam from supply at up to 15 pounds above atmosphere.

Panel Boards for both (a) and (b) to be of the automatic type to synchronize the action of the several zones.

Manual Control should be provided to increase or decrease the heat flow variably, for producing continuous steam flow and for shutting off the steam flow entirely and provide means for automatically shutting off the steam flow when the outside temperature rises above 65 degrees F.

3. The Combination System will include the principal functions of both No. 1 and No. 2 described heretofore.

Requirements for all Systems.

Each of the above systems should be balanced to synchronize the action of the several zones so as to produce an even load curve on the boiler plant. Demonstration should show this when the steam flow varies less than 20 percent (10 percent above and 10 percent below the average demand) in an interval of 20 minutes.

Comments on all Three Systems: The heating system must be tight enough so that a 15" vacuum produced on a cold system will not be reduced to less than 10 inches within 60 minutes after the pump has been stopped.

The heating system must circulate noiselessly and each radiator must heat throughout to the trap with a pressure differential range of 2 inches to 6 inches of mercury between the steam supply and the return.

Furthermore the control system must be capable of preventing overheating within the range of temperature of 75 degrees to 68 degrees F.

Zone control valves should be located so that each valve will have about the same steam demand. The variation should not exceed 10 percent.

Risers: When exposed in rooms, should be considered as heating surface.

Supply and Return Mains: Should pitch down and be free of pockets, sags or lifts throughout their entire run.

Complete suggested specifications may be had upon application to the United States Housing Authority, Washington, D. C.

PART III - FUEL CONSUMPTION FORMULAE

1. Explanatory Note: E.D.R. (Equivalent Direct Radiation) as used herein is the total heating surface used for space heating, including ferrous or non-ferrous radiators or convectors - pipe coils - exposed risers - unit heaters, etc.; one square foot E.D.R. being equal to a heat emission of 240 B.T.U. per hour.

The following fuel formulae are based on a 24-hour day operation. Deductions in fuel estimates should be made for night ~~shut-down~~. This deduction should be proportionate to the number of hours the plant is inoperative.

2. STEAM HEATING.

(a) Base formula for coal used for space heating:

$$\frac{\text{E.D.R. x Fuel Factor x Annual Degree Days}}{\text{2000 x Efficiency}} = \text{Tons per year}$$

For efficiencies in central or group plants, the following are suggested:

60% - Hand Firing
65% - Stoker Fired (low pressure)
70% - Stoker Fired (high pressure)

Fuel Factor = Pounds of coal per square foot radiation per degree day for corresponding design temperature and 100 per cent efficiency. (See Table No. 1)

(b) Base formula for gas used for space heating:

$$\frac{\text{E.D.R. x Fuel Factor x Annual Degree Days}}{\text{1000 x Efficiency (Use 75\%)}} = \text{M. cu. ft. gas per year.}$$

Fuel Factor = Cu. Ft. gas per sq. ft. Radiation per degree day for corresponding design temperature and 100% efficiency. (See Table No. 2)

(c) Base formula for oil used for space heating:

$$\frac{\text{E.D.R. x Fuel Factor x Annual Degree Days}}{\text{Efficiency (Use 75\%)}} = \text{Gals. oil per year.}$$

Fuel Factor = Gals. oil per sq. ft. Radiation per degree day for corresponding design temperature and 100% efficiency. (See Table No. 3)

(d) For formula for estimating district steam consumption; see paragraphs 9 (a), (b) and (c).

(e) For all space heating estimates during continuous operation, 20% should be added to the fuel consumption if zone control is omitted where the design temperature is 0° or higher Fahrenheit, and 15% where the design temperature is less than 0° F. Twelve (12) per cent should then be added to the fuel consumption to compensate for line losses in high pressure central plants and ten (10) per cent in low pressure central or group plants.

(f) The same base formulae outlined hereinbefore can be applied to individual building and individual dwelling unit plants for space heating estimates. The individual building plants scheme can also include a boiler plant serving two or three small buildings. The following efficiencies are suggested:

Hand Firing, Bituminous Coal	- 44%
Hand Firing, Anthracite Coal	- 52%
Stoker Fired, Bituminous Coal	- 50%
Stoker Fired, Anthracite Coal	- 55%
Gas	- 70%
Oil	- 65%

(g) Five (5) per cent should then be added to the fuel consumption to compensate for line losses in individual building plants.

(h) The line loss percentages suggested herein should be used for preliminary calculations only.

3. HOT WATER HEATING.

(a) The E.D.R. should be transposed in terms of its equivalent in steam radiation. The base formulae including compensation for line losses and for omission of zone control or other regulation set forth in paragraph 2 can then be applied.

(b) Formula for transposing Hot Water E.D.R. to Steam E.D.R.

$$\frac{\text{E.D.R. (Hot Water)} \times \text{B.T.U. per sq.ft.(Hot Water)}}{240} = \text{E.D.R.(Steam)}$$

4. WARM AIR HEATING (Forced and Gravity)

(a) The B.T.U. loss per hour should be transposed in terms of its equivalent in steam equivalent direct radiation by dividing by 240 (see explanatory note paragraph 1). The base formulae as outlined in paragraph 2 can then be applied for the steam or hot water coiled forced warm air unit heater system, for the individually fired forced or gravity heater systems. In all cases compensation should be made for line losses, and for omission of zone control or other regulation.

5. (a) Examples of use of space heating formulae:

Assume 15,000 steam E.D.R. (Low Pressure - Control Plant - Zone Controlled)

5,000 Degree days (Annual)
- 10° to 70° F. Design Range
12,000 B.T.U. per lb. of Coal
1,000 B.T.U. per cu. ft. of Gas
140,000 B.T.U. per gal. of Oil

(b) Coal

$$\frac{15{,}000 \text{ E.D.R.} \times 5{,}000 \text{ D.D.} \times .007 \text{ (Fuel Factor from Table 1).}}{1300} = \text{404 Tons Coal Per Year.}$$

Plus 10% line losses - 404 + 40.4 = 444.4 Tons per year.

(c) Gas

$$\frac{150{,}000 \text{ E.D.R.} \times 5{,}000 \text{ D.D.} \times .084 \text{ (Fuel Factor from Table 2)}}{750} = \text{8,400 M. Cu. Ft. Gas per year.}$$

Plus 10% for Line Losses - 8,400 + 840 = 9,240 M. Cu. Ft. per year.

(d) Oil

$$\frac{15{,}000 \text{ E.D.R.} \times 5{,}000 \text{ D.D.} \times .0006 \text{ (Fuel Factor from Table 3)}}{75} = \text{60,000 Gals. oil per year.}$$

Plus 10% for Line Losses - 60,000 + 6,000 = 66,000 Gals. oil per year.

6. (a) Base formula for fuel used for domestic hot water heated through steam coiled generators. (No. of Dwelling units x 60 gals. per day x 1.1. lbs. steam per gallon x 365 days per year x 960 B.T.U. per lb. steam) all divided by B.T.U. per unit of fuel used x 0.50 (50% assumed efficiency) Units of Fuel used per year.

(b) Coal

$$\frac{\text{D.U.} \times 60 \times 1.1 \times 365 \times 960}{\text{B.T.U. per lb. coal} \times .50 \times 2{,}000 \text{ lbs. per ton}} = \text{Tons Coal Per Year.}$$

or in simplified form

$$\frac{\text{D.U.} \times 23{,}127}{\text{B.T.U. per lb. coal}} = \text{Tons coal per year}$$

(c) Gas

$$\frac{\text{D.U.} \times 60 \times 1.1 \times 365 \times 960}{\text{B.T.U. per cu. ft. gas} \times .50 \times 1{,}000} = \text{M. cu. ft. gas per year}$$

or in simplified form

$$\frac{\text{D.U.} \times 46{,}254}{\text{B.T.U. per cu. ft. Gas}} = \text{M. cu. ft. gas per year}$$

(d) Oil

$$\frac{\text{D.U.} \times 60 \times 1.1 \times 365 \times 960}{\text{B.T.U. per gallon oil} \times .50} = \text{Gals oil per year.}$$

or in simplified form

$$\frac{\text{D.U.} \times 46{,}254{,}000}{\text{B.T.U. per gallon oil}} = \text{Gals oil per year.}$$

(e) For domestic hot water heating fuel consumption where underground heat distribution for this purpose is required, the same compensation for line losses may be applied as noted in paragraph 2 (e). No heat line losses need be figured where hot water generators are installed in boiler plant buildings.

(f) The daily gallon consumption and line loss percentages suggested herein should be used for preliminary calculations only.

(g) For formulae for estimating district steam consumption, see paragraph 9 (d), (e) and (f).

7. (a) Examples of use of domestic water heating formulae:

Assume 100 Dwelling Units (Central Plant)
12,000 B.T.U. per lb. coal
1,000 B.T.U. per cu. ft. gas
140,000 B.T.U. per gallon oil
H. W. Generators are in boiler plant (no heat line losses figured).

(b) Coal

$$\frac{100 \times 23{,}127}{12{,}000} = 192.8 \text{ Tons per year.}$$

(c) Gas

$$\frac{100 \times 46{,}254}{1{,}000} = 4625.4 \text{ M. cu.ft. gas per year.}$$

(d) Oil

$$\frac{100 \times 46{,}254{,}000}{140{,}000} = 33038 \text{ Gals oil per year.}$$

8. (a) Base formula for fuel used for domestic hot water heating through individual heaters (No. of Dwelling Units x 40 gallons per day

x 8-1/3 lbs. of water per gallon x 100° F. temperature rise x 365 days per year, all divided by B.T.U. per unit of fuel used x efficiency = Units of Fuel used per year. The water temperature rise is basic only. Initial water temperatures may vary dependent upon locality.

(b) Coal

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per lb. coal x Eff. x 2,000}} = \text{Tons Coal per year.}$$

Use 35% Efficiency,
or in simplified form

$$\frac{\text{D.U. x 17,381}}{\text{B.T.U. per lb. coal}} = \text{Tons Coal per year.}$$

(c) Gas

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per cu. ft. gas x Eff. x 1000}} = \text{M. cu. ft. gas per year}$$

Use 55% efficiency for flue type heater, or in simplified form

$$\frac{\text{D.U. x 22,120}}{\text{B.T.U. per cu. ft. gas}} = \text{M. cu. ft. gas per year.}$$

(d) Oil

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per gallon oil x Eff.}} = \text{Gals. oil per year.}$$

Use 50% Efficiency

or in simplified form

$$\frac{\text{D.U. x 24,332,300}}{\text{B.T.U. per gallon oil}} = \text{Gals. oil per year.}$$

(e) Electricity

$$\frac{\text{D.U. x 40 x 8-1/3 x 100 x 365}}{\text{B.T.U. per KW hr. x Eff.}} = \text{KW Hrs. per year.}$$

Use 77% Efficiency; B.T.U. per KW Hr. = 3,412

or in simplified form

D.U. x 4,631 = K.W. Hrs. per year.

(f) The daily consumption suggested herein should be used for preliminary calculations only.

