PRELIMINARY REPORT ON

REDUCTION IN HOUSING COSTS

NEW APPROACH TO EFFICIENT DESIGN AND CONSTRUCTION

PREPARED FOR

CENTRAL MORTGAGE AND HOUSING CORPORATION

BY:
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C O N T E N T S

1.0 INTRODUCTION

The rising cost of serviced land particularly in the large metropolitan areas has made it almost impossible for one-third of our urban population to afford to buy a single family home.

The situation has been termed "a housing crisis", and in 1968, the Federal Government appointed a Task Force on housing and urban development "to examine housing and urban development in Canada and to report on ways in which the Federal Government in company with other levels of government and the private sector can help meet the housing needs of all Canadians and contribute to the development of modern vital cities". The report was issued in 1969 with a number of recommendations of which only very few have been implemented. The report strongly urged that "both Provincial and Municipal Governments would view their requirements for the registration, servicing and zoning of land with a view both to simplifying procedures and providing greater flexibility so that the market can serve all income groups and not merely the affluent".

It is well known that many municipalities have minimum space requirements for single family dwellings strictly for the purpose of providing the minimum assessment return necessary to carry municipal, education and welfare costs.

The Task Force also recommended that: "renewed and greater effort be devoted by architects and other professionals to improving housing and urban design in general".

It is the object of this paper to outline possible improvements to the present ways of providing new homes, and to make suggestions for a program for implementation. The major factors involved in planning and engineering for urban development should be analyzed in detail, and each such factor should be looked upon as a "component" to be analyzed for its own requirements and economic justifications. No technological breakthroughs in methods or materials is envisaged as a result of this program, but rather a more efficient use of materials and knowledge already at our disposal.

2.0 OBJECTIVE

TO STOP THE SPIRALLING COSTS OF PROVIDING SERVICED RESIDENTIAL LAND IN ORDER TO MAKE HOMES AVAILABLE AT A PRICE THE LOW TO MEDIUM INCOME FAMILIES CAN AFFORD.

3.0 APPROACH

CARRY OUT STUDIES, RESEARCH AND PILOT PROJECT(S) TO ESTABLISH FEASIBLE VARIATIONS IN REGULATIONS, CODES AND PROCEDURES TOWARD COST REDUCTION, WITHOUT SACRIFICING ESSENTIAL QUALITY.

4.0 IMPLEMENTATION

C.M.H.C. should be prepared to offer its participation in a four-way partnership between private industry and Federal, Provincial and Local Governments for the purpose of obtaining the stated objective. Such participation can be in the following forms:

4.1 STUDIES AND RESEARCH as required to formulate basic requirements to be met.

4.2 Formulate a policy on MORTGAGE availability for homes built under this programme.

4.3 Provide IDEA-BANK for design and construction methods with encouragement for new innovations or improvements of present techniques, resulting in more economic solutions.

4.4 Establish an EDUCATION PROGRAMME with emphasis on change in attitude towards present design and construction methods.

4.5 Make suggestions to all programme participants for improvements to EXPEDITING AND PROCESSING of applications, by eliminating "red-tape" but encouraging flexibility in design.

4.6 Support PILOT PROJECTS to be undertaken in municipalities willing to permit feasible variations to present requirements.

5. MAJOR COMPONENTS OF STUDY PROGRAMME

5.1 LAND UTILIZATION

5.11 Minimum Lot Size

The present C.M.H.C. requirements are as follows:

(a) Detached or duplex house - lot areas shall be not less than 4,000 square feet for internal lots or less than 5,000 square feet for corner lots.

(b) Semi-detached or semi-detached duplex house lot areas (for each half of a semi-detached house or semi-detached duplex house) shall be not less than 3,000 square feet for internal lots or 4,000 square feet for corner lots.

Although these requirements exceed what should be acceptable for low cost housing, individual municipalities usually have increased their requirements to a minimum of 6,000 square feet for a detached or duplex house on an internal lot and 7,200 square feet for corner lots, with semi-detached lots (for each half of the house) to be not less than 4,200 square feet for internal as well as corner lots. The attached sketch shows two different types of houses which adequately could be sited on lots with an area between 2,400 and 3,000 square feet.

