Annexe A

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SUMMARY OF ABSTRACTS

Progressive Capital Recovery In Regulated Public Utilities

Jacques Bellemare, Teleglobe Canada

The entry of many new unregulated capital intensive competitors into service areas traditionally reserved to heavily regulated monopolistic Public Utilities is creating a strong challenge for both regulators and Public Utilities managers dealing with complex capital recovery issues.

This paper proposes a comprehensive analytical environment for the depreciation process which is developed around the integrated concepts of Capital Management and Micro-economic analysis. The Straight Line capital recovery pattern is analyzed within that environment and becomes the reference point for the assessment of various other recovery patterns.

The comparative analysis reveals that progressive (or decelerated) recovery patterns may often constitute a better means of achieving the capital recovery objectives than the traditional Straight Line pattern. The paper also suggests the application of a Step-Wise Adjustment (SWA) approach as a more realistic, practical, and efficient management solution to the capital recovery task.

The paper concludes that a major and fundamental change in perception and approach is required in the area of capital recovery management during the next decade. Such a change may necessitate a complete departure from today's highly dominant straight line depreciation methodologies.

An Expansion of the Gompertz-Makeham Equation for the Life Analysis of Physical Property

Ted L. Leavitt
Teresa T. Ninh

This paper explores the idea of developing a formulation that will improve the current curve fitting process for the life analysis of telecommunications equipment.

Included is a review of the Gompertz-Makeham method in which the original terms accounting for retirements due to age and chance are used. We then introduce an additional term that takes competitive and technological activity into consideration. A new formulation is developed using a computer program for testing mathematical concepts, curve fitting processes, and analysis of results to determine the best general formulation. Sample exhibits of curve plots and best-fit statistics are included.

In conclusion, we show that this new method can produce a better curve fit based on standard statistical measurements. We further speculate how future observed data may reflect competitive and technological influences.

Progressive Capital Recovery in Regulated Public Utilities

Jacques Bellemare †

I - Introduction

The November 1989 inaugural issue of the Journal of the Society of Depreciation Professionals included a paper titled "The Theory and Practice of Depreciation Accounting Under Public Utility Regulation" written by Ronald E. White, Ph.D. This paper was refreshing, timely and stimulating for all of those who are deeply interested in the rigourous development of the capital recovery practices applied by the capital intensive public utilities, regulated or not.

In concluding his paper as it applies to the regulated utilities more or less subject to some form of competition, Dr. White mentions that "the emergence of competition presents a new set of challenges in setting depreciation rates for regulated utilities. The solution, however, does not lie in shorter service lives, identification of assets by equal-life groups or other measures intended to more nearly achieve cost allocation over service life. The threat of competition must be met with depreciation methods that will nearly achieve cost allocation in proportion to the consumption of service capacity. It is pointless to haggle over minor differences in service life and net salvage estimates if competitive pricing will not permit the recovery of revenue requirements based on straight-line depreciation."

Because we tend to agree with the overall critical analysis made by Dr. White in his own paper, the present paper is an attempt to define a new reference framework that could hopefully be helpful in the pursuit of the very stimulating search for analytical and managerial improvements in the field of capital recovery.

Although some of the ideas and comments presented in this paper may appear somewhat fundamental to the depreciation specialist, may we emphasize that the "new set of challenges" referred to by Dr. White are in fact dealing themselves with the very fundamental aspects of the depreciation process and practices.

No real progress is likely to be made until a wide consensus is reached amongst capital recovery professionals about the appropriate framework of reference required to permit the exercise of a rigorous and efficient debate on the many fundamental issues confronting the profession at the turn of the 21st century.

Part II of this paper outlines our proposal for an appropriate analytical environment for the depreciation process. This environment should be as broad as necessary and our proposal is being developed around the overall concepts of Capital Management and Micro-economic analysis.

In Part III, the Straight Line capital recovery pattern is being illustrated and analysed along the lines of the analytical environment set out in Part II. The Straight Line pattern then becomes the reference against which other recovery patterns are being assessed thereafter.

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Degressive (or accelerated) and progressive capital recovery patterns are then described and illustrated along the parameters set in Part II. An attempt is then made to establish the distinction between the degressive/accelerated and the progressive recovery patterns in relation to the Straight Line reference one.

Part III also includes a brief description of the "Step-Wise Adjusted Progressive" (SWAP) capital recovery management approach.

In Part IV, we elaborate on our perception of the Capital Recovery challenge of the next decade and we are discussing a few important and fundamental aspects related to that challenge such as the notions of "service capacity" and "service life", the revenue-expense matching principle, and the necessity to integrate the financial, technological and commercial dimensions into the capital recovery process.

Finally, Part V stresses the need for Corporate and Regulatory acceptance of the gradual application of innovative, progressive capital recovery methodologies in the management of Public Utilities.

The paper concludes that a major and fundamental change in perception and approach will be required in the area of capital recovery management during the next decade and that such a change may necessitate a complete departure from today's highly dominant straight line depreciation methodologies.

II - The Micro-Economic Analytical Framework

The Public Utilities of interest in the context of this paper are capital intensive businesses. In general, they have a Fixed Asset base that could range anywhere between 2 to 3 times their Annual Operating Revenue base, and between 40% to 50% of their total revenue requirements are generated by the "Capital Consumption" process.

This is the case for most of the regulated telecommunications carriers in North America.

A typical micro-economic profile for such a situation is illustrated in Figures 1 and 2. Figures 1 and 2 are idealized illustrations. Their prime purpose is to permit size-up and understanding of fundamental issues. Figure 1 shows a visual representation of the fundamental micro-economic equation for a typical capital intensive Public Utility. It reflects the basic Revenue-Cost relationship of the business. It fits into the micro-economic analytical environment because it applies the revenue-cost relationship to a specific accounting period or service production period and the figures shown are all relative - (100%, 60%, etc.) - to highlight order of magnitudes.

Figure 2 shows a typical micro-economic profile for a capital intensive Public Utility. Again the numbers shown indicate relative measures and the profile is drawn to scale to permit a better visualization of the order of magnitude of the various components. The typical profile is idealized for the case where the current ratio is 1.0 (i.e. Short-term liabilities = Short-term assets).

Figures 1 and 2 are examples of illustrative accounting and are relating to the formal accounting statements of the firm.

This paper also situates the capital recovery process within the much broader management process of the capital resources of the firm. This overall framework of reference is shown as the Capital Management Framework illustrated in Figure 3. It shows that within a capital intensive business the capital management process should be a basic concern at all times: before and after capital resources are invested.

Before capital is invested the emphasis is placed on the management of the capital expenditures program of the firm. That management function however cannot be performed adequately without consideration of the future consequences of committing capital expenditures that are translating into capital consumption costs immediately after being effectively recorded in the Fixed Asset book.

After capital is invested, as shown on Figure 3, the capital consumption process translates itself into two distinct but highly interdependant cost segments:

- the "capital recovery" cost segment, and
- the "capital remuneration" cost segment.

In our opinion, it is not possible to make a proper assessment of the appropriateness, the reasonableness, and the efficiency of a capital recovery system without keeping in mind the duality of the capital consumption process: recovery and remuneration.

The *capital recovery* cost segment deals with the determination of the amount of loss in the value of a capitalized asset which should be allocated to the production cost of various service units in each of the accounting periods during which the service capacity of such asset is effectively consumed.

The capital remuneration cost segment deals with the remuneration of a capital remuneration base, generally the net asset base requiring effective funding by the capital structure of the firm.

|Capital Remuneration Base = Gross Asset Base |
| - Accumulated Depreciation |
| - Deferred Tax Liability |

Figure 1 shows that the "capital remuneration cost" can be assimilated to the firm's pre-tax composite cost of capital. This cost segment includes the interest charges, the net income and the income-tax provision (paid plus deferred). It therefore takes into account the specific capital structure of the firm.

Figure 2 also shows how the capital recovery and capital remuneration costs segments do relate to the capital recovery and capital remuneration bases of the firm.

The capital recovery and capital remuneration costs segments are accounting measures related to the Income Statement for a specific accounting period. On the other hand, the capital recovery and capital remuneration bases are accounting measurements taken from the Balance Sheet of the firm and averaged over the same accounting period as the capital consumption costs segments to which they relate.

The capital remuneration cost (defined as the corporate pre-tax composite cost of capital) and the capital recovery cost can therefore be considered micro-economic cost measures to the extent that they constitute direct basic elements of the cost of production of services, and consequently, of the total revenue requirements of the firm.

Figure 1 represents what, in our opinion, is the fundamental micro-economic equation for a capital intensive public utility, regulated or not, totally or partially.

|Total operating revenue requirements = Total cost of service production |

The consumption of capital contributes a substantial part of the cost of production and of the total revenue requirements of the firm (to be derived from the sale of its services through its *commercial operations*).

The consumption of capital implies two distinct consequences in the financial operations of the company, which translates themselves into two distinct but highly interrelated micro-economic cost elements: capital recovery and capital remuneration.

|Capital Consumption Cost = Capital Recovery Cost |
| + |
| Capital Remuneration Cost |

The capital recovery and the capital remuneration costs segments are intimately interrelated because the effective pattern of expense applied to fully recover the consumed capital base directly determines the magnitude of the *net capital base to be remunerated, and consequently* the absolute amount of such remuneration.

In the following parts of this article, the focus is placed on the description and assessment of various capital recovery methodologies. However, the capital recovery process is not examined in isolation; our analysis is done in full consideration of the tight linkage that exists between the capital recovery and capital remuneration dimensions within the overall capital consumption process.

III-Capital Recovery Methodologies - Back to Basics

In this section various capital recovery patterns are analyzed and compared on the basis of the micro-economic analytical environment that has been described in the previous part. Therefore, for each recovery pattern being considered, the capital recovery, the capital remuneration and the total capital consumption costs are calculated and illustrated; the recovery reserve and the net carrying amounts are also illustrated.

The fiscal effects derived from the application of Capital Cost Allowances (CCA) rates in the Canadian Income Tax context have also been calculated and included in the comparative analysis. It is reasonable to assume that similar effects would be resulting from the application of the US fiscal treatment.

The following assumptions have been made for the purpose of the comparative developments:

- the initial capital amount to be recovered is $15,000
- the capital remuneration rate is 15%
- the corporate income tax rate is 36%
- the Capital Cost Allowance for the asset class is 20%

For each recovery pattern, the comparative data is calculated and illustrated for a capital recovery period of 15 years.

The Straight Line Recovery Pattern - The Reference

The Straight Line recovery pattern data for a 15 year recovery period is shown on Figure 4 excluding any fiscal impact and, on Figure 5, including the Deferred Tax Liability fiscal impact.

Appendix A illustrates the detailed calculation of the fiscal impact of the Capital Cost Allowance (CCA) on the capital remuneration cost for the Straight Line pattern in the Canadian fiscal context.

Appendix B provides the various formulas used to obtain the data shown on the diagrams illustrated in Figures 4 and 5 for the Straight Line pattern. The Microsoft EXCEL software was used for that purpose.

As can be seen from Figures 4 and 5, the basic feature of the Straight Line recovery pattern is that the *initial cost* is being recovered uniformly (in equal amounts) through the recovery period.

Said differently, the capital recovery cost is the same for each accounting period. In our example, the capital recovery cost is therefore equal to $1,000 per year as shown on diagrams 4.3 and 4.5. The recovery (or depreciation) reserve builds up linearly from zero $ to the full recovery amount of the $15,000 initial cost (no more, no less) at the end of the last accounting period as shown on diagram 4.6.

In the absence of any fiscal impact due to deferred taxes, the capital remuneration base (the "net carrying amount" shown on diagram 4.2) is decreasing linearly from $15,000 (initial cost) to zero $ at the end of the recovey period. When the capital remuneration rate is applied to that remuneration base, a linearly decreasing "capital remuneration cost" is obtained as shown on diagram 4.4.

The total "capital consumption cost" profile for the Straight Line pattern (diagram 4.5) is the sum of both the capital recovery cost (diagram 4.3) and the capital remuneration cost (diagram 4.4). The dark costs segments on diagram 4.5 are corresponding to the costs segments shown on diagram 4.4 and the white segments on diagram 4.5 correspond to the costs segments shown on diagram 4.3.

Diagrams 5.4 and 5.5 of Figure 5 show the impact of including the Deferred Tax effects (CCA) in the calculations of the Capital Remuneration Cost and the total Capital Consumption Cost.

In this article, we are looking at the Straight Line recovery pattern as the basic reference for the rest of our analytical treatment for a few important reasons:

a) the Straight Line pattern corresponds to the first level of rationalization in attempting to deal with the capital recovery "problem". It is the first criteria of rationality that comes to mind when attempting to justify a recovery pattern especially if the recovery process is analyzed in isolation or in abstraction of any of its interrelated dimensions: financial, technological and commercial.

b) in its simplest form it is relatively easy of application, at least in theory, because it only requires the determination of a specific life estimate for the asset which, once translated mechanically into a recovery rate, is applied uniformly to the initial cost to be recovered throughout the recovery period.

c) it is the pattern which is the most widely applied in the Public Utility environment, despite incredibly complex intellectual girations that makes it less and less linear in its practical applications, to such an extent that many depreciation specialists are experiencing great difficulties (or simply refuse by principle) to even consider that alternative patterns may be as "rational" at a more global level and may be worth looking at.

d) although the Straight Line recovery pattern generates a constant flow of recovery costs (or depreciation expenses), it does produce an uneven spread of total capital consumption costs (or revenue requirements) in the various accounting periods, with the largest cost impact occurring in the early span of the recovery period as indicated by diagrams 4.5 and 5.5 on Figures 4 and 5.

e) being characterized by a constant recovery rate applied throughout the recovery period, the Straight Line pattern can therefore serve as a good base of comparisons for other recovery patterns that can thereafter be analyzed in relation to their deviation from that reference pattern.

Other recovery patterns can then be classified in two categories as follows:

i) the degressive (or accelerated) recovery patterns: those where the initial cost is recovered faster than in the reference straight line pattern during the initial phase of the recovery period,

and

ii) the progressive recovery patterns: those where the initial cost is recovered less rapidly than in the reference straight line pattern during the initial phase of the recovery period.

Degressive (or Accelerated) Recovery Patterns

A degressive (or accelerated) recovery pattern can therefore be defined as a pattern where the recovery rate decreases gradually over the recovery period and the recovery reserve is building up faster than in the straight line pattern.

The "Declining Balance" and the "Sum of the year digits" (SOYD) depreciation methods are two examples of degressive recovery patterns.

The SOYD pattern is characterized by a linearly decreasing "recovery cost" pattern. Figures 6 and 7 show similar profile data for the SOYD pattern as Figures 4 and 5 do for the reference straight line pattern. As can be seen, a degressive pattern accelerates the recovery process in the early years of the recovery period. The Capital Consumption Costs (revenue requirements) are therefore much larger in the early years and consequently lower in the later years of the recovery period than they are in the reference pattern. However, because of the recovery acceleration process, the total revenue requirements generated over the entire recovery period are less than those generated by the reference pattern. This would also be true for the application of any Degressive (or Accelerated) recovery pattern.

Progressive Recovery Patterns

On the other hand, a progressive recovery pattern can be defined as a pattern where the recovery rate gradually increases over the recovery period and the recovery reserve is building up less rapidly than in the straight line reference pattern.

Progressive recovery is presently rather uncommon in the current management and regulation of Public Utilities, but it is a financial management mechanism commonly applied in other sectors of the capitalistic system. The best illustration of a progressive recovery mechanism is the well-known mortgage reimbursement system applied by financial institutions where both the capital remuneration cost (interest payment) and the capital recovery cost (principal repayment) are paid by means of a constant periodic amount collected throughout the recovery (or repayment) period.