9. (a) Base formula for District Steam used for space heating:

$$\frac{\text{E.D.R. x 96 B.T.U. x monthly degree days x } 70^{\circ} \text{ Range}}{\text{960 B.T.U. x 1000 x Design Temp. Range}} = \text{M. lbs. steam}$$

for the particular month that the degree days are selected.

If no zone control is provided 20% should be added where the design temperature is 0° or higher Fahrenheit and 15% where the design temperature is less than 0° F. Twelve (12) per cent should be added for line losses, if these losses are to be absorbed by the project.

Note: The estimate for each month must be computed separately as District Steam Companies render bills monthly.

(b) Simplified Formula for District Steam (Space Heating)

$$\frac{\text{E.D.R. x monthly degree days x Factor (from table 4)}}{1000} = \text{M. lbs. steam per month}$$

Plus compensation for line losses and omission of zone control.

(c) The yearly total can be figured from this formula by substituting the annual degree days in lieu of the monthly degree days. Compensation for line losses and for omission of zone control should be made.

(d) Base Formula for District Steam used for domestic water heating.

$$\frac{\text{D.U. x 60 x 1.1 x 365}}{\text{12 x 1000}} = \text{M.lbs. steam per mo.}$$

The same line losses as applied to heating should be added where underground heat distribution for this purpose is required.

(e) Simplified formula for District Steam for domestic hot water.

D.U. x 2.007 = M. lbs. steam per month;
plus compensation for line losses.

(f) Simplified formula for District Steam for domestic hot water (Annual consumption).

D.U. x 24.084 = M. lbs. steam
plus compensation for line losses.

(g) Example: 604 D.U. 76,000 E.D.R. 0° - 70° Design Temp. Range - Zone Control - Hot water generators located in basement of certain buildings.

Space Heating - $\frac{76,000 \times \text{Degree Days} \times .1}{1000}$ = M. lbs. steam

where .1 $\doteq$ fuel factor

M. lbs steam = 7.6 x Degree days (see following degree day tabulation)

Plus 12% for line losses.

Domestic Hot Water = 604 D.U. x 2.007 = 1212.2

Plus 12% for line losses

10. Note: Origin of Constant 96 Used in Tables 1, 2 and 3.

"About 1926 a large number of actual fuel consumption figures (in cubic feet of gas per degree-day per square foot of steam radiation) was collected by gas utilities. These figures, averaged, were reduced to a figure (at 0° to 70° design conditions of 0.218 cu. ft. of 535 B.t.u. per cubic foot gas per square foot of steam radiation per degree-day, or, in other words, an input of 116.6 B.t.u. per sq. ft. of steam radiation per degree-day. Here was a figure which was actually obtained in the field and from which could be calculated a theoretical figure at 100% efficiency. It was assumed that these gas heating plants were operating at an overall efficiency of 82.5%, so that if the plants had been operating at an efficiency of 100% they would have required only 116.6 x 0.825 or 96 B.t.u. per sq. ft. of steam radiation per degree-day."

- - - - -

Consequently the constant 96 B.T.U. per square foot of steam radiation per degree day is the basis of all fuel constants used in the following tables.

EXAMPLE FOR DEGREE DAYS TABULATION

1	2	3	4	5	6	7	8
			HEATING - M LBS. STEAM		DOM.H.W.-M LBS. STEAM		
MONTH	DEGREE DAYS	% TOTAL		COL.4 PLUS 12% LINE LOSSES		COL.6 PLUS 12% LINE LOSSES	TOTAL M LBS. STEAM COLS.5 PLUS 7
JANUARY	682	23.5	5,180	5,802	1,212	1,357	7,159
FEBRUARY	557	19.0	4,230	4,738	1,212	1,357	6,095
MARCH	388	13.5	2,950	3,304	1,212	1,357	4,661
APRIL	132	4.5	1,000	1,120	1,212	1,357	2,477
MAY					1,212	1,357	1,357
JUNE					1,212	1,357	1,357
JULY					1,212	1,357	1,357
AUGUST					1,212	1,357	1,357
SEPT.					1,212	1,357	1,357
OCT.	96	3.5	730	818	1,212	1,357	2,175
NOV.	396	13.5	3,000	3,360	1,212	1,357	4,717
DEC.	639	22.5	4,860	5,443	1,212	1,357	6,800
TOTAL	2,890	100.0	21,950	24,585	14,544	16,284	40,869

TABLE - 1

FUEL FACTOR TABLE

COAL PER SQ. FT. PER D.D. @ 100% EFF.

Coal or Coke	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
11,000 B.T.U.	.00678	.00764	.00813	.00872	.00938	.01018	.01222
11,500 B.T.U.	.00648	.0073	.0078	.00835	.00899	.00975	.0117
12,000 B.T.U.	.00622	.007	.00746	.008	.00862	.00933	.0112
12,500 B.T.U.	.00596	.00672	.00716	.00767	.00826	.00896	.01075
13,000 B.T.U.	.00574	.00646	.00689	.00738	.00795	.00862	.01034
13,500 B.T.U.	.00562	.00622	.00664	.00712	.00767	.0083	.00996
14,000 B.T.U.	.00532	.006	.00639	.00685	.00737	.0080	.0096
14,500 B.T.U.	.00514	.00578	.00617	.00662	.00712	.00772	.00926

TABLE - 2

CU. FT. GAS - PER SQ. FT. PER D.D. 100% EFF.

GAS	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
500 B.T.U.	.14933	.168	.179	.192	.2065	.224	.2688
1,000 B.T.U.	.07466	.084	.0896	.096	.1033	.112	.1344
1,040 B.T.U.	.07180	.08077	.0862	.0923	.0994	.10769	.12923

TABLE - 3

GAL. OIL - PER SQ. FT. PER D.D. 100% EFF.

OIL	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
140,000 B.T.U.	.000533	.0006	.00064	.0006857	.000737	.0008	.00096
148,000 B.T.U.	.000505	.000563	.000606	.000649	.0007	.000757	.0009081

TABLE - 4

POUNDS STEAM - PER SQ. FT. PER DEGREE DAY - 100% EFF.

	-20° F	-10° F	-5° F	0° F	+5° F	+10° F	+20° F
	.0778	.0875	.09334	.1	.1077	.11667	.14

BULLETIN No. 20

Selecting a Method of Heating

SUBSTITUTED FOR BULLETIN No. 20
DATED SEPTEMBER 25, 1939

REVISED JULY 11, 1940

FEDERAL WORKS AGENCY • UNITED STATES HOUSING AUTHORITY

BULLETIN NO. 20 ON POLICY AND PROCEDURE

Revised July 11, 1940

(Substituted for Bulletin No. 20,
dated September 25, 1939)

Selecting a Method of Heating

This Bulletin contains technical information for use by architects and engineers in selecting the method of heating for USHA-aided projects. The characteristics of the different heating methods, and the factors which should be considered in determining the type of heating system most economical and desirable for a particular project, are considered.

The Appendix to the Bulletin contains instructions for preparing economic analyses of the different types of heating systems, and other material which should assist local authorities in selecting the most economical and desirable heating method for their USHA-aided projects.

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
Washington

CONTENTS

SELECTING A METHOD OF HEATING

SCOPE AND CONTENT.

This Bulletin discusses (I) the objective which the local authority should attain in selecting a method of heating for its USHA-aided projects; (II) the various heating methods and their characteristics; (III) the factors affecting the choice of a heating system; and (IV) the types of heating systems and the characteristics peculiar to each. The Appendix to the Bulletin contains information and instructions for the preparation of an economic analysis of the different types of heating systems and other technical data which should be considered in the selection of the heating method.

I. OBJECTIVE.

Heating systems for low-rent housing involve a variety of considerations, with one basic purpose—*the provision of suitable heating at the least possible over-all expense*. Economy of initial costs is mandatory under the United States Housing Act which states that "projects will not be of elaborate or expensive design or material and economy will be promoted both in construction and administration." The Act further requires that rents (including the cost of heating) shall be within the financial reach of families of low income. Since the heating expense may represent a very material portion of the total rent, or total expenditures for rent and household operation, economy in operating expense of the heating system is essential.

II. HEATING METHODS.

The individual tenant-operated heating unit should always be given consideration and, under conditions favorable to its use, this type should be the first tentative selection. As compared with the project-operated plant, the individual tenant-operated unit has the following definite advantages:

(*a*) The responsibility for fuel consumption is placed squarely on the tenant. It is obvious that when he pays directly for the fuel consumed, he will adjust the heat to his actual needs.

(*b*) Tenant operation is substituted for the paid labor of others.

(*c*) Simple, individual tenant-operated units are likely to be lower in first cost than large, frequently complex, project-operated plants. Under favorable climatic and fuel conditions, the small heating units will generally cost the tenant less in over-all operating expenses.

There are conditions, however, under which consideration must be given to the project-operated plants. In such cases, its initial cost and annual expense should be estimated and compared with the individual unit costs, and the advantages and disadvantages of the two types should be compared and weighed before a definite decision is made. For example, flats and apartments do not lend themselves readily to individual tenant-operated units except when gas is available at a low rate. In very cold climates with a long heating season, the more efficient performance of the larger project-operated plant may result in definitely lower operating expense. The project-operated plant may have a distinct advantage in the anthracite regions (indicated in Zone 3 on the map on page 4) since such plants may often be operated with the smaller sizes of anthracite coal available locally in large quantities, whereas individual units may require the larger, more expensive sizes. The types of fuel available, possible methods of fuel purchase and distribution, the cost of project labor contingent upon different types of fuel, and other factors must be analyzed before making a final decision.

For purposes of general consideration, the country may be roughly divided into three heating zones, as shown on the map on page 4. In the warmest of these, Zone 1, no separate means for heating need generally be provided. In the next cooler area, Zone 2, a simple individual unit system of warm air circulation (tenant-operated) should usually be sufficient and except under unusual conditions, no consideration need be given to the project-operated plant. In the coldest area, Zone 3, various more extensive methods of heating should be considered and carefully compared.

Because of the technical considerations involved it is usually important to have the services of a qualified heating engineer in the preparation of an economic analysis, and in the final choice and the design of the heating system. An initial investment in qualified technical advice may pay for itself many times over in more accurate and dependable estimates, greater speed in the preparation of working drawings, and greater operating economy and efficiency.

III. FACTORS AFFECTING CHOICE OF HEATING SYSTEM.

(*a*) Desirability of tenant responsibility.

(*b*) Initial cost and its effect on annual expense: The comparative initial costs of providing space and chimneys for the individual dwelling heating unit or the project boiler plant must not be forgotten.

(*c*) Total annual expense: The choice of fuel used for domestic water-heating and the use of the same fuel for other purposes may affect this item.

(*d*) Effect on site and building plan: The choice of tenant-operated heating units requiring delivery of fuel to the individual dwellings may control the layout of service drives, and consequently influence the cost of the system. Similarly, the requirements of economical underground distribution lines for project-operated plants may influence the layout of buildings.

(*e*) Continued availability of fuel and probable trend of its price.

(*f*) Local practice, acceptability.

(*g*) Climate.

(*h*) Labor rates and related factors such as municipal and labor organization requirements.

