

## SELECTION OF BUILDING SITES FOR CENTRAL OFFICES

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E. Surface and Subsurface Conditions . . . . .	3	1.01 This section covers factors to be considered in the selection of central office building sites that will allow the development of buildings with well-balanced elements of utility, economy, and appearance.	
F. Other Factors . . . . .	3	1.02 This section replaces Section 760-230-150 and supersedes part of Section 1 of Specification X-74300, New Equipment Building System (NEBS) Building Engineering Standards (BES). This issue includes recommendations for locating the building on the property given the area of the site and the orientation of the building. It includes information for fire and flood protection and site selection standards. Whenever this section is reissued, the reason for reissue will be listed in this paragraph.	
3. ZONING . . . . .	3	1.03 Although the information contained in this section is applicable in general to sites for other types of telephone buildings, factors to be considered specifically for such buildings will be outlined in separate sections. Certain special considerations in connection with the location of and the selection of sites for garages and garage work centers are contained in Section 760-120-160, Project Planning-Service Operations Centers. The defense considerations recommended in 7.01 are equally important and applicable to the location of nonequipment space as well as equipment space. The locations of storerooms and garages are important in planning for disaster operations. It is to be expected that all available company vehicles	
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and supplies will be needed in the event of a disaster whether natural (such as storms, earthquakes, or floods) or otherwise (such as enemy air attacks, sabotage, conflagrations, or explosions). Storerooms or garages in target area cities are included in defense planning as possible locations for emergency switchboard positions, rendezvous points for off-duty company employees returning to work after a disaster, company operating centers for directing restoration work, etc.

## 2. ACQUIRING THE PROPERTY

### A. Scheduling

**2.01** The time factor inherent in acquiring land, with the attendant processes of negotiation, title search, survey, zoning, and subsoil tests, should be recognized.

**2.02** Experience has indicated the importance of selecting a definite plot sufficiently early in the project schedule to permit ample time for the preparation of surveys, test borings, test pits, etc. On the other hand, it is usually not desirable that land for a new location be acquired years in advance of its need because of the probability of changes in outlook as to future development and other similar changes during the period the property is held. However, sufficient planning should be done to assure the availability of the plot when needed. To avoid possible inflation of prices, investigations of sites and purchase of property are carried out on a confidential basis.

### B. Site Selection

**2.03** When a new central office building is to be established, the building planning engineer must determine, in connection with the preparation of the preliminary floor plans, the minimum plot size required for the ultimate building. This minimum plot plan is used as a basis for review of available sites in the vicinity of the theoretical wire center or area of search of a proposed operating facility. This is not to say that only minimal plots should be considered or that at this stage, redesign of preliminary plans will not be required due to the physical aspects of an actual plot selected. During the search, however, the relative availability and cost of the land, zoning, and physical characteristics of the land, dictate a degree of flexibility for rejecting or tentatively accepting a plot for further detailed consideration. Where there is doubt about

the site conditions, in particular subsurface conditions, it is desirable to obtain options from the owner-seller until these can be investigated and resolved.

**2.04** In general, the acquisition of a liberal amount of land affords opportunities for orderly expansion to accommodate growth and unforeseen contingencies, provides ample light and air, reduces fire exposure, permits flexibility in arranging the building on the lot, and allows for appropriate landscaping. The need for employee and company vehicle parking should be considered in view of increasing municipal demands, requests, and regulations for off-street parking.

**2.05** In addition to the suitability of a plot for building purposes, it is necessary to weigh a number of factors in order to determine the most economical site. Some of these considerations follow.

### C. Location

**2.06** Location is the foremost site factor regarding new central offices in that the most economical centering of outside plant cabling to serve customer demand, or theoretical wire center, is the ideal geographical point for the building. Where the building is to house operating facilities, the proximity to a good labor market will predominate, as present technology for remoting operator units lessens the critical aspects of cabling. Other associated factors will be availability of transportation, vehicular access, utilities, overall inherent advantages of through and corner plots, and absence of adjacent property hazards.

**2.07** Corner locations and sites partly or entirely surrounded by streets have certain advantages over interior locations such as:

- (a) Greater opportunities for favorable public attention
- (b) Increased natural light and air
- (c) Decreased fire exposure
- (d) Better facilities for bringing in outside cables
- (e) Opportunities for flexibility in providing electric, water, gas, and drainage services to the building

(f) More flexibility in arranging entrances to the building.

**2.08** In the case of building sites for community dial offices, consideration is given to available locations on secondary streets in order to obtain maximum economy in these small offices; possible fire hazards on adjacent property, however, are to be minimum.