The mortgage reimbursement system is a "Constant Capital Consumption Cost" progressive capital recovery pattern. The profile of a "mortgage type" progressive capital recovery pattern is illustrated in Figures 8 and 9 along the same parameters used to describe the previous patterns. Figure 8 shows the pattern characteristics in the absence of any fiscal effect caused by deferred income-tax measures (CCA) and Figure 9 includes the fiscal effect of applying a 20% CCA rate to the original cost of the asset.

The "Constant Capital Consumption Cost" (or 4-C) feature of the "mortgage type" pattern is well illustrated on diagram 8.5. As can be seen on diagram 8.3, a constant capital consumption cost (4-C) pattern is also characterized by the application of a different "recovery rate" in each one of the accounting period constituting the whole recovery period. There is also a slow build-up of the recovery reserve (accumulated recovery) in the early years of the recovery period followed by an acceleration of the reserve build-up in the last phase of the recovery period as indicated on diagrams 8.6 and 9.6. Diagram 9.5 illustrates that the inclusion of the fiscal CCA effects into the calculations is causing the Capital Consumption Cost pattern to adopt a saucer shape through the recovery period.

Figure 10 illustrates the particular recovery reserve profiles for various capital recovery patterns. It clearly shows how the traditional "straight line" recovery pattern can serve as a good "reference base" or "dividing line" to qualify other recovery patterns as being "Degressive" or "Progressive" in relation to that reference.

The area below the straight line recovery path can be defined as the Progressive Capital Recovery Area and those recovery patterns that follow a recovery path within this area can be qualified as being Progressive Recovery Patterns.,

The area above the straight line recovery path can be defined as the Degressive Capital Recovery Area and those recovery patterns with recovery path within this area can be qualified as being Degressive Recovery Patterns.

Step-Wise Adjusted Capital Recovery Patterns

Figure 11 illustrates two typical profiles of Step-Wise Adjusted (SWA) Capital Recovery Patterns: a degressive one (or SWAD type) situated in the degressive recovery area above the straight line reference profile, and a progressive one (or SWAP type) situated in the progressive recovery area below the straight line reference profile.

A SWA pattern is characterized by the fact that the full recovery of the total amount to recover is accomplished by a succession of straight line recovery patterns each applicable during a specific span of the recovery period.

Under a SWA pattern, the full recovery of the capitalized amount is achieved by adjusting the recovery rate at specified interval during the recovery period. Adjustment intervals could well vary from 3 to 5 years for assets with recovery periods extending from 10 to 30 years or more.

For a short recovery period of, say, five years, a succession of five yearly adjustments could well constitute a SWA profile. In the context of this paper, yearly adjustments of the recovery rate for recovery periods exceeding 10 years would not fall within the spirit of a SWA pattern. Nevertheless, at the limit, any pattern resulting from a number of discrete adjustments to the capital recovery rate (CRR) could be considered as a SWA pattern.

For the purpose of our comparative analysis of the various capital recovery patterns, the impact of applying a SWAP pattern to the recovery of the $15,000 asset example is illustrated in Figures 12 and 13 in the same format already used for the prior patterns. The step-wise adjustments of the "depreciation" or "recovery" rates are reflected by the step-wise profile of the Capital Recovery Cost shown on diagram 12.3. The resulting patterns of Capital Consumption Costs and Recovery Reserve build-up are shown on diagrams 12.5 and 12.6 respectively.

It should be noted that, under a "straight line" capital recovery process, a SWA type recovery pattern is effectively created every time a change in the "life expectancy" of an asset is made and is reflected by making a corresponding change to the "straight line" recovery rate (depreciation rate) required to achieve the full recovery of the initial cost over the remaining life of the asset. Figure 14 illustrates that process.

In Figure 14, an asset is initially put into service with an expected service life of 25 years and it is "depreciated" at 4% per year under a straight line regime so that 20% of the initial cost is being recovered after 5 years. At that time a life study indicates the total life of the asset is reduced to 20 years, and that the 80% of unrecovered cost should be recovered over the 15 years remaining life at a 5.4% recovery rate. Finally, at year 10 another study indicates a revised remaining life estimate of 5 years (total life of 15 years) and a further change of "depreciation rate" is made to 10.6% in order to recover the last 53% of original cost before the final retirement of the asset from service at the end of year 15.

All of the changes in the capital recovery treatment illustrated in Figure 14 are made within the framework of a "straight line" capital recovery regime. Nevertheless, the resulting recovery pattern can, by no means, be qualified of being a Straight Line recovery pattern. The result is, in fact, a SWAP recovery pattern over the real 15 years capital recovery period.

In Figure 14, the notions of "theoretical" recovery reserve and of "reserve deficiencies" are also illustrated. Within a Straight Line recovery environment, a "theoretical" reserve level corresponds to the % recovery level that would have been reached if a current view of the estimated asset life had been known at the start of the recovery period and if the corresponding recovery rate had been applied throughout the real recovery period.

A "reserve deficiency" is the difference between the "theoretical" reserve level and the "actual" reserve level. In a straight line recovery environment, reserve deficiencies occur in a situation where an asset service life is overestimated initially. A SWAP pattern generally leads to "reserve deficiency" situations when compared with a pure straight line recovery pattern objective as indicated in Figure 14.

Figure 15 illustrates the case of a SWAD pattern resulting from an initial underestimation of the service life of an asset. A SWAD pattern generally leads to "reserve excess" situations when compared with the pure straight line recovery objective over the life of the asset.

In this paper we are suggesting that, under current capital recovery practices, pure straight line recovery patterns seldom exist for all practical purposes. In fact, because of the many corrections that are made to the "depreciation rates" during the service life of an asset by the application of so-called "straight line" methodologies, the real resulting recovery patterns are SWA type patterns, SWAP or SWAD.

IV - The Capital Recovery Challenge

In Part II of this paper we have attempted to describe our vision of what constitutes an appropriate analytical environment for the capital recovery process within a capital intensive Public Utility. Such an environment clearly situates the Capital Recovery process as only one of the many interdependent activities related to the broader Capital Management process.

In Part III we have attempted to illustrate (through the development of simple examples) some of the fundamental implications of applying various Capital Recovery Patterns in that broader analytical environment.

As a result of this first level of analysis, it appears evident to us that the widely applied Straight Line Recovery Pattern does not satisfy a high level of rationalization but merely corresponds to a first order of rationality in which the capital recovery process is considered in complete isolation from the other capital management realities of the firm.

We believe this is the greatest intellectual challenge that is now confronting the capital recovery professionals, because it is forcing a complete reevaluation of the validity and appropriateness of the basic principles supporting the current day to day depreciation accounting practices. In this short paper we do not pretend to offer an exhaustive answer to that challenge. We rather intend to express views and ideas that will stimulate the debate towards a full recognition of the challenge by all professionals involved in the Capital Recovery discipline. In that perspective, we believe it is now useful to elaborate further on the following aspects:

a) the notion of "service capacity" of an asset,
b) the revenue-expense matching principle,
c) the integration of the financial, technological and commercial dimensions into the capital recovery process.

The notion of "Service Capacity" of an asset

In part II of his paper, Dr. White deals with the Fundamentals of Depreciation Accounting. He then summarizes as follows the definitions and objectives of depreciation accounting provided by cost allocation and accounting theory:

- "Depreciation is a measurement of the service capacity of an asset that is consumed during an accounting period. This is the relevant concept of depreciation which underlies the accounting process."

- "Ideally, the service capacity of an asset should be measured as the present value of the net revenue (revenue less expenses exclusive of depreciation and other non-cash expenses) or cash inflows attributable to the use of that asset alone."

- "Depreciation expense is an estimate of the cost of the service capacity of an asset that is consumed during an accounting interval. It is the estimate of the cost of obtaining the net revenue attributable to the use of an asset during an interval in which income is earned."

- "The goal and objective of depreciation accounting is cost allocation over the service life of an asset in proportion to the consumption of service capacity."

- "The pattern of cost allocation that best approximates the net-revenue contribution method should be selected."

We do not dispute the validity of these definitions and objectives - in fact they are guiding us in our attempts to arrive at practical means of approaching the "ideal" situations described in Dr. White's summary.

It can be seen from the summary that the notion of "service capacity" is fundamental to the significance of most of the stated definitions and objectives.

However, the great difficulty of measuring the "service capacity" of assets used in capital intensive P.U. along an "ideal" parameter such as a net-revenue contribution pattern is also well recognized by Dr. White.

On our part we feel that the "ideal" measurement proposed by Dr. White (net-revenue contribution) is too remote from the operational realities of modern Public Utilities to be used in any practical manner into an efficient management system. It is an "ideal" in principle. It can only be used to determine how well other practical and efficient measurements are performing in approaching it.

In recent years the accounting profession has gone a long way to improve its understanding and treatment of the notion of "service capacity" for an asset especially in the context of capital intensive Public Utilities. By example, in May 1989, the Accounting Standards Committee of the Canadian Institute of Chartered Accountants (CICA) issued an EXPOSURE DRAFT of Proposed Accounting Recommendations dealing with the appropriate accounting treatment for the measurement, presentation, and disclosure of property, plant and equipment including both tangible and intangible items.

The proposals included in the Exposure Draft also deal with the unique characteristics of rate-regulated property, plant and equipment.

The following statements related to the object of this paper are of interest in the accounting standards proposed by the CICA:

- "Property, plant and equipment should be charged to income over their useful lives in a rational and systematic manner appropriate to their nature and use. Useful lives of intangible properties are not to exceed 40 years."

• "Amortization policies and estimates of useful lives and residual amounts should be reviewed regularly and at least every five years."

• "Rate-regulated property, plant and equipment is acquired for or employed in operations meeting both of the following criteria:

i) the rates for regulated services or products provided to customers are established by or are subject to approval by an independant, third-party regulator or by a governing board empowered by statute or contract to establish rates charged to customers; and

ii) the regulated rates are designed to recover the specific costs of providing the regulated services or products."

• "Service potential is used to describe the output or service capacity of an item of property, plant and equipment and is normally determined by reference to attributes such as physical output capacity, associated operating costs, useful life and quality of output."

• "Useful life is either:

• the period over which an item of property, plant and equipment is expected to be used by an enterprise; or

• the number of production or similar units expected to be obtained from the item by the enterprise."

• "Expected useful life is normally the shortest of the physical, technological, commercial and legal life of an item of property, plant and equipment. Factors considered in estimating useful lives include expected future usage, the maintenance program, results of studies made by an industry association, studies of similar items retired, and the condition of existing comparable items. For intangible properties, however, the estimate of useful life does not exceed forty years. The amortization of property, plant and equipment is adjusted when a betterment increases the expected useful life."

The CICA also specifically recognizes the rational application of different methods of capital recovery when it specifies the following at Item .32 on page 8 of the May 1989 Exposure Draft.

"Different methods of amortizing property, plant and equipment result in different patterns of recognizing their amortizable amounts in income. The method selected for use will be one that reflects the consumption of service potential of the property, plant and equipment. A straight line method reflects consumption of service potential as a function of time. A units of production method reflects consumption of service potential as a function of usage, when units of input or output can be identified and estimated. An accelerated method may be appropriate in certain situations, for example an increasing charge method may be used when an enterprise can price its goods or services so as to obtain a constant rate of return or a revenue contribution method may be used when there is a direct relationship between the service potential of the item and revenue, and future revenue can be reasonably estimated."

The May 1989 CICA Exposure Draft uses terms such as "consumption of service potential" when dealing with the capital recovery process. This is clear evidence that the notion of "service capacity" is evolving and is now extending to cover the more comprehensive conceptual framework of the production process of the services, more in line with a micro-economic analytical environment such as already been described earlier in Part II of this paper.

In an era of intense technological development and improved manufacturing techniques, many physical assets are enjoying large service capacities and, in fact, most of their "service potential" is likely to be fully exploited towards the end of their physical, technological or commercial service lives rather than at the beginning.

To illustrate this point we can say that the service potential of a train locomotive is certainly higher in the early years than in the last years of its service life. By contrast, the service potential of a high capacity major Fiber Optic trunk cable route is certainly much larger in the later part than in the early part of its service life.

We can see that the notion of "service capacity" of an asset is gradually moving from a direct and linear association with its physical life to a more sophisticated link with its commercial service potential, a notion expressing its capability to contribute to the effective generation of revenues for the enterprise.

In that perspective, the unused "service capacity" of an asset is not contributing to the generation of revenues for the enterprise until it is effectively put to work during the physical service life of that asset.

In most of the public utilities an individual asset is not generating service revenues by itself. Assets of various kinds and vintages need to be aggregated together to form service networks. Individual assets are contributing to the service production process, i.e. the revenue generation process, only to the extent that some of their service capabilities are used to render the services sold.

The "consumption of service potential" pattern for a specific asset unit is certainly a basic and relevant information item to be used in the determination of a pattern of "revenue generation potential" applicable to this asset unit. The "revenue generation potential" of an asset is certainly a notion that could be used as a satisfactory proxy for, and capture the essential spirit of, the "net-revenue contribution" ideal measurement in the case of a Public Utility capital recovery regime.

Various Levels of Rationality for the Matching Criteria

As stated before from Dr. White's paper, "the goal and objective of depreciation accounting is cost allocation over the service life of an asset in proportion to the consumption of service capacity".

In a statement also cited above and that can be seen as complementary to the goal and objective one, the CICA proposes that assets "should be charged to income [or recovered] over their useful lives in a rational and systematic manner appropriate to their nature and use".

At this point we are entering into a discussion as to what can be considered rational and systematic. Various levels of "rationality" can be visualized that correspond to various levels of perception and/or definitions concerning the task to be accomplished by the capital recovery process.

As we said earlier in setting our own terms of reference in Part II of this paper - we perceive the straight line recovery method as only responding to a first level of rationality whereby the goals and objectives of the capital recovery process are examined and treated in complete isolation from the other distinct but interdependant aspects of the corporate capital management function of a capital intensive business. This first level of rationality consists of achieving the total recovery by the application of an equal recovery amount in each accounting period throughout the service life of the asset.

The straight line recovery pattern in its pure and integral application is certainly a rational and systematic manner of proceeding - but it is only a partial response to a highly constrained vision of the overall micro-economic process of capital consumption in the production of goods and services.

We believe that an appropriate capital recovery pattern for an asset could also be situated at a higher level of rationality and could very well consist in the selection of a recovery pattern that would ensure the best match between the Capital Consumption Costs and the Revenue Generation Potential patterns of that asset over its service life. We are now talking about matching the Costs and Revenue "patterns" over the expected life of the asset.

In this paper, we are suggesting that the total Capital Consumption Costs pattern is a better mean of rationalization for the Cost side of the matching game, and that the Revenue Generation Potential pattern is the more coherent element of rationalization on the Revenue side of the matching game.

When viewed in that perspective, it is the Mortgage Type recovery pattern (illustrated in Figures 8 and 9 in Part II) with its Constant Capital Consumption Costs (4-C) pattern that would ensure the best Cost-Revenue Match in the case of an asset having a uniform Revenue Generation Potential pattern throughout the recovery period (or its service life). In that case, the Constant Capital Consumption Costs recovery pattern (the 4-C or Mortgage Type pattern) appears to satisfy the depreciation accounting "matching principle" in a more appropriate and refined manner. It is also "rational and systematic" but at a higher level of rationality corresponding to the inclusion of a more comprehensive understanding of the capital consumption process affecting a capital intensive business.

In practice, for most of the assets used by modern Public Utilities, the 4-C Mortgage Type capital recovery pattern is certainly much closer to the Revenue Generation Potential or Service Capacity Consumption pattern than is the current widely applied Straight Line pattern. But the 4-C pattern implies the application of a "Progressive" capital recovery pattern through the service life of the asset. This is exactly where the challenge resides for the Depreciation Professionals over the next decade!