5.12 Minimum Frontage

The present C.M.H.C. requirement calls for a minimum average interior lot width 50 feet for detached and 35 feet for each half of a semi-detached house. On corner lots, the minimum lot widths for detached housing should be 55 feet and 40 feet for each outside half of a semi-detached house. C.M.H.C. does permit however, reduction in these widths where the house type is known provided side yard requirements can be met. But again municipal requirements do not permit a reduction in lot widths from those stated by C.M.H.C., irrespective of compliance with side yard requirements. Again from the attached sketch, it is apparent that lot widths of 30 to 35 feet could be sufficient for the house types shown provided side yard requirements are changed as stated below.

5.13 Side Yard Requirements

The present C.M.H.C. requirements state that side yards, clear of all projections except a 2' eave projection and a 4' chimney projection shall be not less than 4' for one storey buildings, plus 2' for each additional storey or partial storey, except as provided in the following:

(i) where a building wall adjacent to a side lot line contains windows, the side yard shall be increased if necessary to meet the fire protection requirements of residential standards 4.K.3;

(ii) a side yard may be less than required above, where the building wall complies with the fire protection requirements of residential standards, Clause 4.K.3, provided that a registered easement on the adjacent property permits maintenance access along the side of the building for width of 4' for one storey buildings, plus 2' for each additional storey or partial storey.

Side yard requirements could be eliminated on one side of the house or reduced to the actual eave or chimney projection, provided window area is kept to a minimum and possibly limited to windows with obscure glass only, thereby avoiding considerable waste of frontage. This has been achieved in various places in the United States, with most satisfactory results.

5.2 SERVICING

5.21 Width of Roads

The present general municipal standard specifications call for a road allowance with a minimum width of 66 feet with increases for collector and arterial streets determined from the expected volume of traffic.

C.M.H.C. in their site planning handbook points out that the general adoption of a standard width for all streets is uneconomical and suggests that minor residential streets should be less than 66 feet in width, and indicates that a street allowance of 50 feet should be adequate for such streets.

The simplest approach to this problem will be to determine the width of pavement based on expected traffic volume, and make additional allowance for boulevards to accommodate services.

The following is a table of pavement widths which would appear sufficient for the use intended:

C.M.H.C. Class 5 - Local Residential Streets, intended solely for residential use from which through traffic is discouraged.

(a) Short cul-de-sacs 400' or less - Pavement Width 18'

(b) Cul-de-sacs exceeding 400' and crescents up to 1000' - Pavement Width 20'

(c) Other local streets - Pavement Width 24'

Compared to present requirement of 28' minimum pavement width generally used for roads with curbs, it is apparent that considerable savings should be possible, particularly in residential areas with low traffic volumes.

5.22 Pavement Construction

Present requirements for residential road construction varies considerably between the various municipalities. In order to determine the most economic yet satisfactory design and construction requirements, separate studies will have to be carried out for each area allowing for such varying factors as soil conditions and climate.

Some uniform guide lines can be established, namely, width of pavement, curb types, etc., which should be determined as a function of traffic volume.

5.23 Cul-de-sacs

The present C.M.H.C. requirements places other stringent requirements on the street system. One example is the requirement for cul-de-sacs which in accordance with C.M.H.C. requirements can only have a maximum length of 350 feet unless an emergency vehicle access and pedestrian walkway of 10 feet minimum width is provided from the head of the cul-de-sac giving direct access to an adjacent street.

in which case the maximum length may be increased to 700 feet. This is a particular "expensive" requirement and its justification is hard to understand. Many cul-de-sacs of considerably greater length have been built in this country prior to the issuance of the C.M.H.C. requirement, and are being built in other countries with great success. There is no reason why the length of cul-de-sacs could not be increased considerably.

At present the paved turning circle at the end of cul-de-sacs have to be of sufficient width to facilitate snow removal and to permit easy access for fire fighting equipment and general truck delivery, in accordance with C.M.H.C. requirements. This usually means that the diameter of the paved circle often exceeds 80 feet dependent upon the local municipal requirements, sometimes even determined by the snowplough operator.