**2.09** The selection of central office building sites in cities which are likely targets for an enemy attack or are near installations which are likely to be subject to attack or sabotage requires special considerations in addition to the usual factors. Some of the more important considerations are outlined in 7.01. It is not suggested that the selection of building sites be based primarily on defense considerations; however, it is suggested that defense factors be included along with the usual considerations that are normally applied.

#### **D. Size and Shape**

**2.10** Size and shape will directly affect the configuration and efficiency of the ultimate building. Minimal size, while sufficient for projected growth, may not allow for future unforeseen requirements. Unusual shape may force inefficient utilization of the plot and lead to building design inconsistent with good equipment layouts.

#### **E. Surface and Subsurface Conditions**

**2.11** Severe grades, exposed rock, excessive ground water levels, poor drainage, and unstable and easily compressible earth are all serious factors that may add unreasonable cost to a building project. An ideal site, in this report, will be a level plot at established grade, devoid of water problems, and capable of sustaining ultimate building weight with nominal foundation preparation.

#### **F. Other Factors**

**2.12** Two additional factors that may be of a critical nature in a particular project are legal entanglements and community considerations. Confused or unknown land titles, perpetual easements, and involved rights-of-way may cause delaying litigation in purchase of property. When title has been obtained, governmental highway and civic improvement plans and/or community reaction may necessitate changes in building design. Both

of these situations stress the importance of thorough advance investigation and review of proposed property by all personnel associated with land purchases.

### **3. ZONING**

**3.01** Consideration of local governmental regulations and zoning ordinances is as important as the physical characteristics and the optimum utilization of a proposed plot. A zoning ordinance is established to limit the character, size, and use of buildings which may be erected in specified areas or districts for the protection of values and for the best interest of the community. These ordinances vary widely for each community and, therefore, it is important that the particular zoning laws be studied carefully, particularly with regard to the following paragraphs.

**3.02** Most zoning ordinances divide the community into districts for residential, commercial, and industrial uses. These districts are planned so that the residential districts can be free of the interference and confusion of business establishments and, conversely, so that the businesses can be concentrated, thereby making their operations more profitable. Within most districts, however, communities will allow more than one type of use category to exist. It is obvious that different types of telephone buildings are usually limited to particular districts. The office buildings are most often found in the business districts and the garages usually located in the industrial areas. As for the central office, a different situation arises, since the building must be placed at or near the theoretical wire center. Most communities have recognized this fact and have included central offices in their special usage allowances. These special uses are included in zoning ordinances expressly to handle situations not adequately governed by the general regulations. Thus, a special use permit can usually be obtained from the community's Board of Appeals upon presentation of the need by the telephone company.

**3.03** If, however, the local ordinance does not include central offices in their special uses and the company finds it necessary to place the central office in a restricted area, a variance must be obtained. This also applies where an existing central office must be expanded beyond the structural limits designated for a district or where there is need for a larger parking area. A variance is a

permit granted by a community's Board of Appeals to depart from the established zoning regulations. This procedure should be invoked only as a last resort and only after carefully considering all aspects of the public relations involved. The legal department of the telephone company must apply for the variance, since it is necessary to prove unique circumstances and financial hardship if the zoning regulations are followed.

**3.04** It must be stressed, however, that even if the telephone company has been able to obtain a special use permit or a variance, it is still necessary to comply with other regulations not covered by the variance which restrict height, set back distance, etc. Some of the varying restrictions which interrelate uniquely for effective community protection are:

- (a) Size of the lot
- (b) Height of the building and setbacks (sky exposure plane)
- (c) Proportion of the total site area which may be covered by the completed building to preserve required open space
- (d) Setback distances from property lines for required yards
- (e) Adequate parking facilities
- (f) Accessible loading areas

**3.05** Along with the problem of choosing a site to comply with the local zoning codes, the future expansion of the building must be considered. Naturally, the enlarged ultimate building must also be within the zoning restrictions, unless a variance has been obtained, whether the building is extended vertically or laterally.

**3.06** Thus, future expansion becomes an important consideration in choosing the site. In determining the suitability of available sites, it is highly desirable to have in hand a well-considered tentative floor plan for the original and ultimate buildings.