In fact, one of the major consequences of applying a Progressive recovery pattern is that the capital is recovered at a less rapid rate than under a Straight Line pattern during the early stage of the asset life. And this appears somewhat in contradiction with the current trend or pressures towards the implementation of accelerated or degressive recovery patterns. Reversing this trend while respecting the fundamental principles of accounting and ensuring a high level of rational justification will require a deep understanding of all the dimensions and consequences of the Capital Recovery activities within the broader scope of the Capital Management process.

The application of the SWAP capital recovery approach that we describe in Part II is a practical attempt to cope with the new challenge. We submit it to the good consideration of the Capital Recovery Professionals community because it appears to achieve the following in relation with the depreciation accounting goals and objectives:

a) It takes into account the high level of uncertainty inherent to the forecasts of the service life especially in the early years of a long-life asset.

The objective of making a precise estimate of the service life right from the start does not reflect a realistic management behavior. Hoping that such an estimate will materialize in the longer term without changes is not any more realistic. The only certainty with an initial precise life estimate for an asset having a 15 to 25 years life expectancy is that such a precise estimate is likely to be wrong.

The SWAP depreciation approach explicitly recognizes that reality with a low recovery rate being applied in the early years of the service life with no real attempt to achieve a predetermined specific life estimate. At that stage it should be sufficient to know that we are in presence of a long-life rather than a short-life asset.

b) It proposes to achieve the total recovery of capital by making a series of periodic "adjustments" to the depreciation rates applied throughout the service life of the asset. These adjustments could be made every three to five years and, each time an adjustment is made, a new judgment is passed on the expected remaining life of the asset, but always in recognition of an uncertain environment.

This periodic adjustment process is illustrated on Figure 16. It can be seen that the path to the full recovery of consumed capital can be gradually modified as more specific information on the ultimate asset service life is gained throughout its service history. Under such an approach the capital recovery decisions are always taken on a prospective analysis basis very much integrated to the financial, commercial and technological strategic business plans.

c) It approaches the results of the more "ideal" mortgage type recovery pattern (the 4-C pattern) in a step-wise manner. In fact, for an asset with an uncertain long life expectancy, the 4-C pattern is also subject to certain deviation from an ideal situation. Unlike a real mortgage situation where the interest rate (capital remuneration) and the repayment period are fixed in advance by contract, in the case of a 4-C pattern, the recovery period is subject to uncertainty and the capital remuneration rate is also subject to many possible variations of the firm's pre-tax composite cost of capital throughout the recovery period.

In addition, even in its purest form with fixed terms (life and remuneration rate), the 4-C pattern also requires an annual adjustment of the recovery (depreciation) rate. The SWAP approach eliminates the need for annual recovery rate adjustments.

d) Most of the assets used in modern Public Utilities are characterized by Service Capacities and Revenue Generation Potential patterns that are progressive or increasing with time. A SWAP recovery pattern would ensure a better match between the total Capital Consumption Cost and the Revenue Generation Potential patterns for these assets. Typical matching profiles are illustrated on Figure 17.

The declining CCC solid line pattern illustrated in diagram A of Figure 17 is a typical Straight Line profile as already illustrated in diagrams 4.5 or 5.5 of Figures 4 and 5. The Revenue Generation Potential (RGP) profile represented by the other solid line in diagram A is typical for most of the long-lives assets used by P.U. The CCC pattern shown as a dotted line would constitute a better matching proposal for the RGP pattern indicated on diagram A than the solid line one. In fact, the solid line which corresponds to a Straight Line recovery pattern can even be qualified as a "mismatch" profile when compared to the dotted line one.

Diagrams B and C are examples of "matching" profiles. Diagram B would reflect the case of an asset having a declining Service Capacity with time; diagram C reflects the situation of an asset with a constant Service Capacity (or Revenue Generation Potential) through its service life.

Integration of the Financial, Technological and Commercial Dimensions

As indicated earlier, a modern capital intensive P.U. requires the placement of a large capital asset base to perform its commercial business operations. In this paper we are suggesting that the capital recovery process is an integral part of the broader capital resource management process illustrated in Figure 3. We also suggest that the Capital Management process is one that should integrate the technological, financial and commercial dimensions of the P.U. business operations.

We perceive the capital recovery decisions as forward-looking activities very much related to the business Capital Expenditures Program planning process, and we are likely to hear more and more about "technology turnover management" in the future.

The recent applications of the Fisher-Pry and other models by recovery specialists in attempting to cope with the technology turnover problem is symptomatic of a fundamental need for change in capital recovery methodologies. It appears to be more a question of emphasis and realism than of fundamental theoretical validity.

By example, in his paper, Dr. White uses the cases of vehicles to illustrate the application of sound and very likely valid theoretical accounting principles. But the vehicles are short-life assets and furthermore their specific contribution to "net revenue" is assumed to be known for the covered accounting periods.

However, the investment reality of modern capital intensive P.U. is quite different. Their operating networks are vast aggregates of very diversified long-lived assets used to provide more and more sophisticated services in a rapidly changing technological and managerial environment. Furthermore, unlike the vehicle example used by Dr. White, the expected contributions of each of these network's segments to the business profitability (net revenue contribution) are generally unmeasured or unknown and would be of very little practical significance on a current accounting period basis. In fact, it is the profitability of specific "services" which is of current management significance to the business.

Figure 18 illustrates the fundamental concept by which a SWAP capital recovery methodology can be rationally and systematically integrated with new technology introduction planning information to constitute a Technology Turnover Management Strategy. The SWAP recovery approach specifically recognizes the high level of uncertainty inherent to an original life estimate in the case of a long-life asset. As can be seen from the two top diagrams on Figure 18, the accelerated recovery of the capital invested in technology A is realized in the last phase of its life (1980-85), at the same time as technology "B" is initially installed. But, because of inherent life expectancy uncertainty, technology B is being recovered at a low rate in the initial phase of its technological service life, which coincides with the period 1980-85.

The remaining life expectancy of technology A in the last phase of its life (1980-85) is not subject to the same level of uncertainty as it was in the early years of its life. In fact, the remaining life estimates for a technology under replacement shall be much more precise because of the need to have specific Capital Expenditures planned in the business' construction program to ensure the placement of the replacing technology B.

The two last diagrams on Figure 18 illustrate how the decision affecting the recovery rates for technology B could match the decisions to implement technology C earlier or later. Again, planning information related to the introduction of the new technology C would affect the specific recovery pattern applied to the prior technology B. And, for the same reasons as for technology B, the initial recovery of technology C would be realized at a low rate during the initial phase of its service life, and at a faster rate at the end of that life, under a SWAP approach.

Again, to summarize, the low rate of recovery applied in the initial years fulfills two objectives:

i) it takes into account the level of uncertainty inherent to the estimation of the service-life expectancy for long-life assets, and

ii) it permits to levelize the total Capital Consumption Cost pattern to ensure a better match with the Revenue Generation Potential pattern in the case of assets with flat or rising "service capacity" patterns.

Another area of integration lies in the introduction of market data considerations in the determination of appropriate recovery patterns. Figure 19 illustrates "Unit Capital Consumption Cost" (Unit CCC) profiles for various recovery patterns (Declining Balance, Straight Line, SWAP, and 4-C Mortgage type) in the case of a $15,000 capital asset serving an annual market potential growing from 100 to 400 service units over a 15 years interval.

The Unit CCC for each recovery pattern and for each accounting period is calculated by dividing the Total Capital Consumption Cost shown in diagrams 5.5, 7.5, 9.5 and 13.5 by the number of Service Units in each year of the Market Forecast shown in diagram 19.1. The resulting Unit CCC data is shown on diagram 19.2 together with an hypothetical Constant Unit Revenue (Unit Price) pattern set at $15.00 throughout the 15 years recovery period (or service life).

It can be seen that in the case of a rising market or a rising Revenue Generation Potential, it is still the Mortgage type pattern that minimizes the variations from a "Constant Unit Price" situation when compared with the Straight Line or other Degressive recovery patterns. We also see that the SWAP pattern approximates very well the Mortgage Type pattern. Again it is the matching relation between patterns which is of interest.

The "Net Revenue Contribution" Concept

In Dr. White's summary of definitions and objectives of depreciation accounting cited earlier, he says:

"The pattern of cost allocation that best approximates the net-revenue contribution method should be selected."

The "net-revenue contribution" notion is itself defined in Dr. White's summary as part of the definition of the service capacity of an asset "which should be measured as the present value of the net revenue or cash inflows attributable to the use of that asset alone", where net revenue means "revenue less expenses exclusive of depreciation and other non-cash expenses".

That type of definition based on present-worth estimates of future cash-flow, or discounted cash-flow financial analysis (DCF) appears as another means of saying that any loss in the commercial or market value of an asset incurred in a specific accounting period should be recovered in that same accounting period.

Such an approach is certainly theoretically valid and fully legitimate. By example, a capital investment in land is generally not subject to depreciation (or capital recovery) because the "market" value of a piece of land is normally increasing with time and consequently there is no "capital consumption" in its use to perform a business operation.

But the "net-revenue contribution" is an ideal way of looking at the capital recovery task. It would be a satisfactory process if there was an easy and practical way of determining on a continuous basis the fair "market" value of each item, constituting the complex network of interworking assets of a "public utility".

But the assets that are being considered under the scope of the present paper are those who are losing most of their value in the course of their service-life within the Public Utilities. They are not normally reused after removal from service and they can be considered as having zero salvage value for the sake of the present analysis. We believe this is a fair assumption for the bulk of the depreciable assets of most of the regulated public utilities.

Furthermore, we don't believe it would be feasible or practical to attempt to measure the "market value" of the various asset items and it is doubtful that there would even exist a "market" to determine a fair value for such items. This vacuum of practical and significant measurement explains why we are promoting the idea of matching a Revenue Generation Potential profile with a Capital Consumption Cost profile for a given asset item as being a valid alternative proposal for a practical and manageable mean of achieving a "pattern of cost allocation that best approximates the net-revenue contribution method".

As it is now being defined, the net-revenue contribution of an asset is some kind of continuous residual (or remaining) profitability measure for that asset alone. In the development of the broad "Capital Management" analytical framework that we are proposing, we are suggesting that the Revenue and Cost profitability parameters are well taken into consideration and captured by the imputation of the Capital Remuneration cost segment into the matching game.

Therefore, the "ideal" statement of objective for the capital recovery process of a capital intensive Public Utility could be reformulated as follows: "To assign Capital Recovery costs in order to obtain the best match between the Revenue Generation Potential pattern and the Capital Consumption Cost pattern of an asset".

Revenue Requirements considerations are legitimate and essential

In Sections III and IV of his own paper, dealing with "Depreciation under Regulation" and "Depreciation under Changing Economic Conditions", Dr. White recognizes that:

"A major concern of regulation in recent years has been the revenue requirement impact of ratemaking proposals that would shift the timing of depreciation expense or the burden of capital recovery to different classes of ratepayers."

A few other statements from Dr. White are worth citing at this point, on the question of Regulation and Competition:

"Regulation has for the most part adopted the accounting standard of cost allocation over service life as the proper measurement of depreciation expense. Little attention, however, has been given to the second objective of the dual accounting standard (i.e. cost allocation in proportion to the consumption of service capacity) which is admittedly more difficult to apply to a regulated firm,"

"Regulatory practices which deliberately defer the recognition and recovery of depreciation are not necessarily inequitable nor in conflict with generally accepted accounting principles as long as the opportunity for capital recovery is preserved by the absence of significant competition."

In our opinion, Revenue Requirements considerations are legitimate and essential to achieve the efficient capital management of a public utility, regulated or not, and operating or not in a competitive market environment.

If an unregulated competitor to a regulated P.U. is also a capital intensive entity, he will be subject to a similar micro-economic profile as illustrated in Figures 1 and 2 of this paper and his own revenue requirements base will equate his Cost of Service base which in turn includes the Capital Consumption Cost element as a major contribution.

The unregulated capital intensive competitor does not enjoy full freedom of action in terms of his own pricing policies; he also has to be concerned by his corporate and services profitability, of which both the Capital Recovery and the Capital Remuneration costs segments are a good part.

Unlike Dr. White, we do not believe that services offered by unregulated competitors can be "priced without regard to an assumed pattern of depreciation expense". Sound management implies knowledge and understanding of service production costs in the development of competitive pricing strategies and service production costs include Capital Recovery as a major concern. Of course, regulation also has to recognize the pertinence of sound Capital Recovery practices when dealing with pricing decisions affecting competitive services.

V - Summary and Conclusion

In this paper we have attempted to make a positive contribution to the profound debate that is required to ensure the evolution of the Capital Recovery profession over the next few years.

The advent of competition in many service areas traditionally reserved to heavily regulated monopolistic Public Utilities and the entry of many new unregulated capital intensive competitors into the same service markets are creating a strong challenge to both regulators and P.U. managers.

Many capital recovery specialists now agree that the time has come to go back to our basic working assumptions, to improve our knowledge and understanding of the overall Capital Management process.

Of course, this paper remains a limited contribution.

The issues at stake are just too broad in scope to be covered in a short paper.

And time is required to assimilate the material exchanged and confront the various perceptions, digest and debate. We have not hesitated to enter into the paradox! At a time where it is generally well perceived by P.U. managers to push for accelerated depreciation, our own reflexion and analysis indicates that it may not always be appropriate to do so. We are suggesting that there may be strong merit to the application of "progressive" capital recovery methods. We even suggest that Straight Line depreciation may become the exception rather than the rule. For reasons related to realism and manageability we are recommending the application of a SWAP capital recovery process. Nevertheless, as we conclude this paper, we firmly believe that a major and fundamental change in perception and approach will be required in the area of capital recovery management during the next decade and that such a change may necessitate a complete departure from today's highly dominant straight line depreciation methodologies .

We hope to have positively contributed to such a change.