(*i*) Safety and cleanliness of operation.

(*j*) Rate of obsolescence.

(*k*) Effect on insurance rate.

Some of these factors relate to the type of system, some to the fuel, some to both. There may be other factors in particular cases.

IV. TYPES OF SYSTEMS.

(*a*) *Design.*—In the selection and design of the heating system, consideration should be given to the fact that a continuous temperature of 70° F. in all rooms is not considered an absolute essential for health and comfort. Since outside design temperatures are reached for comparatively short periods of time during the average heating season, a temperature range (inside room temperature minus outside design temperature) 5° to 10° F. lower than that generally accepted for the locality may be used in calculating heat losses. For example, in cities where there is a generally accepted design temperature of 0° F., the project design range can be reduced (from 0° to 70° F.) to +5° to 65° F. Local conditions must be considered carefully before reductions in the accepted range are established.

(*b*) *Fuels.*—Consideration should also be given to the characteristics of fuels which affect the feasibility of a particular method of heating. Among these are:

(1) *Coal* requires storage space and means for ash disposal, and this may restrict its use for individual dwelling heating units above the first floor.

(2) *Gas* involves no storage or handling difficulties and, when low enough in price, makes the individual unit available for any type of dwelling. One hundred percent check metering may be necessary, however, to insure economical fuel consumption. The initial cost and annual operating expense of individual gas-fired units with check metering should be weighed against the costs of an automatic project-operated gas-fired system.

(3) *Oil* requires tankage in the project-operated plants. For tenant-operated units in the one- or two-story flats or row houses, a storage drum (approximately 50-gallon capacity) which is set on a stand directly outside the dwellings may be provided, which would be in addition to the fuel tank furnished as an integral part of the oil-burning equipment.

(*c*) *Individual Tenant-Operated Units.*

(1) *Fireplace or Circulator.*—These types of equipment are definitely justified in Zone 2. Fireplaces are generally of the metal chamber type encased in masonry and so constructed as to permit the warming and circulating of air. Circulators are self-contained and embody steel casing, steel or cast-iron combustion chamber and means for firing, as well as necessary controls. Circulators may burn any fuel. The fireplace or the circulator may be placed in the living room and can be supplemented by simple duct arrangements to the other rooms in the larger-size dwelling units.

(2) *Gravity Warm Air.*—This type is lowest in initial cost of the more extensive types of heating systems. Basement space is required, however. The pipeless variety is only partially effective in distribution and may be selected for the warmer points of Zone 3. For colder points, more effective distribution will be obtained by the use of ducts.

(3) *Forced Warm Air.*—Supplemented by ducts or plenum chamber, or a combination of both, distribution is more effective than in the gravity type. No basement is required, since the equipment may be located within the dwelling unit, generally in the utility room.

(4) *One Pipe Steam with radiators.*—This type is generally higher in initial cost than gravity warm air and requires basement space.

(5) *Hot Water with radiators.*—This type is generally higher in initial cost than one pipe steam and requires no basement space. It is very satisfactory in operation, particularly when a steady, moderate supply of heat is wanted.

(*d*) *Project-Operated Plants.*—(Central, Group, or Individual Building.)

(1) These types may be justified usually under the following conditions:

(i) Concentration of dwelling units in flats and apartments and to a lesser extent in row houses.

(ii) Climate requiring nearly continuous heating for four or more months.

(2) The most common types of systems for the project plants are:

(i) Two-pipe vapor (with return trap, vacuum, or condensate pump).

(ii) Two-pipe forced hot water.

(iii) One-pipe gravity.

(3) The decision between a single central plant and two or more plants, each serving a group of buildings, or individual building plants will be affected by:

(i) The size, arrangement, and topography of the project.

(ii) The types of fuel available at low prices.

(iii) Labor rates and related factors.

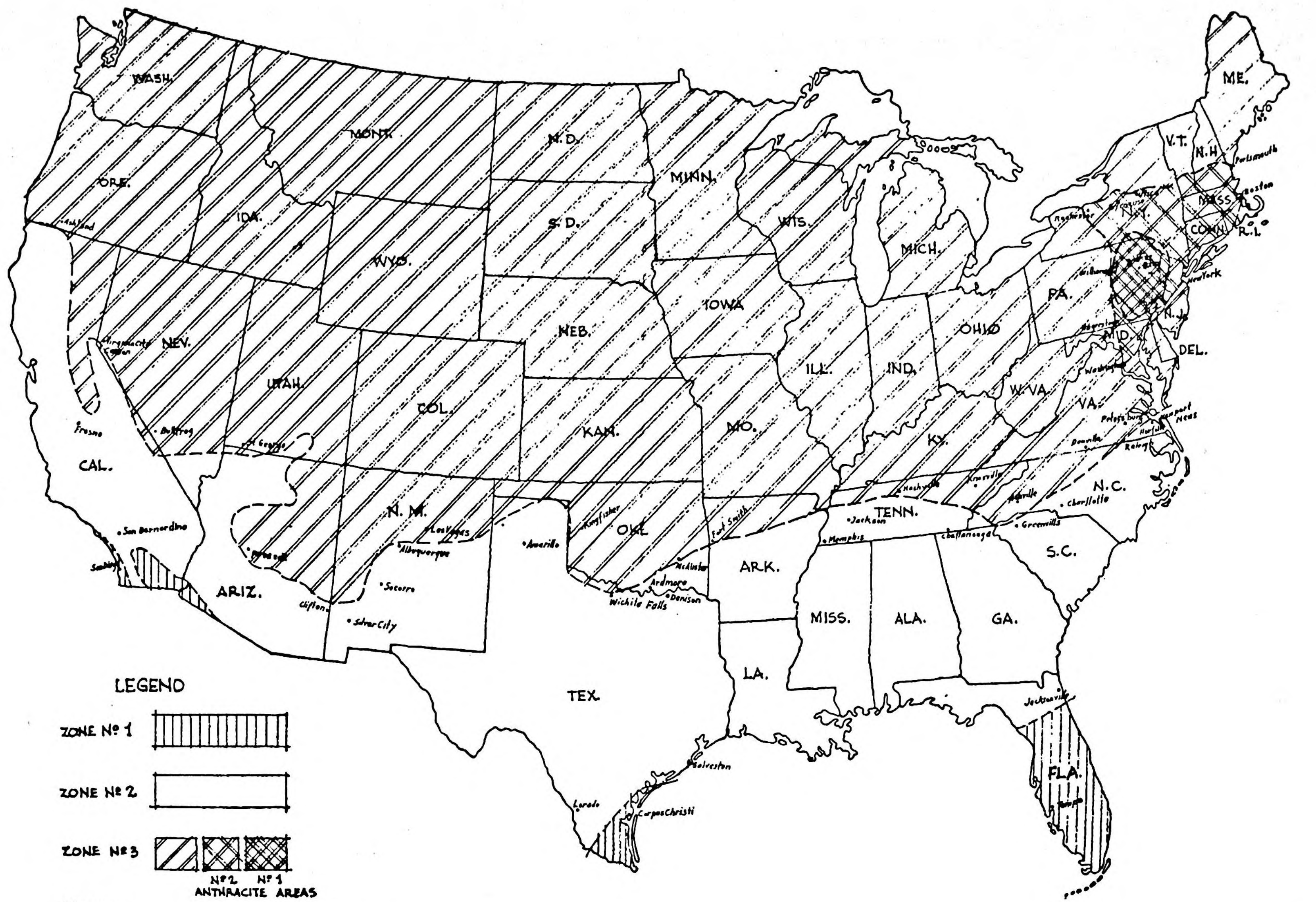
(4) Fuels such as oil or gas may be readily handled, regardless of the number, size and location of the plants. Group plants should be interconnected, wherever feasible, to permit more flexible operation which will result in greater economy in the low-demand months. This is particularly important where coal is the fuel used. The site plan should therefore be arranged to permit nearly uniform sizing of the group plants and their location established for economical interconnection. The design of the underground distribution system should not be deferred until after the site plan has become set. Both the character and extent of the distribution system may be influenced by close cooperation between the heating engineer and the site planner from the beginning. Buildings arranged compactly will achieve economy in heating distribution.

(5) A large central plant will usually require a separate building and high chimney. This may be undesirable from a site planning point of view or for architectural reasons. The delivery, storage, and handling of coal and the disposal of ashes, however, may be efficiently handled in such a plant.

Nathan Straus

NATHAN STRAUS,
Administrator.

JULY 11, 1940.



NOTES:

Area No. 1 is the center of the anthracite industry.

Area No. 2 embraces the balance of the anthracite market, however, prices will increase due to transportation costs.

Appendix

Part I

ECONOMIC ANALYSES

Comparative analyses should be prepared to select the most suitable and economical space and domestic water heating scheme for a project, indicating the total evaluated economic expense for each scheme considered. The evaluated economic expense is the summation of the following applicable expenses:

1. Replacement, maintenance, and repair.
2. Fuel.
3. Electric consumption.
4. Operating labor.
5. Ash removal.
6. Miscellaneous.
7. Vacancy and collection losses.
8. Debt service.

The resultant evaluated economic expense for the space and domestic water heating systems should be coordinated and combined with the similar studies prepared for lighting, refrigeration, and cooking as described in Bulletin No. 19.

In selecting the various heating schemes and fuels for the comparative cost analyses, particular consideration should be given to local practices and methods.

Forms for Analyses.

Form USHA 637 (see pages 8 and 9) is intended for use in the preparation of each space and domestic hot water scheme and Form USHA 652 (see page 7) for the combined lighting, refrigeration, water, and space heating functions.

Initial Cost.

1. For estimating the initial cost of a heating and domestic hot water system, the prices included in this Bulletin are recommended unless definite current local quotations or previous contract prices for corresponding equipment are obtainable.

2. In addition to complete heating system, include cost of—

(*a*) Hot-water piping and equipment.

(*b*) Related plumbing and electric work.

(*c*) Additional cost of interior and exterior gas piping for space and domestic water heating above basic cost of gas piping for cooking, or cooking and refrigeration.

(*d*) Structural space above normal construction required for housing the systems.

(*e*) Stacks or flues.

(*f*) Facilities for fuel storage; additional facilities for fuel delivery.

3. The initial costs of the electric and gas check meters are listed in Bulletin No. 19. The initial costs and economic expenses of the gas and electric check meters should be indicated under separate items on Form USHA 712, "Analysis of Lighting, Refrigeration, Cooking," and on Form USHA 652, "Summary of Utility Analysis."

In the exceptional case where space and domestic water heating schemes are compared independently of lighting, refrigeration, and cooking, and gas fuel is used, the economic expense of gas check meters should be included in the corresponding analysis.

Economic Expense.

1. *Replacement, maintenance, and repair.*—Applicable factors enumerated in this Bulletin are suggested to establish the above expense, but may be modified whenever more accurate local expense data are available. These factors are the annual average over a 58-year project life, as this period is the basis of the economic analysis. The replacement factors are based on 2% interest.

2. *Fuel, Heating.*

3. *Fuel, Domestic Hot Water.*

Fuel consumption for space and domestic water heating may be estimated according to the attached applicable formulae.