**3.07** The floor plan for a central office building is determined largely by consideration of the equipment space required in the ultimate building. The space required for other than

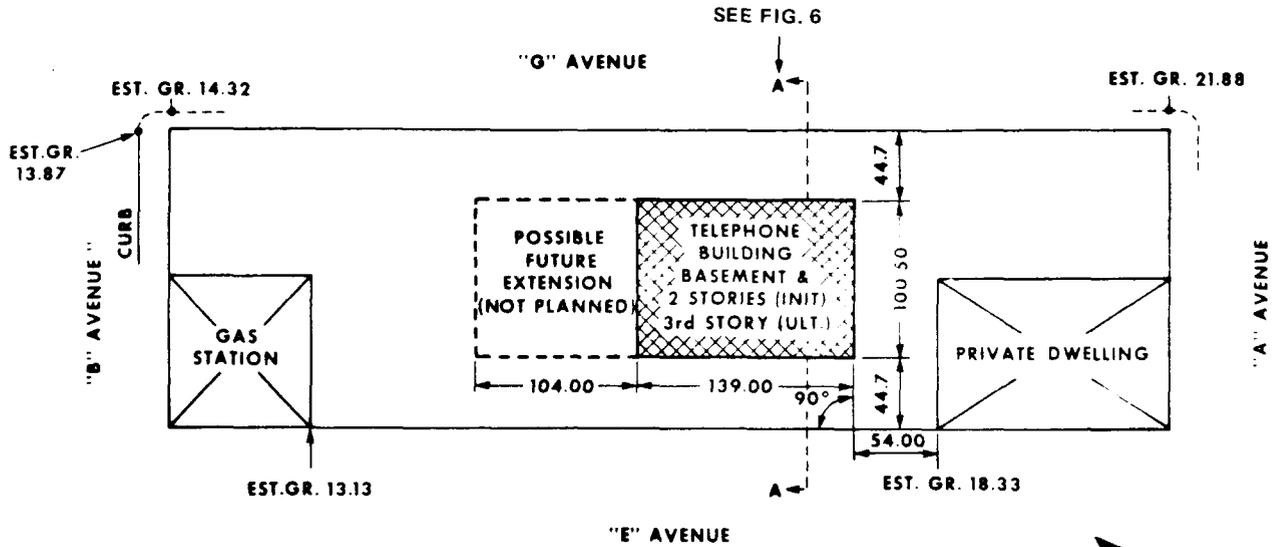
equipment purposes, and the indication of the fundamental plans as to possible future changes in exchange boundaries, are also important factors to be considered.

#### **4. SITE CAPACITY**

**4.01** When an option to purchase a new building site has been taken, the building planner reviews in detail the zoning regulations applicable to the property to establish the allowable parameters of building construction permitted. This serves to confirm the adequacy of the site for the proposed ultimate size of the central office prior to final closing of title, and also provides the data to enable the engineer to recognize the site capacity or potential for construction beyond any known requirements.

**4.02** Site capacity is an important consideration in determining the optimum orientation of the initial building on the plot for several reasons. For example, in an actual study of the parcel of land shown in Fig. 1 through 6, a number of factors have influenced the placement of the building (Fig. 1) that will not be apparent to the casual observer upon completion of the initial structure; however, the maximum potential of the property (Fig. 2) has been preserved. Figures 3, 4, and 5 indicate alternate building orientation and minimal plot areas required to meet the bulk regulations of the zoning ordinance.

**4.03** Notice that in Fig. 3 versus Fig. 4 a more desirable portion of property (in terms of future resale) has been used to satisfy open space requirements; the potential for parking has been fragmented; and the possible "Use" change, advantageous to the company if a future plant work center or garage is required, has been obviated. While Fig. 4 and 5 indicate identical placement of the building, as recommended, the zoning calculations of Fig. 5 obscure the overall potential of the property. Fig. 6 relates elevation considerations affecting both cable entrance and ultimate height in terms of required yards and sky exposure plane. These are interrelated regulations of some zoning ordinances which control building height and setbacks with respect to property and street lines. It is obvious that a failure to recognize this restriction initially could jeopardize the full potential of the future third story in this particular example.



NOTE: ALL DIMENSIONS AND ELEVATIONS TO BE VERIFIED BY ARCHITECT. REFERENCE-SURVEY CERTIFIED TO THE TITLE INSURANCE CO.

