AN ANALYSIS OF THE REAL PROPERTY ASSESSMENTS

AND TAXES IN BRITISH COLUMBIA

by

Wayne Leslie Tomko

B.Com., University of British Columbia, 1971

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE
in the Faculty of
Commerce and Business Administration

We accept this thesis as conforming to the

required standard

THE UNIVERSITY OF BRITISH COLUMBIA

October, 1972

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Department of _Commerce_

The University of British Columbia
Vancouver 8, Canada

Date _October 6, 1972_

ABSTRACT

The Real Property Tax requires a major outlay of funds by
most property and non-property owners. Property owners are directly
affected by the tax, in that they pay the taxes to the taxing author-
ities, while the non-property owners are indirectly affected as the
property tax paid by the owners is reflected in the rents which the
non-property owners pay. Because of the magnitude of the property
tax as a proportion of the property owners net income or disposable
income, the individuals right or obligation of an equal portion of
the tax burden should be upheld. The portion of the total tax
burden for which a property taxpayer is responsible, is determined
by the "actual value" of his real property, subject to legislative
exemptions and reliefs.

To ascertain the degree of the equality of the tax burden
a sample of 1632 properties was obtained consisting of seven different
land uses from eight municipalities located within the Greater
Vancouver area. For each property in the sample the adjusted selling
price, assessed value of land and improvements for municipal and
school purposes, and the net taxes payable were obtained. To fur-
nish the reader with some insight as to the causes of possible tax
inequalities between municipalities, land uses, or price categories
within municipalities, calculations measuring the degree of
assessment uniformity and equality were executed.

The findings of this thesis give evidence that the tax burden between municipalities, land uses and price categories within municipalities are not equally distributed as the concept of equality was defined. Further, it was discovered that these inequalities were, in part, due to the occurrance of unacceptable levels of assessment inequality and ununiformity.

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INTRODUCTION

A. PROPOSITION

There has been in the past and will continue to be in the

future, widespread discontent of the real property tax system as it

is presently administered in British Columbia. The scope of the

criticism can be illustrated by quoting Jen Jenson who in 1933 wrote,

[1]."if it were possible to eliminate a tax by adverse
criticism the general property tax should have
been eliminated years ago."

The criticisms have persisted since then with a millennium of reports and

articles which suggested either its erradication or methods of

amelioration. The hypothesis of this thesis stems from the multi-

tude of criticisms and can be simply stated as follows:

Are there inequities or ununiformity in assessments of

real property which cause the tax burden to be distributed unjustly?

B. SCOPE OF STUDY

The real property tax is but one tax of a multiplicity of

taxes, but due to its importance as a municipal source of revenue

it is imperative that the doctrine of 'equal treatment of equals'[2]

is upheld. Table I indicates the importance of the property tax

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[1] Jenson, Property Taxation in the U.S. (Chicago: University
of Chicago Press, 1931), P.7.

[2] Musgrave. The Theroy of Public Finance. (New York: McGraw
Hill Book Co., 1959), Chapter 8.

by outlining the percentage of a municipalities revenue which is re-
ceived through assessments of real property. Figures are provided

for the years 1962, 1966 and 1970 for the municipalities under study

and the province as a whole. The percentage of the municipalities

revenue received from property assessments has dropped only slightly

since 1962 if the whole province is considered, however, the munici-

palities selected for analysis have varied considerably in the

change of this percentage. West Vancouver has increased the percen-

tage of its revenue received from real property assessments by 1.65%

while Richmond has decreased its percent by 17.21%.

TABLE I *

PERCENT OF MUNICIPAL REVENUE RECEIVED VIA REAL PROPERTY

ASSESSMENTS BY MUNICIPALITY FOR THE YEARS 1962, 1966, 1970 [3]

	YEARS	1962	1966	1970
MUNICIPALITY				
BURNABY		71.62	66.18	63.18
COQUITLAM		72.14	67.23	70.22
DELTA		60.30	42.23	51.97
RICHMOND		81.18	80.87	67.21
SURREY		66.73	59.16	59.09
NORTH VANCOUVER		73.01	69.54	74.21
WEST VANCOUVER		74.33	71.65	65.54
VANCOUVER		65.94	68.16	66.88
BRITISH COLUMBIA		67.13	64.96	64.58

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[3] Department of Municipal Affairs, Municipal Statistics.
(Victoria: Queens Printer 1962, 1966, 1972.)

*Contributions, grants and subsidies by the Provincial and Federal governments were not included. Municipal revenue sources which represent the remaining percentage are: business tax, other tax, special assessments and charges (these are collected as part of the property tax); licenses and permits; rents, concessions and franchises; fines, interest, tax penalties, etc; service charges; and recreation and community services.

The doctrine of 'equal treatment of equals' rests on the foundation that:

> "the equality of individuals before the law, tax treatment being legal treatment in essential respects. Arbitrary and capricious treatment of individuals by legal institutions is prevented by constitutional protection . . . has been extended to apply to the distribution of taxes."[4]

The objectives of this thesis are as follows: 1. to examine the equality of British Columbia's real property tax burden between municipalities, land uses and price categories; 2. to examine the equality and uniformity of assessments which govern the tax burden of property owners; 3. to analyze the concept of exempitons and/or grants as they eventuate in lower taxes to some property owners and a greater tax burden to other owners.

C. LIMITATIONS OF STUDY

The first limitation of this study is the elimination of any discussion centering around the form which the burden of taxation should take. A tax system may be progressive, regressive, or proportional and based upon 'ability to pay' or 'benefits received'[5]

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4 James M. Buchanan, The Public Finances. 3rd Edition (Illinois: Richard B. Irwin, 1970), P.100.

5 Information on taxing principles can be found in: Musgrave, R.A. Loc. Cit. and Buchanan, James M. Loc. Cit.

but the choice varies for different tax purposes and between individuals. Since the property tax system in British Columbia is based upon actual value of property, whereby the assessments and tax should be proportional to it, this thesis will analyze the degree to which the proportionality is upheld and not be concerned with the type of tax system which is appropriate or desirable. The other facets of a tax system which will not be discussed are:

adequacy — does the tax system provide enough revenue.

flexibility — is it flexible as to the income flow.

elasticity — does it respond to the economy - built in stabilizers.

balance — are the above three balanced.

certainty — as to time, manner and amount of payment of the tax.

simplicity — in both administration and collection.

convenience — time, place and manner in which a taxpayer is called upon to discharge his obligations.

economy of collection and compliance — lowest cost consistant with the guidelines set out above and the procedures for appeals by the taxpayer.[6]

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6 Ontario Committee on Taxation, Report 1967, (Toronto: Queens Printer 1967). Another excellent source describing some of the above is: Stanley W. Hamilton and Philip H. White, "The Real Property Tax in British Columbia - An Analysis", Research Report prepared for the B.C. School Trustees Association, (Vancouver: B.C. School Trustees Association, 1971).

A second limitation of this thesis is a result of the sampling

procedure chosen. When judging the uniformity and equality of assess-

ments it is necessary to determine the market value of the properties

as this is the basis from which assessments are determined.

The usual method of determining the market value of properties

when assessment uniformity is being measured is from sales data. The

weakness of this method becomes apparent when it is realized that the

researcher is automatically eliminating a large portion of the properties

for his sample (all those which did not sell) thereby biasing his sample

statistics. Leslie E. Corbert states:

> "The sales ratio method almost certainly contains
> statistical bias, at least in the sampling phase
> of its application . . . A portion of the total
> assessment universe is automatically, excluded
> from the sales ratio selection by the simple fact
> that only a portion of the total assessment universe
> is sold under market conditions."[7]

Corberts' model illustrating that market activity does not generate a

random sample of all the properties in the assessment roll is summarized

below.

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7 Leslie E. Corbert "An Appraisal of Sales Ratio Studies",
National Tax Association. (Proceedings of the 51st Annual Conference,
1958), P. 109.

ILLUSTRATION 1

CORBETTS' MODEL*

Ratio of Assessed Value to Market Value (in %)

Number of Sales

Market Value (in $'s)
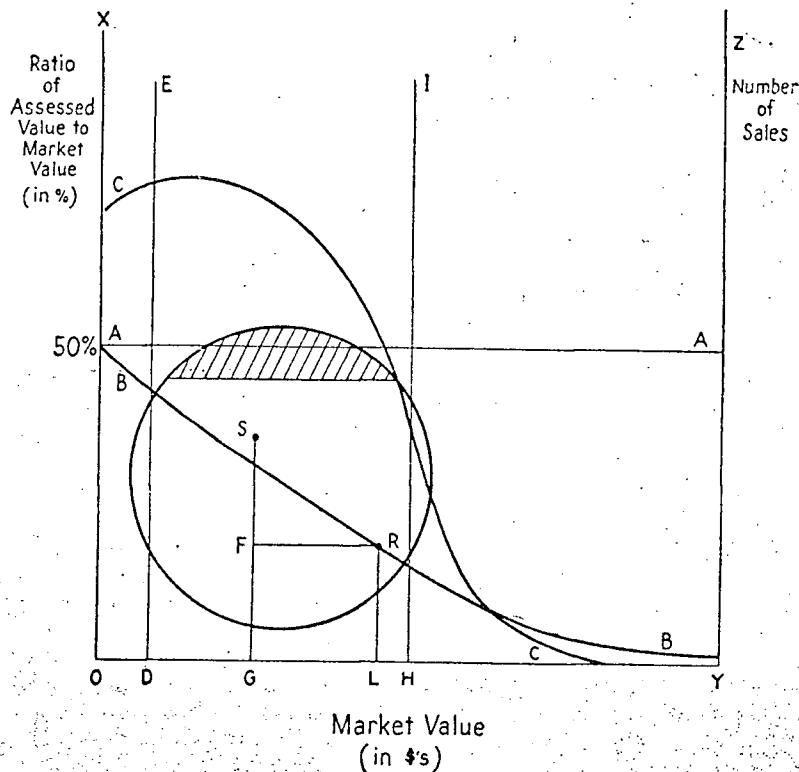
* Leslie E. Corbert. op. cit. pp 107-117

In illustration 1, the assessments would be perfect if they all fell upon line AA which represents an assessment sales ratio of fifty percent. If, however, line AA represented only the average, then the ratios of individual parcels would lie above and below this average line. Assessment uniformity would then be measured by the degree of variability from this line. It is not known, however, whether the average line of the population ratios is sloped as in AA or as in BB of figure 1. If curve BB represents the average relationship between market values and assessment ratios then a weighted average of all the individual assessment ratios may yield a point such as R on the figure. The vertical distance LR would then measure the average ratio of assessed

value to market value for all the property items in the assessment universe of this jurisdiction.

Curve CC represents the number of property sales which take place within a given period of time (shown on the right-hand vertical axis). The bulk of the sales falls within the price range bounded by De and HI. If the investigator were using the sales ratio method of ratio determination he would restrict his universe to those properties for which the assessment ratios are relatively high. Thus, even if the sample selected is truly representative of those properties which lie within the DH range of market values, it cannot be representative of the entire universe of assessment ratios because it automatically excludes those high-value properties which have low assessment ratios.

The bias effect of the sampling procedure is to raise the average assessment market value to GS. If the correct ratio for the universe is LR than GS is overstating LR by FS.

By making use of sales ratio study rather than a representative sample study the investigator has improved the appearance of the assessor's performance by moving the ratio findings closer to the line of assessment perfection (Line A).

Ratio line B was chosen only to illustrate the effects of selecting a sample from the properties which sold and not from the entire universe of properties. In actuality, the ratio line may be sloping downward or upward or behave erractically as the market value

increases. The investigator knows only that the ratios he finds relate generally to properties with market values falling roughly between verticles DE and HI.

It can be further proven that the properties which sold constitute a population unto itself which has different parameters than the population of unsold properties. Even if an assessor's assessments were perfect, in that all assessments were uniform at 50% of market value, at the time the assessment rolls were printed a sampling of the sold properties would still not be representative of the total population due to the larger proportion of sold properties which have had minor improvements, such as painting and repairs, to increase the value of the property. The effect of this can be illustrated as follows: assume two equivalent properties (A & B) each with a market value of $25,000. Since the assessment market value ratios are uniform at 50% they are each assessed at $12,500. Owner A wishes to sell his property but before doing so, he paints his home and puts on new roofing shingles. If he sells his property for $26,000 then the assessment-sales ratio is calculated to be 12,500/26,000 = 48.08. If this ratio was deemed to represent the population (in this case properties A & B) then the population is being misrepresented. If, as was suggested, the sold properties are on the average, improved upon before sale, more than the unsold properties, then the sample statistics will not be representative of the population parameters.

It becomes unfeasible to relate accuractely the sold, and unsold properties on the assessment roll because if all the sold properties in the sample were examined and the improvements compensated for by adjusting the selling price then this must also be done for all the properties which have not sold. Not only does this process become too laborious, but it subjects the researcher to making subjective judgements or assessments as to the extent of the property value added by these new improvements.

If the sales prices employed in the sample are over a time interval (eg. 6 months or 1 year), then unless prices have been constant during that time period, the statistics will not be representative of the uniformity of assessments. For instance, assume ; three properties A, B, & C sold over a period of 1 year; the market value of all three properties as of Jan. 1st, 1971 was $25,000 and the corresponding assessments were $12,500. On Jan. 1st, 1971 property A sold for $25,000, on June 31st, 1972 property B sold for $26,250, on Dec. 31st, 1971 property C sold for $27,500. During this year period all three properties increased in value by 10%. If assessment sales ratios were calculated the following results would prevail.

	S.P.	A.V.	A.V./S.P.
A	25,000	12,500	.50
B	26,250	12,500	.476
C	27,500	12,500	.455

The ununiformity in the assessment/sales ratios is due solely
to the increase in market price over the time period. If all the
sales had occurred at the same time, then the assessment-sales ratios
would have been uniform.

Adjusting the sales figures by the average increase of
property value over the time period would not improve matters be-
cause of the deviation from the average. If the date of each sale
were known and the sale price adjusted by the average property
value increase up to that time, in the time series, the results
will still be inaccurate, because the individual property being
adjusted may not be represented by the average.

A second method of determining the market value of pro-
perty would be through rigorous appraisal techniques. This method
alleviates the researcher from being restricted in his choice of
a sample, as he may choose not only those properties which sold, but
also properties which did not sell. If, however, as Corbert suggests,
sold and unsold properties constitute two separate populations, then
the sample is being chosen from two populations and inferences cannot
be made of the total assessment roll.

Further problems arise in that assessments to determine
market value is to some degree dependant upon subjective judgements
by the appraisers. Two appraisers will often predict two different
market values for the same property, of which both may be wrong. If
this method was chosen, then the reliability of the researchers'

statistics is based on the fact that his appraisals are more accurate

then the city appraisers'. The researchers' appraisals must not only

be more accurate than the city appraisers but they must also be the

market value.

Finally, this method of determining market value becomes

much more time consuming then does the selection of selling price.

The market value indicator chosen for this study is an ad-

justed sales price.[8] Reasons for eliminating or adjusting sales prices

are discussed in the following chapter. The statistical analysis

presented will be subject to the limitations as stated above.

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8 Sales during the 9 mo. period between Jan. 1 and Sept. 31st, 1971 were considered in the sampling. The change in market price during this period was an average of 3.98%. This average was determined in the following manner; Gross Sales in Jan. 1971 recorded by the Multiple Listing Service of the Real Estate Board of Greater Vancouver was divided by the number of properties sold during that month.

gross sales	23,399,080
no. of properties sold	860
average price per property	$26,049

The cumulative gross sales figure from Jan. 1st to Sept. 31st, 1971 was divided by the cumulative property sold figures to obtain an average sales price of:

cumulative gross sales	203,511,374
no. of properties sold	7,813
average price per property	$26,047

This represented an average price increase over the 9 month period of 26,047 - 25,049 = 998 or 3.98%. The following table summarizes the price changes during the 9 month period.

8

Month	average price per property for the month	% increase or decrease from the previous mo.	cumulative av. price per property.	av. increase or decrease from January
Jan.	25,049	---------	25,049	------------
Feb.	23,861	(D) 4.74%	24,321	(D) 2.90
Mar.	25,006	(I) 4.80	24,609	(D) 1.76
Apr.	26,747	(I) 6.96	25,222	(I) .69
May	26,745	0	25,568	(I) 2.07
June	25,597	(D) 4.29	25,574	(I) 2.09
July	26,771	(I) 4.59	25,770	(I) 2.87
Aug.	26,556	(D) .80	25,875	(I) 3.30
Sept.	27,440	(I) 3.33	26,047	(I) 3.98

(I) = Increase
(D) = Decrease

Because market prices of property fluctuated during this period the assessment/market value ratio would vary according to the sample of properties taken from any particular month. It should be stressed again at this point that because these price increases and decreases are averages, changing the selling prices by the average will not necessarily result in more accurate statistical tabulations. The price per property is the average of all the properties in all the different land uses, therefore, there may be no relationship between the price change of a particular property in a land use category to the average change of all the properties in all the land use categories.

D. PROCEDURE IN DEVELOPEMENT OF THESIS

Chapter II discusses the data collection procedure and the assessors method of determining market value, assessed value, taxable assessed value, and gross taxes.

Chapter III investigates the rational for property exemptions as well as identifying the magnitude of its relief. Also presented in this chapter is an explanation and examples of the consequence of the Provincial Governments' imposed five, and ten per centum rules as stated in the Assessment Equalization Act.[9]

Chapter IV compares the assessment equality between municipalities, land use categoriés and price categories of residential property. The measures employed in the ascertaining of the degree of assessment equality are the mean and median.

Chapter V determines the degree of assessment uniformity within municipalities and land uses. The primary measures employed for this determination are; coefficient of dispersion, coefficient of variation, regression analysis and the proportion of properties within a $\pm$ percentage from the median assessment-sales ratios.

Chapter VI describes the burden of taxation upon property owners and discusses the equality between Municipalities, land uses and price categories. The measures employed are the mean and median.

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9 Assessment Equalization Act. Revised Statutes of B. C. (Victoria: Queens Printer, 1960) (5% rule was introduced in 1953 and the 10% rule in 1971)

Chapter VII summarizes the findings and presents hypotheses describing why the conclusions were as found.

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CHAPTER II

METHODOLOGY AND THE METHOD OF DETERMINING TAXES

A. METHODOLOGY

The basic premise employed in the sampling procedure was to obtain properties which had sold during the period, January 1st - September 31st, 1971, in 8 municipalities located in the greater Vancouver region. The municipalities were as follows: North Vancouver District, Vancouver, Burnaby, Coquitlam, Richmond, Delta, West Vancouver and Surrey.

The sampling was initiated by obtaining the sales of residential property which had sold through the Vancouver Multiple Listings Service. Only transfers involving downpayments of 25% or greater were considered and the selling price was deemed to be the cash value price.[1] This procedure was followed for the following reason:

In theory, the selling price of a property will be greater than the cash value price whenever the purchaser assumes or obtains a mortgage which contains a lower than market value interest rate. The divarication between the two values can be illustrated with the following examples:

Case I	Amount	Mo. Pymt.
Equity	5,000	
1st mortgage (vendor) 25 years @ 7%	15,000	105.0624
Selling Price	20,000	

Current Interest rate for an equivalent mortgage = 9½%.

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1 It is realized that this would produce a biased sample but it was regarded as being more representative of the population then had I arbitrarily assigned interest rates to obtain a cash value.

If the holder of the agreement for sale wished to sell his paper he would receive only $12,201.92 (present value of 105.0624 per month for 25 years discounted at 9 1/2%). Therefore, the cash value of the sale is construed to be:

	Amount	Mo. Pymt.
Equity	5000.00	
Present value of agreement for sale	12201.92	105.06241
Cash Value of Sale	17201.92	

Case II	Amount	Mo. Pymt.
Equity	1000.00	
Standard 1st Mortgage (Institutional Lender) 25 years @ 9 1/2%	15000.00	129.15
2nd mortgage (vendor) 15 years @ 9 1/2%	4000.00	
Selling Price	20000.00	

If the second mortgage was sold to an institutional lender, the vendor would receive $2,883.37 (present value of $41.33 per month for 15 years discounted at 16%). The cash value of the transactions becomes $1000 + $15000 + $2,883.37 = $18,883.37.

There may be a mortgage against the property which the purchaser must assume. This mortgage could have an interest rate which is either advantages or disadvantages to the purchaser. Let us first look at a situation which would be advantageous to the purchaser.

Case III	Amount	Mo. Pymt.
Equity	6,000	
Assumed Standard 1st mortgage 23 yrs. remaining @ 8 1/2% outstanding balance	14,000	114.30
Purchased Price	20,000	

If the purchaser could not obtain a loan with an interest rate under 9 1/2% he is saving 8.98 per month.

14,000 in 23 years @ 9 1/2%   = 123.28/mo.

14,000 in 23 years @ 8 1/2%   = 114.30/mo.

saving   8.98/mo.

The cash value of the transaction becomes: 6,000 + 12,979.85 (present value of 114.30) month for 23 years @ 9 1/2% = 18,979.85 [2]

Case IV Purchaser assumes unfavourable financing

	Amount	Mo. Pymt.
Equity	6,000	
Assumed 1st mortgage 23 yrs. remaining @ 10%	14,000	127.86
Purchased Price	20,000	

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2 The cash value will be larger if there is a 5 yr. call clause in the mortgage as the purchaser benefits for the lower interest rate for only 3 yrs. Present value of 114.30/mo. at 9 1/2% for 3 yrs. equals 3,577.73. Outstanding balance at the end of the 3 yrs. equals 13,440. Present value of 13,440 discounted at 9 1/2% is 10,173.61. The present worth of the mortgage is 10,173.61 + 3,577.73 = 13,751.34 and the cash value becomes 6,000 + 13,751.34 = 19,751.34

The 14,000 mortgage if bonused at 9 1/2% has a present value
of $14,519.73. The cash value of the transaction becomes 6,000 + 14,519.73
= 20,519.73. [3]

The figure required in this thesis to evaluate assessment
uniformity and equality is the market value which is defined as the price
paid by a willing buyer to a willing seller at arms length transaction
with neither party being under any duress and the transfer being financed
under normal market conditions. In actual practice, when the downpayment
of the transfer is less than 25% the purchaser will pay more for the
property if he has received beneficial financing thereby equating
cash value and market value and when the downpayment is greater than 25%
the purchaser will not usually pay the higher price thereby equating
selling price and market value.

If transfers with downpayments of less than 25% were considered,
then the cash value price would have to be determined by the ascertation
of a suitable interest rate which should be charged for the mortgage.
Ascertaining the correct interest rate becomes too laborious as it is a
function of not only the loan-to-value ratio, but other factors such as
the age of the improvements, the gross and net income generating ability
of improvements, the type of improvements, the location of the property,
the credit rating and income of the borrower and the amortization period.
Without physically examining every property and knowing the circumstance
of every borrowing transaction the assignment of a market interest rate to

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3 This figure would be lower if there is a five year call
clause in the mortgage.

each transaction becomes a highly subjective matter.

The July issue of the appraisal briefs states:

> "obtaining a cash value accurately in
> every instance is near impossible be-
> cause so many of these transactions
> involve income tax considerations,
> trades and intricate negotiations
> only known to the principles". [4]

Once having obtained the selling price or market value of a

particular property, the congruent assessments and taxes were obtained

from the appropriate municipality.

Vacant land sales were collected from the municipalities of

Surrey and Delta. These sales were obtained from A.C. 3 forms [5] and

transfers which involved downpayments of less than 25% were eliminated

as well as those noted in the footnote.

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4 Appraisal briefs, Weekly Newsletter of the Society of Real
Estate Appraisers. (Chicago: July 5, 1972) P. 1.

5 A.C. 3 forms are prepared by the Provincial Assessment
Commissions and contain the following information: legal description
of property, land use, date of sale, and selling price. The office of
the Assessment Commissioner edits out the following types of transfers,
those "a) agreed upon some time prior to the year in which they were re-
corded; b) involving unusal financial provisions; c) of partially finished
improvements; d) those including personal property, the value of which can-
not be separated from the total consideration; e) involving trades; f) be-
tween relatives or associated corporations; g) under financial duress; h)
to any church, lodge, school or charitable, benevolent, fraternal or gov-
ernment organization; i) on which the value stated is an opinion rather
than an actual exchange price; j) the circumstances of which are unusual and
as a result render the transaction useless for sales analysis." Appraisal
Manual. Province of B.C. (Victoria: Queens Printer, 1953) pp. A-4 and A-7.

The congruent assessments and taxes were then obtained for the vacant
land properties.