Fuel prices and their method of purchase, distribution, and storage require careful investigation. Fuel prices for project-operated plants may be checked by comparison with city or institutional purchases in the same city.

It is suggested that in investigating bulk fuel costs, one of the following wholesale purchasing methods most suitable for the specific locality in question be investigated.

(*a*) For project-operated plants, wholesale quotation based on estimated annual consumption.

(*b*) For tenant-operated heating units, the project should obtain a wholesale price on the estimated total annual consumption based on limited retail delivery (at designated point in each block or if service road permits, at each dwelling unit). The tenant completes wheeling from sidewalk to individual bulk fuel storage compartment. Project collects individual bills from tenants. Project is billed by fuel supplier for periodic delivery.

(*c*) Purchasing method same as in paragraph (*b*) with exception of delivery which should be in 1-ton or half-ton quantities chuted in individual storage bins but a minimum of one truckload per delivery.

(*d*) Purchasing method same as in paragraph (*c*) but tenant pays directly to fuel dealer.

(*e*) Any of the above-described methods from (*b*) to (*d*) through tenant cooperative contracts instead of project management guarantee and project accounting methods or any other tenant cooperative method.

The gas fuel unit cost for space and domestic water heating should be established on the total gas consumption used for all utility functions within the project in the scheme considered and the average fuel price applied in this analysis.

4. *Electric Consumption.*—Electricity consumed for the operation of heating and hot-water systems may be estimated according to the attached formulae. The average electric rate based on all electric functions within the project should be applied in the analyses.

5. *Labor.*—In estimating labor costs, it is advisable to formulate tentative operating schedules. Care should be taken that such schedules conform to applicable regulations and local requirements.

6. *Ash Removal.*—The cost of ash removal need be considered only when ashes are not removed by the city.

7. *Miscellaneous.*—Such items as oil, waste, water, tools, wheelbarrows, etc., for project plants should be included.

8. *Vacancy and Collection Losses.*—When vacancies occur, project expenses continue and affect the operating expenses. For this analysis, 3 percent of all the above items with the exception of fuel purchased directly by the tenant should be included.

9. *Total.*—This total is the sum of the actual operating expenses exclusive of the debt service.

10. *Debt Service.*—The debt service is interest and amortization of the initial costs. This rate may vary according to government interest rate; for comparative purposes, 3.67 percent is now used.

11. *Economic Expense.*—The sum of the operating expenses and debt service gives the economic expense which should form the basis of comparison.

NOTE.—After local authority has selected a combination of utilities considered to be practical and lowest in economic expense, a check of this expense should be made, basing the consumptions on the formulae and quantities given in Bulletin No. 36, "Budgeting Dwelling Utility Costs." This check is for the purpose of assuring that the selection made will come within the "Utility Cost Control Figure."

U·S·H·A 652
REV. 3/1/40.

SHEET NO. 3
OF ____ SHEETS.

SUMMARY OF UTILITY ANALYSIS.

LOCATION ____________ PROJECT NO. ________

SCHEME	COMBINATION	SERVICE	SYSTEM OF D.H.W. & S.HTG.	FUEL	FORM OF PURCH.	CONSUMP. ALLOW D.U./MO.	INVESTMENT COST TOTAL	INVESTMENT COST PER D.U.	ECONOMIC EXPENSE D.U./MO. MAINT.	FUEL	VAC. & COLL.	TOTAL EXP. TO PROJ.	DEBT SERV.	ECONOMIC EXPENSE	TENANT DIRECT PURCHASE	GRAND TOTAL
1		SP. HTG.														
		D.H.W.														
		COOK.														
		REFRIG.														
		LTG.														
		PR.L.&P.														
		CHECK METERS: GAS ____, ELEC. ____														
		REMARKS:														
2		SP. HTG.														
		D.H.W.														
		COOK.														
		REFRIG.														
		LTG.														
		PR.L.&P.														
		CHECK METERS: GAS ____, ELEC. ____														
		REMARKS:										DIFFERENCE BETWEEN SCHEMES 2 AND 1. INVESTMENT COST PER D.U. $____		ECONOMIC EXP. GRAND TOTAL D.U./MO. $____		
3		SP. HTG.														
		D.H.W.														
		COOK.														
		REFRIG.														
		LTG.														
		PR.L.&P.														
		CHECK METERS: GAS ____, ELEC. ____														
		REMARKS:										DIFFERENCE BETWEEN SCHEMES 3 AND 1. INVESTMENT COST PER D.U. $____		ECONOMIC EXP. GRAND TOTAL D.U./MO. $____		

SCHEME	COMBINATION	SYSTEM OF D.H.W. & S.HTG.	FUEL	FORM OF PURCH.	CONSUMP. ALLOW D.U./MO.	INVESTMENT COST TOTAL	INVESTMENT COST PER D.U.	ECONOMIC EXPENSE D.U./MO. MAINT.	FUEL	VAC. & COLL.	TOTAL EXP. TO PROJ.	DEBT. SERV.	ECONOMIC EXPENSE	TENANT DIRECT PURCHASE	GRAND TOTAL
4															
		CHECK METERS: GAS ____, ELEC. ____													
		REMARKS:											DIFFERENCE BETWEEN SCHEMES 4 AND 1. INVESTMENT COST PER D.U. $____		ECONOMIC EXP. GRAND TOTAL D.U./MO. $____
5															
		CHECK METERS: GAS ____, ELEC. ____													
		REMARKS:											DIFFERENCE BETWEEN SCHEMES 5 AND 1. INVESTMENT COST PER D.U. $____		ECONOMIC EXP. GRAND TOTAL D.U./MO. $____
6															
		CHECK METERS: GAS ____, ELEC. ____													
		REMARKS:											DIFFERENCE BETWEEN SCHEMES 6 AND 1. INVESTMENT COST PER D.U. $____		ECONOMIC EXP. GRAND TOTAL D.U./MO. $____

FOLD

FOLD

COMPUTED BY ______, DATE ____
CHECKED BY ______, DATE ____

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION • UTILITY SECTION

U.S.H.A G37
REV. 3/1/40.

92 - 3 room units
28 - 3½ room units
131 - 4½ room units
27 - 5½ room units
278 — 1112 rooms

ANALYSIS OF HEATING & HOT WATER

LOCATION______. PROJECT NO.______.

SHEET NO. 1 OF 2 SHEETS.

SCHEME NO. II-1

DESCRIPTION: Ind. Coal circulator; Ind. Gravity Hot Water; Gas Hot Water

SYSTEM Individual Coal Circulator - 3 & 3½ room units; Ind. Coal Gravity Hot Water - 2 sty. row houses - Gas Hot Water	INITIAL COST	ANNUAL EXPENSE ITEMS REPL. %	MAINT. %	TOTAL %	TOTAL $
HEATING EQUIP.					
** 120 coal circulators @ $60	7200	4.12	2.0	6.12	440
131 gravity hot water systems @ 225 — 29500; 27 gravity hot water systems @ 250 — 6750	36250	1.66	1.0	2.66	965
HOT WATER EQUIP.					
278 gas hot water heaters @ $40	11120	5.78	8100	5.78+8100	920
Hot water piping 278 du @ $22	6120	1.66	1.0	2.66	163
Gas piping 278 du @ $5	1390	1.0	1.0	2.0	28
STRUCTURAL & RELATED ITEMS					
Double Flues - 278 @ $60/du	16680		$.75	$.75	208
Coal Bins - 278 @ $30/du	8340	2.46	1.0	3.46	289
Additional cost of drives 278 du @ $12/du	3330		$.35	$.35	117
METER EXPENSE					
TOTAL FOR PROJECT	90430				3130
TOTAL PER DWELL. UNIT	325				11.25

FUEL & ENERGY CONSUMPTIONS

DESIGN TEMP. 0° — DEGREE DAYS 5441 — E.D.R. 37,900

FUEL HEAT Coal — B.T.U. 11500/lb. — @ 4.60/ton*

FUEL HOT WATER Gas — B.T.U. 1000/c.f. — @ .441/mcf.

EDR - 1112 rooms x 160 sq ft / 4.7 = 37900 sq ft (steam)

Fuel Heat $\frac{37900 \times 82 \times 5441 \times 70}{11500 \times 2000 \times 40 \times 70}$ = 1840 tons

Less 25% — .460 tons; 1380 tons

1380 tons @ 4.60 = $6350

Fuel Hot Water $\frac{278 \text{ du} \times 40 \times 8.3 \times 85° \times 365}{1000 \times 1000 \times .55}$ = 5220 mcf

5220 mcf @ .441/mcf = $2300

OPERATING LABOR

OPERATING EXPENSE	TOTAL ANNUAL	D.U./MO.
REPLACEMENT & MAINT.	3130	.94
FUEL HEATING	6350	1.90
FUEL HOT WATER	2300	.69
ELEC. CONS.		
LABOR		
ASH REMOVAL		
MISCL.		
Vac. and Coll. Loss 3%	165	.05
TOTAL	11945	3.58
DEBT SERVICE (3.67%)	3320	1.00
ECONOMIC EXPENSE	15265	4.58

REMARKS

* Based on yearly purchase

** Coal circulators recommended by local authority

COMPUTED BY______. DATE______.

CHECKED BY______. DATE______.

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION • UTILITY SECTION

FOLD

USHA G37
REV. 3/1/40

ANALYSIS OF HEATING & HOT WATER

LOCATION______ PROJECT No.______

SHEET No. 2 OF 2 SHEETS.
SCHEME No. C-1
DESCRIPTION: Coal - Central Plant

SYSTEM Coal Fired Central Plant	INITIAL COST	ANNUAL EXPENSE ITEMS REPL. %	MAINT. %	TOTAL %	TOTAL $
HEATING EQUIP.					
Piping, radiation and specialties within					
buildings - 37900 EDR @ 1.40/sq ft = 53000					
Outside distribution 1240' @ $8/ft = 9920					
Boiler room equipment (less firing equip.)	74920	1.75	1.75	3.5	2620
400 HP @ $30/HP = 12000					
Stokers 400 HP @ $20/HP = 8000	8000	4.12	2.0	6.12	490
HOT WATER EQUIP.					
2 - 1500 gal. storage tanks @ $750 each	1500	5.78	2.5	8.28	125
Exterior hot water piping 1240' @ $2/ft	2480	1.66	1.0	2.66	66
Interior hot water piping 278 dw. @ $29/dw.	8050	1.66	1.0	2.66	21
2 circulators @ $100 each	200	5.78	2.0	7.78	15
STRUCTURAL & RELATED ITEMS					
Boiler room and stack	8000	–	.5	.5	40
Electric work	1000	1.75	1.0	2.75	28
METER EXPENSE					
TOTAL FOR PROJECT	104,150				3405
TOTAL PER DWELL. UNIT	375				12.20

FUEL & ENERGY CONSUMPTIONS

DESIGN TEMP. 0° — DEGREE DAYS 5441 — E.D.R. 37900
FUEL HEAT Coal — B.T.U. 11000 @ $4.00 per ton
FUEL HOT WATER Coal — B.T.U. 11000 @ $4.00 per ton
EDR - (see scheme U-1)