Figure 1

FUNDAMENTAL MICRO-ECONOMIC EQUATION OF A CAPITAL INTENSIVE UTILITY

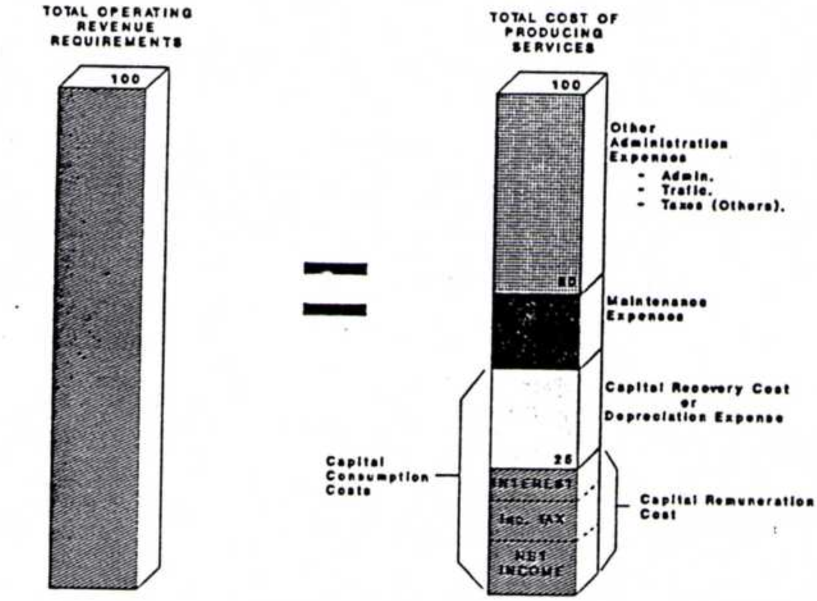
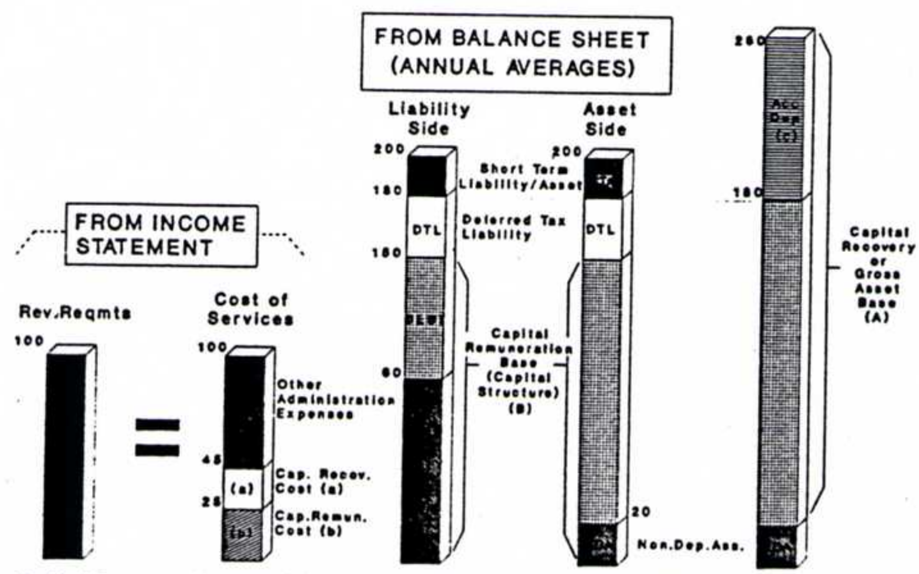


Figure 2

TYPICAL MICRO-ECONOMIC PROFILE OF A CAPITAL INTENSIVE UTILITY



- Capital Remuneration Rate (%)......... : (b/B) x 100 = (25/150) x 100 = 16.7%
- Capital Recovery Rate (%) .... : (a/A) x 100 = (20/240) x 100 = 8.3%
- Overall Depreciation Reserve .... : (c/A) x 100 = (80/240) x 100 = 33.3%

FIGURE 1

FUNDAMENTAL MICRO-ECONOMIC EQUATION OF A CAPITAL INTENSIVE UTILITY (TYPICAL)

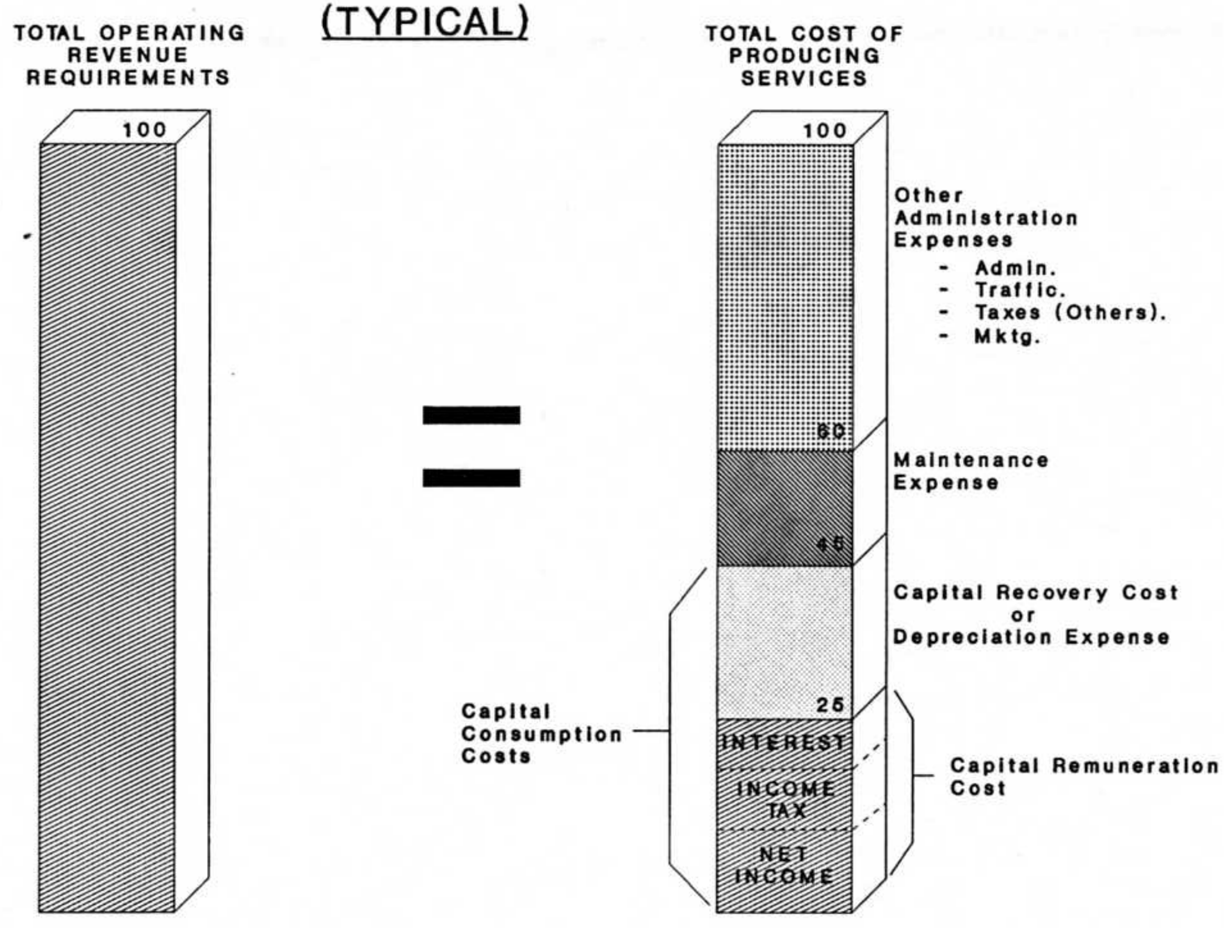
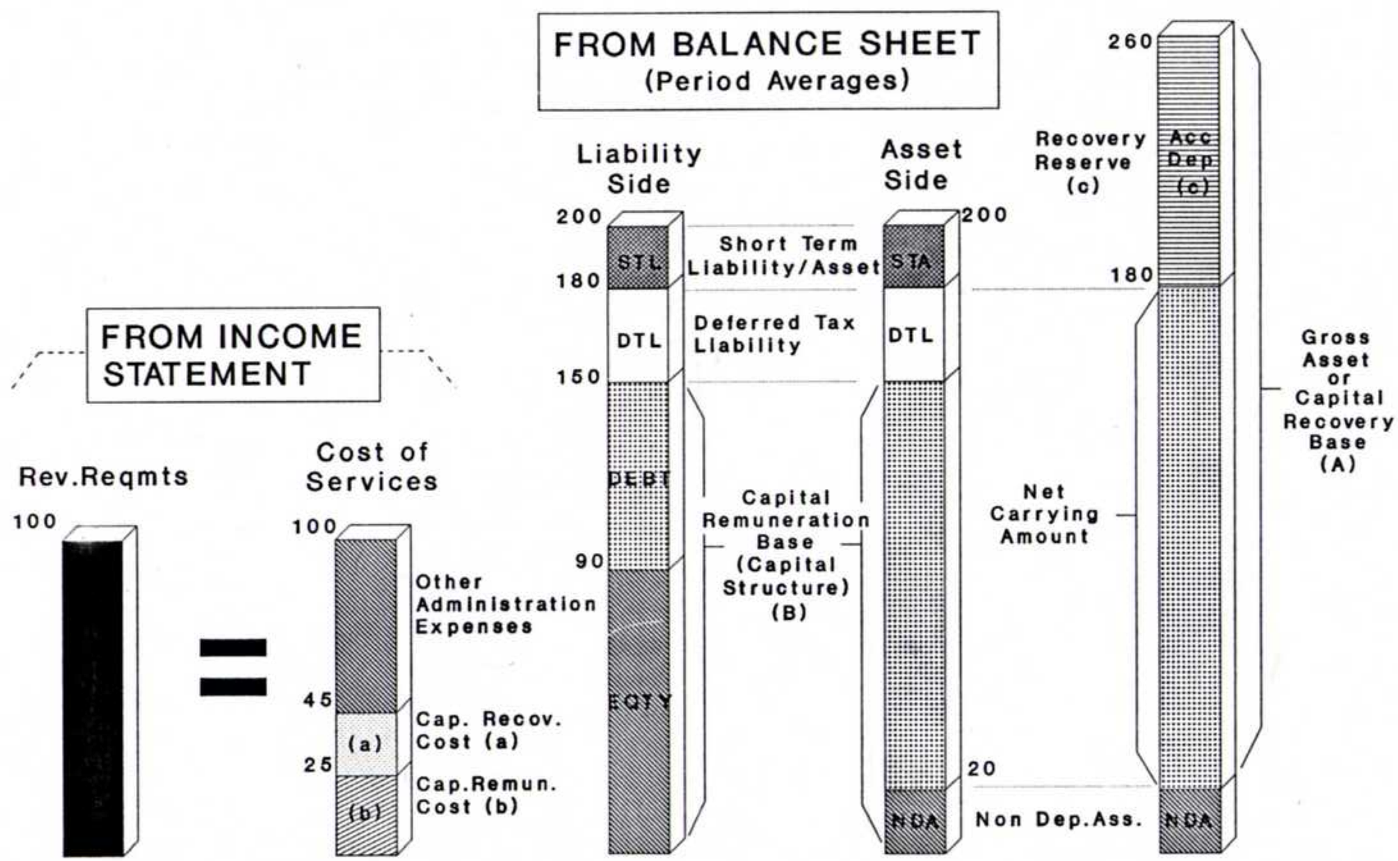


FIGURE 2

TYPICAL MICRO-ECONOMIC PROFILE OF A CAPITAL INTENSIVE UTILITY



- Capital Remuneration Rate (%)......... : (b/B) x 100 = (25/150) x 100 = 16.7%
- Capital Recovery Rate (%) .... : (a/A) x 100 = (20/240) x 100 = 8.3%
- Capital Recovery (%) .... : (c/A) x 100 = (80/240) x 100 = 33.3%

Figure 3

THE CAPITAL RESOURCE MANAGEMENT PROCESS

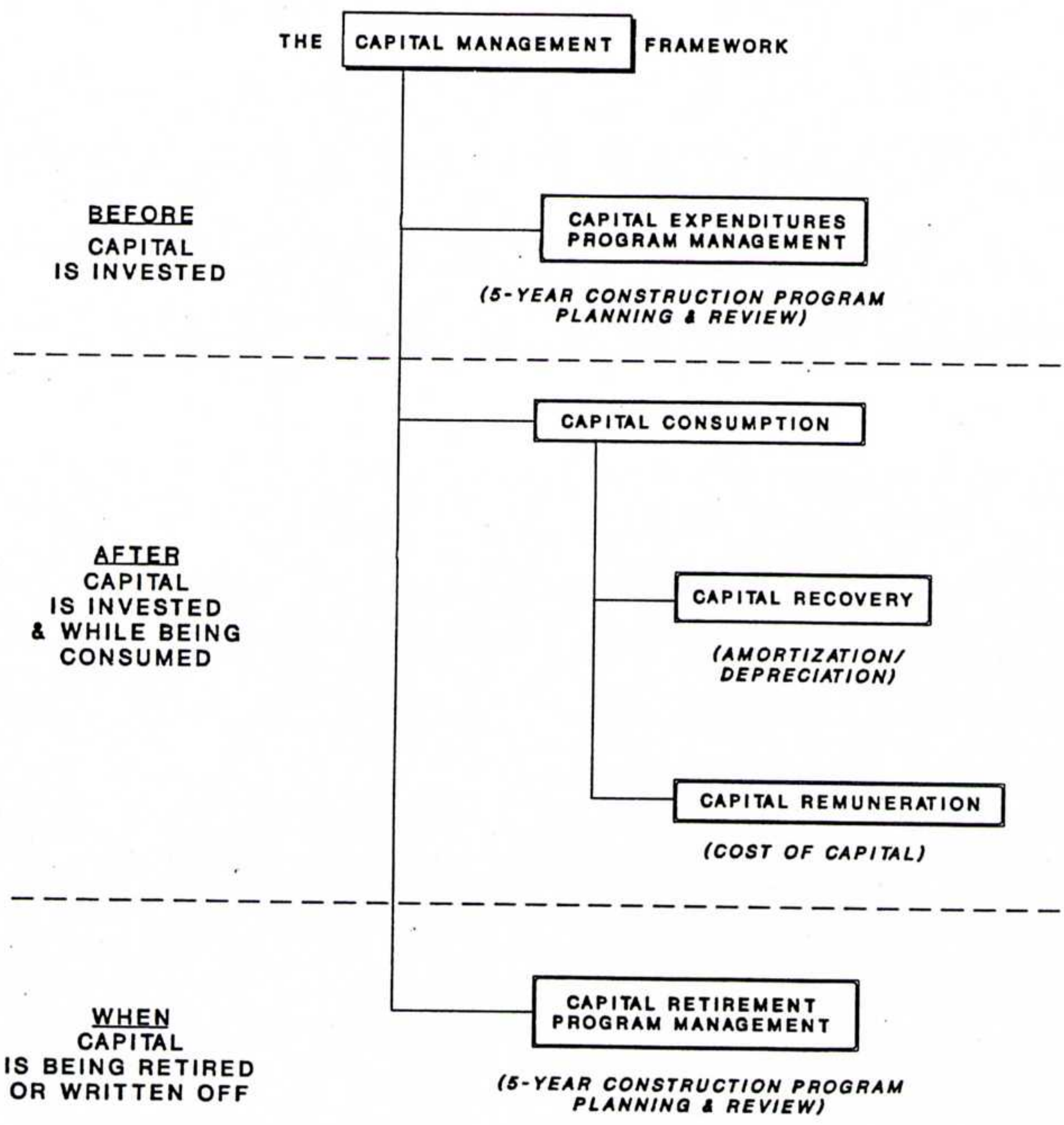


Figure 4

THE STRAIGHT LINE RECOVERY PATTERN
(Excluding Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capital Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %

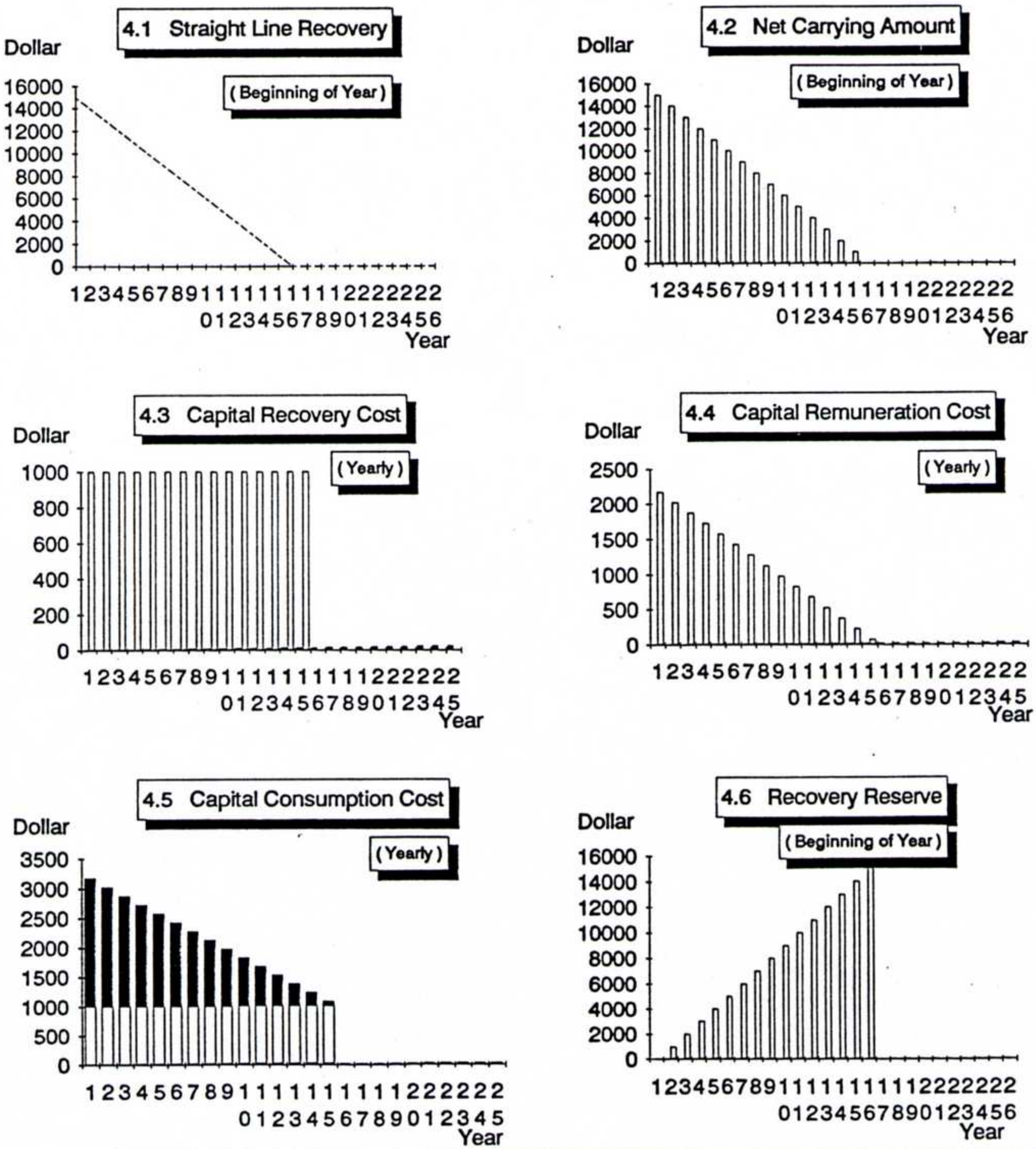


Figure 5

THE STRAIGHT LINE CAPITAL RECOVERY PATTERN

(Including Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capitalized Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %
Income Tax Rate	36 %
Capital Cost Allowance Rate	20 %