The Industrial, Commercial and Income [6] property sales were
obtained from an unpublished essay written at U.B.C.[7] The sales prices
for I.C.I. were abstracted from Teela[8] at what was deemed to be a 50%
sample of the I.C.I. property which had sold between Janauary 1 to
September 31, 1970. Only sales in Vancouver were recorded as a total of
other municipalities would not have generated a significantly large
enough sample. Once registering the sales prices it was necessary to
determine, by physical examination, the land use classification attri-
butable to each property.

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6 Herein referred to as I.C.I.

7 Tyke Babalos, Greg Carros, Daniel Doran, David Greenwood,
David Lack, Wayne Tomko. "Empiracel Study of Mortgage Financing in the
City of Vancouver." (U.B.C. Faculty of Commerce and Business Administration
April 1972)

8 Teela is a publication prepared by Teela Market Surveys
listing all the realty sales transactions in a locality. The information
provided is as follows: date of sale; addresses and names of purchaser and
vender; selling price; legal and civic address of the sold property;
mortgage amount, terms, interest rate, date, and monthly payment; and
mortgagee and mortgagor.

The land use classifications of I.C.I. property were as follows: conversions; apartment; retail; office and induatrial.[9] Due to the limited number of I.C.I. sales transactions, transfers involving down-payments of 25% or less were not eliminated from the sample. The financing of the transfers was obtained from the land registry office and any financing arrangements which deviated from the normal method was investigated and transformed to a cash value deemed to be appropriate from the available information.[10]

9 The definitions of land uses as employed herein are as follows: "residential" - to include those uses of improvements which house one or two family units; "vacant land" - to include land which is void of improvements; "apartment" - to include improvements housing multiple family units (greater than 10 units); "conversions" - improvements which have been converted from a single family dwelling unit to a multiple-family dwelling unit (containing between 6 - 15 families); "retail" - to include improvements used for the provision of consumer goods such as bakeries, department stores, grocery stores, milliners, and the like together with service uses not included in the definition of offices such as dry cleaners, hairdressers, and service stations; "office" - to include improvements used for clerical, professional, consultative, data processing, financial and similar activities not included in retial; "industrial" - to include improvements used for a manufacturing, warehousing, repairing, etc. nature. Where multiple uses were prevalent the property was classified under the category which was its primary use.

10 From the 338 samples obtained of I.C.I. property, 220 were not investigated because of the 25% rule. Of the remaining 118, 47 were allotted a cash value which was a more appropriate value figure than the selling price.

Once having determined the market values of the properties

their respective assessments and taxes were recorded from the Vancouver

City Halls' records.

A list of the sample size obtained is outlined in Table II.

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TABLE II

SAMPLE SIZE BY MUNICIPALITY, BY LAND USE, BY PRICE CATEGORY

MUNICIPALITY	LAND USE	PRICE CATEGORY *					
		LOW		MEDIUM	HIGH		TOTAL
		Number	Price Below which 1/3 of sample fell	Number	Number	Price Above which 1/3 of sample fell	Number
Burnaby	residential	41	($23,400)	42	42	($28,900)	125
Coquitlam	residential	40	($25,500)	48	45	($31,500)	133
Delta	residential	32	($22,900)	35	33	($27,933)	100
	vacant land						107
Surrey	residential	42	($16,900)	44	46	($20,500)	132
	vacant land						123
Vancouver	residential	65	($19,067)	65	65	($23,767)	195
	office						32
	apartment						93
	industrial						49
	retail						142
	conversions						22
Richmond	residential	21	($21,900)	19	25	($26,000)	65
West Vancouver	residential	51	($35,500)	52	54	($45,000)	157
North Vanc. District	residential	49	($30,767)	49	49	($35,467)	147

* The sample of residential property was divided into 1/3's by price for each municipality. The price in the low column is the figure below which 1/3 of the properties were priced. The price in the high column is the figure above which 1/3 of the properties were priced. The remaining 1/3 were priced either at, or between those values.

Tabulations were also performed for the residential property uses of all the municipalities. The sample sizes of all the residential property of all the municipalities by price range, is illustrated in Table III

TABLE III

SAMPLE OF ALL RESIDENTIAL PROPERTY BY

PRICE CATEGORY

Price Category	- 0-19,999	20,000 24,999,	25,000 29,999,	30,000 34,999,	greater than 34,999,	Total
Sample Number	226	241	205	159	223	1054

When collecting the tax information, it was necessary to make a distinction between gross and net taxes. Gross taxes included charges for general municipal purposes, school and hospital purposes, pavement, water service, municipal finance authority levy , street light installation and community building. Net taxes were determined by the taxes actually payable by the owner. Where the owner is also the resident of the property a $170[11] maximum grant is given to the owner by the provincial government which is deducted from the Gross Taxes payable. Since the purpose of the purchase of a residential home could not be determined (eg. whether it was for owner-occupancy or rental) the $170 grant was deducted from all residential land-uses.

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11 In early 1972 this grant was increased from $170 to $185 and where the owner-occupier is over the age of 65 another $50 grant is given.

If the land use was other than residential and the previous owner received the $170 homeowners grant, because he was living on the premises, it was deemed that the new owner would also live on the premises and therefore receive the grant. If the land use was such that no homeowners grant was applicable the net and gross taxes were equivalent.

B. BRITISH COLUMBIAS' REAL PROPERTY TAX SYSTEM

Relevant features of British Columbias' present real property tax system are: the determination of market value or equivalent actual value, assessed value, taxable assessed value, exemptions and taxes.

1. Market Value or Actual Value

The Assessment Equalization Act, Municipal Act, Public Schools Act, and Taxation Act prescribe the assessor to determine the actual value of land and improvements.

> "In determining the actual value, the Assessor
> may give consideration to present use, location,
> original cost, cost of replacement, revenue or
> rental value, and the price that such land and
> improvements might reasonably be expected to bring
> if offered for sale in the open market by a
> solvent owner and any other circumstances affecting
> the value.

Municipal assessors are provided with an assessment manual which they may use when determining the value of improvements. If the assessment manual is used in determining the market value of an improvement the following procedure is followed:

a) The assessor refers to the specific land use category of the improvements.

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12 Assessment Equalization Act, Province of British Columbia (Victoria: Queens Printer, 1953), Chapter 18, Part IX, Section 37, Subsection 1.

b) Within the land use category the improvements is then classified into its architectural group.

c) The improvement is then further classified into the number of stories.

d) The final classification of the improvement is into a particular class.

Once the assessor narrows the classification of his subject improvement to a specific class, a base value is assigned to it.[13] Additions to, or subtractions from, this base value may arise due to such contigencies as the type of masonary, the electrical wiring, the insulation used; the amount of physical and functional depreciation; and the size and quality of the basement rooms.[14]

The assessor usually determines the value of the land by the market approach. A limiting factor in the setting of these values however, are the five and ten per centum rules which are defined and explained in Chapter III.

2. Assessed Value

From the determined market value of land and improvements the assessor assigns an assessed value figure. The assessed value for school and hospital purposes must be 50% of the calculated market value.[15]

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13 A per square foot value is predetermined every year which is a function of the cost of labor and material. Since this is a provcial average, local assessors may adjust these costs to correspond with their own locality.

14 Examples of classes in land use categories are provided in Appendix A.

15 Assessment Equalization Act. op. cit. Chap. 18 Part IX, Sec. 37, Subsec. 3 states "the assessed value of land & improvements for the purpose of real-property taxation under the Public Schools Act shall be 50 per centum of the value of land and 50 per centum of the value of improvements."

The assessed value for municipal purposes may be either 50% or 100% of the calculated market value.[16] Municipalities adopting the assessed value for school purposes as the assessed value for municipal purposes are said to operate on a single roll basis, while municipalities having different assessed values for the two purposes operate on a duel roll basis.

3. Taxable Assessed Value

The final step of the assessor is the calculation of the taxable assessed value for both land and improvements. For school purposes taxable assessed value is 100% of the assessed value of land and 75% of the assessed value of improvements.[17]

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16 Municipal act. Province of British Columbia; (Victoria: Queens Printer, consolidated 1971), Chap. 255, Part IX, Div. 1, Section 330, Subsection 1. "Land and improvements shall be assessed at their actual value" and Chap. 255, Part IX, Div. 1, Sec. 332, subsection 2. "Prior to the thirteenth day of Nov. in any year, the council may by by-law provide that for the purposes of this act the assessed values of land and improvements shall be determined pursuant to the Assessment Equalization Act, 1953."

17 Public Schools Act, Province of British Columbia, (Victoria: Queens Printer, consolidated 1971), Chap. 319, Part 1, Div. 3, Sec. 198, Subsec. 2, "..and every person shall be taxed on the assessed value of his taxable land and 75 per centum of the assessed value of his taxable improvements.

For general purposes taxable assessed value of land is also 100% of its assessed value, but in the case of improvements it may be up to a maximum 75% of the assessed value.[18] A summary of the above rules are elucidated below.

a. Dual Roll - Burnaby, Vancouver and West Vancouver

	Assessed Value (A.V.)	Taxable Assessed Value
General Purposes		
land	100% of market value (M.V.)	100% of A.V. & M.V.
improvements	100% of M.V.	max. 75% of A.V. & M.V.
School and Hospital Purposes		
land	50% of M.V.	100% of A.V. = 50% of M.V.
improvements	50% of M.V.	75% of A.V. = 37½% of M.V.

b. Single Roll - Richmond, Delta, Surrey, Coquitlam and North Vancouver District.[19]

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18 Municipal Act. Op. cit, Chapter 255, Part IX, Section 206, Subsection 3 paragraph (a) "The rates authorized by this section...shall be levied upon the full assessed value of land and not more than seventy-five per centum of the assessed value of improvements.

19 North Vancouver District converted to a dual roll system for the 1972 assessment year.

	Assessed Value (A.V.)	Taxable Assessed Value
General, School & Hospital Purposes		
land	50% of M.V.	100% of A.V. = 50% of M.V.
improvements	50% of M.V.	100% of A.V. = 50% of M.V.

4. Taxes

Once having determined the taxable assessed values the municipalities then apply mill rates to these to determine a substantial portion of the Gross taxes.[20] The mill rates are ascertained in the following fashion: 1. General Purposes: the municipality forecasts its revenue requirements for the oncoming year and sets its mill rate at a figure which when multiplied by the total taxable assessed value of non-exempt property will generate enough income to equalize this revenue requirement. The municipalities being studied are, however, restricted to a mill rate which does not exceed fifty.[21]

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20 Usually accounts for between 85 - 95% of the Gross taxes.

21 Municipal Act, op. cit., Chap. 255, Part IV, Sec. 206, Subsection 2. "Except with the approval of the Lieutenant-Governor in Council in respect of a municipality....no rate in excess of the limit prescribed herein for each of the classes of municipalities specified shall be levied....
(a) in a city or district, not exceeding fifty mills
(b) in a town, not exceeding forty mills
(c) in a village not exceeding thirty mills." All the municipalities being studied fall under paragraph (a) classification.

2. School and Hospital Purposes: The provincial government imposes
a levy each year (in 1971 it was 24.1 mills) on the taxable assessed
value for School Purposes, which it redistributes to the school districts.
The municipalities are able to add a limited levy onto this mill rate
to aid in the amortization of its borrowing debts.

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CHAPTER III

FACETS OF BRITISH COLUMBIAS' REAL PROPERTY TAX SYSTEM

This chapter purports to analyze some of the factors which influence the determination of the tax burden upon property owners as well as set forth the need for both assessment uniformity within a municipality and assessment equality between municipalities. The concepts to be discussed which affect the distribution of the tax burden are exemptions and reliefs and the legislated five and ten per centum rules.

A. EXEMPTIONS AND RELIEFS

It is necessary to include a section on exemptions and reliefs as they grossly alter the distribution of the tax burden. Reliefs are the reduction of taxes payable to an amount greater than zero, whereas exemptions are the reduction of taxes payable to zero.[1] Exemptions or reliefs from taxes are granted to land owners for the following reasons: administrative convenience; charitable considerations; equity policy; or to influence a particular land use.

In British Columbia, exemptions or reliefs are either mandatory or at the discretion of the municipality. The principle exemptions or reliefs have been adequately summarized in a Research Report published by the B.C. School Trustees Association from which the following excerpt has been extracted:

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1 Stanley W. Hamilton and Philip H. White, "The Real Property Tax in B.C. - An Analysis", Research Report, (Vancouver: B.C. School Trustees Association, 1972), Page 21.

"Mandatory Exemptions and Reliefs

Charitable: Exemption of land and improvements of: public libraries;
                places of religious worship; public hospitals; certain
                private schools of "incorporated institutions of learning";
                elderly citizens homes belonging to non-profit making
                corporations; public cemeteries and, in Vancouver,
                charitable institutions.

Administrative: Exemption of land and improvements of: school boards; the
                taxing municipality's own property; the Crown (both federal
                and provincial).

Equity & Policy: Exempitons of: farm fixtures and machinery; fruit-trees;
                except in Vancouver.
                Reliefs: first $1,500 of assessed value of trade fixtures
                of commercial or industrial undertaking for school purposes;
                the first $1,000 of assessed value of farm land for school
                purposes; first $5,000 of assessed value of farm improve-
                ments (other than dwelling and trade fixtures) except in
                Vancouver; farm land, tree-farm land and residential land
                as noted previously; not less than 25% of assessed value of
                all improvements; the homeowners grant (of $170 in 1971)

Permissive
Exemptions & Reliefs (Except Vancouver which has its own charter)
Charitable: Exemptions of land and improvements of: certain charitable
                organizations used for the relief of the poor, the aged,
                the infirm, the disabled, or as a children's home and
                athletic clubs.

Administrative: Exemption of land and improvements of: the park or
                recreation ground of another municipality; another
                municipality's airport or property used for water purposes.

Equity & Policy: Exemption of land and improvements of historical buildings.
                Reliefs: reduction of the assessed value of the land of
                gold courses and certain cemeteries (general rate only).

                N.B. Permissive exemptions and reliefs are at the discre-
                tion of the municipality. They may grant complete exemption
                or relief of some part of the taxable assessed value."[2]

2 ibid., pp 19 - 20

1. Rationale for Exemption

Taxpayers who are subsidizing others have a right to know the extent of their subsidy. The amount of the subsidy should be made public in order that the taxpayer has an opportunity to guage the cost against the benefits.

Justification for exemption for charitable consideration rests on the foundation that these institutions provide services which merit public support and as such if not provided by private institutions wouldbe provided and paid for by the governing body. It has been argued,[3] and the author agrees, that direct grant assistance is more logical then assessment exemptions because the cost of the service can be more readily ascertained.

In Canada, the right of exemption of all Federal and Provincial land is guaranteed in the B.N.A. act. There is no logical reason for exempting Crown owned land, however, because the ownership of property by the Crown is not distributed evenly between taxing jurisdictions. For this reason residents in one taxing jurisdiction are required to pay for the services of Crown property which is being used in the interests of the national or provincial population. This unjust consequence has been somewhat remedied in recent years, when the Municipal Grants Act was established in 1951, authorizing the Federal Government to issue grants in lieu of property taxes on some types of properties. This requirement

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3 Ontario Committee On Taxation. op. cit., Page 125.

does not apply to Crown Corporations. The Municipal Grants Act also

established the requirementof the Provincial Government to pay a "grant

in lieu of the real property tax equal to the product of a rate of 15

mills on the estimated taxable assessed value of the property." [4]

There seems to be no justification in exempting Crown

corporations as they are operating in the public interest of the country or

province as a whole. Also, it becomes an advantage to crown corporations

in its competition with private enterprise. The panel of the Ontario

committee on Taxation states that:

> "Provincial and Federal Governments should pay
> grants in lieu of taxes both because they de-
> rive benefits from the local jurisdiction in
> which they are situated and because they are
> engaged in business transactions"[5]

On the surface, the process of a Municipality taxing its own

property seems to engender added paper work for no rational objective.

If, however, the taxing department taxed all municipality departments,

each separate department would then have to consider property taxes as

another cost in its location anlysis, rather than completely ignoring

it as they presently do. The exemption of municipal property leads to a

misuse of land in some areas as the departments make their location

judgement irrespective of taxes. Also, since the School Board is a

separate taxing entity from the municipality andthey provide different

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4 Hamilton and White, op. cit., page 24.

5 Ontario Committee on Taxation, op. cit., page 53.

services the municipality should be required to pay school property taxes and the School Board Municipal taxes.

Because any tax system bears injustly upon some fraction of the population, adjustments are made to compensate for these injustices. In some instances these compensatory adjustments seem to be determined on capricious grounds. Little is known about the incidence of the tax burden or exemption, in some cases, making them completely erroneous. If an adjustment in taxes is deemed necessary, grants should be given to the owners in an effort to equalize the burden as the incidence of grants can be more readily ascertained than the incidence of exemptions.

The exemption on improvements discussed earlier stems from the Henry George[6] philosophy of a single tax, whereby, land only is the tax base. The site value tax rests on the propositions that; 1) land value increases are an unearned increment brought into existance not by anything done by the owner, but by the community at large, and a tax on land does not distort the free market as only the economic rent is being taxed. Taxing improvements results in a disincentive to develope or maintain property. It is said to benefit slums and blighted areas, antiquated buildings on valuable land, and vacant land held idle although there is a demand. I do not propose to discuss the advantages and disadvantages of the site value tax as there are many books and articles describing

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6 Henry George, <u>The Land Question</u>, (New York: Doubleday, Page and Company, 1891).

these facets as well as examples of its use.[7] For my purposes

it is sufficient to mention that exempting improvements requires assessors

to divide the value of the property into two categories; an assessed value

for land and an assessed value for improvements. This becomes a highly

subject problem, and many appraisers acknowledge that the value of a pro-

perty cannot be divided between land and improvements. There are many

instances when the value of the property is greater or less than the total

of the value of the land and the value of the improvements on it.

The Ontario Committee on Taxation summarized its discussion on

exemptions with the following points:

"1. Exemptions narrow the tax base, thereby in-
     creasing the tax load on owners of taxable
     property.

 2. A tax exemption is an indirect subsidy, the
     cost of which is not generally apparent, and
     is subject to less control than a grant, which
     ordinarily is renewable annually. '

 3. Tax exemption may not distribute a government
     subsidy in the most equitable or desirable
     manner.

 4. The proportion of all properties in the com-
     munity that are exempt varies from one mun-
     icipality to another, thereby creating dis-
     proportionate burdens among local communities.

 5. Exemptions are, for the most part, legislated
     by the Province, but their burden falls on
     municipalities or local school boards.

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7 For further information regarding site-value tax refer to: (A)
"The Rating of Site Values." Report of the Committee of Enquiry, (London.:
Her Majesties Stationary Office, 1952). (B) B.H. Cowen, International
Research Committee on Real Estate Taxation, "Municipal Improvements & Finance
as Affected by the Untaxing of Improvements & the Taxation of Urban Land."
Help & Brothers, New York, 1958. (C) Dick Netzer, Economics of the Property
Tax, (Washington: Brookings Institution, 1966)

6. Exemptions, once established, are not readily ter-
   minated, thus they tend to perpetuate community
   wishes of an earlier day. In addition, the range
   and extent of exemptions can grow. well beyond
   justifiable limits."[8]

Grants have the following advantages:

"1. Each request for financial assistance clearly
   establishes its cost to the community.

 2. The assistance made available is flexible in
    amount.

 3. The extent of the subsidy is determined afresh
    each year by the local council.

 4. Municipal aid through grants is exposed to
    public view, item by item and in total.

 5. Grant assistance can be adjusted to each
    changing condition, including reversals of
    public attitudes."[9]

2. Methods of Granting Exemptions and Reliefs.

Relief or exemptions may be initiated at any three instances:

(1) when determining the taxable assessed values; (2) when applying the

mill rate or (3) when determining the taxes payable.

If relief is granted at the first stage, ie. when determining

taxable assessed value, there are three ways in which this can be done:

(1) the taxable assessed value can be set at a particular amount, (2)

taxable assessed value can represent a percentage of the assessed value,

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8 Ontario Committee on Taxation, op. cit., Vol. II P. 126.

9 ibid., Page 163.

or (3) a certain dollar figure can be subtracted in each case. British Columbia employs all three methods in granting reliefs.

The second instance which allows the instigation of reliefs is at the time of the application of the mill rate. The relief may take either of two forms: 1) the mill rate may be set a some fixed amount below the rate applied to the non-exempt properties or 2) the mill rate to be applied to the exempt properties may be a fraction of the mill rate applicable to the non-exempt properties. When granting relief at this stage of the procedure, municipalities in British Columbia generally resort to the first method mentioned.

The final phase of the assessment-taxing procedure suitable for the granting of relief is during the determination of taxes actually payable by a property owner. Relief applied at this stage may be; 1) a fixed amount which is to be subtracted from the gross taxes; 2) a percentage of the gross taxes or 3) a maximum tax above which taxes payable cannot progress beyond. In British Columbia the primary method of granting relief at this stage is via the first one mentioned.

3. Magnitude of Exemptions

Table IV presents an estimate of the exemptions as a percent of total assessed value[10] for municipal, school and hospital purposes, by municipality, property class and assessment class, for the years 1962, 1966 and 1970.

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10 The assessed value of exempt property was included in the total assessed value figure.

TABLE IV

Exemption as a Percent of Total Assessed Value, General, School   and Hospital Purposes, by Municipality, Property Class and Assessment Class.