Fig. 1—Utilization of Property (Orientation of the Building)

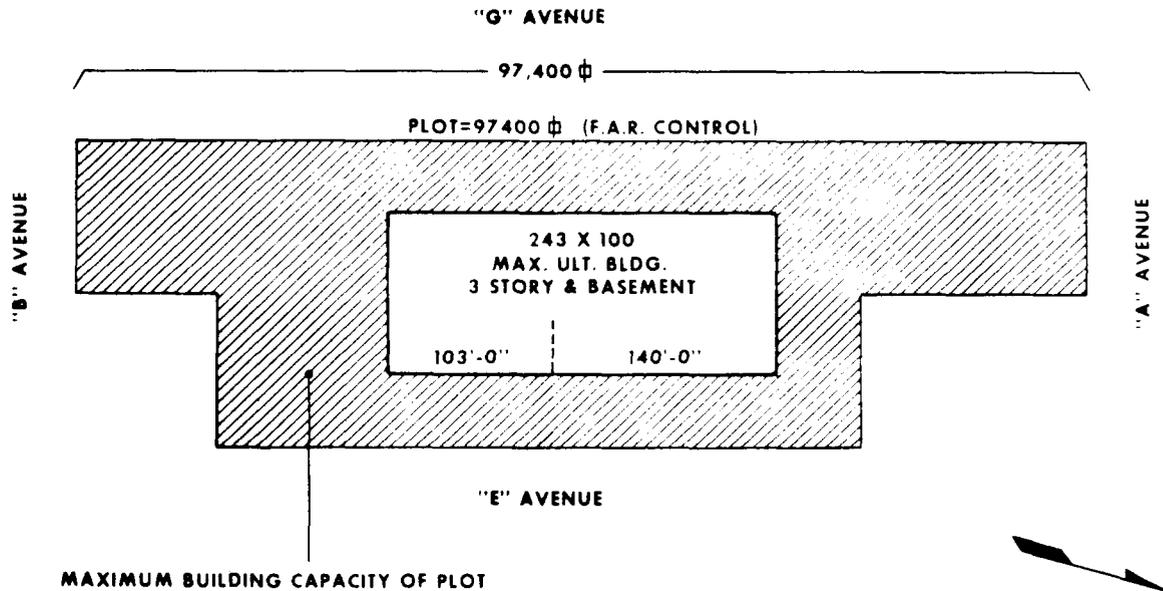


Fig. 2—Utilization of Property (Controlled by Zoning)

5. ORIENTATION OF BUILDING

A. Cable-Entrance Facility and Distributing Frames

5.01 In establishing the orientation of the building on the site, primary consideration should be

given to the cable-entrance facility (CEF), the interface between the central office and the outside plant network. Detailed planning considerations for the CEF and for the conduit entrances, risers, and holes are discussed in Sections 760-200-030 and 760-200-031, respectively. CEF planning should



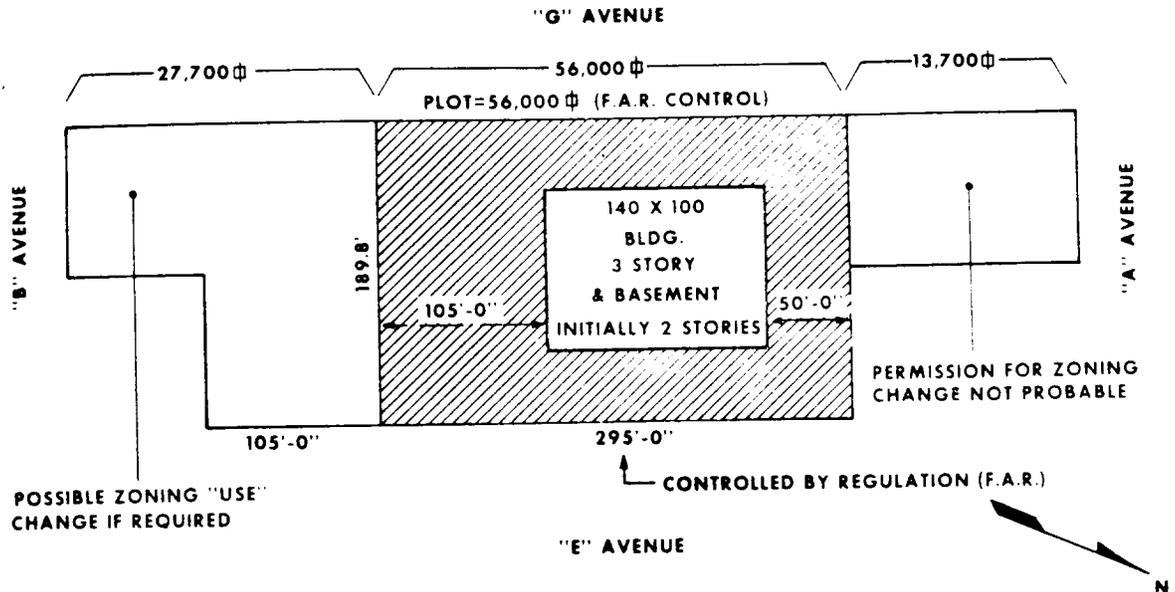


Fig. 5—Utilization of Property (Controlled by Zoning)