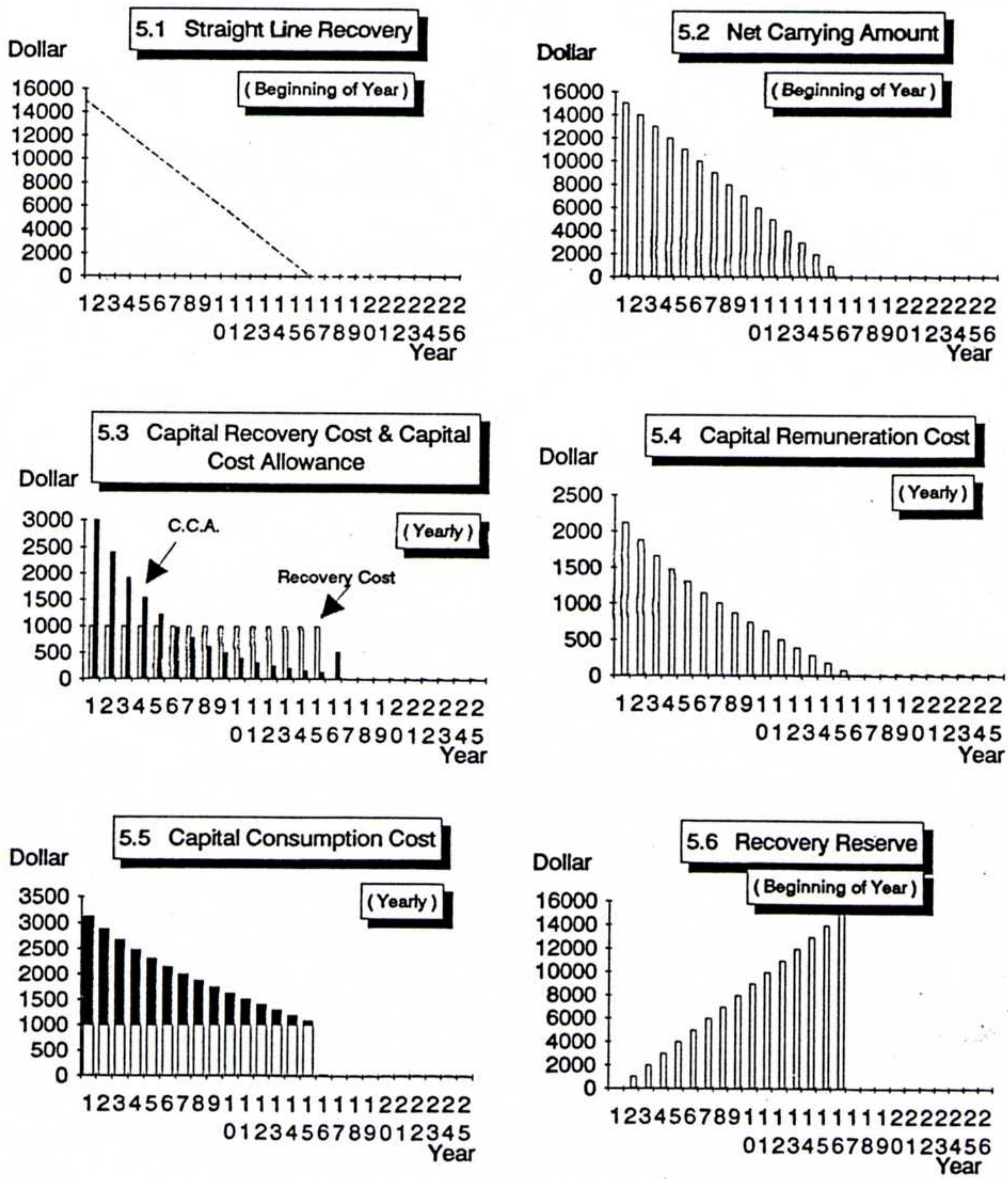


Figure 6

THE SOYD CAPITAL RECOVERY PATTERN

(Excluding Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capital Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %

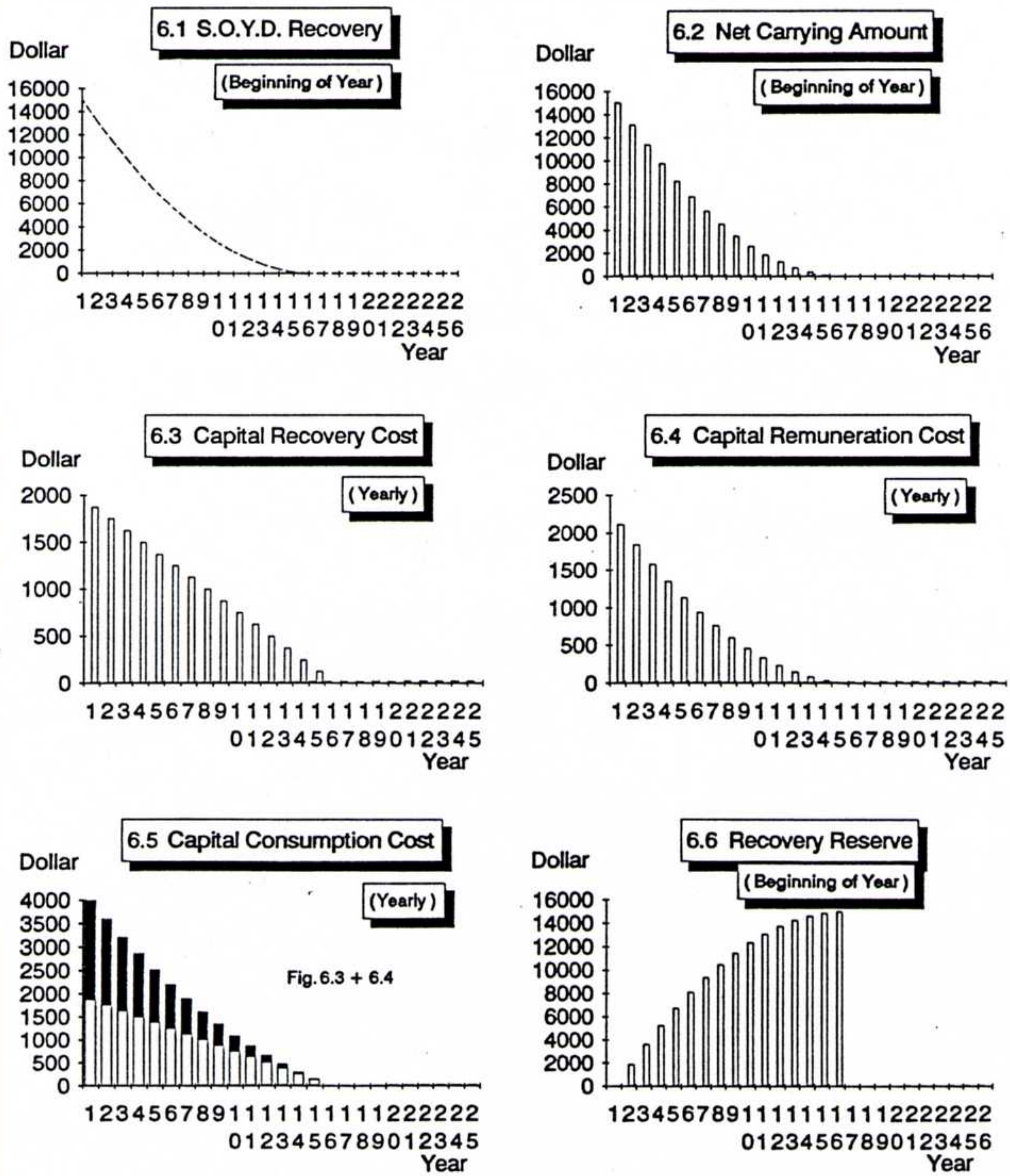


Figure 7

THE SOYD CAPITAL RECOVERY PATTERN

(Including Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capitalived Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %
Income Tax Rate	36 %
Capital Cost Allowance Rate	20 %

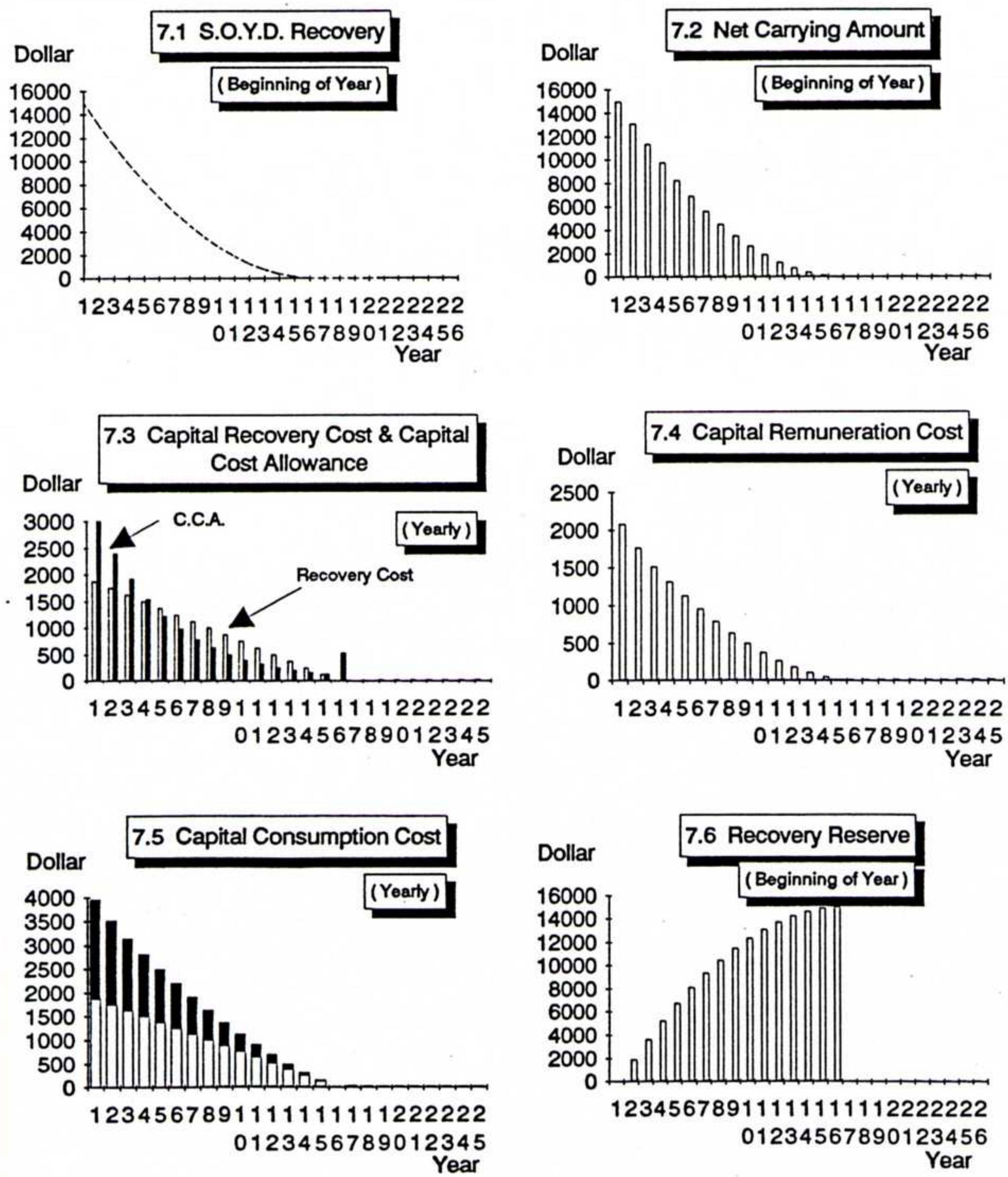


Figure 8

MORTGAGE TYPE PROGRESSIVE CAPITAL RECOVERY PATTERN

(Excluding Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capitalized Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %

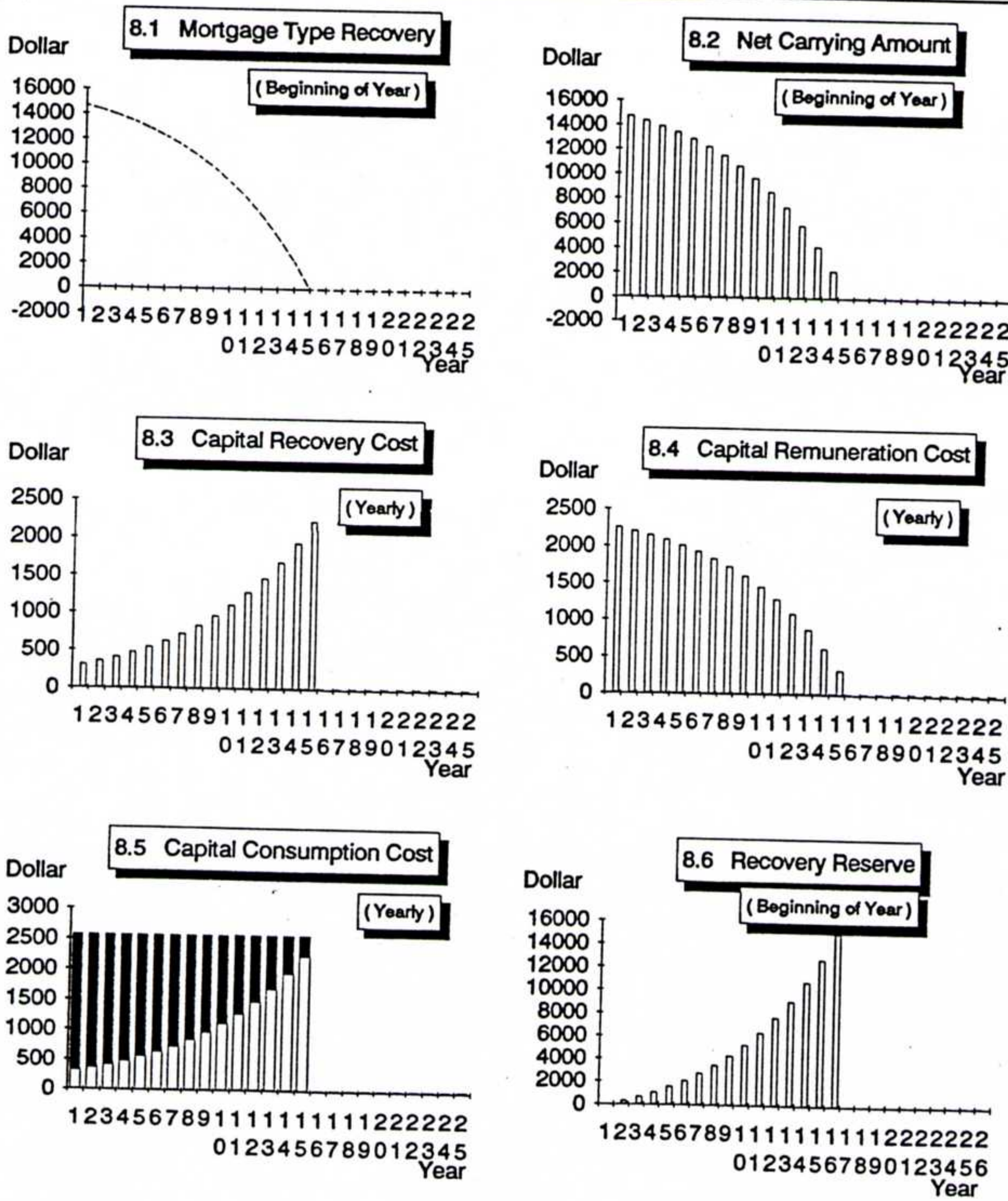


Figure 9

MORTGAGE TYPE PROGRESSIVE CAPITAL RECOVERY PATTERN

(Including Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capitalized Cost to Recover	15,000 Dollars
Capital Remuneration Rate (C.R.R.)	15 %
Income Tax Rate (I.T.R.)	36 %
Capital Cost Allowance Rate	20 %

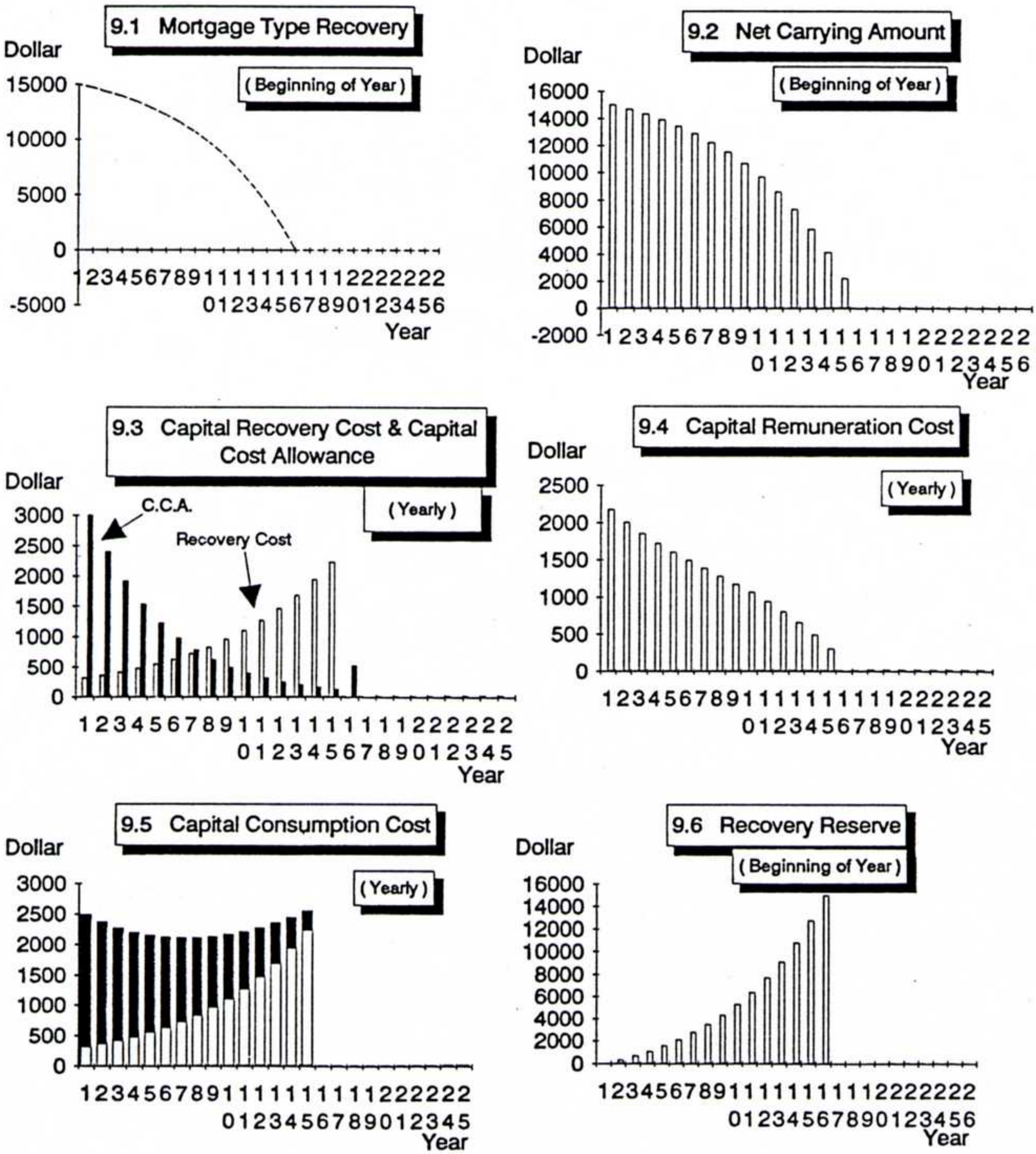


Figure 10

CAPITAL RECOVERY RESERVE BUILD-UP PROFILES

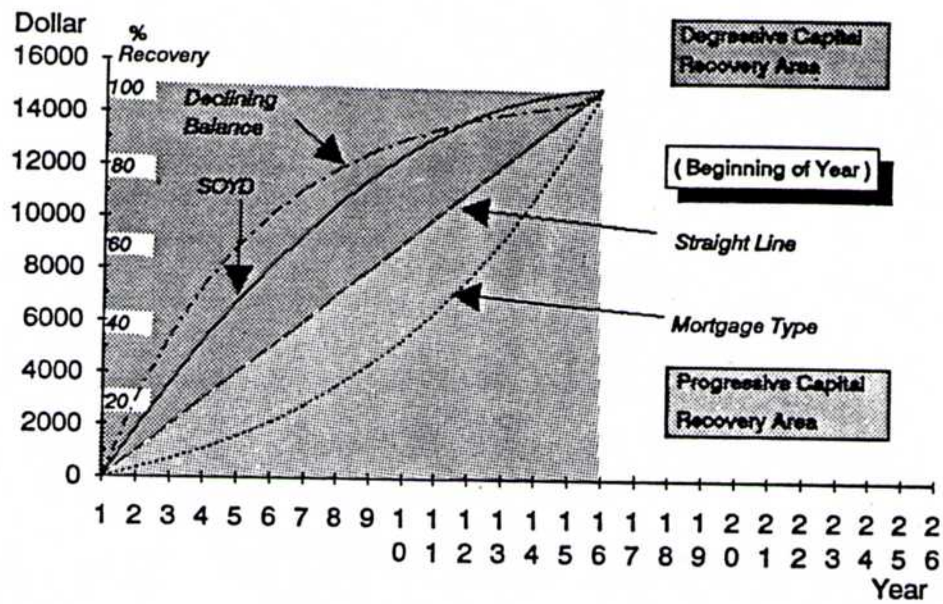


Figure 11

RECOVERY RESERVE BUILD-UP PROFILES
STEP-WISE ADJUSTED PATTERNS

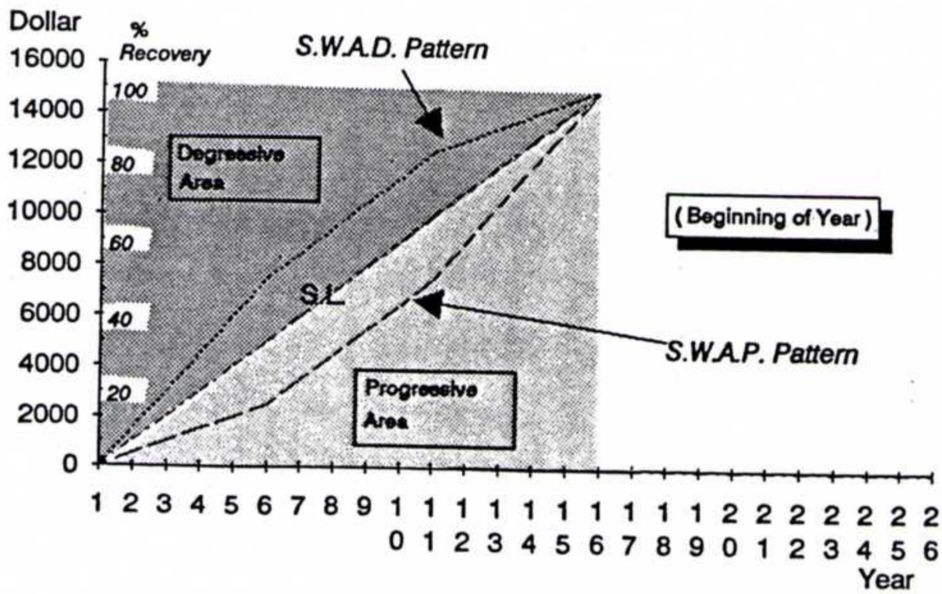


Figure 12

STEP-WISE ADJUSTED PROGRESSIVE RECOVERY PATTERN (SWAP)

(Excluding Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capitalized Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %

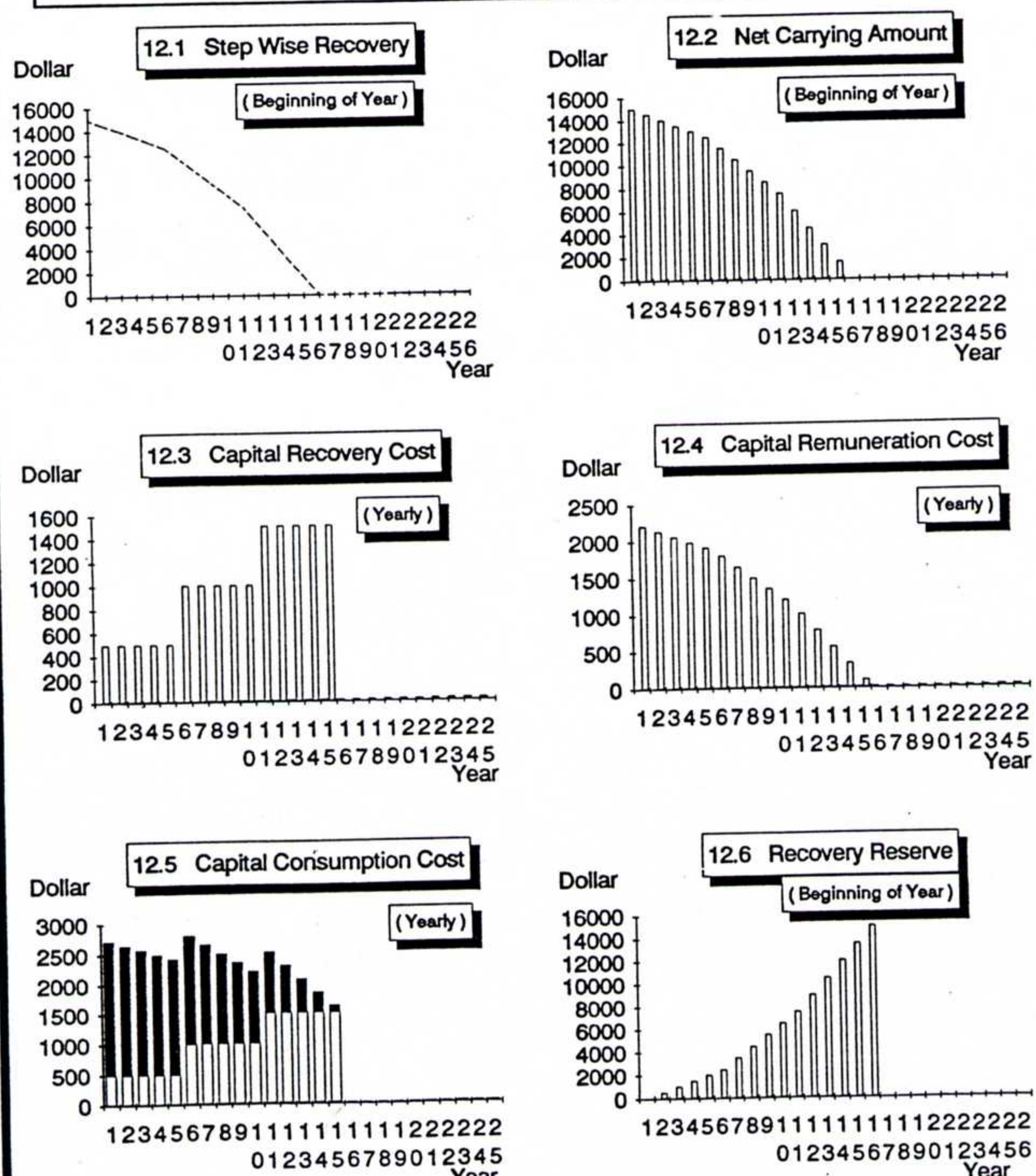


Figure 13

STEP-WISE ADJUSTED PROGRESSIVE RECOVERY PATTERN (SWAP)

(Including Fiscal Impact - C.C.A.)