1962, 1966, 1970

		Burnaby			Coquitlam			Delta			North Van.			Richmond			Surrey			Vancouver			West Van.			Provincial		
		1962	1966	1970	62	66	70	62	66	70	62	66	70	62	66	70	62	66	70	62	66	70	62	66	70	62	66	70
Exemption																												
Property																												
Fed. Municipal		.6	.6	.5	.1	-	-	3.0	2.6	1.5	2.8	2.5	3.5	2.8	3.4	6.3	.9	.9	1.1	3.6	3.3	2.9	2.0	1.2	1.1	3.2	3.0	2.5
School		.6	.5	.4	.1	-	-	3.2	2.3	1.4	2.6	2.4	3.3	2.5	3.1	5.8	.9	.9	1.2	2.1	3.2	2.7	2.0	1.2	1.2	3.1	2.8	2.4
Provincial	M	3.0	8.0	6.3	42.3	17.5	13.5	6.7	6.7	9.0	4.9	3.5	4.7	4.5	3.8	3.4	11.5	11.5	10.2	1.7	4.3	2.8	3.8	3.7	2.1	4.9	6.2	4.7
	S	2.1	3.1	4.0	39.5	14.4	10.8	.9	.8	1.7	1.5	1.3	1.4	.4	.4	.3	1.6	1.7	1.2	2.6	.9	.9	1.8	1.4	1.4	2.3	1.8	1.8
Municipal	M	6.8	7.0	7.4	2.7	7.0	8.8	2.7	3.4	4.2	7.5	7.2	10.7	4.8	9.3	7.6	4.5	6.8	6.8	7.3	6.0	6.9	5.8	6.0	6.3	7.2	7.4	7.8
	S	6.8	6.5	6.7	2.7	7.0	8.7	2.9	3.1	3.9	7.1	6.8	10.3	4.4	8.5	7.0	4.4	6.5	6.6	12.2	5.7	6.4	5.8	6.1	6.6	6.9	6.8	7.3
Sub Total	M	10.4	15.5	14.2	45.1	24.4	22.3	12.4	12.8	14.7	15.2	13.1	18.9	11.9	16.5	17.3	16.9	19.1	18.1	12.6	13.6	12.5	11.5	10.9	9.6	15.3	16.6	15.0
	S	9.4	10.1	11.2	42.3	21.3	19.5	6.9	6.1	7.0	11.2	10.6	15.1	7.3	11.9	13.1	6.9	9.1	9.0	16.9	9.8	10.0	8.9	9.7	9.2	12.3	11.3	11.5
Non-governmnet	M	1.5	3.9	5.1	.6	.9	1.3	1.6	2.3	1.3	4.9	4.6	.6	1.2	1.5	1.1	2.1	2.6	2.9	3.8	6.1	6.0	.7	.7	.7	3.8	3.9	4.2
	S	1.5	3.9	4.9	.7	1.1	1.3	2.3	2.3	1.5	5.1	4.6	.8	1.7	1.8	1.4	2.8	3.5	3.5	2.5	6.1	5.8	.8	.7	.8	3.2	4.0	3.8
Total	M	11.9	19.4	20.3	45.7	25.4	23.5	14.0	15.0	15.9	20.1	17.7	19.5	13.2	18.0	18.4	19.0	21.7	21.1	16.4	19.7	18.4	12.3	11.5	10.3	19.2	20.5	19.2
	S	11.0	14.0	16.0	43.0	22.4	20.8	9.2	8.7	8.5	16.3	15.2	15.9	9.0	13.7	14.5	9.7	12.6	12.5	19.4	15.9	15.8	9.7	9.4	9.9	15.5	15.3	15.3
Others	M	18.5	13.6	12.8	10.7	15.2	14.2	10.5	14.6	14.2	33.9	35.4	12.8	16.1	15.4	15.4	14.4	14.5	15.6	31.5	26.7	12.2	13.8	14.9	14.0	24.4	21.8	14.1
	S	15.0	14.6	13.8	10.4	14.8	14.3	15.0	16.2	15.8	15.2	15.5	13.5	16.5	16.1	15.6	15.7	16.7	16.2	16.7	14.0	12.9	13.4	14.5	14.4	15.8	15.7	15.3
Grand Total	M	30.4	33.0	32.1	57.3	40.6	37.7	24.5	29.6	30.1	54.0	53.1	32.2	29.3	33.4	33.8	33.4	36.2	36.6	47.9	46.4	30.6	26.0	25.4	24.3	42.5	42.3	33.9
	S	26.0	28.6	29.8	53.3	37.2	35.1	24.3	24.9	24.3	31.5	30.7	29.3	25.5	29.8	30.2	24.4	28.2	28.7	36.1	29.9	28.7	23.2	23.9	24.4	31.3	31.1	30.6
Assessment Class wholly exempt																												
Land	M	6.3	6.7	7.9	1.9	3.0	4.1	2.0	2.2	3.6	7.4	7.0	10.3	2.9	4.3	5.5	2.7	2.4	2.3	5.1	5.7	7.2	5.7	4.6	5.0	4.1	4.4	5.9
	S	5.7	5.7	6.7	1.8	2.9	4.0	2.3	2.1	3.2	6.9	6.5	9.5	2.9	4.1	5.0	2.3	2.4	2.3	2.2	5.3	6.4	5.7	4.6	5.2	3.9	4.1	4.8
Improvements	M	5.5	12.6	11.5	43.8	22.4	19.4	12.0	12.8	12.4	12.7	10.8	9.3	10.3	13.7	12.9	16.3	19.3	18.8	11.3	14.0	11.3	6.6	6.9	5.3	15.1	16.1	13.3
	S	5.3	8.3	9.4	41.2	19.5	16.9	6.9	6.6	5.3	9.4	8.7	6.3	6.1	9.6	9.5	7.4	10.1	10.3	17.3	10.7	9.3	4.1	4.9	4.7	11.6	11.3	10.5
Other Exemptions Improvements	M	18.5	13.6	12.8	10.7	15.2	14.2	10.5	14.6	14.2	33.9	35.4	12.8	16.1	15.4	15.4	14.4	14.5	15.6	31.5	26.7	12.1	13.8	14.9	14.0	24.4	21.8	14.7
	S	15.0	14.6	13.8	10.4	14.8	14.3	15.1	16.2	15.8	15.2	15.5	13.5	16.4	16.1	15.6	15.7	15.7	16.2	16.7	14.0	12.9	13.4	14.5	14.4	15.8	15.7	15.3
Total	M	30.4	33.0	32.1	57.3	40.6	37.7	24.5	29.6	30.1	54.0	53.1	32.3	29.2	33.4	33.8	33.4	36.2	36.6	48.0	46.4	30.6	26.0	26.5	24.3	42.5	42.3	33.9
	S	26.0	28.6	29.8	53.3	37.2	35.1	24.3	24.9	24.4	31.5	30.7	29.3	25.6	29.8	30.2	24.5	28.2	28.8	36.1	30.0	28.7	23.2	23.9	24.4	31.3	31.1	30.6

Municipal Statistics. Province of British Columbia, Queens Printer.   Victoria, 1962, 1966, 1970.

It should be mentioned that these percentages are for exemptions and as

such do not include grants provided via reliefs. Figures of grants pro-

vided via reliefs were not obtained, but they do represent a substantial

percentage of total assessed value. The major forms of relief are; 1)

twenty-five percent reduction of the assessed value of improvements when

determining the taxable assessed value for school and hospital purposes

and a minimum twenty-five percent reduction when determining the taxable

assessed value for general purposes; 2) the home owners grant of $170

which was applicable in 1971 and 3) special assessments on farms and

residents. Under the Assessment Equalization Act and the Municipal Act

farm land is to be assessed at a value which is equal to its value as

farm land rather than a value which may be determinable from another use.[11]

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11 Municipal Act, op. cit., Chapter 255, Part IX, Div. 1,
Sec. 332, Subsection 4. "....Land classified by the Assessor as farm land
while so classified shall be assessed at the value which the same has for
such purpose without regard to its value for other purposes."

Assessment Equalization Act, op. cit., Chapter 18, Part IX,
Section 37, Subsection 5, Clause D. "Lands classified as 'farm land'
in a muncipal corporation or rural area shall, while so classified,
be assessed at the value which the same have for such purposes without
regard to their value for any other purpose or purposes...."

Farm land may have a market value considerably above its value as farm

land because of its potential as a development site for commercial or

residential use. Owners of residential property may receive relief if

they were owner-occupiers a minimum of five years previous to 1964, for

the Assessment Equalization Act states that such properties shall be

valued with consideration given only to its persent residential land

use.[12] The market value of the residential property may exceed its

value as determined by residential property or land use because of the

potential use of the site as a commercial, industrial or apartment

location. The special assessments to residential property applies

only to school purposes while the special assessments to farm land

applies to both school and municipal purposes.

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12 Assessment Equalization Act, op. cit., Chapter 18, Part
IX, Section 37, Subsection 6, Clause C. "Where the assessor received
on or before the first day of November from the owner and occupier of
land and improvements, notice in such form as the Assessment
Commissioner shall prescribe that the land and improvements thereon
were owned and occupied by the applicant as his principle place of
residence for not less than five consecutive years prior to the
first day of January, 1964, then actual value of the residential
land shall, for the purpose of the assessment role for the succeeding
year, be determined....with consideration given only to the present
residential use of the land and without any consideration that the
residential land may have a higher actual value for an alternative
use or uses or is zoned for an alternative use."

In examining Table IV it can be noticed that the total exemptions as a percent of assessments for the province in 1970 was 33.93% for municipal purposes and 30.63% for school and hospital purposes. The percentage for school and hospital was relatively consistent with the 1962 and 1966 percentages, but for municipal purposes the percentage dropped by 20.20% from the 1962 figure. This decline was a result of the drop by 39.23% in the other property classification and 39.23% drop in the improvement other exemption assessment classifications. The remaining percentages are relatively consistent between 1962 and 1970.

Again, referring to Table IV we find that the percentage for the individual municipalities vary widely between themselves and from the provincial figures. Exemptions for municipal purposes of federal property as a percent of total assessed value amounts to 6.33 in Richmond and .00 in Coquitlam, while exemptions for municipal purposes of provincial property ranges from 13.47% in Coquitlam to 2.12% in West Vancouver. Unless grants by these governments in lieu of taxes reasonably approximate the taxes, then undue burdens are falling upon the taxpayers of the municipalities which have a higher percentage of government property relative to total assessments than the provincial percentage while those municipalities with a lower percent than the province have taxpayers which benefit.

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B. UNIFORMITY AND EQUALITY OF ASSESSMENTS

Uniformity of assessments implies that the assessments of properties within a muncipal jurisdiction are a uniform percentage of their market value. This is an essential requisite if the burden of taxation is to be proportionally distributed as is laid down in the Municipal and Public School Acts.

Equalization of assessments implies that the average assessment-market value ratios of municipalites be equal. This requirement would not be necessary if school districts did not over-lap municipalities[13] and subsides to municipalities and school boards did not exist. Revenue for the school districts is obtained by applying a uniform mill rate (24.1) to all the properties within its area. Suppose a school district contained three municipalities (A,B,C) with average assessed value market value ratios of 50,47 and 45% respectively. Because the average ratios are not equal while the same mill rate is applied to all the municipalities, municipality A is, on the average, contributing a greater share to the school district than either muncipality B or C.

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13 A map of school district is provided in Appendix B.

It is evident then, that, if mill rates are applied equally, equality

of assessments must also be maintained to ensure an equal distribution

of the taxation burden.[14]

If the assessments within municipalities are uniform and the

average assessment-sales ratios of the municipalities are the same then

it is axiomatic that equality between municipalities exists. Equality

of assessments betwen municipalites does not insure uniformity of

assessments within municipalities, however, as the equality of assessments

is measured only by the average assessment market value ratios

from which individual assessments may vary considerably.

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14 Equal assessments does not in itself ensure an equal burden of
the taxation between municipalities because of the legislation restricting
the taxable assessed value of improvements to 75% of its assessed value.
A municipality which assigns a different land improvement ratio to its
property than other municipalities will also have a different tax burden
than the others. For example, suppose there are two municipalities (A & B)
each with a total assessed value for property of 25million and an assess-
ment sales ratio of 50%. If a mill rate of 25 was applied at this stage
then each would have an equal tax burden of $625,000. Also assume that
the 25 million assessed value was divided between land and improvements
in the following proportions, municipality A, land = 5M, improvements
= 20M. Municipality B land = 20M, improvements = 5M. The taxable
assessed value for the municipalities becomes:

$$\begin{array}{lll}
\text{Municipality A} & 5 \text{ X } 100\% & = \quad 5M \\
& 20 \text{ X } 75\% & = \underline{15M} \\
& & \quad 20M \\
\text{Municipality B} & 20 \text{ X } 100\% & = 20M \\
& 5 \text{ X } 75\% & = \underline{3.75M} \\
& & \quad 23.75M
\end{array}$$

When a mill rate of 25 is applied to the taxable assessed values,Municipality
A pays (20 X 25) $500,000 and Municipality B pays $593.750.

C. FIVE AND TEN PER CENTUM RULES

The 'five per centum rule'[15] was initiated by the British

Columbia Government in the amendment of 1968 to the Assessment

Equalization Act of 1953 for the purpose of equalizing assessments

(for school and hospital purposes) between municipalities located

within the same school district. The 'ten per centum rule'[16] was

legislated by the British Columbia Government in an act passed in 1971

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15 Assessment Equalization Act. op. cit., Chapter 18, part III, Section 8 (a), Subsection (1). "The total assessed value of all land and improvements in a school district shall not be increased in any year by more than 5% of the total assessed value of all land and improvements in that school district in the preceding year, but, in determining the extent of any such increase, there shall be excluded any increase in assessed value which is attributable to a change in the physical characteristics of land or improvements or to new construction or development thereon."

16 Bill #22. British Columbia Government, (Victoria: Queens Printer, 1971. An act to amend the Assessment Equalization Act). Chap. 18, Part III, Section 37A, Subsection 1. "the assessed value of land or improvements shall not be increased in any one year by more than ten per centum of the assessed value of land or improvements in the preceeding year unless the increase is attributable to a change in the physical characteristics of the land or the improvements, or to new construction or development thereto, thereon, or therein, or results from a reassessment ordered by the Commissioner under Subsection (2) of Section 9.

to amend the Assessment Equalization Act "for the purpose of being able
to forecast more accurately the revenue proceeds to be distributed to the
school boards."[17]

1. Effects of the Five Per Centum Rule

The 5% rule has led to a situation whereby the assessment
market value ratio of properties is below the legislated 50% ratio.
Uniformity of assessments can still be maintained, however, but the
process becomes supererogatory. The following example will illustrate
the procedure to ensure uniformity and its ramifications if not followed.
Suppose that in municipality X the 1970 total taxable assessed value of
property equalled 25 million and the mill rate for school and hospital
purposes was 30, producing a revenue of $750.000. (25M x 30 mills). By
1971, property values and revenue requirements have both increased by 10%.
The 5% rule would restrict the assessment roll increase to 1.25 million
instead of the 2.5 million increase which actually occurred. In order
to raise the required revenue of $825,000 (750,00 + 75,000) the mill
rate must be increased to 31.429 from its 1970 level of 30. (26.25 M
x 31.429 = 825.000).

Complicating factors arise, however, when property values in-
crease at discrepant rates. To simplify this phenomenon I shall consider
only two land use classifications (A & B) which have differing value
increases. Referring back to municipality X, suppose the total taxable

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17 Discussion session with the Provincial Assessment Commissioner.

assessed value was divided between land uses class A and class B in the following fashion:

          class A   =   15,000 million
          class B   =   10,000 million

Taxes paid by class A equals 450,000 (15.M x 30) which represents 60% of the total (450,000/750,000) and taxes paid by class B equals 300,000 (10M x 30) which represents 40% of the total (300,000/ 750,000). If the 10% increase in total taxable assessments for 1972 was due to a 2.5 million increase in class A (representing a 16.67% increase) and a 0 increase in class B, then the assessments and taxes without the 5% rule would be as illustrated in Table V.

TABLE V

PERCENT OF TOTAL TAXES EACH PROPERTY CLASS PAYS WITHOUT

THE FIVE PER CENTUM RULE

	Class A	Class B	Total
Taxable Assessed Value	17.50 million	10 million	27.50 million
mill rate	30	30	30
revenue	525,000	300,000	825,000
Percent of Total	63.64	36.36	100

Since the 5% rule prohibits the increase of total assessment by 10%, the following calculations must be executed to ensure equity between the two classes:

1) the percentage of the total taxes for which each class would be responsible had the 5% rule not been in force must be determined. (Class A = 63.64%; Class B = 36.36%)

2) increase the total assessed value by the 5% maximum (25M + 1.25M =
26.25MO.

3) total revenue required is $825,000 of which class A is responsible for
63.64% or $525,000 and class B is responsible for 36.36% or $300.00.
The mill rate which when multiplied by the taxable assessed value of
26.26 million yields a product of 825,000 is 31.429.

4) the assessed value of class A becomes 525,000/31.429 = 16.704Mand
the assessed value of class B becomes 300,000/31.429 = 9.545M.

The complexities and prohibitiveness of the calculations
becomes apparent when it is realized that in reality there is amulti-
tude of land uses each with subclasses and individual properties within
the subclasses which have varying degrees of value increase.

If the above calculations were not performed then ununiformity
such as those illustrated below would prevail.

TABLE VI

PERCENT OF TOTAL TAXES EACH PROPERTY CLASS PAYS WITH

THE FIVE PER CENTUM RULE

	Class A	Class B	Total
Taxable Assessed Value	16.25M	10M	26.25M
mill rate	31.429	31.429	31.429
revenue	510,710	314,290	825,000
Percent of total	61.90	38.10	100

In Table VI the 1971 total taxable assessed value has been increased by the 5% maximum. The increase of 1.25 million was attributed to class A (it actually increased 2.5 M) and it represents an 8.33% increase in class A's assessments. Because of the incongruence between the actual increase, class A pays only 61.90% of the total taxes instead of its equitable portion of 63.64%. Class B becomes riddled with an extra burden amounting to 4.785% (1.74/36.36).

The 5% rule: (1) results in ununiformity of assessments; (2) increases administrative costs; (3) confuses the taxpayer in his efforts to determine what his share of the tax burden should be and (4) causes unequal average assessment-market value ratios between municipalities.

2. Effects of the "Ten Per Centum Rule"

The "10% rule," which was introduced in 1971, will add complications to the finding of a seemingly already insoluable solution to the manifestatious results of the "five per centum rule". If we refer back to the prescribed solution obtained under the "five per centum rule" it is discovered that the increase in assessed value class A equals 11.135% (1.25/15.00). Since the "ten per centum rule" prohibits such an increase, a new solution must be found. Table VII summarizes and equitable solution when both the five and ten per centum rules are observed.

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TABLE VII

EQUITABLE SOLUTION WHEN FIVE AND TEN PER CENTUM RULES ARE

APPLIED

	Class A	Class B	Total
Taxable assessed Value*	16.39M	9.36M	25.75
mill rate	32.039	32.039	32.039
revenue (nearest ,000)	525,000	300,000	825,000
Percent of Total	63.64	36.36	

* Total taxable assessed value is increased by 3%.

The longer these rules are in force, the larger will be the discrepencies caused by them. The "five per centum rule" does not help engender assessment equalization between municipalities because the municipalities experiencing the greatest property value increases are restricted the most in their assessment increases. The need for assessment equalization was dilated upon in the previous section of this thesis but stated briefly here, since a 24.1 mill rate is uniformily applied to the assessments, for school purposes, on all properties then the residents of the municipalities with the largest average property value increases over five percent will pay proportionally less school taxes then the residents of the other municipalities within the same school district, yet they are receiving equal benefits.

The "ten per centum rule", although it may enhance the School Boards revenue forecasting ability, results in two consequences; 1) it acts as an added catalyst to the "five per centum rule" in encouraging

assessment inequality between municipalities and 2) it ensures the lack

of, or decreases the degree of assessment uniformity within municipalities.

The owners of property which value is increasing the greatest in a munici-

pality will benefit the most, by paying proportionally less taxes, because

the same mill rate is applied to the assessments for general purposes to

all properties in the municipality yet they receive the same benefits. It

is hoped that the Provincial Government weighted the benefits of the in-

creased revenue forecasting ability of the School Board against the social

injustice of the assessment ununiformity and inequality which it causes.

White and Hamilton surmised that the purpose of the "five and

ten per centum rules" may have been:

> "to provide relief to certain classes of owner
> whose property is increasing rapidly in value,
> but whose current income out of which taxes
> have to be paid is not increasing to the
> same extent."[18]

They continue the above statement with the following remark:

> "If this is the situtation, there are a number
> of less clumsy and more equitable ways (then
> the "five and ten per centum rules") of
> achieving the desired results."[19]

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18 Hamilton and White, op, cit., Page. 9.

19 ibid., Page 9.

CHAPTER IV

EQUALITY OF ASSESSMENTS

As was discussed in the previous chapter, one of the requirements
of the municipalities and the Provincial Assessment Commissioner is to
assess properties at an equal proportion of their market value. This
chapter pruports to compare the assessment equality between municipalities,
land use categories and price categories of residential property for if
inequalities do exist between categories and/or municipalities, then,
because the same mill rate is applied to all the properties within the
same municipalities and to all properties of different municipalities
for school purposes an unequal burden of taxation will result due to
these inaccuracte assessments. It is necessary to study assessments in
the first instance rather than taxes payable because the inequalities of
the tax burden resulting from inaccurate assessments will not be apparent
when studying taxes payable as a percent of market value due to two
factors; 1) the homeowners grant and 2) the extra charges added onto some
properties for additional services received.

The mean and median of the assessment-sales ratios for each of the
categories studied have been employed as the measures to ascertain the
degree of assessment equality.[1] The mean is the average of a group of
scores while the median is the middle score of a ranked listing.

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1 definitions and formulas for the measures of central tendency
and the dispersion from the central measure have been included in Appendix
C.

In determining assessment equality between municipalities, land use cate-

gories and price categories the average score is of greatest relevance,

and as such, the results produced by the mean will be deemed the most

significant.

A. EQUALITY OF ASSESSMENT BETWEEN MUNICIPALITIES

Since the Provincial Government requires that a fixed mill

rate be charged, to the assessment for school purposes on all proper-

ties, than those municipalities having the highest average assessment-

sales ratios are contributing proportionally more than municipalities

with a lower ratio and are receiving only proportional[2] benefits.

The means and medians of the assessment-sales ratios for the municip-

alities being studied are recorded in Table VIII.

TABLE VIII

MEANS AND MEDIANS OF THE ASSESSMENT-SALES

RATIOS FOR THE MUNICIPALITIES*

Municipality from lowest to highest mean	Mean	Municipality from lowest to highest median	Median
1. Surrey	29.69	1. Surrey	29.79
2. Delta	29.84	2. Vancouver	30.59
3. West Vancouver	30.13	3. West Vancouver	30.64
4. Vancouver	30.40	4. Richmond	30.98
5. Richmond	31.08	5. North Vancouver District	31.95
6. North Vancouver District	31.84	6. Delta	32.27
7. Coquitlam	32.16	7. Coquitlam	32.36
8. Burnaby	33.00	8. Burnaby	33.09

* field study - School purpose assessments were employed in the calculations.

2 The collected revenue is redistributed to the school districts on a per student basis.

If all the municipalities above represented one school district then, on an average, the residents of Surrey would pay proportionally (to market value) less in school taxes than the residents of the other municipalities and the residents of Burnaby would be paying proportionally more than the residents of any other municipality towards the school district, yet, they would be receiving equal benefits.

TABLE IX

PERCENT DIFFERENCE BETWEEN SURREYS' MEAN AND THE MEAN

OF OTHER MUNICIPALITIES

Municipality	Percent From Surrey's Mean
1. Surrey	0 (base)
2. Delta	.505%
3. West Vancouver	1.48
4. Vancouver=	2.39
5. Richmond	4.68
6. North Vancouver District	7.38
7. Coquitlam	8.49
8. Burnaby	11.15

Table IX supplies the percent difference between Surrey's mean assessment-sales ratios and the means of the other municipalities. Due to the assessors in Surrey underassessing residential property to a greater degree than the assessors in Burnaby, on an average, the residents of Burnaby are paying 11.15% higher taxes, for school purposes then the residents of Surrey.

B. EQUALITY OF ASSESSMENTS BETWEEN LAND USES

This section will describe the equality of assessments be-
tween land uses employing the mean and median as measures. The means
and medians of the assessment-sales ratios for the land uses are
illustrated in Table X.

TABLE X

MEANS AND MEDIANS OF THE ASSESSMENT-SALES RATIOS

FOR THE LAND USES*

Municipality	Land use in order from lowest to highest mean	Mean	Land use in order from lowest to highest median	Median
Vancouver	conversion	25.50	conversion	24.87
	residential	30.40	residential	30.59
	retail	31.62	restail	30.62
	industrial	32.39	industrial	31.08
	office	33.00	office	34.57
	apartment	33.17	apartment	34.82
Surrey	vacant land	14.48	vacant land	13.67
	residential	29.69	residential	29.79
Delta	vacant land	25.50	vacant land	25.22
	residential	29.84	residential	32.27

* field study - school purpose assessments were employed
in the calculation.

Referring to Table X the order of the land uses is the same
under both the mean and median. The land use with the lowest mean or
median is being underassessed relative to the other land uses while the
one with the highest is being over-assessed. To aid in the description
of the amount of under or over assessment, Table XI decribes the mean

of the means and medians and presents the percent variation of the individual means and medians from the overall mean.

TABLE XI

PERCENT VARIATIONS OF THE LAND USE MEANS AND

MEDIANS FROM THE OVERALL MEAN

Municipality	Land Use	% of Mean from Overall Mean	Land	% of Median from Overall Mean
Vancouver	(mean of means	31.01)	(mean of medians	31.09)
	conversion	-17.79	conversion	±20.00
	residential	± 1.97	residential	- 1.61
	retail	+ 1.97	retail	- 1.70
	industrial	+ 4.45	industrial	- .30
	office	+ 6.49	office	+11.19
	apartment	+ 6.97	apartment	+12.00
Surrey	(mean of mean	22.08)	(mean of median	21.73)
	vacant land	-34.42	vacant land	-37.09
	residential	+34.42	residential	+37.09
Delta	(mean of mean	27.67)	(mean of median	28.75)
	vacant land	- 7.84	vacant land	-12.28
	residential	+ 7.84	residential	+12.28

Although the order of land uses from lowest to highest mean or median is the same under both measures the extent of the deviation of the individual means or medians varies under the different measures. The conversions are assessed at 17.79% below the mean of the means assessments and 20.00% below the mean of the median assessments. Under the mean measure two land uses in Vancouver are below the overall mean but under the median measure four are below the mean of the medians.

The order and deviations as found under the means should be allotted more significance, as it is the average with which we are concerned and not the mid-point.

Employing the mean as the dominate measure we observe from Table XI that

the income type properties in Vancouver are over-assessed relative to

residential land use properties and vacant land in Surrey and Delta are

under-assessed in comparison to residential land. Those types of pro-

perties being over-assessed are paying proportionally higher taxes to

the School District than is their legislated responsiblity.

C. EQUALITY OF ASSESSMENTS BETWEEN DIFFERENT MARKET PRICE CATEGORIES

The question to be answered in this section is; Are different

price categories assessed at the same or at dissimilar percentages of

market value? Inferences made about the inequality of assessments between

price categories cannot be transposed with much validity to conjecture

inferences about the assessment treatment of income categories. The gen-

eralization that an owners' home is representative of his income is invalid

often enough to discredit any assumptions about the owners income derived

from the market value of his home.

