The Engineer's Job in Sub-Dividing Acreage Property Into Home Sites

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Thirty minutes of this morning's session have been assigned to me for the purpose of presenting a subject which could be discussed for the rest of the morning and part of the afternoon with profit to all of us.

As I see it, the engineer employed by the owner of a tract of land assumes a three-fold responsibility:

(1) A responsibility to the owner, his client. The owner has a right to expect as many *salable* lots as can be worked out on the area to be covered by the subdivision.

(2) A responsibility to his community. The engineer must realize that the lines he establishes and records now, the streets, lot widths and depths which he designs and surveys, fix indelibly the present and future pattern of community growth on that area. His plan must fit the master plan as adopted by the plan commission—must be approved by that agency in order properly to implement their master plan. He must also acquaint himself with the rules of the plan commission relative to the manner in which his work is to be performed.

(3) A responsibility to the future owner of each lot. This may be the most important of the three. The purchase of a site and the building of a home are for many American families their most important economic effort. Safeguarding that investment; preventing deterioration in values caused by poor design; holding construction and maintenance costs of streets, sidewalks, sewers and other public services to a minimum by good design become most important responsibilities of the engineer. Years ago Robert Whitten stated that "15 to 40 per cent of street improvement costs can be saved by careful planning." That statement is as true today as it was in 1920.

Let us now examine these responsibilities in detail and, in particular, the activity of the subdivision engineer in his discharge of them.

When he, the engineer, is approached by the owner, the question should be raised as to whether or not there is a need for the type of development contemplated; in other words—whether there will be a sufficient number of prospects to warrant the expense of subdivision. It may not be the engineer's responsibility to answer the question but he should at least remind the land owner that profits result from sales and that unless there is a reasonable prospect of sales, it might be unwise to undertake the subdivision.

Assuming that there is need, the next steps to be taken by the engineer are, I am sure, familiar ones to all of you, namely:

(1) The boundary survey, thus checking the deed description.

(2) Accurate plotting of that survey.

(3) Investigation of adjacent subdivision layouts, if any.

(4) Topographic information, if needed.

(5) Determination of locations and other pertinent data relative to sewers, water supply and other public services.

(6) Consultation with the plan commission concerning their master plan at the site of the subdivision, their acceptable street widths, lot widths and all other data which may influence the design.

With these data at hand, the street pattern through the subdivision may be drafted. The plot of the boundaries, the topographic information, and the locations of adjacent streets and lots serve as guides for the proper delineation of the streets of the subdivision. The street pattern breaks up the entire area into blocks; and the subdivision of these results in the final building sites for homes.

Personally, I prefer to go through this stage by free-hand sketching, devising several schemes, discarding, changing and, finally, deciding that a particular scheme is best fitted to the area. The free-hand stage is then followed by very careful plotting of the selected street arrangement, establishing P.C.s and P.T.s of the curves, the lot lines and corners and all other features of the design; finally, scaling as carefully as possible all distances, radii and other facts which will expedite the field work. This completes the preliminary map which, after receiving approval of the plan commission, serves in the field as a guide for the survey party.

During the progress of the final survey minor changes in the location of lot-corners, or street alignments may be made if in the judgment of the engineer better building sites or better drainage or grading may be accomplished.

The results of the field survey, when accurately plotted, produce the record map which is then presented to the plan commission for approval and then recorded.

This, then, in my opinion, is a procedure which will enable the engineer to discharge his three-fold responsibility.

If properly designed, the subdivision plan will fit into the jigsaw puzzle of the master plan of the street system. The lots, in size and arrangement, will fulfill the proposed land use plan. The street widths will be proper for the traffic needs. The street alignments will fit the topography and make possible a minimum of earth work in order to establish acceptable gradients.

Each lot will offer a building site in keeping with the expected type of development. In shape, size and orientation, each lot will have sales appeal and, finally, the whole development will yield the maximum number of lots possible. All three responsibilities will have been discharged—the owner will have a reasonable profit, the community a worth-while addition to the civic structure, and the home owner a safe investment.

During the remaining minutes of my assigned time I shall discuss several problems of the subdivision engineer, hoping that what is said will result in improved practices in this field.

I. *Subdivision Control.*

Sec. 34 of the 1947 Community Planning Act states that "the plan Commission *shall* adopt a master plan". Also, Sec. 45 states in part that "after a master plan and an ordinance, *containing provisions for subdivision control and the approval of plots and re-plots",* etc.

The intent of the legislation is clear. Eventually, each city, town or county of the state will have a master plan and will exercise control of subdivisions. This is as it should be. Many cities and counties are now preparing or considering seriously the preparation of rules governing the subdivision of land. Adherence to the rules leads to good design. For example, the typical guide establishes minimum widths of different classes of streets; minimum lot widths; adequate easement for utilities; and makes suggestions for certain community facilities such as parks, playgrounds, and school sites.

The plotting rules also define the activity of the engineer in such matters as setting permanent monuments, errors of closures of traverses, the scale and form in which the preliminary map and the final map must be presented to the plan commission. The data which must appear on these maps are also listed as, for example: street names, title under which subdivision is to be recorded, names of adjacent property owners, utility information, curve data, registered surveyor's certificate, owner's certificate of dedication of traffic ways, certificate of approval of the

plan commission and the private covenants which are to run with the deed.

II. *Other Design Principles.*

In order to satisfy all interests concerned, the engineer should be familiar with the F H A minimum requirements for subdivisions which are submitted to that agency as sites for homes financed under its insured mortgage program. No difficulty will be encountered with F H A if he, the engineer, follows the procedure outlined in the local subdivision regulation ordinance and if, in addition, he keeps in mind the following design principles:

(1) Alignment of streets should fit the topography.

(2) Dead end streets or cul-de-sacs should be used only when topographic conditions make it necessary or when the shape of the area being subdivided into home sites prevents any other solution. The outside radius of the turnaround at the end of the cul-de-sac should be not less than 50 feet, preferably 60 and the maximum length of the cul-de-sac about 400 or 500 feet.

(3) Compound and reversed curves should be avoided, particularly when the curves are sharp. Tangents should connect curves of the same or contrary flexure.

(4) Long blocks, up to 1200 feet, are acceptable if the length is in the direction of heavy traffic flow.

(5) Minor streets should intersect major streets at right angles, or nearly so.

(6) Side lines of lots should intersect street lines at about 90 degrees or along radii of curves.

(7) Acute angles at lot corners should be avoided.

(8) Under average conditions, lot depths from 120 to 130 are best. Depths greater than 150 feet are undesirable except for estate property developments.

(9) Lot widths should be such as to admit of from 10 to 20 feet distance between buildings. Fifty, sixty or seventy-five feet are adequate widths of lots designed for average homes. Corner lots should be at least 10 feet wider. The modern trend to the ranch type home with attached garage indicates a need for a 75 foot minimum width.

(10) Lots should be planned to face desirable views such as parks, school grounds and the like. Conversely, undesirable views should be blotted out by judicious design and planting.

(11) Tree growth on the site should be preserved but not at the expense of the proper development of the neighborhood as a whole, or if the preservation introduces traffic hazards.

In closing, I would like to suggest three publications which should prove valuable additions to your engineering libraries:

I. Subdivision Regulations by Harold W. Lautner, published by Public Administration Service, Chicago, in 1941.

II. ASCE Manual of Engineering Practice No. 16 on Land Subdivision, 1939.

III. Home Builders Manual for Land Development, Published by National Association of Home Builders, 1028 Connecticut Avenue, NW, Washington, D. C., 1950.