ASSUMPTIONS	
Recovery Period	15 Years
Capitalized Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %
Income Tax Rate	36 %
Capital Cost Allowance Rate	20 %

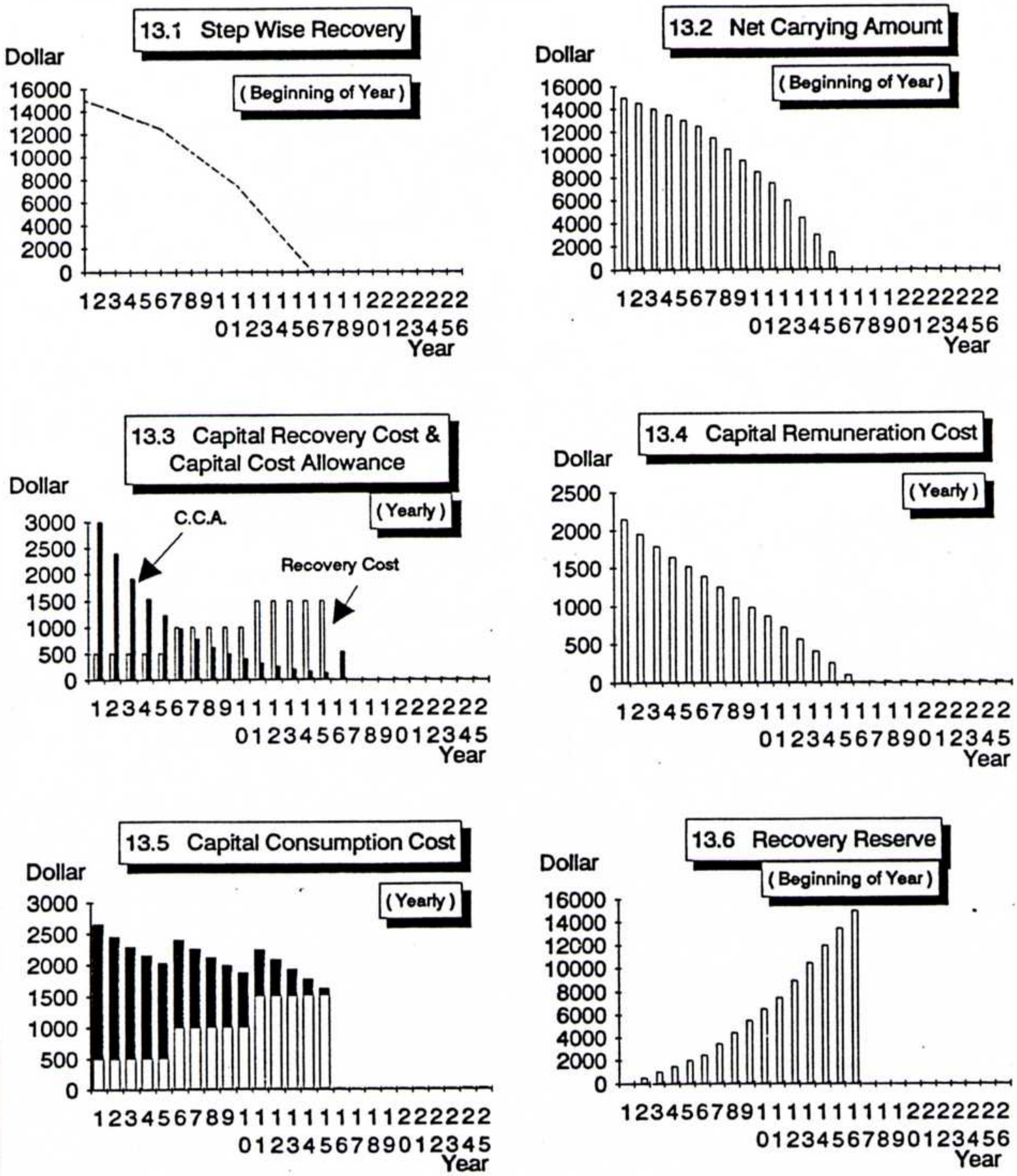
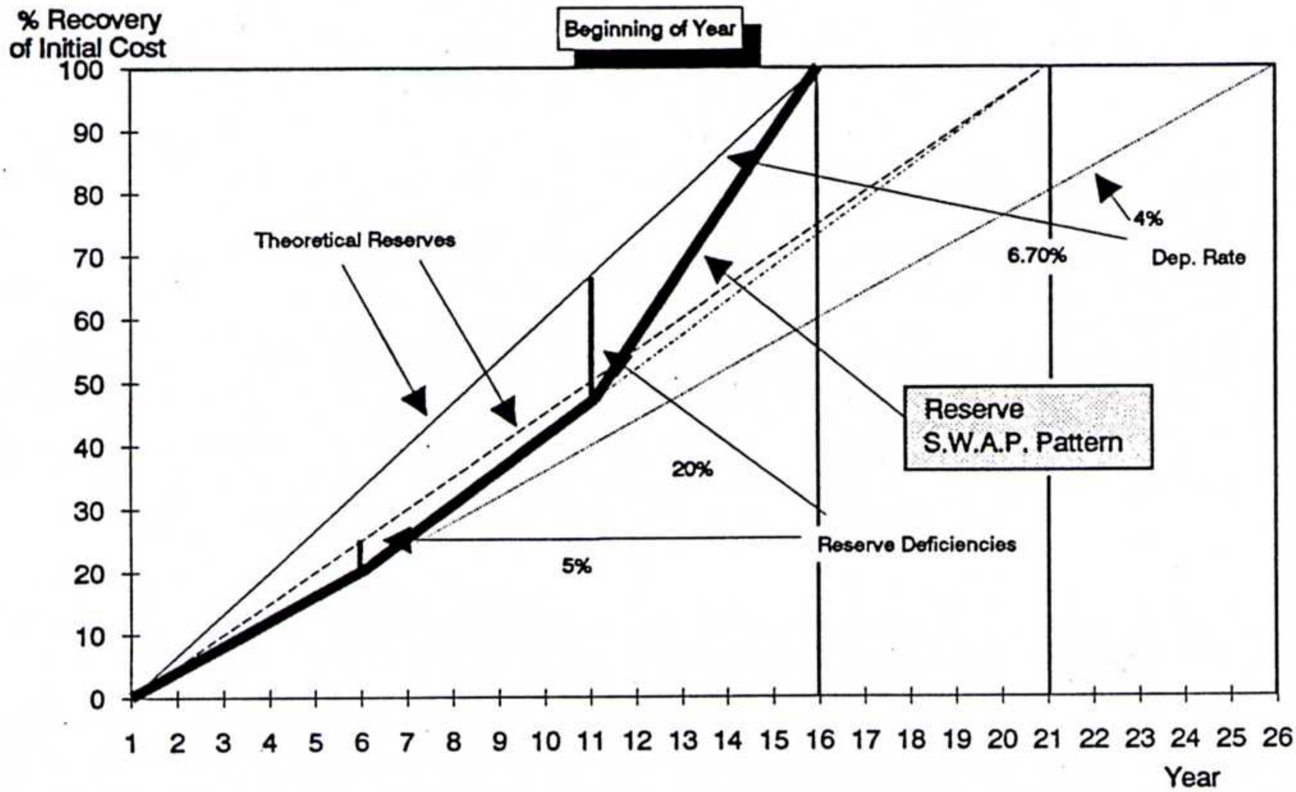


Figure 14

RECOVERY RESERVE PATTERN

(Illustration of Reserve Deficiencies)

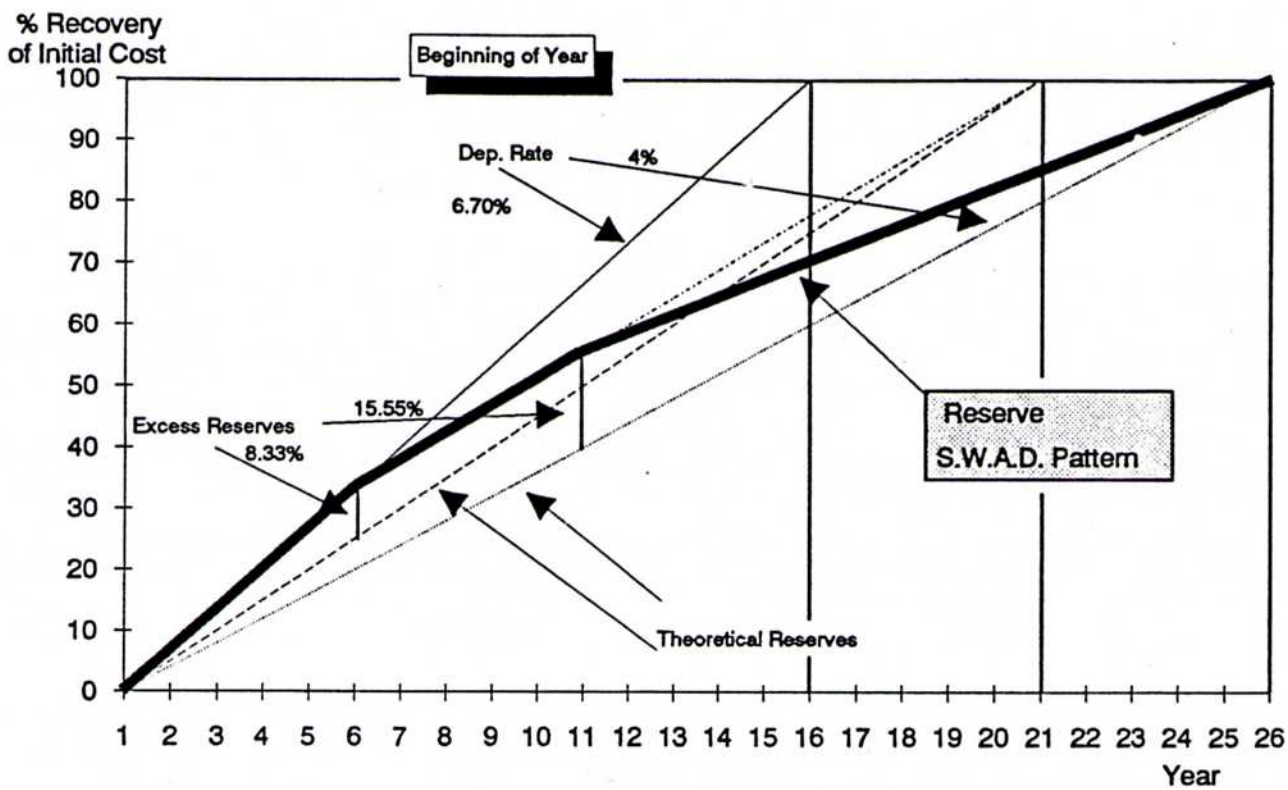


% Recov.	Life Span		Total Dep. Rate		Theoretical Dep. Rate		Deficiency Correction Dep. Rate	Theoretical Dep. Rates
20	0 - 5	:	4.0 %	=	4.0 %	+	0.0 %	25 Years - 4.0 %
27	5 - 10	:	5.4 %	=	5.0 %	+	0.4 %	20 Years - 5.0 %
53	10 - 15	:	10.6 %	=	6.7 %	+	3.9 %	15 Years - 6.7 %
100								

Figure 15

RECOVERY RESERVE PATTERN

(Illustration of Reserve Excesses)



% Recov.	Life Span		Total Dep. Rate		Theoretical Dep. Rate		Excess Correction Dep. Rate	Theoretical Dep. Rates
33.33	0 - 5	:	6.67 %	=	6.67 %	-	0.0 %	15 Years - 6.7 %
22.22	5 - 10	:	4.44 %	=	5.00 %	-	0.56 %	20 Years - 5.0 %
44.45	10 - 25	:	2.96 %	=	4.00 %	-	1.04 %	25 Years - 4.0 %
100.00								