The measures employed to determine the degree of equality

between different valued residential properties are the mean and median.

Due to the sample sizes obtained, the price categories for each municipality

were determined such that 1/3 of the properties would be in each of three

price categories. The dollar figures for each price category in each

muncipality is located in Table II.

The means and medians for each 1/3 price category for each of

the municipalities are summarized in Table XII.

TABLE XII

MEANS AND MEDIANS OF ASSESSMENT-SALES RATIOS FOR PRICE CATEGORIES OF

DIFFERENT MUNICIPALITIES*

Municipality	Low 1/3		Middle 1/3		High 1/3	
	Mean	Median	Mean	Median	Mean	Median
Vancouver	30.22	31.01	31.77	29.70	29.23	30.87
Burnaby	32.68	32.34	33.46	33.36	32.86	33.46
Coquitlam	31.48	33.01	33.27	32.78	31.58	31.72
Richmond	32.06	30.05	31.96	31.64	29.59	30.87
Delta	30.14	32.00	27.77	31.53	31.73	32.98
Surrey	28.96	28.45	29.91	29.11	30.16	31.80
North Van. Dist.	31.51	31.36	31.91	32.40	32.11	32.11
West Vancouver	29.01	29.48	31.26	31.46	30.11	30.51

* field study - school purposes assessments were employed in the calculations.

The results produced by the mean is of primary concern as it is the average, with the median being presented as a matter of interest. Table XIII ranks the price ranges for each municipality from the lowest mean of the assessment-sales ratio to the highest.

TABLE XIII

RANKED ORDER OF MEANS OF PRICE CATEGORIES FOR

EACH MUNICIPALITY

Municipality	Low 1/3 numercial order of price category within the municipality	% Variation from the lowest mean of the 1/3 priced categories for each municipality	Middle 1/3		High 1/3	
Vancouver	2	(3.39%)	3	(8.69%)	1	
Burnaby	1		3	(2.39%)	2	(.43%)
Coquitlam	1		3	(5.68%)	2	(.32%)
Richmond	3	(8.34%)	2	(8.01%)	1	
Delta	2	(9.14%)	1		3	(14.26%)
Surrey	1		2	(3.28%)	3	(4.14%)
North Van. Dist.	1		2	(1.27%)	3	(1.90%)
West Vancouver	1		3	(7.76%)	2	(3.79%)
	12		19		17	

The lower priced properties have the lowest assessment-sales ratios the greatest number of times while the middle 1/3 has the highest ratios the greater number of times.

The different municipalities vary in their equality of price ranges as well as their biasness towards or against a particular price category. Table XIII also provides (in brackets) the percent difference between the mean of the lowest price bracket and the mean of the other two price brackets. Burnaby and North Vancouver District have the least percentage variation of the means and therefore, provide the greatest equality between price categories. The municiaplity with the greatest degree of inequality between price categories is Delta. The remaining municipalities in order from the one which provides the greatest equality to least is as follows:

Surrey, Coquitlam, West Vancouver, Vancouver and Richmond. In Delta

there is a 14.25% difference between the mean of the middle 1/3 priced

properties and the mean of the high 1/3 priced properties.

The muncipalities which are prejudiced towards the low priced

properties are Burnaby, Coquitlam, Surrey, North Vancouver District and

West Vancouver. Delta's middle 1/3 price.ranged residential properties

benefit by a lower assessment relative to market value while Vancouver

and Richmond bestow the advantage upon the higher priced residential

properties.

To obtain a general overview as to whether or not assessments

are equal between price categories of residential properties all the

residential properties from all the municipalities were grouped together

and classified into the price ranges; less than 20,000; 20,000-24,999;

25,000-29,999; 30,000-34,999; and greater than 35,000. The mean and median

assessment (for school purposes) sales ratios were then calculated for

each price category. The results are summarized in Table XIV.

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TABLE XIV

MEANS AND MEDIAN OF ASSESSMENT-SALES RATIOS FOR

EACH PRICE CATEGORY*

Price Category	Mean	Median
less than 20,000	30.61	30.35
20,000 - 24,999	30.49	31.06
25,000 - 29,999	31.81	32.11
30,000 - 34,999	31.15	31.60
greater than 35,000	31.07	31.73

* Field study

When comparing the equality of assessments between price categories the means should be regarded as the most significant of the two measures as it is the average of the price category. Utilizing the mean as the measure of equality, the price category $20,000 - 24,999 is assessed at the lowest percent of market value, and the less than $20,000 price category is assessed at the next lowest percent. The remaining price categories from lowest to highest assessment-sales ratios are: greater than 35,000; 30,000-34,999; and 25,000-29,999.

The lower price ranges seem to be benefitting slightly over the higher price categories as their assessment-market price ratios are lower. The advantage is very slight, however, as the difference between the lowest ratio to the highest is only 4.33%.

It must be realized that the obtained figures in Table XIV do not represent conclusive evidence that one price category has a lower

assessment-sales ratio than another because all the residential sales from all the municipalities were grouped together and the municipalities possess different average ratios and different average priced residential property.

D. SUMMARY

This section on the equality of assessments is a prelude to the chapter on the burden of taxation. Since property taxes are related to assessments, inequalities of assessments between municipalities, land uses or price categories cause a tax burden distribution which is legislatively unjust. Another factor affecting the tax burden distribution is the assessment uniformity within municipalities and land uses. The following chapter examines the assessment uniformity with the aid of various measures.

CHAPTER V

ASSESSMENT UNIFORMITY

As was stated in Chapter II the municipalities are required by law to assess all property at fifty per centum of its actual value.[1] The purpose of this chapter is to measure the degree of assessment uniformity within municipalities and land uses to determine which of the municipalities and lands uses studied exhibit the greatest degree of uniformity.

The degree of assessment uniformity will be determined from statistical analysis as it allows us to employ measures which have been especially designed to ascertain the dispersion of individual points about the central tendency point.[2] These measures vary in the type of information which they present and, as a consequence of this, the advantages and disadvantages of each as they relate to the needs of this thesis will be expounded upon.

Measures of dispersion from the central tendency have been chosen as determinates of the degree of assessment uniformity rather than the dispersion of individual points from the legislated fifty percent level for two reasons; 1(it is conceded that assessing at the fifty percent level is a near impossibility and equality of the tax burden within a municipality may be maintanined as long as the assessments are uniform at the average assessment-sales ratio and 2) the consequences of municipalities assessing at dissimilar average assessment-sales ratios were discussed in the previous chapter.

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1 actual value is equated to the adjusted selling price in this thesis

2 the measures used herein are defined in Appendix C.

A. MEASURES OF ABSOLUTE DISPERSION: MEAN DEVIATION, STANDARD DEVIATION, QUARTILE DEVIATION AND FREQUENCY TABLES

The simplest and crudest measures of dispersion from the central tendency are the mean deviation, standard deviation, quartile deviation and frequency tables. Since the quartile deviation measures only the central 50% of the cases it is a crude estimate of the total dispersion. The mean deviation and standard deviation are affected by every property with the standard deviation placing more emphasis on the extreme cases than the mean deviation. Although these measures can give some insight into the dispersion of individual assessment rolls, they do not lend to the comparison of municipalities in their assessment uniformity unless the measures of central tendency (median and mean) are the same for each municipality and land use studied and in chapter IV it was proven that this situtation does not prevail. The need for equal central tendencies can be illustrated by citing the following example.

	Municipality A	Municipality B
A/S ratio-mean	.424	.33
Standard deviation	.082	.065

From the data given it is difficult to determine which municipality has the greater uniformity because, although municipality A has the greater standard deviation in an absolute sense its uniformity may be better in a relative sense (relative to the mean). Because assessment uniformity in municipalities with different central tendencies are being compared, attention will be immediately focused upon more appropriate

measures.

B. <u>MEASURES OF RELATIVE DISPERSION</u>

Although the standard deviation and mean deviation are not suitable measures themselves, they are stepping stones to more appropriate measures.

1. Coefficient of Dispersion

The coefficient of dispersion is the average deviation of a series divided by the median of the series and in this instance it measures the dispersion of the assessment (for school purposes) - sales ratios about the mean of the ratio. This was chosen as one of the measures because it is employed by the Assessment Commissioner of British Columbia when determining the degree of assessment uniformity within a municipality. Also:

> "The coefficient of dispersion is the 'index of assessment inequality' referred to by the late Dr. John H. Russell, former Director of Research Virginia Department of Taxation. His recommendation was that a coefficient of dispersion of "20 should be considered a goal desirable of achievement and reasonably attainable," and that anything below this is to be considered an excellent degree of equalization of uniformity. Conversely, he stated "an index as high as 45 should be judged caused for gravest convern?"3

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3 Bernard Irvin Ghert, "Measures of the Quality of Real Property Assessments: An Examination of Their Validity." (Unpublished M.B.A. Thesis completed at the University of British Columbia, 1965), Page 161.

Table XV illustrates the coeffiicent of dispersion by land use and by municipality from the lowest coeffiicent to the highest.

TABLE XV

COEFFICIENT OF DISPERSION BY MUNICIPALITY, BY

LAND USE. (FROM LOWEST TO HIGHEST)*

Municipality	Coefficient of Dispersion	
1. North Vancouver District	7.83	
2. Coquitlam - residential	8.40	
3. Burnaby - residential	9.77	
4. West Vancouver - residential	11.69	
5. Vancouver - residential	12.13	12.13
conversions		14.54
apartment		16.80
industrial		23.65
office		23.84
retail		25.86
6. Richmond - residential	13.62	
7. Delta - residential	14.61	14.61
vacant land		16.22
8. Surrey - residential	16.19	16.19
vacant land		29.55

* field study

It should be mentioned at this time that comparisons between municipalities can only be made when the same items are being measured, therefore, the uniformity of assessments of municipalities can be compared only for the residential land uses and land uses comparisons can be made only within the municipality in which they are found. No information will be gained by comparing the coefficient of dispersion of the vacant land use in

Surrey to the apartment land use in Vancouver. Realizing these limitations the following observations can be noticed.

a) If we accept Dr. John H. Russells limits of a coefficient of dispersion of 20 representing an acceptable figure and index as high as 45 being "just cause for concern," then all the municipalities analyzed are within the acceptable region with respect to residential land use. The municipalities are not, however, consistent in their uniformity, with North Vancouver District registering the lowest coefficient of dispersion of 7.83 and Surrey registering the highest at 16.19.

b) If the same standard is applied to the land uses we find that in Vancouver the residential, apartment, and conversions are within the acceptable level, while the retail, industrial and office are outside the acceptable limits but not beyond the 45 mark.

There is considerably more uniformity of assessment within the residential property than the Industrial, office or retail property. This is to be expected as the appraisers are able to assess residential property easier due to the greater number of comparables which they may refer to. We also find that vacant land assessments in Surrey and Delta are less uniform than the residential assessments within those municipalities.

Since the coefficient of variation utilizes the average deviation as the numerator, little is known about the individual dispersions about the mean. It is not know how many properties, either numerically or percentage wise, lie within the acceptable region of below 20 or unacceptable region above 20.

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2) Coefficient of Variation

The coefficient of variation is the standard deviation divided by the arithmetic mean and then multiplied by 100 to express it in percentage terms. This measure was chosen, because with it the proportion of the sample which is between particular ratios can be determined under normal distribution conditons. For instance, a municipality with an average assessment level of 50%, with the ratios normally distributed about the mean and a coefficient of variation of 25 then we know that 68.26% of the ratios should lie between the assessment-sales ratios of 37.5 and 62.5. The proportion of the ratios which lie between any two ratios can be determined by using the standardized normal variate.

The coefficients of variation from the means of the assessment-sales ratios for the municipalities and land uses studied are presented in Table XVI.

TABLE XVI

MUNICIPALITIES AND LAND USES IN ORDER FROM

LOWEST TO HIGHEST COEFFICIENTS OF VARIATION*

Municipalities A Land Uses	Coefficient of Dispersion	
1. North Vancouver District - residential	10.31	
2. Coquitlam - residential	11.93	
3. Burnaby - residential	14.41	
4. Vancouver - residential	14.50	14.50
conversions		20.32
apartment		23.39
industrial		28.86
office		30.41
retail		32.12
5. West Vancouver - residential	16.06	
6. Delta - residential	22.57	22.57
vaoant land		20.87
7. Surrey - residential	22.81	22.81
vacant land		35.45
8. Richmond - residential	24.95	

* field research

The order of the municipalities and land uses produced in Table XV lare slightly different than the order produced in Table XVI. Although, the first three municipalities have assumed the same order under both the tables the remaining 5 municipalities have assumed different positions. The land uses in Vancouver have the same order under both tables.

The main advantage of the coefficient of variation over the coefficient of dispersion is in its ability to predict the proportion of the

population which should lie between two values. If the scores of the population are not normally distributed about the mean then this advantage disappears for the reseacher can no longer predict the proportion of the population lieing between two values. Before proceeding further in the analysis of the results produced by this measure it should be examined as to whether or not the assessment-sales ratio figures obtained are normally distributed. It is necessary to prove that only one of the municipalities and land uses studied has a dispersion of ratios which is not normally distributed because the different municipalities and land uses are being compared in their assessment uniformity. The chi-squared test[4] for goodness of fit was employed in determining whether or not the dispersions were normally distributed. The following procedure was followed:

a) The assessment-sales ratios were divided into deciles thereby yielding ten divisions each with an equal number of observed frequencies. The figures for Burnaby will be provided as an example.

Municipality: Burnaby

Number of observations   =   125

Median of assessment   =   33.09

Standard deviation   =   4.75

Mean   =   33.00

---

4 defined in Appendix C

TABLE XVII

OBSERVED AND EXPECTED FREQUENCY

OF EACH DECILE

A. SALES RATIO

decile	28.59	30.40	33.31	32.12	33.09	33.84	34.69	36.29	37.80
observed frequency	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
expected frequency	22.07	14.43	8.62	8.19	10.13	7.83	8.60	14.59	11.02	19.52

Referring to Table XVII we find that, as an average, 12.5 of the observations had assessment-sales of less than 28.59%, 12.5 had ratios between 28.59% and 30.40% etc.

b) Having determined the deciles it was necessary to calculate the number of observations which should have fallen under each decile had the ratios been normally distributed, (expected frequencies are provided in Table XVII)

c) From the above information the chi-squared was determined with a 1.9809% confidence limit. The results were as follows:

degrees of freedom = 8
the chi-squared obtained was 18.199

The probability of obtaining a chi-squared of 18.199 with a mean of 33.00 and standard deviation of 4.75 if the observed values were normally distributed is 1.9809.

_____

A similar test for Delta resulted in the following:

number of observation	= 100
mean	= 29.84
S.D.	= 6.73
df	= 8
chi-squared	= 43.846
probability of dispersion being normally distributed	= .0000%

Testing two land uses produced the following results:

Apartment - Vancouver

number of observations	= 93.7
S.D.	= 7.76
Mean	= 33.17
df	= 8
chi-squared	= 16.499
probability of dispersion being normally distributed	= 3.56%

Industrial - Vancouver

number of observations	= 47
Mean	= 31.95
S.D.	= 9.38
df	= 3
chi-squared	= 4.797
probability of dispersion being normally distributed	= 18.55%

The tests were also performed for the other municipalites and land uses, but it is necessary only to provide the reader with the above calculations to conclude that it is highly improbable that all the municipalities and land uses have observed frequencies which resemble a normal distribution. Because the observed ratios do not take on normal distribution characteristics the coefficient of variation is not an adequate test for comparing assessment uniformity.

C. <u>REGRESSION ANALYSIS</u>[5]

The regression equation y = A & BX is a mathematic model in which variables are statistically related so that the value of one variable can be estimated on the basis of the value of the other variable. It is used in this thesis, not as a tool of prediction, but as one which describes the relationship between assessed values and market values. Assumptions of the linear regression model are as follows:

"1) The assumption of linearity. The average of the y's in each sub-population is the conditional expected value of y for that specific x, that is,the u y. x. values fall on a straight line defined by u y. x. = A + BX.

2) Each of the sub-populations of x values is assumed to be normally distributed.

3) Each sub-population of y values has a variance of σ_i^2. These variance are equal for all sub-populations. This means there is uniform scatter of the points around the regression line.

4) Values of y are assumed to be statistically independant of x."[6]

Properties of a linear regression line -
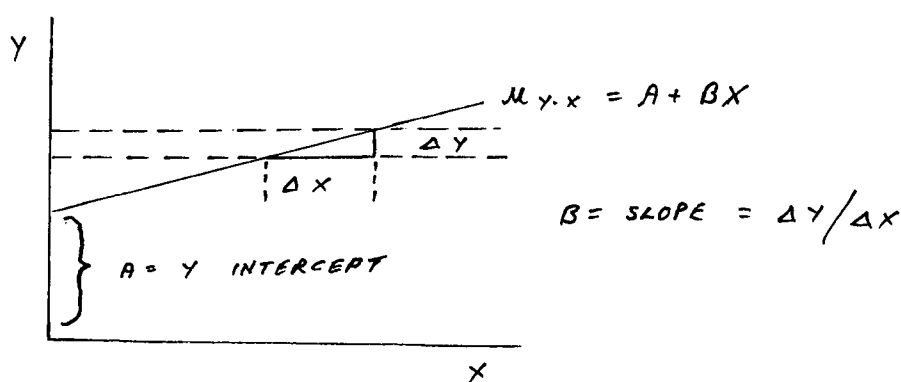
5 defined in Appendix C.

6 Ann Hughes and Dennis Grawosky, <u>Statistics: A Foundation for Analysis</u>, (Don Mills: Addison - Wesley Publishing Co., 1971), PP. 311-312.

The regression line Yc = a + bx is the sample regression line which estimates the populations regression line. The regression lines obtained from the sampling were determined by the least squares method. This method determined the intercept A and the slope B such that the sum of the squared error terms are minimized. The error term is defined as $\varepsilon_i = Y_i - U_{y \cdot x}$. Letting the symbol SSM represent the sum of the squares of the error terms, we have $SSE = \underset{i}{\varepsilon}\left(Y_i - a - b X_i\right)^2$ = minimum. Properties of the least squares line are as follows:

"1) The sum of the deviations of the observed values from the estimated values will be zero. The plus deviations are equal to and cancel out the minus deviations leaving $\varepsilon(Y - Y_i) = 0$.

2) The sum of the squares of the deviation of the observed values from the estimated values is less than the sum of the squared deviation around any other line of this type drawn through the points.

3) The regression line goes through the overall mean of the data.

4) When the data represents a random sample, the least squares line is the line of 'best fit' because the estimates a and b are the best unbiased estimate of the parameters A and B."[7]

If we find the standard deviation of the difference between the observed value of y and the estimated y values (called the standard deviation of regression or the standard error of estimate y on x) then we have a measure showing the degree of concertration of its actual observations around the regression line.

Since the standard deviation of y yields an abolute figure, it does not represent a suitable measure for comparing the uniformity of

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7 ibid., P. 322.

assessments betwen municipalities or between land uses. A relative measure

of the standard error of y can be obtained by dividing the standard error

of y by the mean price to obtain the percentage error from the mean price.

Another relative measure the coefficient of determination (r^2) may also be

used to compare assessment uniformity. The higher the coefficient of deter-

mination, the greater the degree of uniformity. An r^2 of 1 should mean

that all the items fall upon the best-fit line. This does not necessar-

ily imply that the assessment-sales ratios are uniform, however, because

the A factor in the equation y = A + BX biases the ratios.

If the A were 0, that is the best fit line bisected the origin

then the test would be of greater significance because the best fit line

would truly measure the assessment-sales ratio uniformity. But because

the A's have values, then, although the individual properties may all

be located on the best fit line it does not necessarily imply that

uniformity exists. An example is illustrated below. Suppose the best

fit line were as follows:

ILLUSTRATION 2

BEST FIT LINE
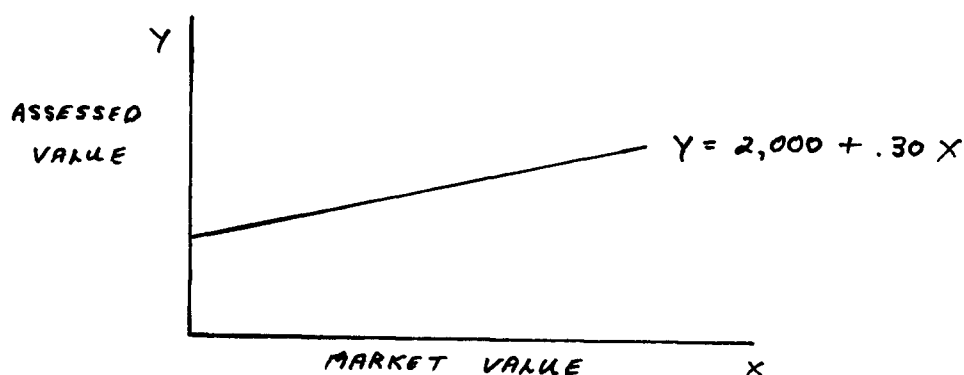
Although all the assessments may be located on the best fit line

$y = 2,000 + .30X$, all the assessments are not 30% of market value because

of the 2,000 absolute figure which must be added to determine each y

value. therefore, those properties in the lower price range are ass-

essed at a greater percent than the properties in the higher price range.

The A figure also influences the standard error of y, therefore calcu-

lations involving this figure are also biased.

This problem may be solved by finding the least square line for

each municipality and each land use which produced a value of 0 for A,

that is, a best fit line which bisects the origin. This will alleviate

the biasness of the A.

Calucaltions were performed to obtain the regression line and

the standard error of y, forcing the best fit line through the origin.

Table XVIII exhibits the regression lines and standard errors of y

for the two methods of obtaining the best fit line.

TABLE XVIII

REGRESSION LINE AND STANDARD ERROR OF Y

BY MUNICIPALITY AND BY LAND USE*

Municipality	Regression Line	SY.X	Regression Line	SY.X
Vancouver	$y = 1470 + .2306x$	1087	$y = o + .2938x$	1138
Burnaby	$y = 524 + .3508x$	1203	$y = o + .3324x$	1208
Coquitlam	$y = 6.67 + .3221x$	1043	$y = o + .3323x$	1039
Richmond	$y = 2635 + .1986x$	1614	$y = o + .2965x$	1761
Delta	$y = -293 + .3103x$	1865	$y = o + .2005x$	1858
Surrey	$y = 195 + .2862x$	1416	$y = o + .2955x$	1412
North Van. D.	$y = -119 + .3228x$	1026	$y = o + .3194x$	1023
West Van.	$y = 1435 + .2668x$	2243	$y = o + .2977x$	2282

Land Use	Regression Line	SY.X	Regression Line	SY.X
			A = 0	
Vancouver				
-residential	$y = 1740 + .2306x$	1087	$y = o + .2938x$	1133
-apartment	$y = 6667 + .2872x$	15710	$y = o + .3774x$	16490
-conversion	$y = 3452 + .1598x$	1811	$y = o + .2387x$	2068
-retail	$y = 11500 + .3972x$	34870	$y = o + .3868x$	36300
-industrial	$y = 3957 + .3676x$	10110	$y = o + .3495x$	10350
-office	$y = 15970 + .4502x$	25720	$y = o + .4181x$	23240
Delta				
-residential	$y = -293 + .3103x$	1614	$y = o + .3005x$	1858
-vacant land	$y = 102 + .2423x$	471	$y = o + .2866x$	469
Surrey				
-residential	$y = 195 + .2862x$	1416	$y = o + .3194x$	1023
-vacant land	$y = -89 + .1561x$	418	$y = o + .1530x$	418

*field study

Setting A = 0 and determining the best fit line produces an R^2 which is different from that originally defined, and for this reason cannot be considered as an appropriate measure. Table XIX provides the reader with the relative standard error of y as a percent of the mean price by municipality and by land use.

TABLE XIX

RELATIVE STANDARD ERROR OF Y BY MUNICIPALITY

BY LAND USE. (FROM LOWEST TO HIGHEST)

Municipality	Relative Standard Error of Y
North Vancouver	3.10
Coquitlam	3.64
Burnaby	4.63
Vancouver	5.13
West Vancouver	5.47
Delta	6.86
Richmond	7.09
Surrey	7.25

Land Use	Relative Standard Error of Y
Vancouver - residential	5.13
conversion	5.21
apartment	6.41
industrial	8.43
office	14.13
retail	19.37
Delta vacant land	5.40
residential	6.85
Surrey vacant land	6.80
residential	7.25

If the dispersion of items of y for any praticular value of x were normally distributed then the proportion of the items which lie within a range of the regression line could be determined. For example 68.24% of the observed values should fall within a range of $Y_c \pm S_{y \cdot x}$. The smaller the standard error of y the closer the relationship and the higher the standard error the greater is the scatter of items.