Fuel Heat $\frac{37900 \times 82 \times 5441 \times 70}{11500 \times 2000 \times .63 \times 70}$ = 1168 tons
Plus Line Loss 10% = 117
1285 tons — 1285 tons @ $4.00 = $5140

Fuel Hot Water $\frac{278 \times 60 \times 1.1 \times 960 \times 365}{11500 \times 2000 \times .50}$ = 560 tons — 560 tons @ $4.00 = 2240
Total 1845 tons

Elec. Consumption: 1845 tons × 35 Kwh = 64500 Kwh
64500 Kwh @ .016/Kwh = $1030

OPERATING LABOR

1/3 Chief's time = $800
2½ Men @ $110/mo. × 7 mo. = 1920
1 Man @ $90/mo. × 7 mo. = 630
2 Men, half time, @ $110/mo × 5 mo. = 550
$3900
Insurance 5% 195
$4095

OPERATING EXPENSE

	TOTAL ANNUAL	D.U./MO.
REPLACEMENT & MAINT.	3405	1.02
FUEL HEATING	5140	1.54
FUEL HOT WATER	2240	.66
ELEC. CONS.	1030	.31
LABOR	4095	1.23
ASH REMOVAL		
MISCL.	100	.03
Vac. and Coll. Loss 3%	425	.13
TOTAL	16435	4.92
DEBT SERVICE (3.67%)	3830	1.15
ECONOMIC EXPENSE	20265	6.07

REMARKS

COMPUTED BY______ DATE______
CHECKED BY______ DATE______

FEDERAL WORKS AGENCY
UNITED STATES HOUSING AUTHORITY
TECHNICAL DIVISION • UTILITY SECTION

FOLD

TENANT-OPERATED HEATING SYSTEMS

Initial Costs, Annual Replacement, Maintenance and Repair Expenses

Item	Initial Costs	Life, Years	Repl. Factor	Maint., Repair Factor	Total
One pipe steam, or gravity hot water	$215 and up.	40	0. 0166	0. 01	0. 0266
Gravity warm air—coal (furnace in basement):					
Furnace and casing	70	20	. 0412	. 015	. 0562
Duct work and registers	90	30	. 0246	. 015	. 0396
Gravity warm air—gas (furnace in basement):					
Furnace	110	20	. 0412	. 01	. 0512
Duct work and registers	90	30	. 0246	. 015	. 0396
Electric control and gas connection	15	15	. 0578	. 05	. 1078
Forced warm air—coal:					
Furnace and casing	70	20	. 0412	. 015	. 0562
Motor, blower, etc	50	15	. 0578	. 03	. 0878
Duct work and registers	45	30	. 0246	. 015	. 0396
Electric connection and control	10	15	. 0578	. 05	. 1078
Forced warm air—gas:					
Furnace	140	20	. 0412	. 02	. 0612
Duct work	55	30	. 0246	. 015	. 0396
Electric control and gas connection	15	15	. 0578	. 05	. 1078
Coal circulators	50–60	20	. 0412	. 02	. 0612
Gas circulators	30–50	15	. 0578	. 015	. 0728
Oil circulators	40–60	15	. 0578	. 025	. 0828
Duct work used with circulators	15–30	30	. 0246	. 015	. 0396

PROJECT-OPERATED HEATING PLANTS

Initial Costs, Annual Replacement, Maintenance and Repair Expenses

Item	Initial Costs	Life, Years	Repl. Factor	Maint., Repair Factor	Total
Piping, radiation, and specialties within buildings	$1. 20–$1. 50 per sq. ft. radiation.				
Exterior pipe distribution	6–10/l. f.				
Boiler-room equipment less fuel-firing equipment: [2]		[1] 38	0. 0175	0. 0175	0. 035
Low pressure	30/hp.				
High pressure	75/hp.				
Fuel firing equipment: [2]					
Oil burners (heavy oil): [3]					
40–50 hp	50/hp.	10	. 0913	. 02	. 1113
60–100 hp	35/hp.	10	. 0913	. 0175	. 1088
100 hp. and larger	25/hp.	10	. 0913	. 015	. 1063
Stokers and comb. control	10–25/hp.	20	. 0412	. 02	. 0612
Oil storage tanks: [3]					
3,000 gallons	250	10	. 0913	. 02	. 1113
5,000 gallons	500	10	. 0913	. 02	. 1113
10,000 gallons	900	10	. 0913	. 02	. 1113
15,000 gallons	1, 300	10	. 0913	. 02	. 1113
20,000 gallons	1, 750	10	. 0913	. 02	. 1113

[1] This figure applies to the over-all heating system less the fuel firing apparatus.
[2] These figures applicable to nominal ratings.
[3] Life based on obsolescence due to uncertainty of oil supply.

DOMESTIC HOT-WATER PIPING AND EQUIPMENT

Initial Costs, Annual Replacement, Maintenance and Repair Factors

Item	Initial Costs	Life, Years	Repl. Factor	Maint., Repair Factor or Exp.	Total
Hot-water piping within buildings:					
With individual hot-water heaters:					
Galv. W. I.	$20/D. U.	25	0.0312	0.02	0.0512
Copper tubing	22/D. U.	40	.0166	.01	.0266
Brass I. P. S.	26/D. U.	40	.0166	.01	.0266
With project hot-water heaters:					
Galv. W. I.	20/D. U.	25	.0312	.02	.0512
Copper tubing	29/D. U.	40	.0166	.01	.0266
Red brass I. P. S.	32/D. U.	40	.0166	.01	.0266
Exterior supply and return hot-water piping when installed in conduits provided by others	2/ft.	For hot water piping, use factors given above.			
When separate conduits required	4-6/ft.				
(Note.—Expected life as listed above is based on a judicious selection of piping materials, in view of local water conditions.)					
Project domestic hot-water equipment:					
Storage tanks with heating coils:					
200 gallons	250	15	.0578	.03	.0878
500 gallons	375	15	.0578	.03	.0878
750 gallons	450	15	.0578	.03	.0878
1,000 gallons	600	15	.0578	.025	.0828
1,500 gallons	750	15	.0578	.025	.0828
2,000 gallons	800	15	.0578	.025	.0828
2,500 gallons	950	15	.0578	.025	.0828
3,000 gallons	1,200	15	.0578	.025	.0828
Hot water circulating pumps to be used with hot water storage tanks:					
750 gallon storage tank	75	15	.0578	.02	.0778
1,000 gallon to 1,500 gallon	100	15	.0578	.02	.0778
2,000 gallon to 3,000 gallon	150	15	.0578	.02	.0778
Individual hot-water heaters:					
Gas-flue type—galvanized steel automatic insulated	40	15	.0578	$1	.0578 and $1
Gas-flue type—nonferrous automatic insulated	60	35	.02	$1	.02 and $1
Gas-flue type—galvanized steel automatic uninsulated	30	15	.0578	$1	.0578 and $1
Oil-flue type—galvanized steel pot or sleeve burner insulated	65	15	.0578	$1	.0578 and $1
Electric—galvanized steel insulated	45	15	.0578	$1	.0578 and $1
Electric—nonferrous insulated	65	35	.02	$1	.02 and $1
Coal pot stove—galvanized tank uninsulated	30	15	.0578	$1	.0578 and $1
Coal pot stove—galvanized tank insulated	35	15	.0578	$1	.0578 and $1
Coal pot stove—nonferrous tank insulated	50	35	.02	$1	.02 and $1

STRUCTURAL AND RELATED ITEMS

Initial Costs, Annual Replacement, Maintenance and Repair Factors

Item	Initial Costs	Life, Years	Repl. Factor	Maint., Repair Factor or Exp.	Total
Transite flues with:					
1 story—flat roof { 4″ flue	$16			$0. 25	$0. 25
6″ flue	22			. 25	. 25
1 story—pitch roof { 4″ flue	20			. 25	. 25
6″ flue	28			. 25	. 25
2 story—flat roof { 4″ flue	25			. 25	. 25
6″ flue	30			. 25	. 25
2 story—pitch roof { 4″ flue	25			. 25	. 25
6″ flue	36			. 25	. 25
Masonry flues:					
Single 8″ x 8″ flue:					
1 story—flat roof	35			. 50	. 50
2 story—flat roof	53			. 50	. 50
1 story—pitch roof	47			. 50	. 50
2 story—pitch roof	64			. 50	. 50
Add for basement	7				
Two 8″ x 8″ flues:					
1 story—flat roof	57			. 75	. 75
2 story—flat roof	84			. 75	. 75
1 story—pitch roof	75			. 75	. 75
2 story—pitch roof	102			. 75	. 75
Add for basement	11				
One 8″ x 8″ and one 8″ x 4″ flue:					
1 story—flat roof	48			75	. 75
2 story—flat roof	72			75	. 75
1 story—pitch roof	64			75	. 75
2 story—pitch roof	88			. 75	. 75
Add for basement	10				
Two 8″ x 8″ and two 8″ x 4″ flues:					
1 story—flat roof	78			1. 00	1. 00
2 story—flat roof	117			1. 00	1. 00
1 story—pitch roof	104			1. 00	1. 00
2 story—pitch roof	144			1. 00	1. 00
Add for basement	14			1. 00	1. 00
Individual coal bins (exterior)	30	30	0. 0246	0. 01	0. 0346
Additional cost of boiler rooms and stacks above normal construction when located in basements of dwelling buildings:					
20 D. U.—coal fired	1, 100			. 005	. 005
50 D. U.—coal fired	2, 500			. 005	. 005
200 D. U.—coal fired	7, 000			. 005	. 005
200 D. U.—oil fired	5, 000			. 005	. 005
Machine rooms	350			. 005	. 005
For larger boiler rooms, sketches should be prepared for estimating purposes:					
Crawl space (additional cost over slab on ground)	60/D. U.				
Electrical work for project plants	3–4.50/D. U.	38	. 0175	. 01	. 0275
Gas piping:					
Basic exterior and interior gas piping for cooking and refrigeration included in Bulletin 19. Add $5 for gas piping for each function, heat or hot water			. 01	. 01	. 02

FUEL AND ELECTRIC CONSUMPTION FORMULAE

The following fuel consumption methods are suggested for preliminary calculations to be used in the preparation of comparative analyses. The following figures are based on average consumptions. If more accurate information is available, it should be reflected in the analyses.

Heating

1. Fuel for space heating may be estimated by the following formula and adjustments.

$$\frac{\text{EDR} \times 82 \times \text{Annual Degree Days} \times 70\text{ Deg.}}{\text{Fuel heat value in B. t. u.} \times \text{Eff.} \times \text{design range}} = \text{ANNUAL FUEL CONSUMPTION.}$$

(*a*) EDR equals total amount of steam radiation (heating load) in square feet or total heat output equivalent to 240 B. t. u. per square foot per hour. EDR may be calculated in accordance with the table on page 15.

(*b*) The factor "82" is 82 B. t. u. per EDR per degree day, based on a 0 degree to 70 degree design condition and 100 percent efficiency. It is based on annual operation for all systems, adjusted for night shut-down and presumes automatic heat control on project-operated plants. When automatic heat control is omitted, fuel consumption estimate for heating should be increased 15 percent.