Section AA

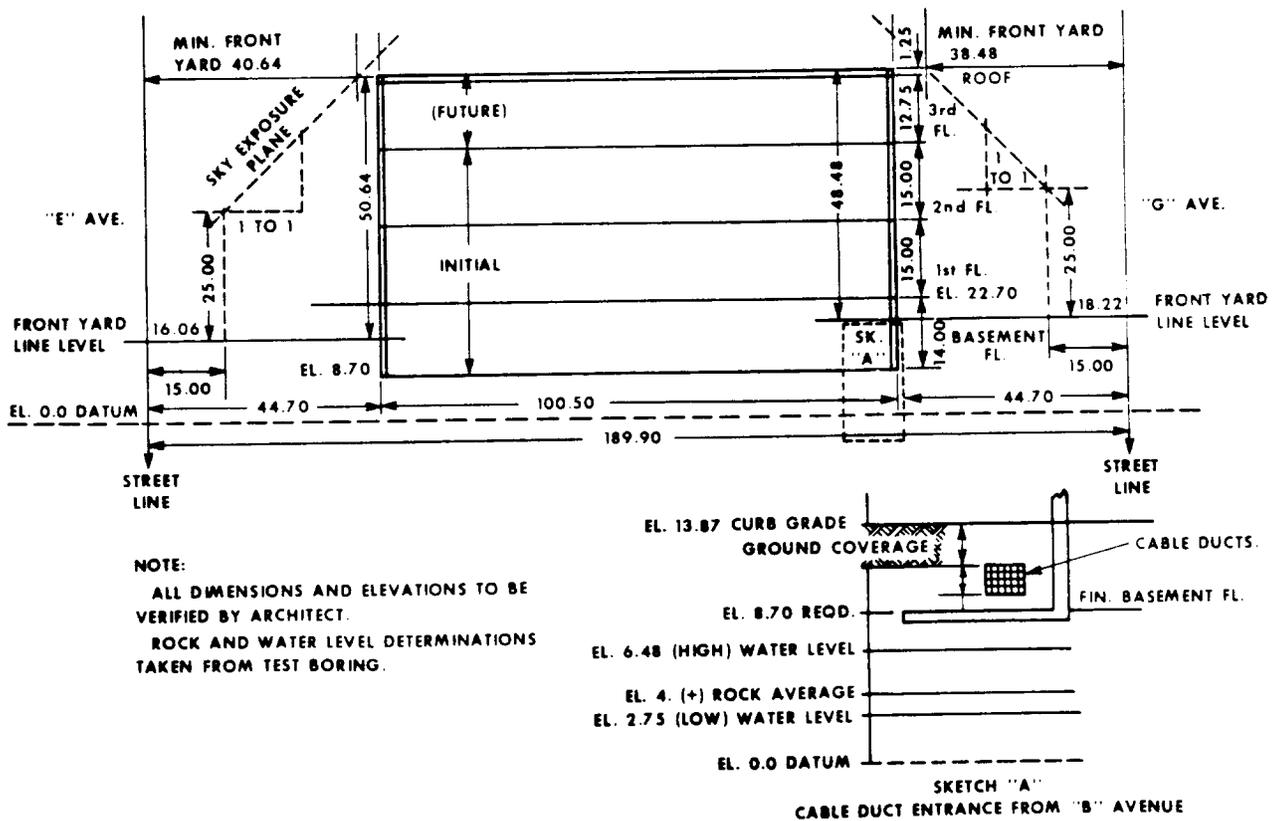


Fig. 6—Utilization of Property (Section AA)

begin as soon as a central office site has been selected and plans for the building are started, and the planning process should include the contributions of outside-plant forces. The proper design and location of the CEF are necessary to ensure the maximum utility of outside plant during the wire center's life and should include the following considerations.

- (a) Building planning engineer, in consultation with outside plant and equipment engineers, is responsible for locating and planning the CEF. He is also responsible for the CEF's impact on the building's structural design, architecture, aesthetics, and environmental and fire protection systems. The building space planner must see to it that the CEF area is utilized efficiently.
- (b) Outside-plant representatives are responsible for determining the number of conduit terminations and configurations, determining riser and floor-opening requirements, locating access ports, CEF cable racking and support structures.
- (c) Equipment representatives are responsible for the main distributing frame (MDF) layout and interface with the CEF.