It was proven previously, however, that the dispersion of items does not assume normal distribution characteristics. It is necessary there-fore, to devise a method of measuring assessment uniformity without having to assume a normal distribution of the items.

D. PERCENT FROM THE MEDIAN

One method of measuring assessment uniformity without having to rely on the assumption that the dispersion of data points is normally distributed is by ascertaining the proportion of the assessment-sales ratios between certain percentages of the median. For instance, the assessment uniformity within municipalities could be compared by ascertaining the proportion of properties within each municipality, which registered an` assessment-sales ratio within plus or minus ten percent of the median.

Suppose municipalities A, B, C had respectively 40, 50 and 60% of their assessed properties within this ± 10% region. If the municipalities were ranked from best to worst assessment uniformity on this basis alone the order would be C, B and A. Employing only the one percentage range has two faults; 1) it does not provide information of the distribution within the ± 10% range. This disadvantage may be corrected by subdividing the ± 10% into quartiles or deciles and examining them; and 2) it does not provide information about the quality of assessment beyond this ± 10% range. For example, suppose that Municipalities A, B. and C had the following distribution of ratios from the medians.

Percent of A/S ratios between		Municipality	
	A	B	C
± 10%	45	50	55
± 20%	90	70	60
± 30%	99	88	65

of the median.

If the municipalities assessment uniformities were to be compared on the proportion of properties with assessment-sales ratios between ± 10% of the median then the ordering of the municipalities from the best uniformity to the worst would be C, B, A. If, however, the proportion of property with ratios between ± 20% and ± 30% of the median were considered the ranked order would be A, B and C. Municipality A has a considerably greater proportion of properties with ratios between the ± 20% and ± 30% from the median range. Also municipality B has a better record than municipality C in these two ranges.

A problem arises, however, when the proportion of properties between the percentages from the median for the municipalities do not change radically from one municipality to another.

For instance, assume three municipalites (A, B and C) have the following percentages of assessment within the following dispersion ratios:

% of A/S Ratios between		Municipality	
	A	B	C
± 10%	40	50	60
± 20%	70	60	65
± 30%	90	85	75
± 40%	92	95	80

of the median.

Municipality C has the greater uniformity if the proportion of properties within the first ± 10% is considered. Municipality A has the least proportion of properties betwen ± 10% of the median and the greatest proportion between the ± 20% of the median. If the municipalities were to be ranked considering the proportion of properties between ± 10% and ± 20% of the median a weighting system should be devised as the proportion of properties between ± 10% of the median is of more importance than the proportion of properties between ± 20% of the median. Before devising such a weighting system let us first review the results obtained when the proportion of properties from the median fall inside ± 10% intervals.

Table XX outlines the percentage of assessments which fall within ± 10% intervals of the median as well as the cummulative proportions from the median for each of the municipalities. Table XXI exhibits the same information only by land use.

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TABLE XX

PROPORTION OF PROPERTIES WHICH LIE BETWEEN PERCENTAGES FROM THE MEDIAN, BY MUNICIPALITY (RESIDENTIAL LAND USE) *

	0+10%	+10% +20%	0+ 20%	+20% +30%	0+ 30%	+30% +40%	0+ 40%	+40% +50%	0+ 50%	Greater than ± 50%	Greater than ± 0%
Vancouver	58.47%	28.42	(87.19)	8.72	(95.91)	1.03	(96.94)	0.00	(96.94)	3.07	(100.01)
Burnaby	65.80%	24.80	(90.60)	3.20	(93.80)	3.20	(97.00)	2.40	(99.40)	.80	(100.20)
Coquitlam	72.18%	18.79	(90.97)	5.27	(96.24)	3.00	(99.24)	.75	(99.99)	0.00	(99.99)
Richmond	60.00%	26.15	(86.15)	6.16	(92.31)	.00	(92.31)	4.62	(96.93)	3.09	(100.01)
Delta	56.00%	24.00	(80.00)	5.00	(85.00)	3.00	(88.00)	4.00	(92.00)	8.00	(100.00)
Surrey	43.18%	31.06	(74.24)	11.36	(85.60)	7.58	(93.18)	1.52	(94.70)	5.30	(100.00)
North Van. Dist.	73.46%	21.76	(95.22)	3.40	(98.62)	.68	(99.30)	.68	(99.98)	.00	(99.98)
West Vancouver	56.69%	28.03	(84.72)	7.64	(92.36)	4.46	(96.82)	2.55	(99.37)	.64	(100.01)

* Field study - inaccuracies in cumulative percentage are due to rounding.

TABLE XXI

PROPORTION OF PROPERTIES WHICH LIE BETWEEN PERCENTAGES

FROM THE MEDIAN BY LAND USE*

Land Use	0±10%	+10% ±20%	0+ 20%	+20% ±30%	0+ 30%	+30% ±40%	0+ 40%	+40% ±50%	0+ 50%	Greater than ±50%	Greater than ±50%
Vancouver											
residential	58.47%	28.72	(87.19)	8.72	(95.91)	1.03	(96.94)	0.00	(96.94)	3.07	(100.01)
apartment	43.01%	24.73	(67.74)	12.91	(80.65)	9.68	(90.53)	5.38	(95.91)	4.31	(100.22)
conversion	45.46%	31.82	(77.28)	13.64	(90.92)	4.55	(95.47)	0.00	(95.47)	4.55	(100.02)
retail	25.35%	26.76	(52.11)	16.20	(68.31)	10.57	(78.88)	8.45	(87.33)	12.67	(100.00)
industrial	28.57%	24.49	(53.06)	10.20	(63.26)	16.22	(79.48)	12.24	(91.72)	8.16	(99.98)
office	28.13%	18.74	(46.87)	18.74	(65.61)	15.62	(81.23)	12.50	(93.73)	6.24	(99.97)
Surrey											
residential	43.18%	31.06	(74.24)	11.36	(85.60)	7.58	(93.18)	1.52	(94.70)	5.30	(100.00)
vacant land	21.96%	21.14	(43.12)	15.44	(58.56)	15.44	(74.00)	11.38	(85.38)	14.63	(100.01)
Delta											
residential	56.00%	24.00	(80.00)	5.00	(85.00)	3.00	(88.00)	4.00	(92.00)	8.00	(100.00)
vacant land	40.19%	28.97	(69.16)	18.69	(87.85)	2.80	(90.65)	5.61	(96.26)	3.74	(100.00)

* Field study - inaccuracies in cumulative percentage are due to rounding.

ILLUSTRATION 3

CUMULATIVE PROPORTION OF PROPERTIES FROM THE
MEDIAN, BY MUNICIPALITY
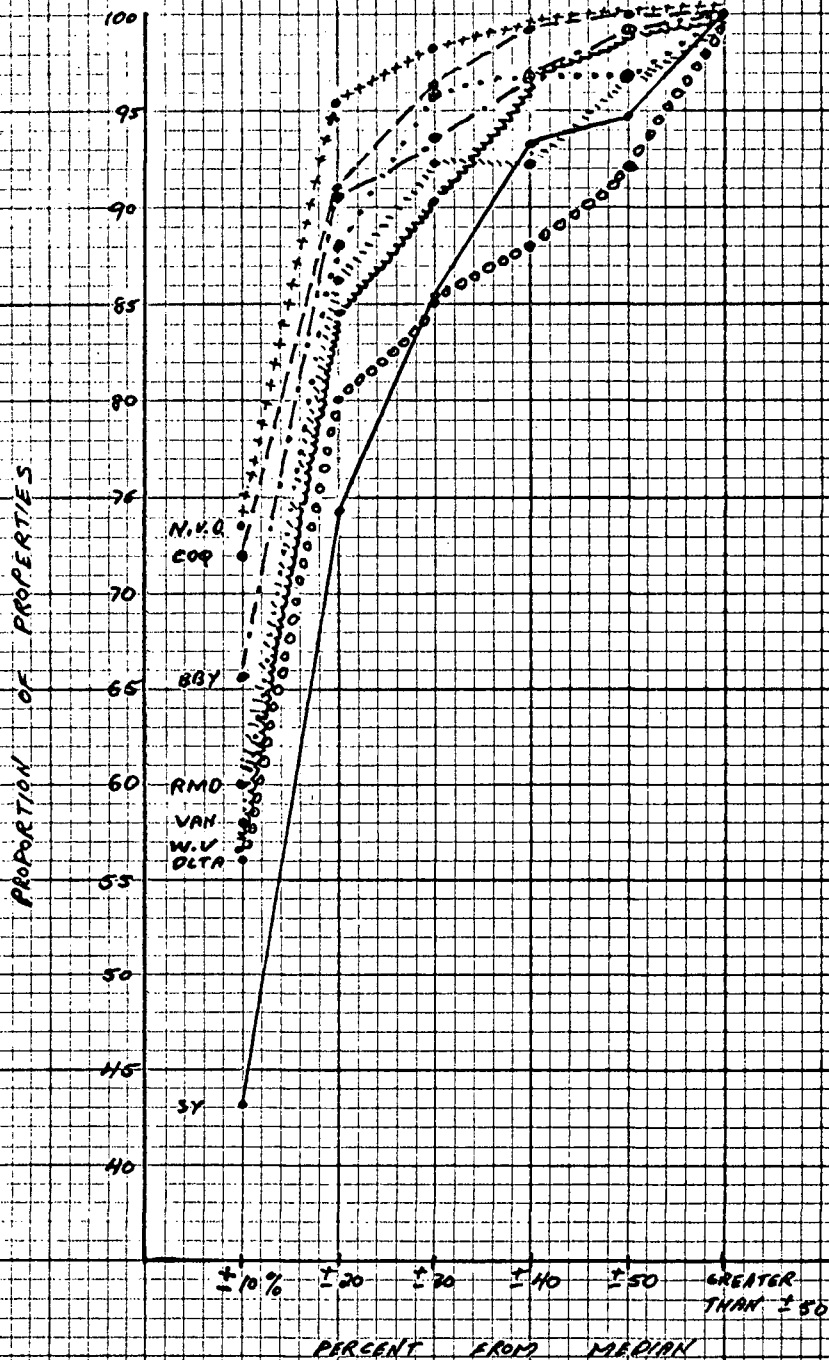
CODE:

VANCOUVER	• • • • • • • •	DELTA	ooooooooooo
BURNABY	— · — · — · —	SURREY	————————
COQUITLAM	— — — — —	NORTH VAN. DISTRICT	××××××××
RICHMOND	\\\\\\\\\\\\\	WEST VANCOUVER	ʌʌʌʌʌʌʌʌ

ILLUSTRATION 4

CUMULATIVE PROPORTION OF PROPERTIES FROM THE
MEDIAN, BY LAND USE IN VANCOUVER

PROPORTION OF PROPERTIES

PERCENT FROM MEDIAN

CODE:

RESIDETIAL · · · · · · · · ·
APARTMENT — · — · — ·
CONVERSION — — — — —
RETAIL × × × × × × × ×
INDUSTRIAL ─────
OFFICE \\\\\\\\
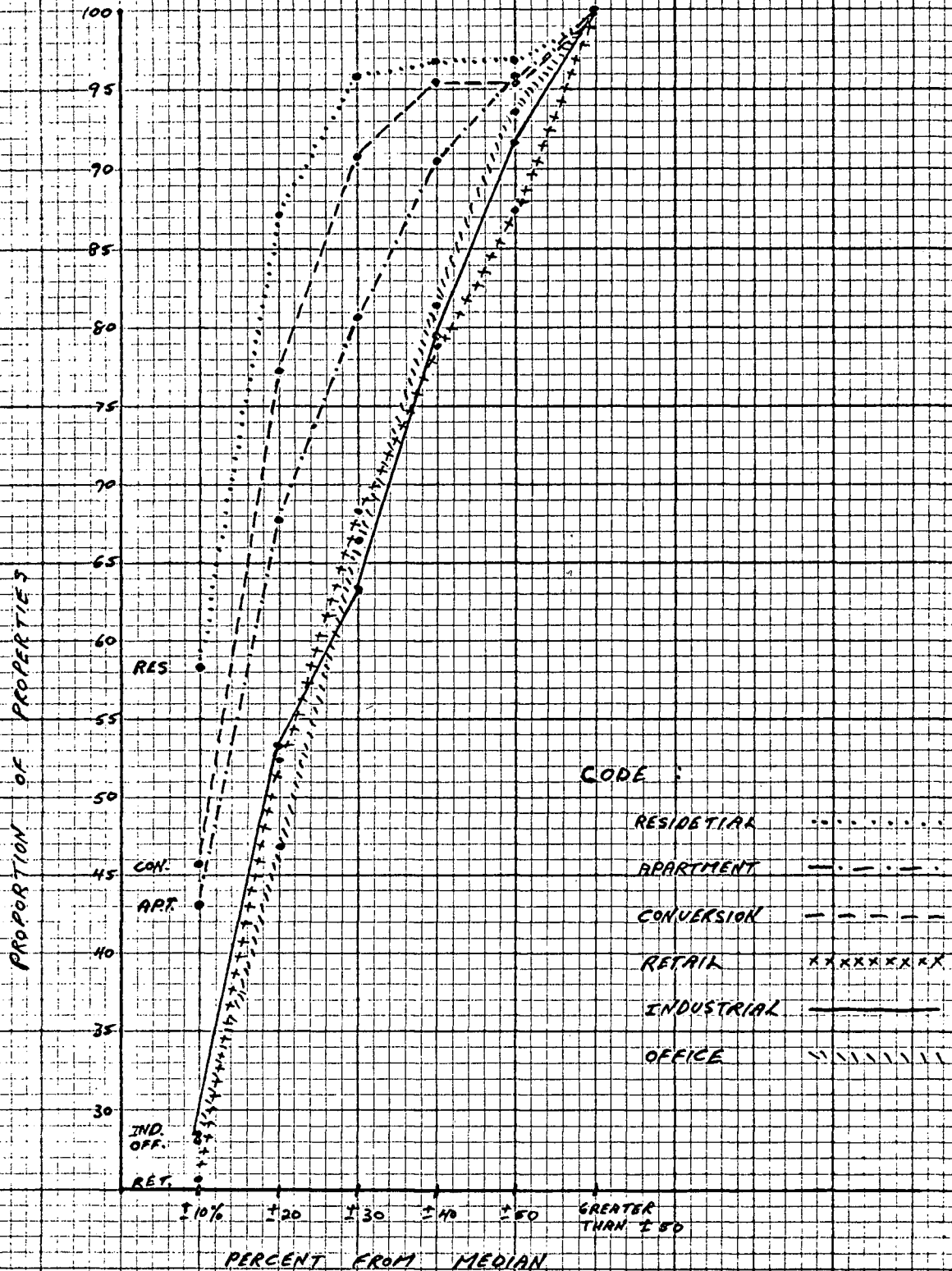
ILLUSTRATION 5

CUMULATIVE PROPORTION OF PROPERTIES FROM THE
MEDIAN, BY LAND USE IN SURREY AND DELTA

CODE :

SURREY · RESIDENTIAL   —·—·—

VACANT LAND   ————

DELTA · RESIDENTIAL   ·········

VACANT LAND   — — — —

PROPORTION OF PROPERTIES

PERCENT FROM MEDIAN
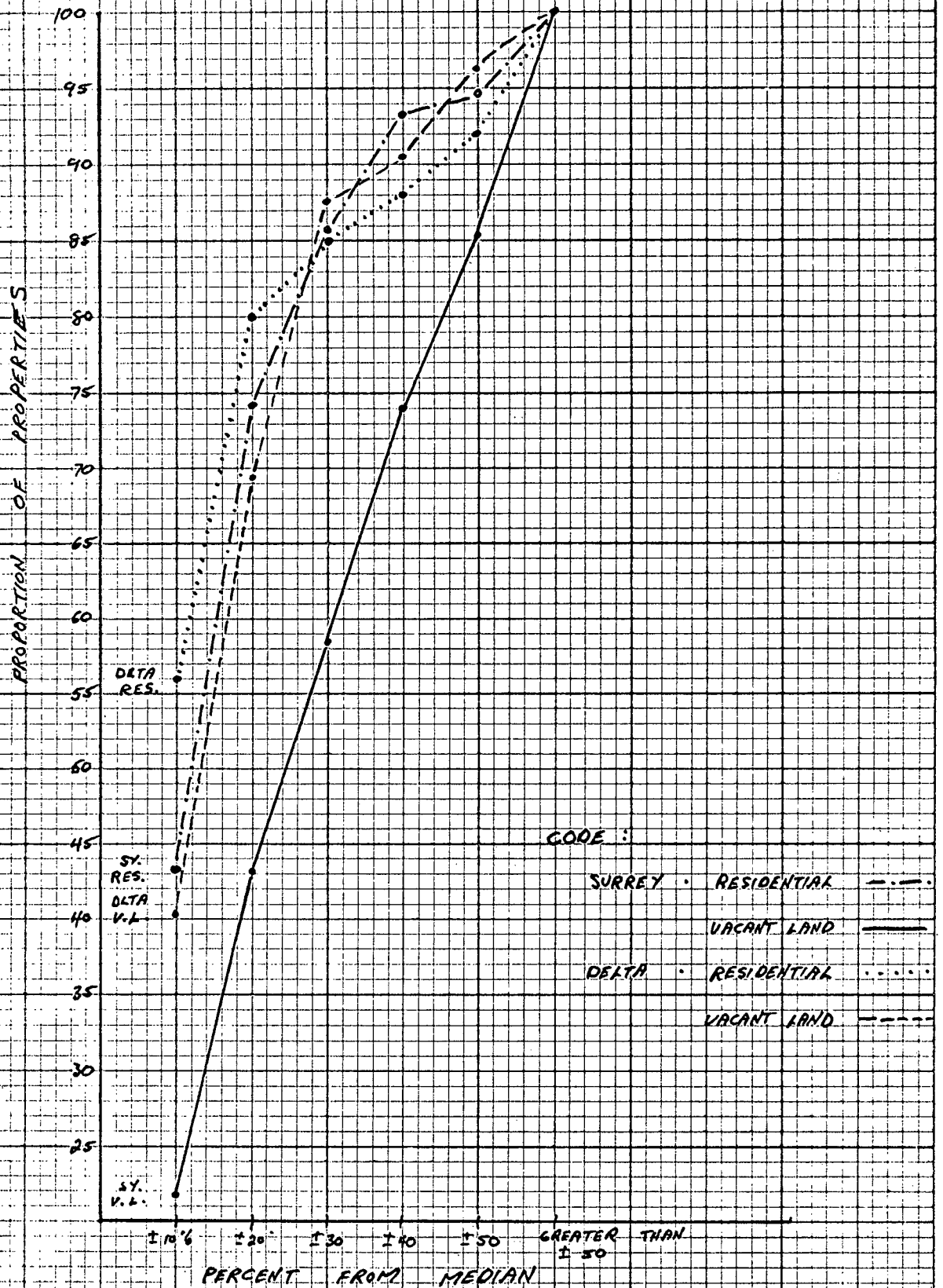
The first column of Table XX indicates the proportion of properties in each municipality within ± 10% of the median. The order of the municipalities from the one with the greatest to the least proportion is as follows:

Municipality	Proportion
North Vancouver District	73.46
Coquitlam	72.18
Burnaby	65.80
Richmond	60.00
Vancouver	58.47
West Vancouver	56.69
Delta	60.00
Surrey	43.18

Illustration 3 presents a cummulative account of the proportion of properties within a certain percent of the median. North Vancouver District has a consistently higher proportion of its assessments within a certain percent of the median assessment sales ratio. Coquitlam has the second best assessment uniformity as it is consistently second only to North Vancouver District. I have rated Burnaby third because they have a higher proportion of properties within a certain percent of the median except the ± 30% in which Vancouver has a greater proportion. Vancouver is rated fourth best even though

Richmond has a higher proportion within the ± 10% range. This was

because Richmond's proportion is only slightly higher in this range

and Vancouver has a better record for the remaining percentage ranges.

Richmond was rated fifth over West Vancouver because of its higher

proportion of properties in the first two percentages ranges which

represent the majoritiy of the properties. The remaining orders were

West Vancouver, Delta and Surrey respectively.

A similar analysis was done for the land use categories. If

± 10% from the median assessment-sales ratio is chosen as the ind-

cator of the level of assessment uniformity then the order of the

land uses from the one with the highest uniformity to the lowest is

as follows:

Vancouver -	residential	58.47
	conversion	45.46
	apartment	43.01
	industrial	28.57
	office	28.13
	retail	25.35
Surrey	residential	43.18
	vacant land	21.96
Delta	residential	56.00
	vacant land	40.19

*land uses are compared only within their appropriate
municipality.

If the cummulative proportions for each percentage bracket

observed in Table XXI or depicted in illustrations 4 and 5 is considered

in determining assessment uniformity then the same order for the land uses

as was outlined above results.

TABLE XXII

RANKED ORDER OF MUNICIPALITIES UNDER

DIFFERENT MEASURES OF ASSESSMENT UNIFORMITY

Municipality	Coefficient of Dispersion	Coefficient of Variation	Measure Standard Error of Y÷mean & A = 0	Proportion of Properties within ± 10% of median	Cumulative Proportion of Properties from the median
North Vancouver District	1	1	1	1	1
Coquitlam	2	2	2̇	2	2
Burnaby	3	3	3	3	3
West Vancouver	4	5	5	6	6
Vancouver	5	4	4	5	4
Richmond	6	8	7	4	5
Delta	7	6	6	7	7
Surrey	8	7	8	8	8

TABLE XXIII

RANKED ORDER OF LAND USES UNDER DIFFERENT
MEASURES OF ASSESSMENT UNIFORMITY

Land Use	Coefficient of Dispersion	Coefficient of Dispersion	Standard error of Y÷ mean & A = 0	Proportion of Properties within ±10% of the median.	Cumulative Proportion of Properties from the median.
Vancouver					
residential	1	1	1	1	1
conversions	2	2	2	2	2
apartment	3	3	3	3	3
industrial	4	4	4	4	4
office	5	5	5	5	5
retail	6	6	6	6	6
Delta					
residential	1	2	2	2	2
vacant land	2	1	1	1	1
Surrey					
residential	1	1	2	2	2
vacant land	2	2	1	1	1

Summary

The ranked order of the Municipalites and land uses under each of the measures used is presented Tables XXII and XXIII. The emphasis should be placed on the last column in these tables when determining the order of the quality of assessments for municipalities and land uses because it is the only measure which=does not assume the normal distribution of the dispersions. The land uses assume the same order under all the measures used. ·

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CHAPTER VI

BURDEN OF TAXATION

The purpose of this chapter is to determine the burden of
taxation upon property owners by muncipality, land use and price
category. The burden of taxation by municipality is being analyzed
because the municipalities under study offer approximately the same
services to their residents and as such they should be paying ap-
proximately the same taxes in relation to the market value of their
property.

The burden of taxation by land use is being analyzed in an
attempt to discover which land uses are paying proportionally higher
taxes. The majority of the property taxes are determined by the
assessed values,[1] which should be proportional to market value, and
since the same mill rate is applied to the assessed values of all the
properties within a municipality, the burden of taxation should be pro-
portional. This proportionality will become distorted, however, for
two desired reasons: 1) some properties are assessed additional charges
for extra services received from the municipality and 2) the homeowners
grant of $170^2 will reduce the gross taxes for only the residential land
users.

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1 The assessed values for a property may account for 75-100%
of the gross taxes depending upon the service charges which are added
onto the taxes calculated from the assessments.

2 This was increased to $185.00 in early 1972 with an extra
$50.00 being granted to owner-occupiers over the age of 65.

Since the burden of taxation to a property owner is not related to the services received by him, no comparison between the two is attempted.

A criticism of the property tax system which is often cited is that it weighs relatively more heavily upon the owners of residential property who are in the lower income bracket than the owners in the higher income bracket. Since income data of residential property owners is difficult to obtain, the criticism will be altered slightly to read as follows: the property tax system weighs more heavily upon the owners of less expensive homes relative to the owners of more expensive homes. Property value and income of the owner cannot be related for two reasons; 1) owners who purchased the property in previous years before their reselling may have had incomes which increased or decreased at a faster, slower, or opposite rate than did the value of their property and 2) purchasers may spend varying amounts on a home depending upon their savings, present income and future expected income.