(*c*) Suggested efficiencies are listed below.

(*d*) Design range is the temperature rise for which the system is being designed or basis of calculating the EDR.

2. The resulting estimated fuel consumption will be expressed in the same units as used for the fuel heat values. It may be more convenient to convert the results to other units. For example, when figuring coal, the number of pounds may be divided by 2,000 to convert the amount to tons, or cubic feet of gas may be divided by 1,000 to give MCF.

	Efficiency	Adjustments
(*a*) *Central or Group Plants.*	*Percent*	
High pressure, coal stokers	65	Add for line losses as follows:
Low pressure, coal stokers	63	Central plant (high pressure or purchased steam), 15 percent. Central plant (low pressure), 12 percent. Group plant (low pressure), 8 to 10 percent.
Low pressure, coal hand fired	55	
Oil fired (No. 6 oil)	70	
Gas fired	70	
Purchased steam	90	
(*b*) *Building Plants.*		
Bituminous coal, hand fired	44	Add 5 percent for line loss.
Anthracite coal, hand fired	55	Add 5 percent for line loss.
Bituminous coal, stokers	50	Add 5 percent for line loss.
Anthracite coal, stokers	55	Add 5 percent for line loss.
Oil fired	70	Add 5 percent for line loss.
Gas with gas designed boilers	75	Add 5 percent for line loss.
Gas with conversion burners	65	Add 5 percent for line loss.
(*c*) *Individual Dwelling Plants.*		
Gas Burning.		
Gravity H. W.—Conversion burner	65	
Gravity H. W.—Gas boiler	75	
Forced or gravity warm air	80	
Circulator	80	Deduct 15 percent.
Coal Burning Units	35–45	When tenant purchases his own fuel, the following is suggested: Less than 4000 degree days, deduct 20 percent. From 4000–6000 degree days, deduct 25 percent. More than 6000 degree days, deduct 30 percent.
Oil Burning Units—pot or sleeve burners	60	

Hot Water

1. Fuel for hot water may be estimated by the following formula.
2. For direct fired units:

$$\frac{\text{D. U.}\times\text{gals./D. U.}\times 8.3\times\text{temp. rise in deg.}\times 365\text{ days}}{\text{Fuel heat value}\times\text{eff.}}=\text{ANNUAL FUEL CONSUMPTION.}$$

3. For steam supplied hot water heaters: (Includes steam line losses, generator losses, and hot water distribution losses.)

$$\frac{\text{D. U.}\times\text{gals./D. U.}\times 1.1\text{ lb. steam}\times 960\text{ B. t. u.}\times 365\text{ days}}{\text{Fuel heat value}\times\text{eff.}}=\text{ANNUAL FUEL CONSUMPTION.}$$

4. If average water temperatures are not known, 90 degree rise may be used for northern cities and from 60–80 for southern regions.
5. *Applicable Over-all Efficiencies.*

Individual gas heater, flue type	55 percent.
Individual gas heater, side arm	35 percent.
Individual electric heater	77 percent.
Individual oil heater, flue type	35 percent.
Steam supplied heaters, coal burning plant	50 percent.
Steam supplied heaters, oil burning plant	60 percent.
Steam supplied heaters, gas burning plant	65 percent.

For individual coal burning units, the consumption may be estimated to be about 1½ to 2 tons per year.

6. *Hot Water Consumption.*

For supplied hot water as in central or group plants, estimate 60 gallons per day per dwelling unit.

For individual units where tenant supplies the fuel or the fuel is 100 percent check metered, estimate 40 gallons per day per dwelling unit.

Electric Consumption

Central or Group Plants.—Including fuel firing, fuel handling, controls, boiler room and remote pumps, boiler rooms and machine room lighting, etc.

Coal burning plants—35 kw.-hr./ton coal burned.
Oil burning plants—20 kw.-hr./gal. oil burned.

Individual Heating Systems.

System	Consumption Per D. U.	Demand Per D. U.
Forced warm air	0.175 kw.-hr./hour of operation	30 minute—0.175 kw.-hr.
Forced hot water	0.125 kw.hr./hour of operation	30 minute—0.125 kw.-hr.

The hours of operation may be estimated as follows:

Gas Fired—Automatic Operation.

$$\frac{\text{Fuel consumed (CF)}\times\text{B. t. u./CF}\times\text{Eff.}\times 1.1}{\text{Average output/hr. (EDR}\times 240)}$$

Coal Burning—Hand Fired.—Approximately 300 hours of operation per ton of coal burned.

BUILDING CUBE (less basement, crawl space or attic) PER SQUARE FOOT OF EQUIVALENT DIRECT STEAM RADIATION

Design Temp., Deg. F.	Inside Temp., Deg. F.	Temp., Diff. Deg. F.	One-Story Building	Two-Story Building	Three-Story Building	Four-Story Building	Six-Story Building
20	70	50	48	61	67	71	75
15	70	55	46	58	63	67	70
10	70	60	44	54	60	63	66
5	70	65	41	51	56	60	62
0	70	70	38	47	52	55	58
—5	70	75	35	43	48	51	53
—10	70	80	32	41	44	47	49
—15	70	85	29	37	41	43	45
—20	70	90	26	33	37	39	42

NOTE.—The above to be used for preliminary purposes only.

Appendix

Part II

DESIGNING THE PROJECT-OPERATED PLANTS

Note.—Suggestions for the design of project-operated plants are presented herein, and should be considered only where careful analyses have clearly indicated the desirability of such plants. The United States Housing Authority recognizes that there are various satisfactory methods of handling particular design features, as well as various suitable classes of materials and equipment. These suggestions are not to be considered as the only acceptable ones.

Boiler Plant.

1. For low-pressure steam, design to operate at up to 15-pound gage; for high-pressure steam, design to operate at 80–100 pound gage; for forced hot water, generally design to provide 200–240 B. t. u. per hour heat transmission at the radiator, with system in larger plants placed under pressure by means of an air compressor automatically controlled and connected to expansion tank.

2. *Group Plants* should be so located to allow economical interconnection for flexibility in operation under mild weather and summer load operation.

3. *Boilers.*—Effective heating surface not less than 10 square feet per nominal boiler horsepower, equal to an evaporation of 34½ pounds of steam per hour from and at 212° F. for each 10 square feet of effective heating surface; up to approximately 160 b. h. p. each, either portable fire box or horizontal return tubular, sized to operate at not less than 100 percent of nominal horsepower rating under maximum load; 160–300 b. h. p., either straight water tube or low head three drum bent tube; above 300 b. h. p., either straight water tube or high head four drum bent tube; all water tube boilers size not less than 150 percent of nominal horsepower rating under maximum load. Nominal horsepower rating per boiler should not exceed 500 b. h. p. except where more than four boilers are required. Minimum of three boilers is recommended where installed horsepower per plant is in excess of approximately 200. Otherwise, two boilers may be used; for small individual building plants, one boiler per plant is satisfactory (portable steel firebox or cast-iron sectional).

(*a*) Include necessary trimmings and tools.

(*b*) Protect each high-pressure boiler at steam outlet connection with automatic stop check valve; control feed water to each boiler through a regulator.

(*c*) Equip each low-pressure boiler with Hartford loop when feed water regulator is not furnished. When firing is automatic, include low-water cut-off.

(*d*) Properly valve each boiler for operation, singly and in combination.

(*e*) Control each boiler separately through its own uptake damper. Support breeching adequately, erect to assure minimum friction, and provide for expansion and contraction. Arrange main stack damper for hand control with locking quadrant.

(*f*) Protect furnaces (stoker, oil, and gas fired) with high-grade fire-brick lining; checker-work floor construction is advisable in oil-fired installations (industrial rotating cup type).

(*g*) Support boilers independently of brick settings. Provide for necessary insulation. In boilers of more than 300 installed b. h. p., consider air-cooled walls, in which case boilers may be sized in excess of 150 percent of nominal horsepower rating under maximum load.

(*h*) Include internal protection, water treatment and blow-off facilities where necessary.

(*i*) Provide for easy cleaning of all water and fire surfaces. Consider soot blowers for boilers in excess of approximately 100 b. h. p. when burning bituminous coal or Bunker "C" oil.

(*j*) Provide catwalks and ladders where boilers are of such height as to make access to all parts requiring servicing difficult under ordinary means.

(*k*) Furnish adequate ventilation in boiler rooms. In large detached plants, this can best be accomplished by a monitor over each boiler with pivoted sash and extended operating device.

4. *Cinder Trap.*—The use of a cinder trap in breeching should be dependent upon the type of stoker, locality of project or local regulations. Spreader or overfeed type of stoker generally requires this equipment.

5. *Firing Equipment.*—Size on basis of rated capacity being not less than 25 percent in excess of total maximum boiler load (total demand load).

(*a*) Provide necessary controls for regulating boiler operation.

6. *Pumps* for high-pressure plants (boiler feed service)—steam driven, horizontal duplex, outside packed, plunger type; minimum of two pumps recommended. When three or more pumps are used, size one pump to handle summer load.

(*a*) Equip each pump with governor and control generally from pump discharge.

(*b*) Arrange for cold-water bypass on boiler feed suction for purposes of boiler wash, for reducing feed water temperatures and for operation of hydraulic tube cleaners.

7. *Pumps* (heating service-steam systems).—Either condensate or vacuum type, generally electric motor driven, centrifugal design, equipped with receiving tank and necessary controls. Design system (low pressure) wherever practicable so that pump discharges directly into boilers accomplished by locating pumps (duplex type) in boiler rooms. When pumps are located in outlying buildings, design system to pump returns into condensate receiving tank in boiler room (low-pressure plants) and into feed water heater or preferably into condensate receiving tank in boiler room (high-pressure plants). Condensate and vacuum pumps when in outlying buildings need not be of the duplex type.

8. *Pumps* (heating service—forced hot-water systems, and for other services such as pumping from condensate receiving tank to boilers in low pressure steam plants when condensate or vacuum pumps are located in outlying buildings and when pumping from condensate receiving tank to feed water heater in high-pressure steam plants).—Generally electric motor driven, centrifugal design, single stage; multistage for larger sizes.

9. *Instruments.*—Consider the following for measuring:

(*a*) Quantity of steam produced (in plants burning in excess of 1,500 tons coal annually per plant or equivalent in other fuels): Use hot-water meter installed on pump discharge line to boilers, suitably designed for service intended (preferably rotating vane or shunt type).

(*b*) Quantity of make-up water (in plants burning in excess of 1,500 tons coal annually per plant or equivalent in other fuels): Use commercial type of water meter installed on cold water make-up line.

(*c*) Boiler load (in steam plants burning 2,000–3,500 tons coal annually per plant or equivalent in other fuels): Use recording steam-flow meter (integrator is not necessary) installed on main steam line.

(*d*) Boiler load (in steam plants burning in excess of 3,500 tons coal annually per plant or equivalent in other fuels): Use recording steam flow meter (integrater is not necessary) installed on each boiler lead.