**5.02** Once the CEF has been selected, a CEF administrative plan should be prepared by the outside-plant organization, approved for reference and guidance, and kept current throughout the CEF's life. Orderly growth of the CEF will be ensured if this plan is used to guide expansion provisions, duct assignment, cable routing and racking schemes, and riser space allocations.

**5.03** The MDF provides the means for interconnecting the outside telephone network with the equipment in the building. It is on this frame that outside plant cable is terminated (usually via a protector frame) and cross-connected to the equipment terminals; consequently, the unobstructed access between the cable entrance and distribution rack or vault, and the distributing frame-protector frame area is mandatory for the proper functioning of the equipment building.

**5.04** To assure that this is attained, the physical space for this cable-frame complex should be planned, as a general rule, along the nongrowth wall of the building having the maximum potential length with the ultimate development of the office.

Within this area and parallel to the wall, single floor side-by-side lineups or multifloor vertically in-line arrangements are the two basic layout designs. Arrangements to be designed into a particular building to reflect size and type of the equipment entity to be served are presented in Section 760-200-090.

**5.05** Foremost among the factors to be reviewed in determining the location and direction of growth for the distributing frame is the relationship of the existing or proposed outside plant cabling facilities to the site and planned orientation of the building. This must be carefully studied in conjunction with the plant engineer to achieve the most direct and least complicated cable entrance route from the street facilities consistent with ultimate building capacity and potential for unforeseen contingencies. In this regard, there are few aspects of a basic building plan of greater asset to ultimate flexibility of a building entity than adequate cable entrance arrangement—whether the plant is comprised of several conduits at a switchroom wall rack or several duct banks in a multiple-bay vault.

#### **B. Building Core**

**5.06** The essential nonproductive portion of the structure that provides the egress for the occupants is known as the "building core." This area of the building contains the primary entrance, main stairway, and elevator(s) when required. In small unattended buildings, the core may consist of a basic entrance vestibule and utility room, but in very large buildings highly complex arrangements may be required. The orientation of the building core must be compatible with the distributing frame space requirements of the ultimate building.

**5.07** In the architectural design of a building, it is highly desirable that toilets, pipe chases, electrical and duct shafts, mechanical equipment, and heating plant be clustered within the vertical plane of the core area for efficient interconnection of utilities and concentration of necessary immovable building facilities. This is especially true where a partial basement is planned for the heating plant, electrical gear, etc, or in multistory buildings where vertical penetration or separation of productive floor areas for nonequipment purposes is to be avoided.

**5.08** Early telephone buildings were constructed with centrally located cores to obtain maximum

natural light and ventilation in the productive areas juxtaposition to exterior walls. This arrangement was well suited to manual central offices where switchboard lineups required relatively long narrow areas. Where building areas of this design have been reused for equipment layouts, however, the impregnable wall of the central core separating these narrow floor areas has resulted in serious inefficiencies of equipment association and cabling.

**5.09** The orientation of the building core within the building envelope and the orientation with property lines, therefore, is of basic importance to the optimum development of the equipment areas and is also essential to the efficient utilization of the site. Accordingly, to obtain proper relationships, the core area, in most cases, should be consigned to a location adjacent to the nongrowth wall of the building having the least influence on the planned distributing frame and CEF. In the case of the building portrayed in **4. SITE CAPACITY**, Fig. 1, the building core was located at the right side of the structure parallel to "A" Avenue.

**5.10** It is the joint responsibility of the building planner and the architect or building engineer to physically design the building core. The planner must be sufficiently knowledgeable to initially size and tentatively locate toilets, stairwells, elevators, and main corridors based on the ultimate height, size, usage, and planned population. The planner should also incorporate into the preliminary design of the core, required storerooms and essential building offices so that all space requirements of this area are made known to the design engineer or architect, and so that the parameters of the permanent building nucleus are established and separated from ultimate equipment areas.

### **C. Equipment Entrance and Uncrating Area**

**5.11** For many years telephone equipment has been uncrated outside the building or in an equipment room. Uncrating outside the building occasionally will result in an accumulation of dirt and dust in new equipment even before the equipment is placed in service. Uncrating in the equipment room will produce such an accumulation in the working equipment that the packaging material will create a potential fire hazard. Neither of these two approaches is wholly satisfactory, especially in the larger buildings where installation activity is almost continuous.