The net taxes paid as opposed to the gross tax, will be employed in the calculations with the market value being the standard from which the burden is determined. The measures employed will be the same as those used to measure assessment equality, that is, the mean and median.

A. Burden of Taxation by Price Ranges

As was done when determining the equality of assessments between different price categories (Table XIV) the residential land uses of all the municipalities have been grouped together then subdivided.

into categories depending upon their market values. The price cate-

gories are the same as those previously used, that is: less than

$20,000; 20,000-24,999, 25,000-29,999, 30,000-34,999, and greater than

35,000. Table XXIV portrays the mean and median net taxes payable as

a percent of market value for the five price categories of the resid-

ential land use.

TABLE XXIV

MEAN AND MEDIAN NET TAXES PAYABLE AS A PERCENT OF

MARKET VALUE, BY PRICE CATEGORY*

Price Range	Mean	(Percent Increase over Lowest Mean)	Median
less than 20,000	1.147		1.075
20,000 - 24,999	1.251	(8.31)	1.234
25,000 - 29,999	1.392	(21.36)	1.436
30,000 - 34,999	1.391	(21.23)	1.387
greater than 35,000	1.374	(19.79)	1.372

* Field study

The greatest weight should be placed upon the mean when com-

paring equality between price ranges as it is the average score.

Referring to the means of Table XXIV we can assume that the

greatest burden of taxation relative to market value of property falls

upon the higher priced home (those with market values greater than 25,000).

As is to be expected, due to the $170 homeowners grant, the less expen-

sive homes, those with a market value under $25,000, pay proportionally

less in property taxes. The three highest price ranges do not pay
proportionally higher taxes to each other because of either added
service charges or inaccurate assessments.

Also, provided in Table XXIV is the percent deviation of the
individual means from the lowest mean. Owners of residential property
valued at between $25,000 and $29,999 pay on an average 21.36 percent
proportionally higher taxes than the owners of property valued at less
than $20,000.

Measuring the equality between different price ranges when
residential properties from different municipalities are considered
does not provide us with an accurate account of the tax burden because
each municipality has different assessment-sales ratios and different
mill rates. A more accurate and informative picture of the tax
burden between price categories would be to measure the difference
within the municipalities. Table XXV furnishes the reader with the
mean and median of the net-taxes to market price ratios of three price
ranges for each municipality. The price ranges were determined by
dividing the number of properties into thirds as was done in Chapter IV.

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TABLE XXV

MEAN AND MEDIAN OF THE NET TAX - MARKET PRICE RATIO

BY 1/3 PRICE CATEGORIES, BY MUNICIPALITY*

Municipality	Low 1/3 Priced		Medium 1/3 Priced		High 1/3 Priced	
	Mean	Median	Mean	Median	Mean	Median
Vancouver	1.191	1.155	1.340	1.229	1.318	1.249
Burnaby	1.397	1.375	1.561	1.520	1.542	1.548
Coquitlam	1.373	1.411	1.652	1.606	1.612	1.603
Richmond	.951	.944	1.163	1.076	1.162	1.236
Delta	1.022	1.021	1.010	1.222	1.451	1.520
Surrey	1.012	.769	1.161	1.006	1.450	1.475
North Van. Dist.	1.202	1.220	1.360	1.300	1.356	1.360
West Vancouver	1.031	1.026	1.254	1.240	1.335	1.309

* Field study - the price range for each municipality is located in Table II

Again, of the two measures used the greatest weight should be afforded to the mean. Table XXVI ranks the 1/3 price categories from the lowest to highest mean for each municipality and provides the reader with the percent difference between the lowest mean and the remaining means for each municipality.

TABLE XXVI

RANKED ORDER OF NET TAX-MARKET PRICE RATIO MEANS BY PRICE CATEGORY

FROM THE LOWEST TO THE HIGHEST WITHIN EACH MUNICIPALITY AND

THE PERCENT DIFFERENCE OF THE TWO HIGHEST PRICE CATEGORIES

MEANS FROM THE LOWEST FOR EACH MUNICIPALITY

Municipality	Low 1/3 Priced		Mid. 1/3 Priced		High 1/3 Priced	
	Numerical Order # Within the Municip.	%Variation from the lowest mean within each Municip.	Numercial Order # Within the Municip.	%Variation from the lowest mean within each Municip.	Numerical Order # Within the Municip.	%Variation from the lowest Mean within each Municip.
Vancouver	1		3	12.51	2	10.66
Burnaby	1		3	12.51	2	10.66
Coquitlam	1		3	11.74	2	10.38
Richmond	1		3	20.32	2	17.41
Delta	2	1.19	1		3	43.66
Surrey	1		2	14.72	3	43.28
North Vanc. District	1		3	13.14	2	12.81
West Vancouver	1		2	21.62	3	29.49

Referring to Table XXVI the low priced 1/3 properties pay proportionally less taxes in all the municipalities except Delta, The middle 1/3 priced properties pay porportionally higher taxes than the other priced categories in 5 out of the 8 municipalities.

Table XXVI also provides information which allows us to compare the municipalities on their equality of taxes between price categories. The municipalities with the least percentage deviation of the means of the price categories have the greatest degree of equality between the price categories being studied.

Burnaby registers the greatest degree of equality with the two highest means of the price categories deviating from the lowest mean by 10.38% and 11.74%. The greatest degree of inequality is in Surrey where the highest 1/3 and middle 1/3 priced properties pay respectively 43.29% and 14.72% higher taxes than the low 1/3 priced. The remaining municipalities in order of equality of taxation by price ranges are: Vancouver, District of North Vancouver, Coquitlam, Richmond, West Vancouver and Delta.

B. Burden of Taxation in Different Municipalities

One municipality has, on the average, residents which pay proportionally higher taxes than residents of another municipality. The means and medians of the net-taxes - market value ratios of all the residential properties in each municipality is outlined in Table XXVII.

TABLE XXVII

MEANS AND MEDIANS OF NET TAX MARKET PRICE RATIOS FROM THE

LOWEST TO THE HIGHEST MEAN OF THE MUNICIPALITIES

AND THE PERCENT DEVIATION OF THE MEANS

OF THE MUNICIPALITIES FROM RICHMOND'S MEAN

Municipality	Mean	% Deviation of Means from Richmond Mean	Median
Richmond	1.094	5.94	1.134
Delta	1.159	5.94	1.235
West Vancouver	1.209	10.51	1.239
Surrey	1.214	10.97	1.067
Vancouver	1.283	17.28	1.251
North Vanc. District	1.306	19.39	1.300
Burnaby	1.501	31.16	1.513
Coquitlam	1.554	42.05	1.575

*Field study

From Table XXVII we find that, on the average, the residence

of Richmond pay proportionally less taxes as a percent of market value than

the residents of the other municipalities, and are in effect receiving

equal benefits.[3] The residents of Coquitlam pay the highest tax proportional

to the market value of property being 42.05% higher than that of Richmond.

This implies that, on the average, the owner of property which is located

in Coquitlam and valued at $20,000 will pay 42.05%

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3 This statement is a conjecture by the author as the service
provided by the different municipalities was not studied in great detail.

higher taxes than the owner of an equivalent $20,000 property located

in Richmond. The point should be made that this is only the average

when all the properties are considered, for as was shown in Table XXVI

there are different tax burdens for different price categories in each

of the municipalities.

This point is best shown by an example. Referring to the mean

net-tax market-value ratios in Table XXVII we find that, when all the

residential properties in each municipality are considered, the resi-

dents of Delta pay 5.94% proportionally higher taxes than the residents

of Richmond. If, however, we consider a specifically priced resi-

dential property, eg. $22,000, and refer to Table XXV and II, then the

following results occur: A $22,000 property located in Richmond is in

the middle 1/3 priced category of the properties considered, while a

$22,000 property located in Delta is in the low 1/3 priced categroy.

The mean of the net-taxes market-value ratio for Richmond within the

middle 1/3 priced properties is 1.163 while the mean of Delta's 1/3

low priced properties is 1.022 (Table XXV). Therefore, the owner of

the $22,000 residential property in Delta pays less property taxes

than the owner of a $22,000 residential property in Richmond. Further

comparisons of the taxes payable between equivalent priced properties

located in different municipalities can be made but one must refer

to the appropriate 1/3 category in each municipality and obtain the

mean for the price category. It must also be realized that it is only

the mean of the price category which the reader is referring to and there

are deviations from the mean for different market priced properties and

even for particular priced properties. A difference in taxes paid by the owners of two equivalent priced properties located in the same municipality may result because of different assessed values or due to extra charges for additional services allotted to one and not the other.

C. BURDEN OF TAXATION BY LAND USE

This section purports to examine the property tax criticism that an undue burden of taxation falls upon some land uses relative to other land uses. The mean and median of the net taxes-market value ratios will be employed to measure the equality of the tax burden. Table XXIX illustrates the mean and median for the land uses.

TABLE XXIII

MEAN AND MEDIAN OF NET TAXES-MARKET VALUE

RATIOS FOR THE LAND USES*

Municipality	Land Use	Mean	Land Use	Median
Vancouver	conversion	1.095	conversion	1.036
	residential	1.283	residential	1.251
	apartment	1.806	retail	1.915
	retail	1.856	apartment	1.878
	office	1.901	office	1.911
	industrial	2.142	industrial	1.953
Surrey	residential	1.214	residential	1.067
	vacant land	1.439	vacant land	1.354
Delta	residential	1.159	residential	1.235
	vacant land	2.752	vacant land	2.798

* Field Study

Of the land uses in Vancouver the conversion, on an average, pay proportionally less taxes than the other land uses and residential properties pay the next least proportional taxes. The industrial and office land uses pay the highest taxes proportionally to the market value of the property. In Surrey and Delta the owners of vacant land pay proportionally higher taxes then the residential owners. Table XXIX outlines the average percentage which the land uses with the higher means pay proportionally above the land use with the lowest mean.

TABLE XXIX

PERCENT WHICH THE LAND USES PAY IN TAXES ABOVE THE

LAND USE WITH THE LOWEST MEAN

Municipality	Land Use	Percent above the land use with the lowest
Vancouver	conversion	------ (base)
	residential	14.63%
	apartment	64.93%
	retail	69.50%
	office	74.52%
	industrial	95.62%
Surrey	residential	------ (base)
	vacant land	18.53
Delta	residential	------ (base)
	vacant land	137.45

Comparing the land uses in Vancouver we find that the owners of industrial property are paying 95.62% proportionally higher taxes than the owners of conversions, while the owners of vacant land in Delta are paying 137.45% proportionally higher taxes than their counterpart owners of residential property.

CHAPTER VII

SUMMARY OF FINDINGS AND RATIONAL FOR THEM

A. SUMMARY

1. Assessment Uniformity - The degree of assessment uniformity within municipalities and land uses varied depending upon the measure, which was engaged. Since the distribution of assessment-sales ratios was not normal the most appropriate statistics which measured the degree of uniformity was the percent deviation from the median method. The conclusions presented here are those determined by that method.

a) Ranking the municipalities in order from the most uniform to the least uniform assessments was as follows: North Vancouver District, Coquitlam, Burnaby, Vancouver, Richmond, West Vancouver, Delta and Surrey.

b) Ranking the land uses from the most uniform to the least uniform assessments produced the following order: In Vancouver; residential, conversion, apartment, industrial, office and retail; in Surrey: residential and vacant land; and in Delta: residential and vacant land.

2. Assessment Equality -

a) Assessment equality between municipalities does not exist as the percent variance between the municipality with the highest mean (Burnaby) of the assessment-sales ratios and the municipality with the lowest mean (Surrey) was 11.15%. The ranking of the Municipalities from the one with the lowest mean to the one with the highest mean is as follows: Surrey, Delta, West Vancouver, Vancouver, Richmond, North Vancouver District, Coquitlam and Burnaby.

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b) Equality of Assessments between land uses is also a non-existent phenonoma. The variation of the land use means from the overall mean ranged from - 17.79% for conversions to +6.97% for apartments in Vancouver. In Surrey the vacant land use was 34.42% below the mean of the means of the two land uses studied. Ranking the land uses from the lowest to the highest mean produced the following order: In Vancouver; conversions, residential, retail, industrial, office and apartment; in Surrey: vacant land and residential; in Delta: vacant land and re-sidential.

c) Price categories in each municipality are also assessed at non-equal percentages of market value. The lower priced properties are generally assessed at proportionally lower rates than the higher priced properties. There are differences, however, in the particular price category of residential property which the municipalities are prejudiced for or against. The municipalities of Burnaby, Coquitlam, Surrey, North Vancouver District and West Vancouver underassess the lower 1/3 priced properties relative to the other properties while Vancouver and Richmond underassess the higher 1/3 priced properties. Delta underassess the middle 1/3 priced properties. Vancouver, Burnaby, Coquitlam and West Vancouver overassess the middle 1/3 priced properties. Only the municipality of Richmond overassess the lower priced properties.

The order of the municipalities from the one with the greatest degree of assessment uniformity between price categories to the one with

the least is: Burnaby, North Vancouver District, Surrey, Coquitlam,

West Vancouver, Vancouver, Richmond and Delta.

3. Burden of Taxation -

a) The lower priced properties generally pay proportionally less taxes than the higher priced properties. The degree of the equality of the tax burden for price categories varies for each of the municipalities studied. In all the municipalities studied except Delta the residents of the lower 1/3 priced properties pay proportionally less taxes than the residents of the other two price categories. The residents of the middle 1/3 priced properties in the municipalities of Vancouver, Burnaby, Coquitlam, Richmond and North Vancouver District pay proportionally higher taxes than the residents of the other two price categories while in the municipalities of Delta, Surrey and West Vancouver it is the residents of the higher 1/3 priced properties who pay the proportionally higher taxes.

Listing the municipalities from the one exhibiting the greatest equality of the tax burden to the least produces the following order; Burnaby, Vancouver, District of North Vancouver, Coquitlam, Richmond, West Vancouver and Delta.[1]

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1 It should be noted that a certain degree of proportional tax inequality is desired. (eg. due to extra service charges and the homeowners grant). However, a portion of the tax inequality is a result of inaccurate assessments. The proportions of the tax inequality which are due to desired and undesired causes were not calculated.

b) On an average, the tax burden of residential property owners varies from one municipality to another. The highest taxes are paid in Coquitlam which is 42.05% proportionally higher than the taxes paid in Richmond. Listing the municipalities from the one in which the residents pay the proportionally lowest taxes to the highest produces the following order: Richmond, Delta, West Vancouver, Surrey, Vancouver, North Vancouver District, Burnaby and Coquitlam.

c) The burden of taxation varies substantially from one land use to another. In Vancouver, the owners of industrial property pay 95.62% proportionally higher taxes than the owners of conversions and in Delta the discrepancy between residential and vacant land is 137.45%.

The order of the land uses from the one in which the owner on an average, pays the proportionally lowest taxes to the highest is as follows: Vancouver; conversions, residential, apartment, retail, office and industrial; Surrey; residential and vacant land and Delta; residential and vacant land.

B. REASONS FOR ASSESSMENT INEQUALITIES AND UNUNIFORMITIES

Factors causing assessment inequality and ununiformity are numerous and at times may operate in opposite directions thereby diminishing the total of an unjust tax burden upon a particular property owner. However, it is very unlikely that the error in one direction will be offset by an equal error in another direction to produce a just distribution of the tax burden. The effects of one error against another were not measured as they vary for every property in every municipality and the calculations would be impossible to make.

Some of the reasons causing inequalities or ununiformity of assessments have been mentioned and studied earlier, so in these cases they will be mentioned only briefly at this time.

1. Five and Ten Per Centum Rules

As discussed in Chapter III the effects of these rules are as follows: 1) ununiformity and inequality of assessments; 2) increases administrative costs and 3) confuses the taxpayer. It is recommended that these rules should be abolished.

2. Appraisal Methods of Assessors

a) Cost Approach - The appraisal methods of the city assessors were described in Chapter III. Basically, it is the 'cost-new-less accrued depreciation' approach and is one of the three most commonly used appraisal methods. In 1932 Babcock quoted the Appraisal Practice of the National Association of Real Estate Boards as saying,

> "such summation appraisals are condemned as unsound,
> inaccurate and misleading because this method bases
> the opinion of value on the addition of values which
> may not be simultaneously obtained, and ignores the
> effect of over-, under-, and misplace improvements,
> and disregards the interrelation between land value
> and the value of improvements."[2]

Granted, the cost approach may have validity when the improvements have been recently constructed upon the land and they represent the lands highest and best use but, when the method is used to appraise older improvements many subjective judgements must be made which results in appraisers obtaining different values for the same property.

The validity of the cost approach may be questioned when one realizes that it does not take into consideration the value which may be added to the total value of the property when a particular improvement is placed upon a particular parcel of land. The value of the property may be greater than the value of the land and the value of the improvements added together.

The flaws in the cost approach method of valuation becomes over-whelming when it is employed for valuing property with older type improvements. The first dimension of the cost approach method to be examined is the valuation of land. A market value for the land must be determined under the assumption tht it is void of improvements. The improved lot is compared to similar unimproved sold lots in order to determine its market value. This procedure will lead to inaccuracies in assessments because improved and unimproved lots are two different commodities which should be treated as such.

The price which is paid for parcel of vacant land will depend upon its potential utilization and the purchaser who will utilize the land to its highest and best use will be able to bid the highest for the land.

R. U. Ratcliffe defines 'highest and best use' of land as:

> "a structure which is perfectly appropriate to
> the site and which suffers from no defects,
> neither physical deterioration, functional
> obsolescence, nor economic obsolescence."[3]

The number of improved properties where the improvements represent the

highest and best use becomes negligable under the above definition.

The assessor is, therefore, comparing the value of a vacant parcel of

land which has a value derived from its highest and best use to the

value of land where the improvements no longer represent its highest

and best use.

The second part of the equation, cost-less depreciation, for

determining market value is also subject to many defects. The appraiser

first detemines what it would cost to build a replica of the improve-

ments at todays prices. The first discrepancy between cost and

market price arises at this point: The structure may contain

improvements which add a greater or a lesser amount to its market value

then the cost of the improvement. For instance, the cost of painting

the structure may equal $800 but when the property is sold it may have

added $1000 to its market price. An often cited cliche used to present

the situtation whereby the cost of an improvement may not equal its market

value is 'the construction of a hotel in the Sahara Desert?'

From the cost figure, which may not represent market value, the

assessor is required to subtract a value equal to its depreciation.

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3 Richard U. Ratcliff, "Appraisal Theory" (Unpublished Course
Material, Vancouver, U.B.C., 1970), Chapter V, P.17

This depreciation may be due to physical deterioration, functional obso-

lescence or economic obsolescence. Since the buyers and sellers in the

market do not usually perform these intricate cost estimates the value

which the assessor attributes to these phenonoma becomes highly suspect.

The buyer usually considers the overall appearance and condition of the

improvements and does not categorize the costs of individual items. For

this reason adding the $800 cost of painting the home mentioned above

may increase the final selling price by $1000.

Functional depreciation may result over time as styles and

needs change. A home built 20 years ago which reflected the style and

needs of that time may be completely different from a house built in the

current times reflecting the changed style and needs. The cost of

converting the older home may be economically unfeasible yet the assess-

or is asked to subtract an appropriate figure from the cost price which

will reflect its market value.

The main defect of the cost approach is that it is very un-

likely that the market value of the property will equal or approximate

the summed values of the individual sectors of the whole. R. U. Ratcliffe

states:

> "any complex product or enterprise generates an
> undifferential stream of productivity through the
> interactions of its components. It is impossible
> to assign to any single component the measure
> of its contribution to the composite productivity
> and thus impossible to assign to any component a
> meaningful capital value which measures its
> contribution."[4]

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4 ibid., Chapter 5, Page 28.

The municipal appraiser is provided with an assessment manual

which is to act as a guide to the assessor when carrying out his assess-

ment by the cost-approach. Finnis has the following comment to make

about the use of the manual:

> "....for each individual property he (the assessor)
> must decide among other things, in which classification
> to put the building, what cost schedule to apply, what
> environmental or intrinsic features cause loss in value
> and to what extent. All these matters require the
> exercise of judgement, with one assessor being influenced
> one way and another assessor in another way. Accordingly
> no two assessors are likely to come up with exactly the
> same value for a given property even though they may start
> with the same facts."[5]

The inequities and ununiformities of assessments caused by

the use of the cost-less depreciation method of assessing may be elim-

inated by reducing the assessor's dependants upon this method and

focusing their attention upon the capitalization and market approach

methods. These methods will not be a panacea for they too have their

faults but if used properly they should prove to be more accurate measures

of market value. Paul Rollo quoted Phillip White as follows:

> "The data must be object, and the only basis of
> assessment that will meet his requirement is
> current market value. Market transactions will
> supply a continuous stream of evidence of value
> for most kinds of property, and it can be used at
> will. No such evidence is available for any other
> basis of assessment."[6]

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5 Finnis, <u>Property Assessment in Canada</u>, op. cit., P. 70

6 Paul Rollo, "Valuation Theory Assessment", (Unpublished paper, Vancouver, University of British Columbia, 1971), Page 26. (excerpt taken from Phillip H. White, "Land Taxation in Canada", (Unpublished paper, Vancouver: University of British Columbia, 1969), Page 5.

b) Market Value Approach - the Provincial Assessment Commiss-
ioner also provides the municipal assessor with bonafied sales transactions
which he may use as concillatory evidence as to the market-value of a
particular parcel of property. But when determining the current assess-
ments the assessor is asked to compare the subject property with the sales
price of property which sold 1 or 2 years previously. The purpose of this
policy is to ensure that a definable market trend has occurred in relation
to the subject property. The Provincial Assessment Commissioner wishes to
avoid a situation whereby the municipal assessors are assessing properties
by relying upon market transactions which may be only a short run phenonoma.
Of this point Finnis states:

> "At best, assessments of properties en masse can only
> reflect established trends within each classification
> of property with modifications made for individual
> properties at the discretion of the assessor. A
> change of values that seem to be appearing in one
> year should not be reflected in revised assessments
> until the assessor can be sure that the change is
> really an established trend."[7]

If this policy is well adheared to,the assessor has very little chance
of ever determining the current market value of the property under study
for market values very seldom remain constant over a one or two year period.
Property values may increase, decrease, or remain constant but most assur-
edly they will not fluctuate at exactly the same rate as the properties
which were deemed comparable to them 2 years previously.

Further study should be conducted comparing the inequities or
ununiformities of assessments which may result from the use of current sales
against the results which occur using sales data which is one or two years
old in order to determine which procedure results in the least distortions.

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7 Finnis, loc. cit.

3. Lag Period in Assessments

A third characteristic of the assessment procedure which has led to the ununiformity of assessments is the lag period in assessments of property. Due to the magnitude of the assessment responsibility, municipal assessors are able to perform re-assessments of property every 4 or 5 years. They must, therefore, provide estimates of assessed value each year for 75-80% of the properties within their jurisdiction. These estimates are, to a certain degree, a reflection of the assessment-sales ratios which are collected and determined by the Provincial Assessment Commissioner. A mean of the assessment-sales ratio is determined for each land use. If a particular land use is low relative to other land uses then the municipal assessor will arbitrarily increase the values of properties within that category a greater extent than the value of properties in other land use categories. The assessment-sales ratios determined by the Assessment Commissioner utilizes the current assessments and the sales from two years previously. The current market assessments obtained by this method may have no direct relationship to the current market values. It is suggested that the sales data in the ratios be as recent as possible, thereby, registering a truer picture of the current assessment-sales ratios.

4. Biasness of Assessors

Mary Rawson suggests the ununiformity of assessments may result due to the tendency to underassess the more valuable property. Her reasons for stating this are: 1) there are a smaller number of large size properties to compare and it is more likely that the assessor will underassess

these properties in order that he won't have to substantiate his figures in court; and 2) holders of smaller or less valuable properties seek redress less frequently.[8] From the data which was collected and analyzed (Tables #18 & 19) the reverse seems to be true, that is, that the less valuable properties are under-assessed.

5. Legislative Causes

Reliefs in the form of special assessments, for example, to farm land and residential land, also cause assessment ununiformities and inequalities. Ununiformities and inequalities of assessments caused by these special assessments are deemed to be essential to avoid a situation whereby a property owner is forced to sell because he cannot pay the increasing property tax. However, under the present system, when the property owner does finally sell and he obtains the market value price for it, all the capital gains go to him. During the period of his special assessments a portion of his tax burden is shifted upon others, yet, when he sells the property the other tax payers do not benefit from its increased market value. Instead of the taxing authorities providing the property owner with a non-recapturable relief a more equitable solution would be the deferment of a portion of the tax, payable at the time of a change of ownership or a change of land use.