This criteria is unnecessary and can be extremely costly, and it is suggested here that the turning circle need not be larger than what would be required for normal turning of passenger vehicles. Larger vehicles can make use of driveways to negotiate their turns or by manoeuvring on the turning circle itself.

5.24 Sidewalk Requirements

Many municipalities require sidewalks on both sides of all streets. The necessity for having sidewalks on cul-de-sacs and other local residential streets is questioned. Since sidewalks could be installed later as a local improvement, it is suggested that the amount of sidewalks for a residential development be limited to collector streets leading to schools and shopping centres only. In most cases, sidewalk on one side only will be sufficient. Where streets are separated with a greenbelt strip, a walkway could be provided within the greenbelt, thereby creating a separation of vehicular and pedestrian traffic. Where walkways are required, some saving can be obtained by using asphalt walkways rather thar concrete.

5.25 Sanitary Sewers

At present, most municipalities require sanitary sewers with a minimum diameter of 8", with a few municipalities even requiring that no sanitary sewer be less than 10" in diameter. It is difficult to find any real justification for such requirement, whereas, there are good reasons for reducing the pipe diameters, namely, better flow characteristics in addition to the cost saving. By reducing the minimum diameter to 6" and maintaining this diameter until the calculated sewage flow exceeds the capacity of the pipe, considerable savings can be realized.

At present an allowance is made for infiltration into the sewers thus requiring pipes to be sized for flows in excess of normal sewage. The criteria for this allowance fluctuates considerably from municipality to municipality, but in most cases, it is based on text book information which has remained unchanged over several decades. This matter is due for a review, and specific recommendations with regard to an approach for such review can be submitted if required.

There are several other aspects of sanitary sewer design and construction which could stand a critical review which no doubt will result in considerable savings. Such items as bedding details, pipe material, manhole types and spacing, curvilinear sewers, and depth to invert, should be reviewed in detail and recommendations made utilizing up-to-date technological knowledge. It is not unrealistic to assume that a complete satisfactory sanitary sewer system can be designed and constructed with a cost saving of as much as 25 percent, compared to what is presently being installed in many municipalities.

5.26 Storm Sewers

Most of the comments stated above for sanitary sewers also apply to storm sewers. In addition, major savings can be obtained in many municipalities, by dropping the requirement for connecting weeping tiles and roof water leaders to

storm sewers. Apart from the apparent cost difference, the policy of connecting weeping tiles and roof water leaders to storm sewers is very questionable. Since storm sewers are usually designed to handle storm flows based on a certain rainfall frequency, usually a 2 year frequency, storm sewers will surcharge when the intensity exceeds the design capacity, in which case, surcharging could cause hydrostatic pressure on basement floors from the backup in the weeping tiles. Considerable damage to basements have occurred due to this condition, but still the procedure is being used. The argument for maintaining this policy is based on the assumption that by connecting the weeping tiles to sanitary sewers, municipalities will be faced with higher treatment costs in sewage treatment plants. A basic assumption is made that the latter would be more expensive, a fact which might not be so easy to prove, and in many instances are just not the case. Some additional research is required on this matter. With regard to connecting roof water leaders to the storm sewers, it is a fact that by doing this, the soil is being deprived from its most needed basic nutrient, resulting in water tables being continuously lowered as the land is developed with a corresponding depletion of vegetation. Many municipalities, particularly outside the larger Metropolitan areas only require storm sewer to handle flows from street catchbasins, resulting in considerable savings due to shallower depth, as well as elimination of storm

sewers on many local streets, where the street itself will act as a lined drainage channel upstream from catchbasins. The present variation in design and construction requirements for storm sewers results in some storm sewer systems being more than double in cost than other systems serving equally well. Since the cost of storm sewers often represents 20 percent of the total cost of servicing, any cost saving on this item will be very significant.