**5.12** In such cases, the provision for an uncrating and storage room in the building core or in the equipment space is recommended. The equipment entrance should open directly into this space through a 4- by 8-foot opening. This opening should be provided at the building floor that is at ground level, and the bottom of the opening should be at the same elevation as the finished floor surface. Where a raised floor is used, the bottom of the opening should be at the same elevation as, or slightly above, the finished raised-floor level.

**5.13** The equipment entrance and uncrating room should be at least 12 feet by 20 feet in area to permit crates to be manipulated. Western Electric Company probably will use the uncrating room for an office while equipment is being installed; the room, therefore, should be provided with air-conditioning and heat and should have a fire rating of 1 hour.

**5.14** The 4- by 8-foot opening need be provided only at the ground floor level if there is a freight elevator that can carry equipment to higher floors. Otherwise, similar openings should be provided at each floor level, along with a roof hoist directly above.

**5.15** An uncrated piece of equipment may have to be hoisted to an upright position. A minimum clear height of 10 feet 10 inches is required to rotate a frame 6 feet 6 inches wide by 7 feet high. For central offices equipped with the conventional cooling system, overhead air ducts should not pass over designated equipment entrance areas. For central offices equipped with the modular cooling system, two options are recommended: the suspended ceiling may be omitted permanently over the equipment entrance area, or the ceiling elements may be disassembled during equipment uncrating and handling periods.

**5.16** Once the equipment has been placed on a dolly in its upright position, it is moved into the equipment areas. Passageways in the building between the uncrating area and the operating locations should be high and wide enough to allow the clear transport of all telephone equipment on a dolly.

## **6. CONSIDERATIONS FOR FLOOD PROTECTION**

**6.01** Proper site selection is of fundamental importance in avoiding central office flooding,

particularly in communities where terrain is not flat and where there is some history of previous high water tables. It is necessary to study the topography of a proposed site and its neighborhood not only in the light of past experience but assuming a catastrophe of greater extent. There will probably be cases where a location several hundred feet from the actual wire center can justify the additional cost of outside plant or an increased cost of land by reducing or even eliminating a flooding hazard to the building.

**6.02** The importance of prudent site selection has been graphically illustrated in several cases where quite new electronic central offices were severely flooded while the former manual buildings, a short distance away on higher ground, suffered no damage.

**6.03** Considerable help can often be obtained from a study of the files of city or county engineers and Federal or Army flood control plans. These sources of information, however, should be used as guides only. A large element of common sense is developed through experience by those responsible for site selection in avoiding a flooding hazard. It is nevertheless often helpful to inquire about local flood experience through "old-timers" in the neighborhood when selecting a building site.

**6.04** Drainage conditions of the site and surrounding area with particular reference to possible flooding due to inadequate sewers, overflowing streams, or other abnormal surface water conditions are not overlooked.

## **7. DEFENSE CONSIDERATIONS**

**7.01** In designated critical target area cities, areas serving atomic energy installations, key military installations, or other locations as deemed necessary, building sites are selected to the extent practical in accordance with the following factors:

### **(a) Dispersion Plans**

(1) Consideration of dispersed locations to the extent practicable with sufficient separation so that the chance of severe damage to more than one building is greatly lessened in the event of an enemy air attack, sabotage, or other disasters. Separation of 5 miles or more is desirable; however, separation to a lesser degree is better than none at all.

(2) Consideration of areas away from installations that are likely to be sabotaged or which are likely targets in the event of an enemy attack.

(3) Consideration of locations away from defense plants, air bases, oil refineries, etc, which constitute likely targets or which are hazards from the standpoint of explosions and fires.

### **(b) Fire Storm and Conflagration**

(1) Consideration of residential areas where the building density is less than 20 percent and likely to remain this way by reasons of zoning laws, etc.

(2) Consideration of locations away from highly congested areas where most of the buildings are not of fire-resistant construction. Such areas may burn in a fire storm or conflagration as a result of an enemy attack through the initiation and spread of fires from an atomic, high explosive, or incendiary attack.

(3) Consideration of the particular part of the more congested areas where the surrounding structures are predominantly of fire-resistant construction.

(4) Consideration of areas free from places where explosives and flammable materials are manufactured, stored, or used.

(5) Consideration of areas with wide streets that would serve as possible firebreaks.

## **8. SELECTION STANDARDS FOR COMPARISON**

**8.01** Deed, zoning and building code restrictions, fire regulations, and possible reaction from neighbors are limiting factors.