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8 Mary Rawson, "Taxation Assessments and the City", (Canadian Institute of Realtors Journal, 1962)

C. REASONS FOR UNEQUAL TAX BURDEN

Unequal proportional tax burdens result due to either administered or unadministered consequences.

1. Administered inequalities of a proportional tax burden will be a consequence of the homeowners grant. Since the grant is received only by owner-occupiers of residential property the burden of taxation is reduced for this type of land use. Also, within the residential land use itself, inequalities will result because the grant is a fixed amount and, as such, it reduces the burden of taxation of lower priced homes proportionally greater than that of higher priced homes.

A second cause of administered inequality is that taxes are apportioned to different properties depending upon the extra services which the municipality supplies to them. Although the value of the property will be increased as additional services are provided, the authorities reason that the increased taxes, as a result of the increased market value, are not in themselves sufficient to pay for the services, so additional charges are assessed the property owner. Perhaps a study should be instigated which relates the increased tax burden of a property owner to the benefits he received from the services or the cost of the services. Unknowingly, the property owner may be paying for the services twice, once when the market value of the property is increased, increasing their taxes and again when the property owners are assessed additonal service charges.

Administered inequalities of the tax burden are also a result
of exemptions and reliefs which were discussed in Chapter III. Exemptions
of taxes or assessments bestowed upon some property owners or property
types redistributed the burden of taxation onto the remaining property
owners. The incidence of an exemption or relief is usually not know be-
cause the authorities granting the reliefs do not look beyond its initial
effects. It is recommended that the exemption policies should be reviewed
and where possible substitute these forms of benefit for grants which are
more closely scrutinized.

2. Unadministered inequalities of the tax burden are the by-products of
poor assessments. The inequalities due to this facet cannot be removed
until the assessment inequalities and ununiformities themselves are ob-
liberated or reduced.

D. CONCLUSION

The hypothesis of the thesis was: Are there inequalities or
ununiformity in assessments or real property which cause the tax burden to
be distributed unjustly?[9] This statement was broken down into three sep-
rate subdivisions which were empirically tested. These subdivisions
were: assessment uniformity, assessments equality and tax burden equality.
It was proven beyond a reasonable doubt that assessment uniformity does not
exist within the municipalites studied, and the degree of ununiformity
varied with the different municipalities. Also proven within the thesis
was that not only did assessment uniformity vary between the municipalities

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9 Supra, P.1

but it also varied in degree by the land use classifications.

The same conclusions were observed about the second part of the hypothesis, that of assessment equality. Equality of assessments betwen municipalities and land uses are not traits of the property Tax System in British Columbia. The equality of assessments between price ranges of residential property was also tested resulting in the supposition that lower priced properties were generally underassessed relative to the medium and higher price properties.

The third and final section of the hypothesis, that of a just distribution of the tax burden, was also proven to be invalid. This is a natural consequence when either assessment uniformity or equality does not exist. The exact extent of the injustice of the tax burden cannot be measured because a portion of the inequalities of taxes is the result of legislated or administrative policies which are deemed to be of just consequence.

It was recommended earlier that some of the legislative policies should be reviewed to determine whether or not the policies are in fact resulting in the effects for which they were intended. Also a revamping of the appraisal methods should be made to decrease the undesired portion of the unequal tax burden.

E. AREA FOR FURTHER RESEARCH

Measuring assessment uniformity and equlity may be useful tool in aiding the assesor in his assessments. If the sample size is increased

thereby enabling the researcher to increase the number and types of categories, then he can pinpoint the types of properties most ununiform or unequal and correct the assessments of those properties. The assessor may group the properties into sections depending upon such factors as: land use, price, architectural design and age of improvements, number of stories, and its location. The number of categories will depend upon the number of properties which fall into them for there must be enough categories that meaningful information can be gained but not an over-abundance such that calculations become to burdensome and confusing.

To provide useful information the appropriate measures must be applied to the categories depending upon the type of information sought. The results obtained will apply to the categories as a whole and it must be remembered that individual differences may exist within the categories themselves. Generally, however, the categories which exhibit the greatest divergencies should be reassessed first.

Other areas which deserve further research and were mentioned throughout the thesis are:

1. The relationship between net taxes and the benefits received by the property owner.

2. A study to determine the extent of the distortion of assessments caused by employing sales data which is two years old.

3. Increased tax burden of homeowners in relation to benefits or costs when extra services are provided by the municipality.

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APPENDIX A

EXCERPT FROM THE BRITISH COLUMBIA APPRAISAL MANUAL

In the following pages, excerpts from the British Columbia Appraisal Manual are provided so that the reader may understand more fully the municipal assessors assessment process.

APARTMENT BUILDINGS

General

The class has been divided into three types, as follows:—

    Class 4-1: Two- and three-story apartment—lower grade.
    Class 4-2: Two- and three-story apartment—average grade.
    Class 4-3: Two- and three-story apartment—better grade.

The types provided cover the more common frame apartments being built throughout the Province and are not adaptable to the less common reinforced-concrete multi-story apartments being built in the Lower Mainland area. In each class, rates have been provided to allow the treatment of apartments with exterior walls of concrete block or brick.

The system of developing the basic square-foot rate for an apartment involves two steps; one, of selecting the square-foot rate for the shell of the building, and, two, of selecting the square-foot rate for each floor based on the average-size suite in the building.

The average suite area is found by dividing the ground area of the building by the number of suites on one of the typical upper floors. When the lower floor is partially developed into suites and finished corridor, that portion developed should be measured and calculated as a percentage of the total ground area. The remaining lower floor may be service area—that is, laundry, boiler-room, lockers, etc.—and this area shall be valued at 50 per cent of the suite rate applicable to the developed area. Should the remaining lower floor, or some portion of it, be unpartitioned, this area shall be valued at 10 per cent of the suite rate applicable to the developed area to allow for nominal heating, lighting, and other items.

By combining the values for the shell and each floor as illustrated by the examples following Class 4-3, a square-foot rate for the apartment will be developed.

Additions and Subtractions

Each class has a range of adjustments for the more common variations from the basic description. Heating in each class includes the radiation, piping, and boiler, but not the stoker or oil-burner. Where automatic boiler-firing methods are encountered, these must be added as unit values. In some cases an attached annex, one story in height, is encountered. Square-foot rates have been provided to value this portion of the structure, with an exterior finish comparable to that of the main structure. Where some form of heating other than specified is encountered, the subtractions provided must be treated in the same manner as set out for calculating the suite rates, on a per floor basis. For special interior finishes, carports and garages, etc., see other Manual classes.

Depreciation

The suggested ranges of depreciation for apartments are as follows:—

	Per Cent
Lower quality	$1\frac{3}{4}$–$3\frac{1}{2}$
Average-quality frame	$1\frac{1}{2}$–3
Average-quality masonry	$1\frac{1}{2}$–3
Better-quality frame	$1\frac{1}{2}$–3
Better-quality masonry	$1\frac{1}{4}$–$2\frac{1}{2}$

The lower limit in each range is recommended where the structure is well maintained.

BASIC DESCRIPTION

1. General.—Two- or three-story frame apartment building with lower floor either above or below grade.

2. Foundation.—Concrete perimeter wall and footings.

3. Basement.—Alternative: (a) Full basement with 4' concrete and 4' frame wall where lower floor below grade, or (b) none where lower floor above grade (suites over crawl space).

4. Floors.—Alternative: (a) Lower floor concrete covered by wood sleepers and flooring in corridors and suites, service area concrete floors, or (b) lower floor on wood joists in corridors and suites, service area concrete floors usually on level below that of suites. Floors in suites finished in good-grade hardwood in living, dining, and hall areas, remainder fir; inlaid linoleum in kitchen and bathroom. Corridors have wall-to-wall carpet or runner with linoleum-tile borders. Intermediate floors have sound-deadening treatment.

5. Exterior Wall.—2" x 4" and 3" x 4" frame, shiplap and paper sheathed, good-grade shingles, stucco, or equal. Insulated.

6. Interior Wall.—Good-grade plaster; good-grade doors, windows, trim, and hardware. Imitation fireplace in each suite. Sound-deadening treatment between suites.

7. Ceilings.—Good-grade plaster or equal.

8. Roof.—Flat, wood joists, with either parapet or small overhang, with fifteen-year bonded built-up roof, roof drains. Insulated.

9. Chimney.—Single-flue inside chimney.

10. Entrance.—Medium-size entrance hall.

11. Heating.—Hot-water heating system with C.I. or convector radiators. Hand-fired boiler. See table for stokers, etc.

12. Plumbing.—Good-grade four-fixture bathroom and kitchen sink in each suite, laundry tubs in service area, central domestic hot-water supply.

13. Electrical.—220-volt service; good-grade wiring and fixtures, range wiring.

14. Painting.—Good-grade paint job.

BASIC COST OF SHELL PER SQUARE FOOT OF GROUND AREA

Ground area (sq. ft.)	1,500	2,000	3,000	4,000	5,000	7,000
Basic 2-story	$3.81	$3.60	$3.24	$2.98	$2.82	$2.55
Basic 3-story	5.05	4.80	4.35	3.99	3.75	3.42

BASIC COST OF SUITES PER SQUARE FOOT OF FLOOR AREA

Average suite area (sq. ft.)	400	600	800	1,000	1,200	1,400
Basic suite rate (per floor)	$3.54	$2.85	$2.50	$2.30	$2.18	$2.10

ADDITIONS AND SUBTRACTIONS

	1,500	2,000	3,000	4,000	5,000	7,000
Basement—Add for full 8' concrete	$0.08	$0.07	$0.06	$0.06	$0.05	$0.05

Floors—
Add for all rooms hardwood, except kitchen and bathroom .... .06 per square foot per floor
Subtract for asphalt tile on concrete, lower floor .... —.18 per square foot of finished area
Add for ceramic tile in bathroom .... $30–$45 per suite

Exterior Wall—
Add for concrete block stuccoed—

	.38	.33	.27	.23	.21	.17
2-story						
3-story	.59	.51	.42	.36	.32	.27

Add for face-brick

	.90	.79	.64	.56	.50	.42
2-story						
3-story	1.55	1.35	1.10	.95	.85	.72

Add for brick veneer .... .60 to .75 per square foot of face area

Roof—
Add for medium pitch .... .10 per square foot of ground area

Chimney—
Subtract for no chimney .... —$150 to —$210
Add for brick incinerator .... 300 to 360

Heating—
Subtract per finished floor for no heat

	—.57	—.53	—.46	—.42	—.39	—.34
2-story						
3-story	—.55	—.51	—.45	—.41	—.38	—.33

Add panel electric heat per floor (after making the above subtraction) .... .42 to .48 per square foot
Add for individual suite hot-water heat-control .... $90 to $120 per suite
Add for coal-stoker .... $315 to $780
Add for light-oil burner and 500-gal. tank .... 315 to 510
Add for heavy-oil burner and 1,000-gal. tank .... 1,125 to 1,320

Plumbing—
Subtract for no basin .... —$50 per suite
Subtract for no toilet .... — 65 per suite
Subtract for no bath .... —100 per suite
Add for shower stall .... $45 to $100 each
Add for separate domestic hot-water boiler, oil-fired .... $225 to $300

Annex—Add for 1-story boiler-room and laundry on concrete slab, attached to main structure (200 to 400 sq. ft. area) .... $2.05 to $2.55 per square foot

SINGLE-FAMILY RESIDENTIAL HOUSING

General

The single-family residential classifications have been divided into three general groups—one-story, one-and-a-half story, and two-story dwellings. These three general groups are again broken down into three age-groups—houses built prior to 1910, houses built in the period of 1910 to 1930, and the modern class of housing built after 1930 to that of our present-day construction. These three groups are in turn broken down into three or four classes, ranging from poor, to average, to good, giving a total of thirty-two residential classes.

Story Grouping

In regard to the three general groups of one-, one-and-a-half, and two-story dwellings, the definition of each, as applied to appraisals made with this Manual will be as follows:—

(a) **One-story.**—A house with a single developed floor above grade. It can have a basement and a finished attic, provided the liveable floor space of the attic does not exceed 30 per cent of the ground-floor area.

(b) **One-and-a-half Story.**—A house with a single developed floor above grade but with an attic or upper floor of which the liveable floor area is in the range of 30 to 70 per cent of the ground-floor area. This house also may or may not have a basement.

(c) **Two-story.**—A house with two developed floors above grade, one above the other, with the top-floor area not less than 70 per cent of the ground-floor area. This house also may or may not have a basement.

Age Grouping

The division of residential housing into different age-groups was done for two reasons. The first and obvious reason was that it helped to clarify the classification of certain types of houses. The second reason, and probably the most important, was that a uniform approach can be applied in regard to design or construction obsolescence.

The term " age grouping " means the architectural age, or period when a particular design was in vogue. This not only applies to the design, but to the materials used and the method by which they were used. Some designs and materials have not lost their desirability to the same degree as others, and it is therefore necessary to define these differences quite clearly.

It might have been more accurate to have called this division the " fashion grouping," as the differences are in design and the age is secondary. The age classification is brought about because the peak of construction of this type of house coincides with a particular age grouping.

An assessor should therefore not deliberately misclassify a house because its actual age does not agree with its architectural age grouping. It may be that the house was built prior to or after the era in which its style was in vogue.

Quality Grouping

Within each of the age-groups a further breakdown has been made into three or four quality classes, ranging from poor, to average, to good. There seems to be no justification to extend this breakdown beyond the three or four classes, as there are only three or four divisions in the cost of the common construction materials.

The assessor must not try to make too fine a distinction between one house and another as far as classification is concerned, but should compensate for the difference by using the additions and subtractions provided in the costing sheets for each class.

Should the assessor still feel a house is above or below the average for its class, and the additions and subtractions provided do not adequately measure this difference, then a plus or minus factor of from 2 to 5 per cent may be applied to the basic unit cost. This factor will be called the " workmanship and design factor."

On occasion an assessor may feel that a house lies directly between two classes. This will be an exceptional case. When the assessor feels this condition exists, he should work out the final figure for the house, including the additions and subtractions applicable, for each classification, and then only should he take the average between the two figures.

Tabulation of the Housing Classifications.—The table below shows the approximate relationship between the classes in age and quality.

ARCHITECTURAL GROUP PRIOR TO 1910

Stories	Very Poor	Poor	Average	Good	Best
One	Class 1-1	Class 1-3	Class 1-4		
One and a half		Class 1-11	Class 1-12	Class 1-13	
Two		Class 1-22	Class 1-23	Class 1-24	Class 1-25

ARCHITECTURAL GROUP, 1910 TO 1930

One	Class 1-1	Class 1-2	Class 1-5	Class 1-6	Class 1-7
One and a half		Class 1-14	Class 1-15	Class 1-16	Class 1-17
Two		Class 1-26	Class 1-27	Class 1-28	Class 1-29

ARCHITECTURAL GROUP AFTER 1930

One	Class 1-1	Class 1-5	Class 1-8	Class 1-9	Class 1-10
One and a half		Class 1-18	Class 1-19	Class 1-20	Class 1-21
Two			Class 1-30	Class 1-31	Class 1-32

Additions and Subtractions

Cases may be found where the cost sheets for a particular classification do not contain the additions and subtractions necessary to complete the appraisal of a house. When this occurs the assessor may take the additions or subtractions from a similar class in quality, in one of the other age or story groups. If no addition or subtraction can be found, the assessor may then go to the next class above or below the one in question.

I-8

It will also be noted that Classes 1-10, 1-21, and 1-32 all have a number of special additions and subtractions. Ordinarily these additions and subtractions apply only to the best-quality homes. However, when these luxury items appear in lower-cost housing, their costing should be taken from the above-mentioned classes.

Log Cabins, Prefabricated Houses, etc.

This type of housing can exist in such a wide range of styling and quality that no attempt has been made in this Manual to develop an individual cost breakdown for each class. The procedure to follow in making an appraisal of this type of dwelling will be to approximate the age and quality as closely as possible to one of the standard thirty-two classes and then price it accordingly.

Mansion-type Residences

It might make this explanation more understandable to say from the start that the " Best " classifications in this Manual were never intended to cover the so-called mansion-type dwellings. First of all, in the construction of this type of residence, money or cost has not been a consideration. The prime objective has been one of satisfying the whim of owner or architect. Because of the vast variation in planning styles, no standard of sq. ft. costs can be set to any degree of accuracy.

On a mansion-type residence where there has been no sale, the problem is one of reproduction costs, with the assessor running into custom-built features, such as special cabinetwork, panelling, art decoration, etc., imported mantels, and chandeliers, that can only be evaluated by a detailed inventory appraisal.

Having arrived at the reproduction cost, the assessor will then experience great difficulty, particularly in houses of considerable age, as to how much of a factor to apply for obsolescence. This phase in the evaluation procedure cannot be taken too lightly, as the question of obsolescence can become of paramount importance in the calculation of a true value.

It is therefore suggested, since the assessor has little time for a detailed appraisal and no set rules to arrive at proper obsolescence factors for this type of dwelling, that he resort to any one or all three of the following procedures:—

(1) Consultation with the owner.
(2) Sales data on the particular house or a similar one, which may exist locally or be made available by the office of the Assessment Commissioner.
(3) A detailed appraisal by the Assessment Commissioner or some reputable appraisal firm.

Mixed-story Housing

If a building is composed of one section of two stories and another section of one story, the one-story part may be broken out as a projection. It will be noted, however, that when unit prices are applied to each section, they should be based on the total area and not the individual areas of each section, otherwise higher unit prices will result than those applicable.

I-9

That is, a 2,400-square-foot residence, the two-story section being a Class 1-32 and having an area of 1,200 square feet and the single-story section being a Class 1-10 with an area of 1,200 square feet also, the unit cost for the one-story section would be $5.40 and for the two-story section $7.95.

The total basic unit cost would be:—

1,200 square feet @ $5.40 = $6,480
1,200 square feet @ $7.95 = 9,540
                                    ————
                        Total = $16,020

Irregularity Factor

All buildings in the Single-family Residential section have been costed on the basis that the house frame was rectangular or L-shaped and that the roof was a simple gable or hip type. No bay windows, projections, spires, or towers are included in the basic costing. If a building under consideration has any of these factors or the roof and wall framing is of a more difficult nature than that mentioned above, then the irregularity factor should be used.

Photographic Illustrations

The A, B, C, D, and E lettering system which appears under each of the photographic illustrations does not designate a difference in quality between one house and another, but is only used as an indexing system. Should the assessor feel the need to describe a house in more detail, he can indicate which picture most nearly fits the house in question by inserting the letter behind the class number.

Basements

The concrete-wall height as referred to in the costing sheets of this Manual means the average wall height. In many cases, the newer-type homes have a front basement wall equal to a height of 8 feet while the back wall drops off to 4 feet or less. The average wall height in this case for selecting the basement rate would then be 6 feet.

It will be noted that this Manual only considers concrete and frame walls as the basis for basement costing. No mention has been made in regard to basement walls which are constructed of concrete block, brick, or stone rubble. It has been felt that no useful purpose could be served by a further breakdown into these categories, and that the small error involved, by saying their costs are similar, would not be a serious one.

Partial Basements

In selecting the unit cost rate to apply when costing a partial basement, it must be remembered that this rate should be based on the total house area. The cost of the partial basement is then the product of this rate and the partial basement area.

That is, a Class 1-8 house with a ground floor equal to 1,000 square feet. It has a partial basement of 600 square feet. The floor is concrete and the average concrete wall height is equal to 4 feet. What is the cost of the partial basement?

From the Manual the rate for a Class 1-8 basement of 1,000 square feet with 4-foot concrete perimeter wall is $0.41 per square foot of ground area.

Therefore, the partial basement costing:—

(a) Walls, $0.41 × 600 = $246
(b) Floor, $0.22 × 600 = $132

Total = $378

Basement Rooms

Because the size and quality of basement rooms can vary to such a degree, regardless of the size and quality of the house, it is felt that three rates, ranging from poor, to average, to good, will suffice in calculation of this nature. It must be remembered in the selection of a rate from the table below that as the size of the room diminishes, the unit cost increases.

BASEMENT ROOMS (PER ROOM)

Classification	80 Sq. Ft.	100 Sq. Ft.	120 Sq. Ft.	160 Sq. Ft.	200 Sq. Ft.	300 Sq. Ft.	400 Sq. Ft.	600 Sq. Ft.
Poor	$0.75	$0.68	$0.63	$0.55	$0.50	$0.41	$0.35	$0.30
Average	1.15	1.05	.95	.80	.71	.59	.51	.43
Good	1.70	1.45	1.30	1.10	.95	.76	.65	.56

The above figures do not include flooring and should never be used when the basement is fully partitioned. (For flooring costs see Class 1-10.)

Basic Specification

(a) Poor.—2″ × 4″ studs, cheaper-type wallboard on ceiling and one side of studs, door, and drop-lights.

(b) Average.—2″ × 4″ studs, medium-grade wallboard on ceiling and both sides of studs, door, some trim, cupboards, painting, and lighting fixture and wall-plug.

(c) Good.—2″ × 4″ studs, plaster or fir plywood on walls and ceiling, nicely finished, some cupboards or closet, door, and good lighting fixtures and plugs.

Masonry

In the costing sheets for the different residential classifications, additions for masonry walls have only been included in the housing classes where this type of construction normally appears. However, should the assessor encounter masonry walls in some of the other classes where this type of construction is the exception, and no additions are given, he may apply a percentage increase to the basic unit rate, as indicated in the table below.

Masonry Type	Increase to Basic Unit Rate (Per Cent)
Concrete block	3 to 7
Pumice block	4 to 8
Cinder block	3 to 7
Brick	10 to 20
Precast concrete stone	6 to 12
Random stone, average	15 to 30
Random stone, good	20 to 40

Caution must be used in the application of the above percentages, as they are only a rough approximation. They should never be used in preference to the individual additions appearing in the classification section. It must also be remembered, when using the above table, that the higher quality the house in question, the lower the percentage increase, and the lower quality the house the higher the percentage increase.

The figures in the above table, as in all the additions for masonry, are based on a masonry-wall height equal to the height of the eaves on one- and two-story houses, and on the one-and-a-half story house to include the stub walls above the upper floor or the gable area.

Electrical

The term " range and water-heater," as used in the classification sheets, was done as an aid to the assessor in identifying 220-volt service, which has a three-wire lead-in, as opposed to 110-volt service with the two-wire lead-in, and is not meant to indicate electric ranges are assessable.

Insulation

The additions and subtractions for insulation are only shown in three of the classes—1-9, 1-20, and 1-31. As insulation costs are fairly constant, these figures can be used for any class within its story grouping.

Courtyards, Patios, Driveways, etc.

A normal amount of sidewalks and driveways in relationship to the average for a classification are included with the costing for each individual class of residential housing. Anything in excess of the normal should be inventoried, priced, and included in the total assessed value.

Depreciation (Normal Physical)

The accepted range of depreciation for single-family residential housing is 1½ to 2½ per cent for wood frame construction, and 1 to 2 per cent for masonry construction. For assessment purposes an average rate of 1½ per cent per annum is recommended. This rate has been suggested so as to ensure some form of uniformity of depreciation rates from one assessment jurisdiction to another.

Design or Construction Obsolescence

SINGLE-FAMILY RESIDENTIAL HOUSING, CONSTRUCTION OBSOLESCENCE TABLE

	Class	Percentage Obsolescence		Class	Percentage Obsolescence			Class	Percentage Obsolescence
One Story	1- 1	0	One and a Half Stories	1-11	0-15		Two Stories	1-22	0-15
	1- 2	0		1-12	5-20			1-23	10-20
	1- 3	0-10		1-13	10-25			1-24	15-30
	1- 4	5-15		1-14	0- 5			1-25	20-35
	1- 5	0- 5		1-15	0-10			1-26	0- 5
	1- 6	0-10		1-16	5-15			1-27	5-15
	1- 7	0-15		1-17	10-20			1-28	10-20
	1- 8	0		1-18	0			1-29	15-35
	1- 9	0		1-19	0			1-30	0
	1-10	0		1-20	0			1-31	0
				1-21	0			1-32	0

1. The above table is based on a survey of the Greater Victoria area and is considered generally applicable to other localities in the Province. Should this not be the case, the assessor should make a study and prepare a revised table based on his own findings.

2. Caution must be exercised in applying physical obsolescence factors to buildings which are converted from single-family residences to multi-family units. In some cases where these conversions have been made, older-type houses, usually because of their size and locality, become very desirable from an income point of view and hence should carry very little or no allowance for design or construction obsolescence.