(*e*) Boiler load (in forced hot-water plants burning in excess of 2,000 tons coal annually per plant or equivalent in other fuels): If type of system makes it practicable, provide means for measuring flow.

(*f*) Means to guide operator in firing:

(1) One combination recording CO_2 and flue gas temperature recorder (one per plant) 300–1,000 installed boiler horsepower, arranged so that the percentages of CO_2 in the flue gas and gas temperature can be measured selectively from each boiler.

In plants in excess of 1,000 installed boiler horsepower, one instrument for each boiler is desirable. Separate instrument for each function may be used.

(2) Where smoke ordinances are rigidly enforced, a smoke density indicator and recorder (one per plant) is desirable. This instrument is useful in oil-burning (heavy oil) plants as an indication of combustion efficiency and is recommended on such plants in excess of 300 installed boiler horsepower.

(3) Three point draft gage (one per each boiler) in plants in excess of 300 installed boiler horsepower.

10. *Coal Storage:*

(*a*) *Underground.*—Floor of storage should not be below boiler-room floor. Coal holes should be raised about 4 inches above trucking grade, sufficient in number and so located that at least two-thirds of total volume of storage can be filled without hand trimming. Provide opening from storage to boiler room fitted with metal door. Provide means for handling and weighing between storage and boilers.

(*b*) *Overhead Bunkers.*—Consider generally where annual consumption is in excess of approximately 2,500 tons per plant; coal handling and weighing equipment is necessary. Topography of site at boiler plant should influence selection of underground or overhead storage.

(1) Use concrete or steel bunkers; when of steel, protect to resist corrosion.

(*c*) Design storage for capacity of not less than 10 percent of the estimated maximum annual coal consumption.

11. *Motor Truck Scales:*

(*a*) Use where not practical to secure certified weights of coal delivery.

(*b*) They should be of the beam type, installed in pits, if feasible, and have ample capacity for weighing maximum coal deliveries.

12. *Ash Handling.*—Provide for easy removal of ashes. Where in excess of approximately 2,000 tons coal annually per plant, provide mechanical (electric-motor-operated) system of handling. Where in excess of approximately 4,000 tons, consider a pneumatic system. Ash conveyor pipe should be not less than 8 inches inside diameter.

13. *Feed Water Heaters.*—Use generally in high-pressure steam plants. They should be of the deaerating type, of sufficient capacity to heat to approximately 210° F. and deaerate the total amount of water per hour delivered to the boiler feed pumps. Figure approximately 15 percent of the total incoming water to be make-up (entering at winter temperature) ; the balance to be condensate (returned at approximately 110° F.) Increase heating capacity approximately 100 percent when no condensate receiving tank is provided.

(*a*) Provide adequate venting.

(*b*) Equip heater with oil separator, vent condenser, float valve, and other necessary equipment.

(*c*) Protect steam exhaust line to heater with back pressure valve and exhaust head.

(*d*) Design water storage compartment for not less than 5-minute storage between overflow and opening of float valve, when used with a condensate receiving tank.

(*e*) When arranged to receive discharge directly from the various condensate or vacuum pumps, design water storage compartment for not less than 20-minute storage between overflow and make-up water inlet.

(*f*) Install thermometers to measure temperature of condensate return and boiler feed water.

14. *Condensate Receiving Tank* (low- and high-pressure steam plants).—When pumps (condensate or vacuum) in outlying buildings discharge into such tank, size for not less than 20-minute storage capacity between overflow and make-up water inlet.

(*a*) Provide adequate venting.

15. *Primary Pressure Reducing Valves* (high-pressure steam plants).

(*a*) Design for reduction from boiler to yard pressure.

(*b*) Provide a minimum of three valves, all operated through pilot piping and mounted in assembly in a horizontal position on one of the side walls (easily accessible).

(*c*) Arrange as follows: One valve to take care of domestic hot water load; one for 75 percent of the heating load and the third for the balance of the heating load. Specify maximum capacities with valves in wide open position, at corresponding pressures. Do not indicate valve sizes.

(1) Equip with strainers.

(2) Protect valves with pop safety valves having capacity of 60 percent of demand load.

16. *Secondary Pressure Reducing Valves* (high-pressure steam plants).

(*a*) Design for reduction from yard pressure to heating service pressure.

(*b*) Valves may be piston or weighted diaphragm type.

(*c*) Equip with strainers.

(*d*) If heating control valve is designed for pressure reduction service, secondary pressure reducing valves may be omitted.

UNDERGROUND DISTRIBUTION:

1. Underground piping should be installed in conduits or tunnels. Conduit should be of the simple type, constructed of terra cotta tile, concrete (poured in place or precast) or cast iron; or of the presealed unit systems, such as the galvanized iron, impregnated felt or asphalt conduit. Wherever possible, house the heating and domestic-hot-water lines in one conduit when using tile, concrete, or cast iron, and in a single trench when using the presealed conduits. House each line singly in presealed conduit.

(*a*) Include necessary pipe insulation. Returns (vapor systems) need not be insulated when installed in tile, concrete, or cast iron conduit or in tunnels.

(*b*) Show all pipe sleeves and openings on the structural or architectural drawings for all pipes passing through footings and exterior walls below grade. The elevation of sleeves need not be given except when passing through waterproof finishes.

2. Distribution should be direct; design system wherever possible to provide for expansion at point of entrance into building by means of swing joints, bends, or long offsets. Where expansion must be taken up in yard, use expansion bends (such as double offset U bend, U or "hairpin" bend with tangent lengths and welding fittings, expansion U bend, quarter bend, etc.) installed in reinforced concrete expansion chamber having removable section (approximately 3 foot square) in slab covering; provide sufficient headroom for servicing.

(*a*) Bends should be "cold sprung" in place after anchors, guides, and supports are set in their respective positions. "Cold spring" should equal approximately one-half the expansion.

3. Where drips are required for yard steam mains, provide traps in nearest building, wherever possible, to preclude necessity of using manholes.

(*a*) Manholes, when required, should be of reinforced concrete, furnished with heavy cast iron frame and cover and, when over approximately 4 feet in depth, with wrought iron or steel ladder imbedded in concrete. Extend tops of manholes to 4 inches above grade.

HEATING WITHIN BUILDINGS.

1. *Supply and Return Mains.*—Ample space should be provided for piping and particular care be taken to avoid structural interferences and conflicts between the different branches of the mechanical trades. Drawings should be generally diagrammatic and all piping and equipment shown as nearly as possible in the location in which they are to be installed. In full basements, provide minimum headroom of 6′ 3″ to underside of lowest pipe.

(*a*) Mains should have proper pitch, avoid lifts on gravity or vacuum returns.

(*b*) Include necessary insulation, the following need not be insulated:

(1) Return mains and branches (vapor systems).

(2) Supply branches to risers (vapor and steam systems) less than 6 feet long.

(3) Supply and return branches to risers (forced hot water system) less than 6 feet long.

(*c*) Provide sleeves when lines pass through walls.

(*d*) Design for proper support and expansion; secure hangers to inserts, wherever practicable.

2. *Risers.*

(*a*) Leave exposed and arrange wherever possible so that each set of supply and return serves two adjacent radiators on the same floor. Include as heating surface when calculating radiation requirements. When necessary to conceal, do not locate in exterior walls where there is danger of freezing, unless proper protection is provided.

(*b*) Use wherever possible to heat kitchens in flats and apartments and in all bathrooms, properly valved.

(*c*) Provide sleeves for risers passing through floors and extend not less than ¼-inch above floor. Furnish escutcheons.

3. *Radiator Branches.*

(*a*) Install above floor.

(*b*) Arrange generally for both supply and return on same side of radiator.

(*c*) Provide sleeves and escutcheons where branches pass through partitions.

4. *Radiators.*

(*a*) *Cast Iron.*—Narrow tube, hot water pattern, generally with high legs; base sizes on manufacturers' catalog ratings.

(*b*) *Convectors.*—Cast iron or nonferrous: Base sizes in accordance with code promulgated by the American Society of Heating and Ventilating Engineers. "Heating effect" should not be included in ratings. Secure cabinets adequately to wall, when not recessed.

(*c*) Place radiators, wherever possible, along inside walls (farthest from window), except in living rooms, in which case, it is advisable to locate radiators along partitions at outside walls or along outside walls. This will permit a simplified system of piping. Reference should be made to the architectural unit plans to avoid interference of radiators with furniture arrangement.

5. *Forced Warm Air Steam or Hot Water Coil Heaters.*—Nonferrous tubes and fins with ferrous or nonferrous headers; blow through type, with direct connected motor and fan assembly (variable speed).

(*a*) Base sizes on entering air at 67 degrees F. and outlet air temperature not exceeding 125 degrees F. when operating at full speed and minimum of 110 degrees F. at less than full speed operation.

(*b*) Thermal head available, with fan off should be capable of releasing approximately 25 percent of total heat output.

(*c*) Supplement heaters with required controls and in larger dwelling units with necessary ducts or plenum chamber or a combination of ducts and plenum chamber.

6. *Heating Controls—Steam Systems.*

(*a*) *Continuous Flow.*—Type capable of circulating steam at variable subatmospheric steam pressures and corresponding temperatures, automatically controlled by heat balancer and selector or other suitable equipment; or type, capable of controlling quantity of steam to heat radiators fractionally, automatically controlled by outside thermostat and selector; either type operated electrically, pneumatically, or by other means.

(*b*) *On and off.*—Type capable of controlling the quantity of steam for fixed cycles, automatically selected by an outside thermostat; or type capable of controlling the quantity of steam intermittently with the periods of operation, automatically selected by outside and radiator temperatures or outside and inside temperatures; either type, operated electrically, pneumatically, or by other means.

(*c*) Circulation of the steam should be equalized by either an adjustable orifice, made as an integral part of the radiator valve, or as a properly sized removable regulating plate in each radiator valve assembly, or any other means; all of which to insure receipt of steam by all radiators at the same time proportionately and to heat the rooms within a temperature range of 73° to 65° F.

(*d*) Each system should be designed so as to produce an even load curve on the boiler, demonstrated as such when the steam flow varies less than 20 percent (10 percent above and 10 percent below the average demand) in an interval of 20 minutes, with outdoor temperatures of 40° F. or less.

(*e*) Type of controls selected shall have been in successful operation in similar installations for a period of two full heating seasons.

7. *Heat Control—Forced Hot Water System.*

(*a*) Arrange control valves so that temperature of the water delivered to the heating system is varied in relation to the outside temperature. The operation of such valves (either electrically or air operated) as may be required to supply the water at the proper temperature should be governed (automatically when operator is not in constant attendance), from outdoor control equipment and from additional equipment, if necessary. The change in heating water temperature per degree change in outdoor temperature should be adjustable. One set of controls is recommended for each circulating pump.

(1) Design system to permit equalized distribution to all radiators by means of orificing each radiator valve, or by other suitable means to insure heating the rooms within a temperature range of 73° to 65° F.

(2) Provide thermometers for measuring supply and return water temperatures.

(3) Type of controls selected shall have been in successful operation on similar installations for a period of two full heating seasons.