**8.02** In purchasing new lots, consideration is given to the marked tendency on the part of many municipalities and other governing authorities, such as County Planning Commissions, Art or Historical Commissions as well as environmental and some federal and state commissions, to restrict the use to which property within certain boundaries may be put, the heights of buildings, the proportion of the total lot area which may be occupied by the completed building including requirements for

certain minimum setback distances from the property lines to the building, and to require, in certain instances, the provision of off-the-street parking facilities in connection with the building.

- 8.03** The theoretical ultimate wire center serves as a guide in determining the general vicinity considered most desirable for a central office location. In many instances, however, because of lack of sites, excessive high prices for those that are available, or for other reasons, it may be advisable to acquire land at some distance from the designated center. The search for such sites is preferably directed toward that portion of the area which offers the best potential prospects for future development.
- 8.04** Proposed or possible future civic improvements which might affect the lot by changes in the width or grades of the sidewalk or street are considered.
- 8.05** Probable future change in the character or development of the neighborhood is important.
- 8.06** The proximity of unfavorable surroundings productive of dirt, noise, and vibration such as a heavily traveled street intersection, a traction line, a noisy or dirty industrial plant, or general lack of neighborhood cleanliness is taken into account. There are known cases where the site selected was too close to an industrial plant that gave off an excessive amount of fumes and dust causing more than normal telephone equipment maintenance. Clean and quiet surroundings are most desirable.
- 8.07** Consideration of the neighborhood is very important where a toll or traffic service center is involved, with operators frequenting the building at all hours of day and night.
- 8.08** The nearness of electric power installations such as electric traction lines, power generating stations, or substations, the ground potentials of which may impair transmission, is an important factor. This condition is usually more serious in outlying districts where ground potentials may be higher and tend to extend over wider areas due to the absence of subsurface piping, etc.
- 8.09** Exposure to fire or other hazards on adjacent property is to be minimum. From the standpoint of eliminating gas leaking into buildings,

particularly from high pressure mains and especially into community dial offices, either following along telephone company underground cable duct or permeating through the soil, selection of a site not in proximity to gas mains is important. If it is impractical to select a site away from gas piping, a plot is chosen, if possible, so that the underground cable duct into the building does not cross gas lines. This is additional insurance to the recommended practice of installing gas venting chambers, and plugging and sealing the ducts at the building to prevent gas leaking through the ducts.

- 8.10** Availability and capacities of water and gas mains, electric distribution systems, and storm and sanitary sewers are evaluated.
- 8.11** Natural and established grades and levels are compared with reference to their effect on both the proposed floor elevations and the cost of the proposed building including any excess excavation or fill for grading. The topography of the site to be selected is of considerable importance when basementless construction is planned. The economic advantages associated with basementless construction diminish as footings and foundation walls are increased over normal requirements. Therefore, it is important that the type of building to be constructed at the proposed location be determined before a final selection of a site is made.
- 8.12** Subsurface conditions as they affect the excavation, foundation, and basement floor level with respect to grade, also as regards subsurface conduit, gas, and water lines are important. Particular attention is given to the bearing capacity of the soil, to subsurface water conditions, and to the presence and character of rock as related to cost of sheet piling, pumping, or caisson foundations. Data are usually available in offices of local civic authorities. If, however, such data are inadequate or if subsurface conditions are otherwise in doubt, obtain an option on the property until test pits or borings may be made.
- 8.13** Sites having bedrock at or near grade usually possess maximum stability against quake movement.
- 8.14** The size and shape of the plot with regard to future extensions to the building and the desirability of landscaping treatment are factors.

**SECTION 760-100-020**

**8.15** The influence of surroundings upon the architectural design of the building are considered from the standpoint of developing favorable public reaction and, also, for the suitability of a public business office if one is contemplated.

**8.16** The general situation with respect to comfort and safety of employees, parking facilities for employees' automobiles, and accessibility to public transportation is important.

**8.17** Plots located near aircraft landing areas and airways, which might require night-lighting together with painting for daytime marking or limitations on height of structures, preferably are not selected for central office building sites when other properties are available.

**8.18** Careful check of these factors should be made by the Building Engineer before

making commitments. It is suggested that a tabulated comparison be made of all properties to be considered with regard to:

- (a) Location with respect to wire center of central office area, ie, distance removed, etc
- (b) Cost of plots—including demolition of any existing buildings (vacant versus improved)
- (c) Cost of building at each site
- (d) Effect of zoning law requirements on each site
- (e) Possible adverse public reaction to use of site.