To aid the assessor in calculating partial assessments in the case of unfinished houses, the Percentage Cost Breakdown Table, shown on page I-14, has been prepared. The table is based on a frame bungalow with basement, in keeping with the basic description of a Class 1-9 house. It should be noted that heating and insulation are not included in the basic 100 per cent and, along with other additions and deductions, must be calculated in the normal manner of completed dwellings, as illustrated in the note following the example.

The table is divided into four main groups or stages following the normal progress of a house during its erection. Considerable variation to this evolution may be encountered, particularly where a house is being owner-built or occupied before completion.

It must be borne in mind that this table is only a guide, and that the individual percentages may vary considerably, depending not only on the floor plan and area of the building, but on architectural design and the choice of materials used.

The following table summarizes the table on page I-14 and also gives corresponding values for the one-and-a-half and two-story equivalent classes. It may be seen from the summary table that at the completion of Stage 1 in the case of the one-story house, approximately 20 per cent of the dwelling is completed; Stage 2, 50 per cent; and Stage 3, 60 per cent. No further grouping of units is practical as the order of completion of the interior finish may vary considerably.

SUMMARY OF PERCENTAGE COST BREAKDOWN

Stories	Progressive Totals by Stages			
	Stage 1	Stage 2	Stage 3	Stage 4
One	20	50	60	100
One and a half	18	50	65	100
Two	13	45	55	100

Note.—The percentages shown for the one-and-a-half story house do not include a finished upper floor, which, if encountered, must be added in the normal manner.

Further variations will be encountered when assessing the percentage of completion of both poorer- and better-grade houses and also one-and-a-half and two-story dwellings. In the case of poorer-grade houses—i.e., Class 1-8 —the ratio varies, with a percentage decrease being made in Stage 4, and a resulting increase in Stages 1, 2, and 3; conversely, in the better-class houses—i.e., Class 1-10— the increase is in Stage 4, and resulting decrease in Stages 1, 2, and 3.

Example.—A Class 1-9 house with a ground area of 1,000 square feet having no basement is under construction. At the time of inspection the foundations, subfloor, walls including siding, exterior painting, roof and roofing are completed; all exterior sash and doors in place; wiring and plumbing roughed in. The interior is unfinished, but walls and ceilings are insulated and lathed ready for plastering, with a built-in wall furnace installed and operating.

Basic unit when complete=$5.10×1,000=$5,100

Stage 3 completed 61.7%	Pres. value 65.8% ×$5,100= $3,355
(See table, page I-14.)	Sq. ft. additions and
Additions:	subtractions:
Siding 2.4%	No basement —.71
Exterior painting ... 1.7%	Insulation .... +.12
——— 4.1%	
Percentage completed 65.8%	Sq. ft. total .. —.59×1,000= —$590
	Heating addition $210
	Net total $2,975

From the above example it will be noted that the percentage must be applied to the basic unit **only** and all square-foot additions and subtractions applied to the residual. To use these values with a house having no basement or only partial basement, calculate the base value with a full basement, 4 feet concrete and 4 feet frame; and after determining the dollar-value percentage completed, deduct the basement value originally added.

PERCENTAGE COST BREAKDOWN OF CLASS 1-9 HOUSE ASSEMBLED IN PROGRESSIVE STAGES OF CONSTRUCTION

Item	Stage 4 values	Stage 3 values	Stage 2 values	Stage 1 values	Unit Totals
Permit and Plans				Excavation 1.0	1.0
Excavation and Back-fill				Excavation 2.1	2.1
Concrete				Foundations 8.6	8.6
Masonry			Chimney 4.1		4.1
Rough Carpentry			Rough siding 2.0; Sub-floor, wall framing, roof 19.3	Foundations 4.6	25.9
Plumbing	Finished wiring and plumbing 3.1	Rough wiring and plumbing 5.1			8.2
Wiring	Finished wiring and plumbing 1.2	Rough wiring and plumbing 2.3			3.5
Lath and Plaster	Plastering 8.0	Lath 2.2			10.2
Millwork—Sash and Doors	Interior sash and doors 1.2	Exterior sash and doors 2.4			3.6
Finished Carpentry	Finished trim and cabinets 12.0				12.0
Hardwood Flooring	Finished floors 4.4				4.4
Roofing			Roofing 3.4		3.4
Painting	Painting—interior 2.2; Painting—exterior 1.7				3.9
Hardware and Nails	Finished wiring and plumbing 0.3; Plastering 0.3	Rough wiring and plumbing 0.4	Roofing 0.2; Sub-floor 0.8		2.0
Heating	Not included in basic rate.				
Linoleum	Finished floors 0.8				0.8
Tile Drains				Foundations 0.9	0.9
Sheet Metal			Roofing 0.5		0.5
Light Fixtures	Finished wiring and plumbing 0.7				0.7
Insulation	Not included in basic rate.				
Sewer Connection				Excavation 1.8	1.8
Siding (Stucco)	Siding (stucco) 2.4				2.4
Unit Totals					**100.0**
Stage Totals	38.3	12.4	30.3	19.0	100.0
Progressive Totals	100.0	61.7	49.3	19.0	
Stages	4	3	2	1	

I-14

ONE-AND-A-HALF-STORY
SINGLE-FAMILY RESIDENTIAL
HOUSING

GENERAL NOTES

Definition

A one-and-a-half-story house shall be defined as such when the liveable floor area of the upper floor is not less than 30 per cent nor greater than 70 per cent of the ground-floor area. Liveable floor area shall mean an area where the ceiling height is at least 4 feet 6 inches or over. For all practical purposes, the Assessor may use shoulder height.

Measurements

Measurements should be carried to the nearest half-foot.

There are cases in one-and-a-half-story house construction where the upper floor extends over the porch area. In these cases, one-half the projecting area may be included with basic ground area and priced at the basic unit rate.

It will be noted that in the one-and-a-half-story group, no additional cost will be made for porches unless the area of the porch involved exceeds 80 square feet.

Roofs

The cost build-up for all roofing has been made using a roof slope of approximately 45 degrees, or what is commonly known as a half-pitch. The subtractions for low pitch are based on the pricing for a quarter-pitch, and similarly the additions for high pitch on the pricing for three-quarter pitch.

Cost Build-up

The cost build-up on the one-and-a-half-story house is based on a completely partitioned and finished ground floor and an unfinished attic or upper floor. The build-up includes the stairway and a cheap board or shiplap upper floor. When the upper floor is partitioned and finished, it is priced separately from the second table, "Attic or Upper Floor," which appears on each class cost-sheet.

BASIC DESCRIPTION

1. Foundation.—Wood post and beams on concrete or wood blocks.
2. Basement.—Nil (crawl space).
3. Floors.—2" x 10" or 2" x 12" joists, shiplap and paper sub-floor; with good-grade fir finish on ground floor only.
4. Exterior Wall.—Carried to upper floor level only. 2" x 4" frame, shiplap and paper sheathed, with good-grade drop siding, shingles, or equal.
5. Interior Wall.—Ground floor only. Walls and partitions lined with lath and plaster, wall-papered, or painted. Extensive softwood wainscoting. Good-grade doors, windows, trim and hardware.
6. Ceiling.—Ceiling height 8' to 10'; lath and plaster, painted or wall-papered.
7. Attic or Upper Story.—30% to 70% of floor area inhabitable. Not partitioned or finished. Good-grade stairway. Floor—shiplap or equal.
8. Roof.—Average high-pitched roof (slope, 45° approximately). Hip or gable, few broken lines. No dormers. 2" x 4" rafters, shiplap sheathing, and good-grade shingles.
9. Chimney.—Inside single-flue chimney built from ground up.
10. Porches.—Average-size porches for this type of home included. (For porch area in excess of 80 square feet see "Additions and Subtractions.")
11. Heating.—Kitchen stove. Wood and coal space-heater.
12. Plumbing.—Water connection, cheap kitchen sink, and hot-water tank. Complete three-piece bathroom. Septic tank or sewer connection.
13. Lighting.—110-volt service; moderate wiring, good fixtures, and occasional wall-plugs.
**14. Painting.**—Good-grade paint job.

BASIC COST PER SQUARE FOOT OF GROUND AREA

Ground area (sq. ft.)	1,000	1,200	1,400	1,600	2,000
Cost (basic unit as described)	$5.10	$4.70	$4.40	$4.20	$4.00

ADDITIONS AND SUBTRACTIONS

	1,000	1,200	1,400	1,600	2,000
Foundation—Add for cheap 2' brick, concrete, or stone perimeter wall (crawl space)	$0.10	$0.08	$0.07	$0.07	$0.06
Basement—					
Add for 2' concrete perimeter wall with 4' to 6' frame section above; dirt floor	.39	.33	.29	.25	.21
Add for 4' concrete perimeter wall with 2' to 4' frame section above; dirt floor	.44	.38	.33	.30	.25
Add for 6' concrete perimeter wall with 0' to 2' frame section above; dirt floor	.52	.45	.39	.36	.31
Add for .7' to 8' concrete perimeter wall; dirt floor	.63	.57	.52	.49	.44
Add for concrete floor	.18 per square foot of floor area				
Add for wood floor	.10 per square foot of floor area				
Floors—Add for good-grade hardwood floors	.17 per square foot of floor area				
Exterior Wall—					
(1) Frame—					
Add for 2' to 3' stub wall above upper floor level	.13	.11	.10	.09	.08
Add for 4' to 5' stub wall above upper floor level	.24	.20	.18	.16	.15
(2) Masonry—					
Add for 8" brick wall	.96	.88	.80	.75	.72
Add for 12" brick wall	1.20	1.10	1.00	.94	.90
Add for 12" stone wall	1.92	1.76	1.60	1.50	1.44
(For masonry veneers see Class 1-21.)					
Roof—					
Add for very steep pitch or gambrel roof	.15	.15	.15	.15	.15
Subtract for low pitch	—.12	—.12	—.12	—.12	—.12
Add for dormer (Dutch or gable)	$55 to $200				

Attic or Upper Floor (Partitioned and Finished as First Floor)—

Half-story liveable floor area (sq. ft.)	300	600	900	1,200	1,500
Cost (finished walls, ceiling and floor)	$1.40	$1.15	$1.05	$0.95	$0.90

Chimney and (or) Fireplace—
Subtract if basic chimney built from wall-bracket ... —$20 to —$30
Add for each additional flue to basic chimney ... 45 to 80
Add for inside fireplace ... 65 to 100
Add for outside chimney and fireplace ... 150 to 225
Add for additional single-flue chimney ... 55 to 100

Porches (per sq. ft. of porch area in excess of 80 sq. ft.)—
(a) Open type ... 2.10 to 2.70
(b) Glassed-in type ... 2.70 to 3.30

Heating—
(1) Hot-air System (Gravity)—
With wood- and coal-fired furnace ... 180 to 375
With oil-conversion fired furnace ... 420 to 650
With automatic coal-stoker fired furnace ... 470 to 700
With automatic oil-fired furnace ... 480 to 800
Add to above for forced hot air ... 75 to 105

(2) Hot-water System (Radiators, Convectors, Radiant, etc.)—
With wood- and coal-fired boiler ... 720 to 1,000
With oil-conversion fired boiler ... 990 to 1,200
With automatic coal-stoker fired boiler ... 1,050 to 1,500
With automatic oil-fired boiler ... 1,080 to 1,600

Plumbing—
Add for additional toilet ... 40 to 65
Add for additional basin ... 30 to 45
Add for additional bath ... 45 to 75
Add for shower ... 20 to 90
Add for additional kitchen sink ... 40 to 65
Add for laundry tubs ... 35 to 45
Add for additional hot-water tank ... 35 to 90

Electrical—Add for 220-volt service (range and water-heater) ... 60 to 75

Structure—
Add for variation from simple perimeter to broken lines (bay windows, projections, etc.) ... 2% to 5% on basic
Add for variation from simple to irregular roof framing (gables, hips, and valleys) ... 2% to 5% on basic
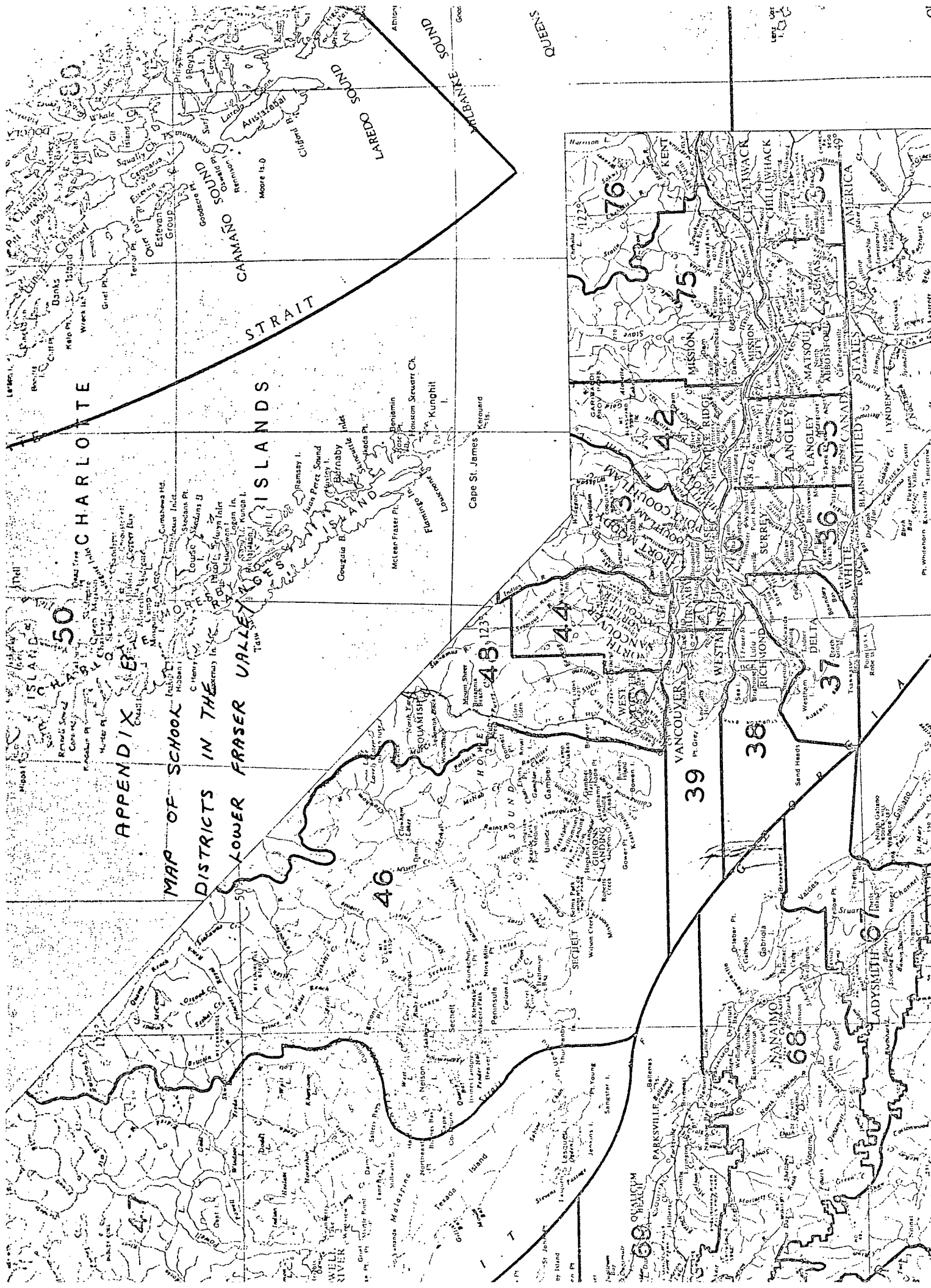
APPENDIX E

MAP OF SCHOOL DISTRICTS IN THE LOWER FRASER VALLEY

APPENDIX C

DEFINITIONS AND FORMULAS

To accommodate the identification of symbols used herein,
the following definitions and formulas are provided:

M   =   measure of central tendency = u & mdn.

Mdn   =   the median is the middle score having an equal number of scores being above this point as below.

$$ \mu + \left(\frac{.5N - \Sigma f b}{f w} \right) i $$

where	=	the lower limits of the class interval which contains the median.
N	=	total number in the sample
f_i	=	the frequency of scores within the ith class interval
$\Sigma f b$	=	the sum of the frequencies below the class interval which contains the median.
$f w$	=	the frequency within the class interval which contains the median.

u = mean =   average of scores

$$ \frac{\sum_i f_i x_i}{N} $$

where x_i = midpoint of the ith interval

d = mean deviation - the average amount each score deviates from the mean or median. The greater the dispersion of the scores the greater the mean deviation.

$$ \frac{\sum_i | f_i (x_i - \mu) |}{\sum_i f_i} $$

s^2 =   variance of the sample
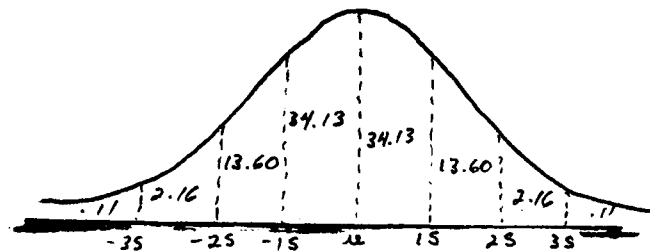
$$ \frac{\sum_i f_i (x_i - \mu)^2}{\sum_i f_i} $$

S = standard deviation of the sample. The standard measure of the variability of the raw scores. The greater the spread of the series, the greater will be the standard deviation.

Formula:

$$\left(\frac{\sum_i f_i \left(x_i - \mu\right)^2}{\sum_i f_i} \right)^{1/2}$$

if the sample is normally distributed then the percent of cases falling within the standard deviation is as follows:

percent of cases falling between ± 1 S = 68.26%

Deciles   - divides the items into 10 equal parts.

Quartiles   - divides the items into 4 equal parts.

Quartile Deviation - it is calculated by substracting the 1st quartile from the 3rd quartile and dividing by two.

= standard normal deviate - describes the deviation of a score from the median, in standard deviation units.

Formula:

$$\frac{x_i - M}{S}$$

confidence interval - allows the researcher to make a hypothesis about the interval within which a sample mean will be, and to state the degree of confidence he has that it is accurate.

In a normal distribution the statistician can predict with 95% confidence that the median of the scores will fall between ± 1.96 standard deviations. Researchers generally will accept an hypothesis as being correct if the probability of its being incorrect is only P = .05. If an hypothesis

is made that the median is between one score value and another, and the
probability of being incorrect is P = 50, the interval between the score
values represents the 5% confidence interval.

$-1.95\,S$ $+1.95\,S$
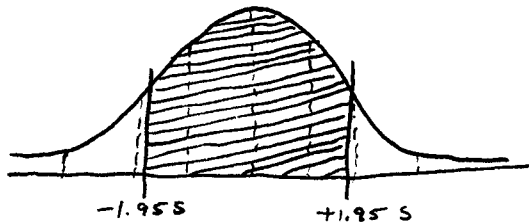
The shaded area gives the area defining the 5% confidence
interval, because the probability that u lies outside this interval is
.05.

Rd   = coefficient of dispersion - is a measure, in
percent, of the average departure of individual
scores from the median score. The smaller the
percent the greater the degree of uniformity.
100 (d/Mdn)

Rs   = coefficient of variation - calculation relating the
standard deviation to the arithmetic mean and
expression it as a percentage. 100 (S/M)

df   = degrees of freedom - illustrates the number of
variables free to vary. In a normal distribution
the sample standard deviation and variance is an estimate
of the population standard deviation and variance
when the degrees of freedom are N-1 instead of N.
The larger the value of N the less distortion is
caused by subtracting 1.

x^2 = Chi-Square test - technique for examining frequency
data. eg. whether or not the population is normally

distributed when df is greater than one.

where O_i = observed frequency

and E_i = expected frequency

V = K-M degrees of freedom

K = number of possible outcomes of the experiment

M = number of known constant values which are used in the calculations of the expected frequencies.

Regression Coefficient [1] - estimating empiracally the relationship between two variables. Since the estimates and predictions are developed from only a sample of observations it is necessary to construct confidence intervals.

Formula: (best-fit line) Sample

$$\hat{y}_x = a + bx$$

where a is the value of y at which the line crosses the x-axis and b is the slope of the line or the amount y changes as x increases by 1 unit. The usual technique for estimating a & b is the least squares method. Each observation can be written $y_i = a + bx_i + e_i$ where e_i is the deviation from the regression line for the ith observation and y_i and x_i are the paired values for the ith observation. The formula can be written as: $e_i = y_i - a - bx_i$.

_____

1 Summary from Edgar P. Hickman and James G. Hilton, Probability and Statistical Analysis, (Columbia: Intext Educational Publishers, 1971. pp. 257 - 262.

The sum of the squared deviation becomes:

$$\sum_i e_i^2 = \sum_i \left(Y_i - a - b\, x_i \right)^2$$

It is this sum which we wish to minimize with respect to a & b. This is done by taking the deviative with the respect to A and then with respect to B , setting the resulting equation to zero, and then solving the two equations simultaneously for a & b:

$$\frac{\partial \sum_i e_i^2}{\partial a} = -2 \sum_i \left(Y_i - a - b\, x_i \right) = 0 \qquad \Bigg| \qquad \frac{\partial \sum_i e_i^2}{\partial b} = -2 \sum_i x_i \left(Y_i - a - b\, x_i \right) = 0$$

Solving these for a & b yields equations for finding the least squares estimations:

$$b = \frac{N \sum_i x_i Y_i - \sum_i x_i \sum_i Y_i}{N \sum_i x_i^2 - \left(\sum_i x_i \right)^2}$$

$$a = \frac{\sum_i Y_i}{N} - b\, \frac{\sum_i x_i}{N}$$

SY/X = standard error of y

Assuming that the variance of the y values for a given x are constant the standard error of y can be determined.

Formula:

$$S_{Y/X} = \left(\frac{\sum_{i=1}^{n} \left(Y_i - \bar{Y}_x \right)^2}{N - 2} \right)^{1/2}$$

where Y_i is the actual value of y and $\bar{Y}_x$ is determined by substituting each corresponding x into the regression equation

$$\hat{Y} = a + b\, X$$

Sb = standard error of b - used to measure the reliability of b

Formula:

$$S_b = \left(\frac{S_{Y/X}}{\sum_{i=1}^{n} \left(x_i - \bar{x} \right)^2} \right)^{1/2}$$

Sa = standard error of a - measures of the reliability of a

Formula:

$$S_a = \left(\frac{S_{y/x}}{\sum\limits_{i=1}^{n} \left(x_i - \bar{x} \right)^2} \right)^{1/2}$$

F = ratio - an F-test is performed to test the significance of the

regression coefficient b. The F-value is calculated

by the formula:

$$\left(\frac{b}{S_b} \right)^2$$

r^2 = coefficient of determination - measures the proportion of

the total variation in x that is due to x

Formula:2

$$\frac{\sum\limits_{i} \left(\hat{y}_{xi} - \bar{y} \right)^2}{\sum\limits_{i} \left(y_i - \bar{y} \right)^2}$$

This is derived from the contention that the total variance in y

or $\sum\limits_{i} \left(y_i - \bar{y} \right)^2$ can be divided into two parts: 1) variation in y due to x

or $\sum\limits_{i} \left(\hat{y}_x - \bar{y} \right)^2$ and 2) variation in y unexplained by x or $\sum\limits_{i} \left(y_i - \hat{y}_{xi} \right)^2$.

The r^2 obtained is always between 0 and 1 and the closer r^2 is to one,

the closer the data points $\left(x_i, y_i \right)$ lie to the regression line $\hat{y} = a + bx$.

r - coefficient of correlation - coefficients of correlation are the square

roots of the coefficient of determination or better defined since the coe-

fficient of correlation may take on values between +1 and -1 the coefficient

---

2 For the mathematical derivation of this formula refer to
Hickman & Hilton, ibid., pp. 272 - 275

of determination is the coefficient of correlation squared. The sign of
the correlation coefficient tells us whether the relationship between the
two variates is positive or negative. A correlation coefficient of +1 in-
dicates a perfect positive correlation while one of -1 indicates a perfect
negative correlation.

The question which r answers is: What percentage of the deviation
of y from its mean is predicted by the equation

$$\left(\frac{\sum_i \left(\hat{Y}_i - \bar{y} \right)^2}{\sum_i \left(Y_i - \bar{y} \right)^2} \right)^{1/2} = r$$