8. *Hot-Water Generators and Controls.* (Generally furnished and set under Plumbing Division of the Specifications; however, heating supply and return connections including installation of temperature control valve generally included under Heating Division.)

(*a*) Locate wherever possible in boiler room.

(*b*) Materials for tank construction should be selected suitable to local water characteristics to insure long life.

(*c*) Size generally on basis of approximately 10 gallons storage of water per dwelling unit with heating element area under normal operation capable of raising temperature of water in tank a minimum of 110° F. over a 2-hour period. (Size proportionately higher for generators used in small individual building plants.)

(*d*) Where hot water is used for space heating (such as laundry drying) and domestic purposes, heating element must be increased in size accordingly.

(*e*) Include necessary control valve with suitable material for bulb on controller.

(*f*) Provide aquastat to control circulating pump operation.

9. *Drying Room Heating.*—Locate drying rooms adjacent to laundries as close as is practical to constant source of heat supply.

(*a*) Preferable consideration should be given to the cabinet type of drying, steam or gas heated, properly vented. Careful analyses must be made of operating expenses before such selection is made.

(*b*) Where clothes are dried in compartment groups separated by wire mesh partitions, arrange for heat supply preferably near floor line with proper control (unit heater is recommended); when steam heated, take supply from hot side of heat-control valve.

(1) Segregate from laundries and other rooms.

(2) Arrange for exhausting vapor, preferably by motorless ventilator.

(3) Provide air circulation.

Appendix

Part III

MATERIALS, CODES, AUTHORITIES, AND SYMBOLS, SPECIFICATION OUTLINE

MATERIALS.

The following table indicates the types of materials which are generally considered satisfactory for the service noted.

Material	Service	Class	Fed. Spec. No. or Other Designation
Pipe	All steam (supply and exhaust) piping in boiler plants and within buildings (except as otherwise noted); all hot water heating supply and return lines throughout project.	Steel (standard weight)	WW-P-403a, types I and II.
Pipe	All return lines (vapor systems, gravity and vacuum) in boiler plant and within buildings; boiler feed and blow-off lines in low-pressure plants.	(a) Wrought iron (b) Copper molybdenum open hearth iron. (c) Charcoal wrought iron (d) All standard weight	WW-P-441a, for wrought iron; and WW-P-403a (type III) for copper molybdenum.
Pipe	All return lines (vapor systems, gravity and vacuum) underground; boiler feed and blow-off lines in high-pressure plants.	(a) Wrought iron (b) Copper molybdenum open hearth iron. (c) Charcoal wrought iron (d) All extra strong	WW-P-441a, for wrought iron; and WW-P-403a (type III) for copper molybdenum.
Pipe	Generally on boiler water column connections; soot blower drain and gage glass drain; may also be used for boiler feed lines.	Brass	WW-P-351, grade A.
Pipe nipples		Same weight and material as pipe.	WW-N-351.
Fittings	All ferrous screwed lines on full boiler pressure and boiler feed lines (high pressure boilers).	Cast iron threaded (250 pounds).	WW-P-501, type B, class 1.
Fittings	Blow-off lines (high pressure boilers)	Steel	As required by A. S. M. E. Power Boiler Code.
Fittings	All other ferrous screwed lines	Cast iron threaded (125 pounds).	WW-P-501, type A, class 1.
Fittings	Brass screwed lines	Brass (threaded)	WW-P-448 and WW-P-461 composition B.
Unions	All ferrous lines	Malleable iron	WW-U-531, type A, black, brass seated.
Unions	All brass lines	Brass	WW-U-516, composition B.
Flanges	All ferrous lines; 250 pounds on full boiler pressure and boiler feed lines (high pressure bôiler); 125 pounds elsewhere.	Cast iron; 250 pounds or 125 as indicated; flanges for fittings and valves to be cast integral.	Dimensioned and drilled to conform to A. S. A. standards.
Flanges	Ferrous blow-off lines (high pressure boilers).	Steel	As required by A. S. M. E. Power Boiler Code; dimensioned and drilled to conform to A. S. A. standards.

(NOTE.—Experience to date indicates that copper molybdenum is satisfactory, but the experience is not considered sufficient to determine whether it is as durable as wrought iron piping.)

MATERIALS, CODES, AUTHORITIES AND SYMBOLS, SPECIFICATION OUTLINE—Continued

Material	Service	Class	Fed. Spec. No. or Other Designation
Flanges	Brass lines	Brass; same grade as specified for pipe to which connected.	Dimensioned and drilled to conform to A. S. A. standards.
Valves	For proper control of pipe and equipment; 250 pounds on full boiler pressure, boiler feed and blow-off lines (high pressure); 125 pounds elsewhere.	Screwed brass on lines 2 inches and smaller, screwed iron body (brass mounted) 2½ inches and larger, flanges 4 inches and larger (high pressure), flanged 6 inches and larger elsewhere; 250 pound or 125 pound as indicated.	WW-V-76b for gate valves; brass for angle, check and globe valves, 80 percent minimum copper content and 5½ percent maximum lead. Blow-off valves as per code requirements.
Traps (thermostatic).	Radiators, heat risers, low pressure mains less than 100 feet long.	Cast brass	WW-T-696.
Traps (float and thermostatic).	Piping and apparatus where condensate exceeds 50 pounds per hour; mains in excess of 100 feet.	Iron body, noncorrosive parts.	
Traps (float)	Piping not connected to gravity or vacuum vapor returns.	Iron body, noncorrosive parts.	
Valves	Radiators	Red brass (packless type)	
Union ells	Radiators (hot water heating)	Red brass	
Insulation	Boilers, breeching, necessary boiler-room equipment and all necessary piping, return lines on vapor systems need not be insulated except underground lines when installed in presealed conduits.	85 percent magnesia or fibrous glass of equal thermal equivalent to 85 percent magnesia.	HH-M-61.
Brick, fire clay	Boiler settings	Grade dependent on service (specify type to be used).	HH-B-671b.
Clay, fire	Boiler settings	Coordinate with type of fire brick used.	HH-C-451a.
Escutcheons	Risers through floors, and branches through partitions.	Stamped steel	
Sleeves	Lines passing through walls	Steel (standard weight)	
Sleeves	Lines passing through floors and interior partitions.	26-gage galvanized sheet metal.	
Bolts and nuts	All flanges	Commercial bolt steel	Threads, U. S. Standard.
Gaskets	Flanges, and elsewhere	Ring type, compressed asbestos sheet.	HH-P-46.
Strainers	Pressure reducing valves (preferably vertical type) and drip traps where necessary.	Cast iron, vertical or Y types; 250 pounds on full boiler pressure lines (high pressure); 125 pounds elsewhere.	
Hangers	All lines in boiler plant and within buildings.	Two inch and smaller; split cast ring, 2½ inch to 6 inch, adjustable clevis; larger than 6 inch, adjustable swivel roller. Support piping on multiple hangers wherever practical.	
Hangers	All underground lines	As recommended by conduit manufacturer.	

Pipe Joints—In Boiler Plant and in Buildings.—Lines carrying steam over 15 pounds gage—up to 3½-inch, screwed, and 4-inch and larger, flanged; all other lines—up to 6-inch, screwed, and 8-inch and larger, flanged. Valves, 6 inches and larger on lines except on those carrying steam over 15-pounds gage, flanged. All boiler supply and return header work should be flanged. Joints 1½ inches and larger may be welded.

Pipe Joints—Underground.—1¼-inch and smaller, screwed; 1½-inch and larger, welded.

Welding Fittings.—Should be of same material as pipe to which welded; and be of wrought or forged construction. In lieu of tees for branch outlets, welding nipples may be used. For flanged connections, use welding neck flanges conforming to A. S. A. standards. Employ qualified welders for all welding.

CODES, AUTHORITIES, AND SYMBOLS:

1. American Society of Heating and Ventilating Engineers' Guide and its recommended codes; use the infiltration method for calculating heat losses; a 5° to 10° F. temperature range less than that generally accepted for the project locality is recommended (refer to Section D, paragraph 1, "Types of Systems," under "Selecting a Method of Heating").
2. American Society of Mechanical Engineers' applicable boiler codes.
3. National Board of Fire Underwriters, particularly for oil-fired equipment.
4. American Gas Association, particularly for gas-fired equipment.
5. State, local, and municipal codes and regulations.
6. *Symbols.*—As recommended by the American Society of Heating and Ventilating Engineers and American Standards Association.

OUTLINE OF A TYPICAL SPECIFICATION:

The following is a typical arrangement of items for a high-pressure steam plant specification. The same arrangement may be followed for low-pressure steam or forced hot-water plants insofar as the particular items apply. Necessary additional items should be included when required. (Numbered items below may comprise one or more sections of the specification.) Item No. 20, "Materials" may be placed in forepart of specifications.

1. *General Note.*—Covering general conditions and other subdivisions of the specifications.
2. *Work included.*—Schedule of general requirements; temporary heat.
3. *Work not included.*
4. *Drawings.*—Schedule, correlation to specifications and shop drawings; coordination of work with other trades.
5. *Testing* requirements, prior tests.
6. *Description* of system in boiler plant, underground and within buildings.
7. *Boilers.*—Type, capacity, construction and insulation; trimmings and tools; internal protection; foundations and settings.
8. *Smoke Breeching.*—Dampers, supports, cinder trap, soot reclaimer.
9. *Chimney* construction and size (for information only).
10. *Firing Equipment.*—Type, capacity, construction, and controls.
11. Coal and ash handling equipment and controls; walkways and ladders.
12. *Boiler Auxiliary Equipment.*—Soot blowers, tube cleaners, feed water regulators, automatic stop check valves, blow-off valves, back pressure valve, and exhaust head.
13. Feed water heater, oil separator, condensate receiving tank, blow-off, and cooling basins, water treatment equipment; pumps for boiler feed and other services in boiler plant.
14. *Pressure Reducing Valves.*—Primary and secondary, strainers, and pop safety valves.
15. *Instruments and Instrument Boards* required in connection with boiler and plant operation.
16. Heating controls; radiators, radiator hangers, radiator specialties (valves and traps); steam specialties (float, and combination float and thermostatic traps).
17. Heating supply and return mains (within buildings) and radiator runout requirements.
18. Vacuum or condensate pumps required in connection with heating system.
19. Welding requirements.
20. *Materials.*—Pipe, fittings, nipples, unions, flanges, gaskets, bolts and nuts,

joints, valves (gate, angle, globe and check) escutcheons, pipe sleeves, metal U covers.

21. Expansion; hangers, anchors and guides in buildings.

22. Connections to hot-water generators.

23. *Trenches,* pits and covers in buildings.

24. *Insulation* of piping and other equipment.

25. *Underground Distribution.*—Conduits, insulation of piping, excavation and backfill, expansion provision, anchors, expansion and anchor chambers, manholes.

26. *Ventilating equipment.* — Motors, controls, voltage characteristics, grilles, registers, sheet-metal work.

27. *Painting.*—Equipment, pipe, structural work, and insulation.

28. Protection of open pipe ends and electrical apparatus and protection of materials for transit.

29. *Tests.*—Boilers, piping within buildings, piping underground and combined test on complete system.

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