5.27 Watermains

Considerable savings in the installation of watermain can be achieved without any significant loss in service. It is presently common practice within municipalities to require watermains with a minimum diameter of 6" on all streets and to terminate dead-end mains with a hydrant to permit flushing of dead-end mains. For dead-end residential streets such as, cul-de-sacs, this requirement is unreasonable and as a rule adds to the maintenance costs of the water distribution system. Due to the relative low flow on dead-end streets, the velocity in 6" mains is extremely low and causes settlements of solids in the pipe, thus requiring flushing to be carried out more often than on streets where self-cleansing velocities can be maintained. Considerable cost reduction in installation and maintenance can be obtained by designing water supply lines for cul-de-sacs on the basis of peak domestic demand only, which likely would reduce the pipe size to 2" diameter. In such case, hydrants

Whereas the present method of designing watermains apart from what has been described above, does not appear to leave much room for cost savings, spacing of hydrants and valves on the distribution system most certainly is due for a review. It is not unlikely that such review would result in a 50 percent cost saving of these items alone.

5.3 PROCESSING AND APPROVALS

In addition to the revaluation of the architectural, planning and engineering aspects of urban development, consideration should also be given to reducing the amount of "red-tape" involved. There has to be more expedient ways of obtaining approvals than what is now considered to be essential. A special study is warranted in order to achieve a smoother and less time consuming processing of application from Draft Plan approval to mortgage financing. Delays in obtaining approvals are costly and as such, is a further burden on the cost of providing serviced land.

5.4 INCENTIVES

It may be advantageous to introduce incentives to the housing industry and possibly even municipalities to encourage design and construction which will permit reduction in housing costs. One possibility would be to introduce mortgage financing on a sliding scale, permitting percentwise higher loans to low cost housing.

6.0 CONCLUSION

Every operation and construction component, from raw land to the door key, represents an opportunity to effect savings, to reduce operating and maintenance costs, to balance need against utility, and to add to or detract from the quality of living. The various savings that can be achieved will add up to a significant total saving in the cost of the finished product.

Some savings are readily attainable, without too much exploration, whereas others may not be available until more extensive investigations have been carried out, some of which may have to wait on the results of a pilot project. Continuous effort over a longer period of time would be necessary to achieve all desirable adjustments in design, construction and regulatory practices.

In order to provide housing at a price people can afford, a concentrated effort by all parties involved, from the private industry to regulatory government agencies is necessary. People are waiting for a "breakthrough". Present technology can be utilized better and further improvements can be encouraged which will provide substantial cost reductions. The task is too complicated to undertake without guidance and encouragement from the highest authorities in the Federal and Provincial Governments.

The Author:

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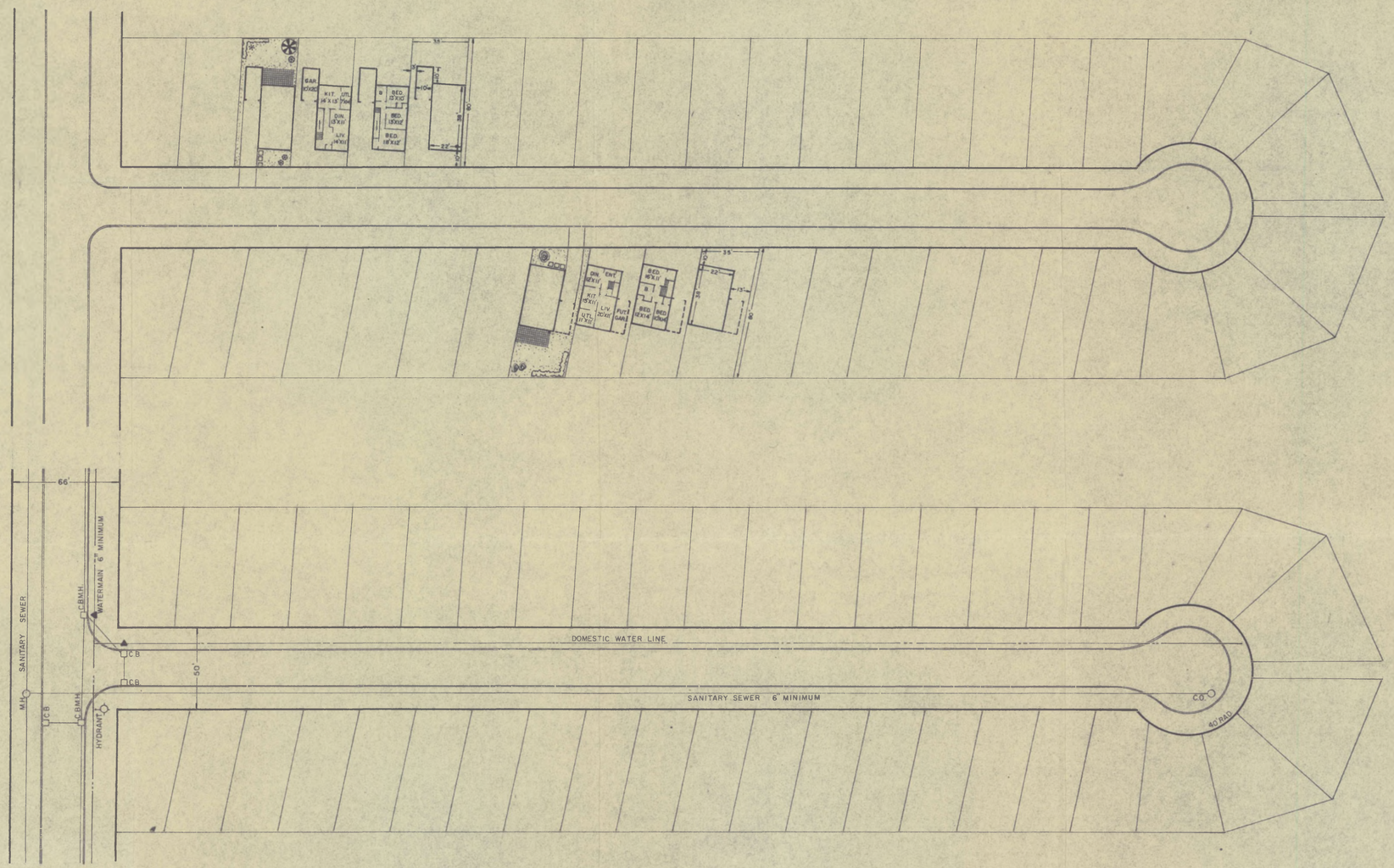
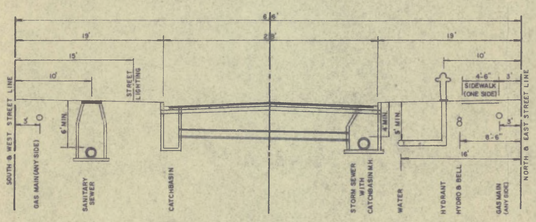
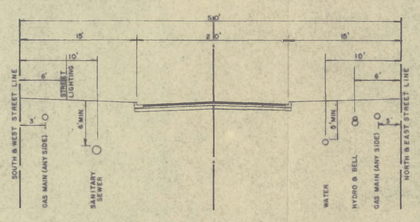
Mr. Theil graduated in Civil Engineering in 1946 and has for the past 15 years primarily been engaged in Land Development projects in various municipalities in Ontario, from small subdivisions to such major undertaking as the 8,000 acre New Town of Bramalea near Metro Toronto.





CROSS SECTION
COLLECTOR ROAD



CROSS SECTION
LOCAL ROAD

BASIC INFORMATION

GROSS AREA OF EXAMPLE	3·90 Acres
SINGLE FAMILY LOTS	42
DENSITY	10·8 Units/Ac.
LOT AREA	2,800 Sq. Ft.
LOT COVERAGE	30%
FLOOR AREA ONE STOREY	836 Sq. Ft.
FLOOR AREA TWO STOREY	1672 Sq. Ft.

REGISTERED PROFESSIONAL ENGINEER P.E. THEIL PROVINCE OF ONTARIO

APPENDIX TO REPORT ON
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PROPOSAL FOR SINGLE FAMILY LOTS ON CUL-DE-SAC.
LAYOUT AND SERVICING.