Figure 16

SWAP RECOVERY PATTERN EVOLUTION

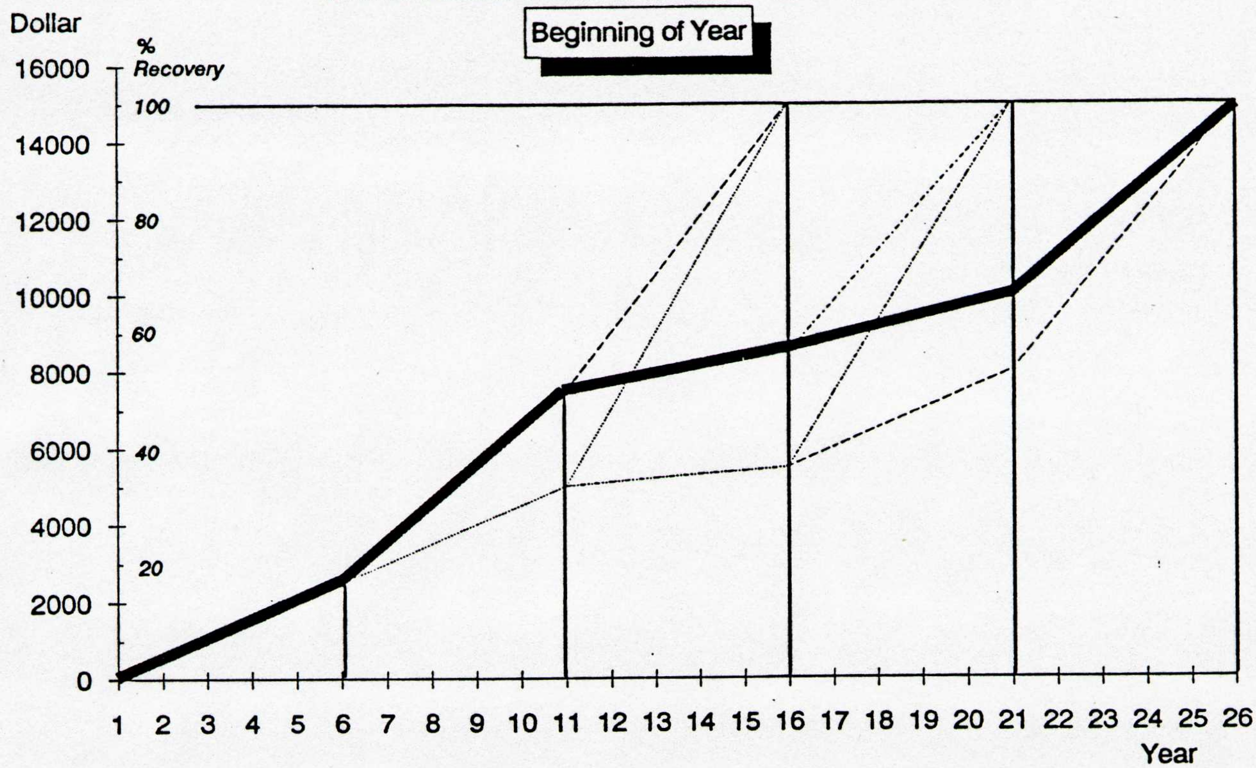


Figure 17

THE MATCHING CRITERIA

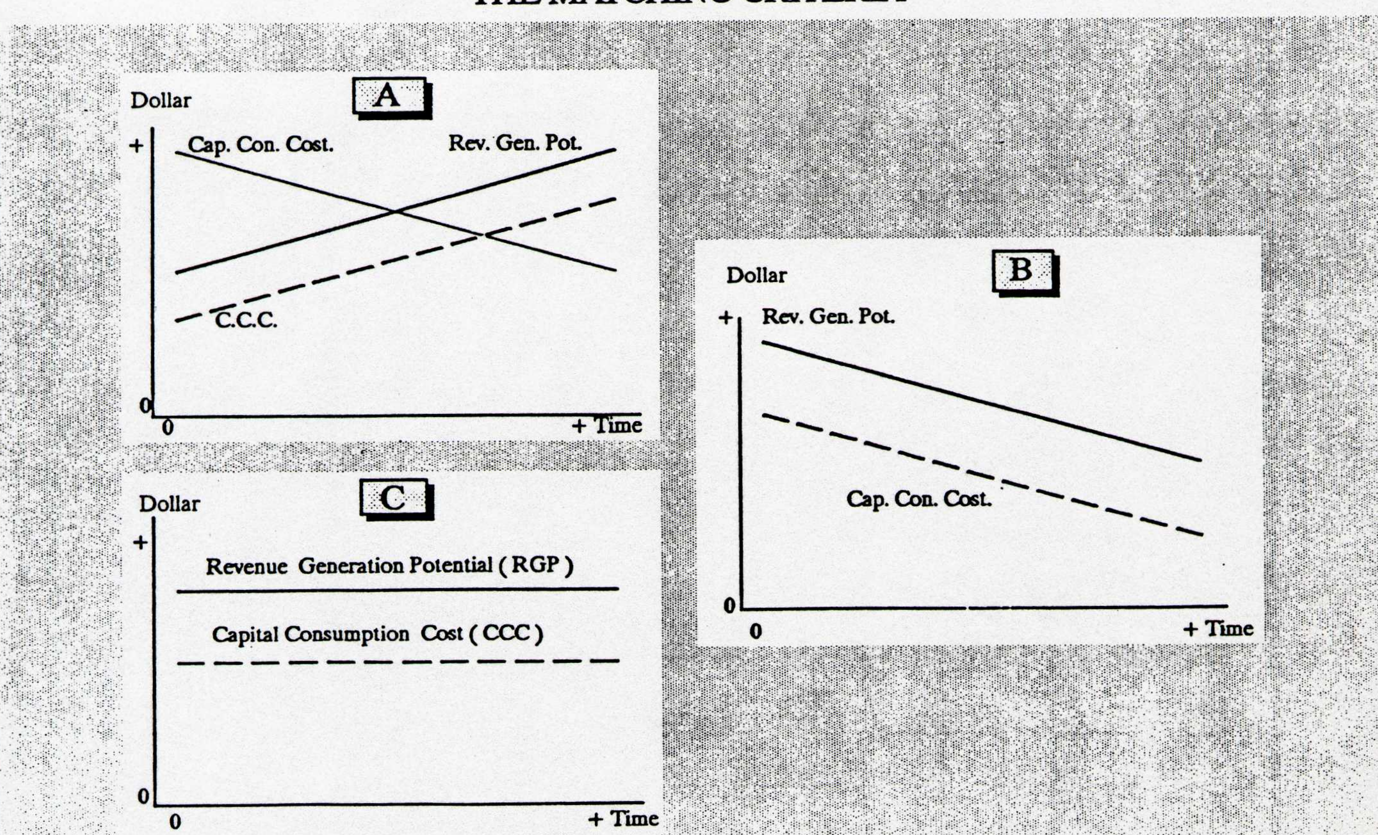


Figure 18

TECHNOLOGY TURNOVER MANAGEMENT STRATEGY

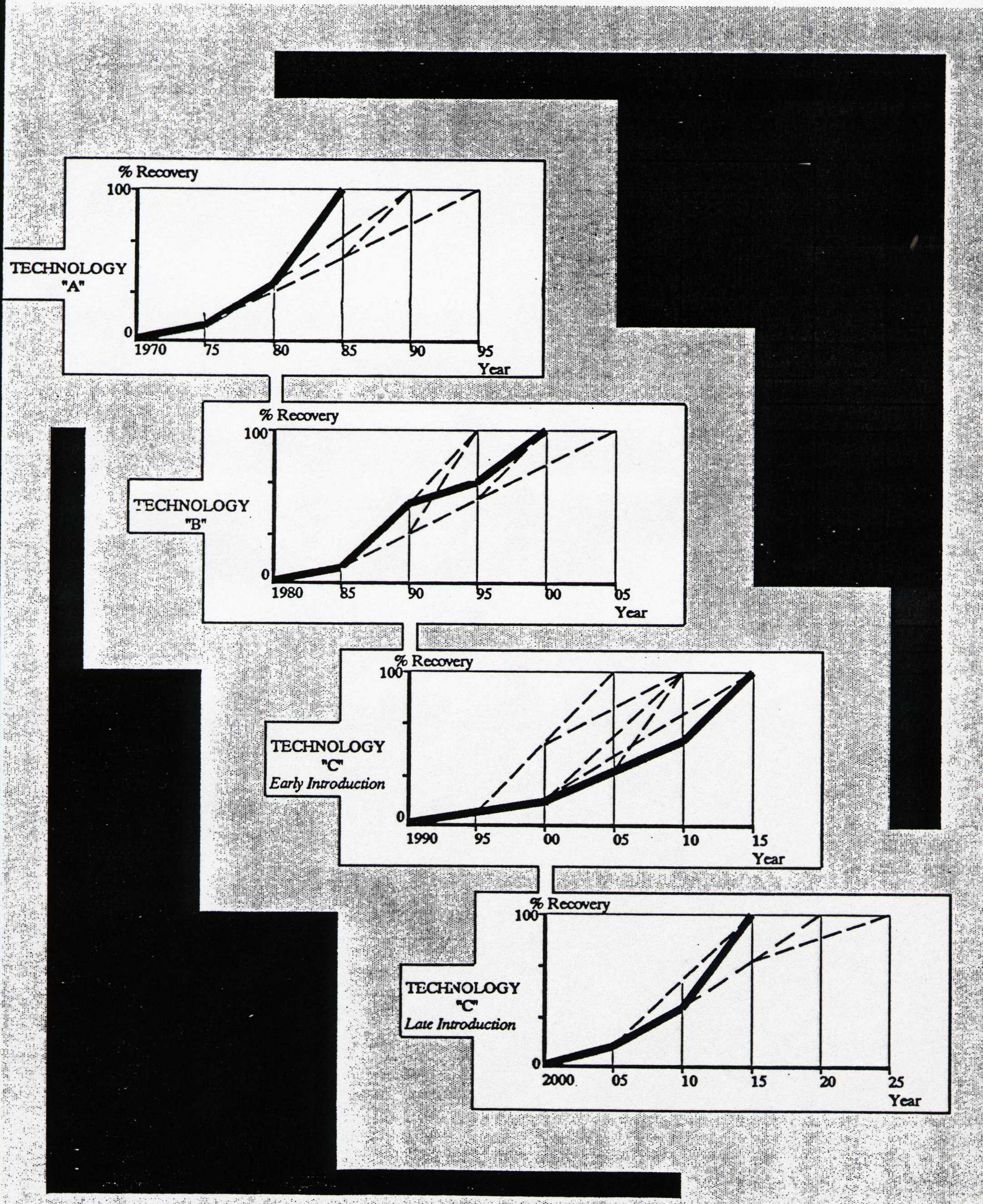
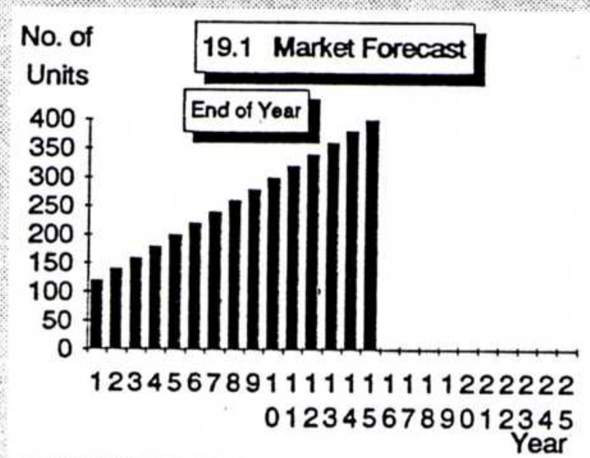


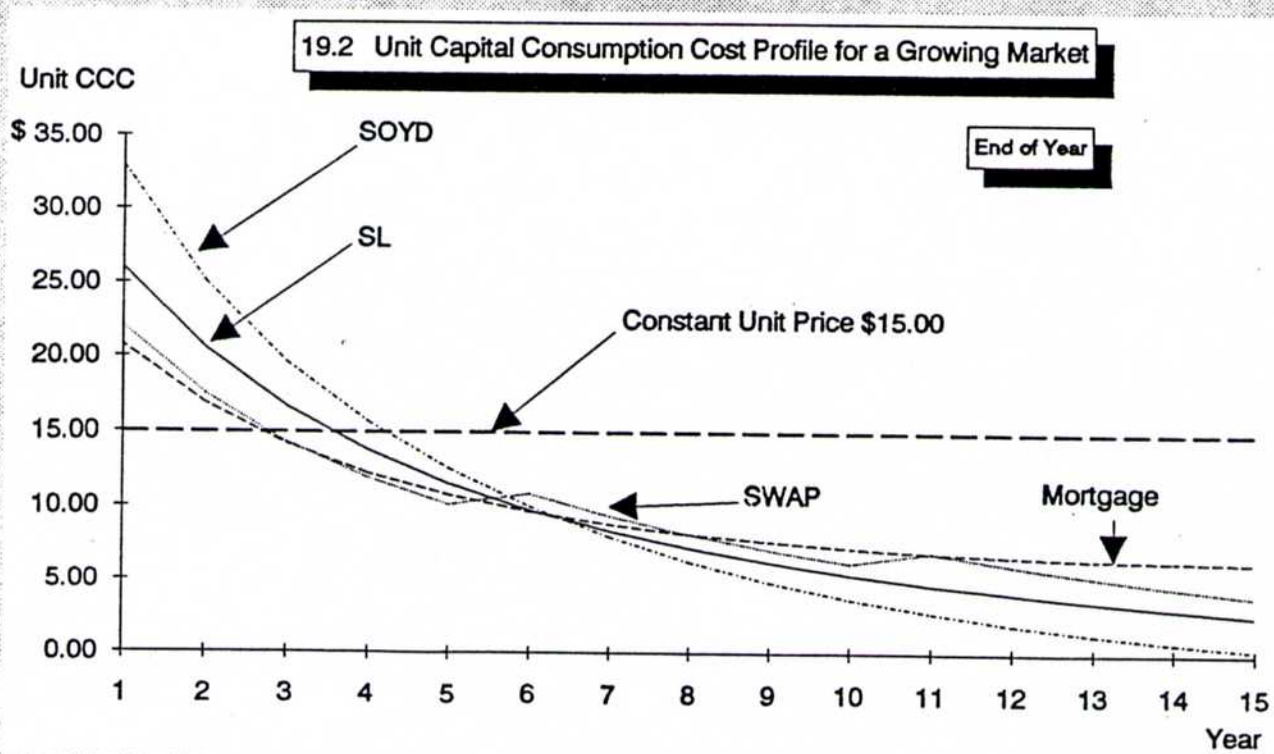
Figure 19

UNIT CAPITAL CONSUMPTION COST PROFILES

(Including Deferred Tax Liability Impact)

ASSUMPTIONS	
Recovery Period	15 Years
Capital Cost to Recover	15,000 Dollars
Capital Remuneration Rate (Cost of Financing)	15 %
Income Tax Rate	36 %
Capital Cost Allowance Rate	20 %
Number of Units (End of Recovery Period)	400 Units
Initial Market (Beginning of Recovery Period)	100 Units



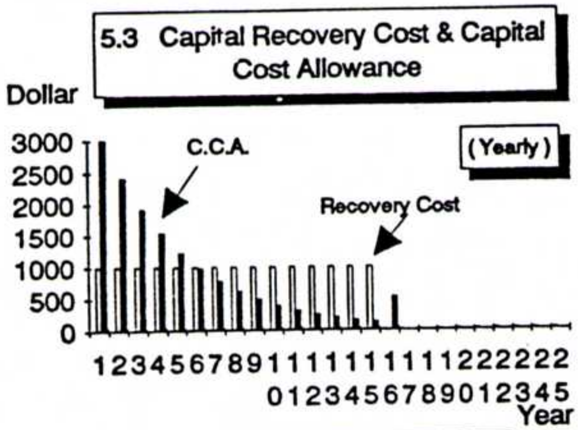


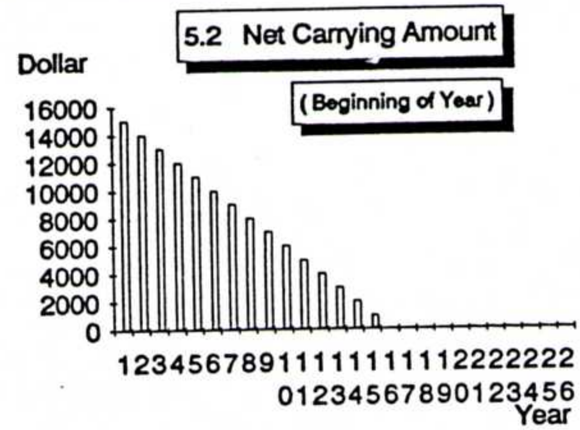
Appendix A

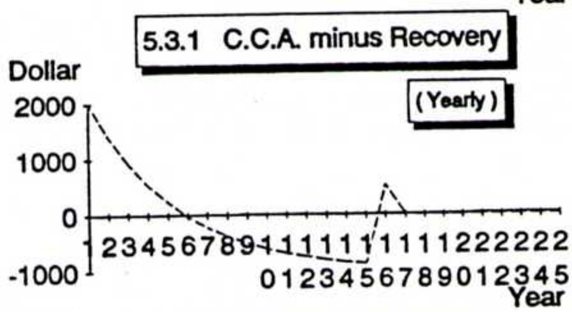
STRAIGHT LINE CAPITAL RECOVERY PATTERN

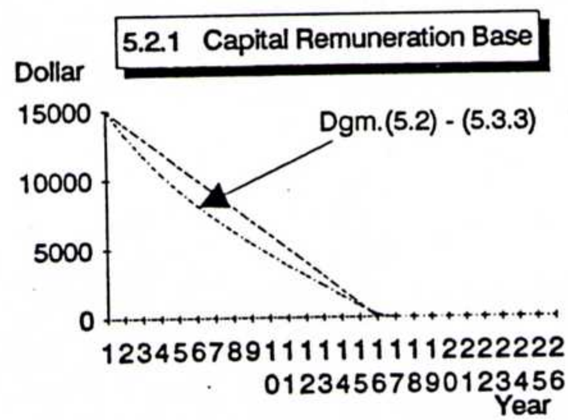
(Illustration of the Capital Cost Allowance (CCA) fiscal impact on the Capital Remuneration Cost)

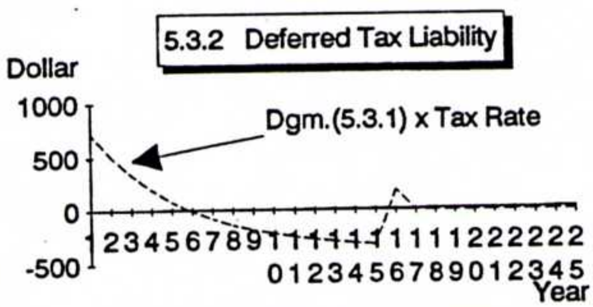
ASSUMPTIONS	
Recovery Period	15 Years
Capitalized Cost to Recover	15,000 Dollars
Capital Remuneration Rate (C.R.R.)	15 %
Income Tax Rate (I.T.R.)	36 %
Capital Cost Allowance Rate	20 %

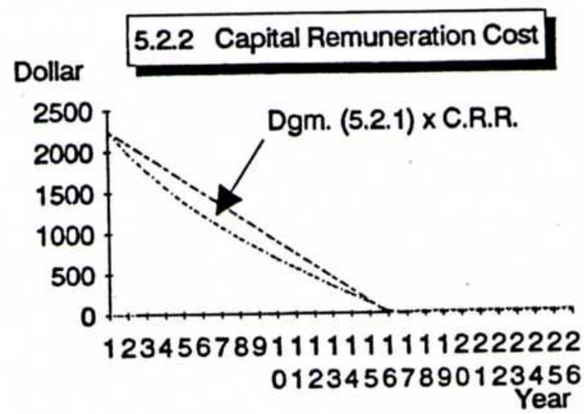


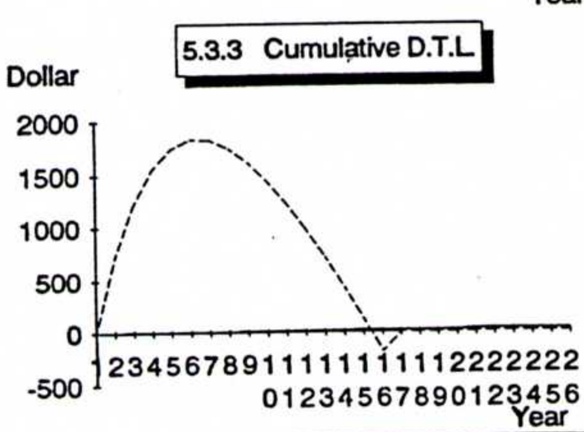












Appendix B

STRAIGHT LINE CAPITAL RECOVERY FORMULAS

Variables
A = Amortization Period
B = Capitalized Cost to Recover
C = Capital Remuneration Rate
D = Income Tax Rate
E = Capital Cost Allowance Rate

References
Figure 4
Figure 5
Appendix A

EXCLUDING D.T.L. IMPACT

Year Placed	Straight Line Recovery (DGM. 4.1)	Net Carrying Amount (DGM. 4.2)	Capital Recovery Cost (DGM. 4.3)	Capital Remuneration Cost (DGM. 4.4)	Capital Consumption Cost (DGM. 4.5)	Recovery Reserve (DGM. 4.6)
H	J	K	L	M	N	P
H{1}	J{1}=(B/A)(A-H{1})	K{1}=(B/A)(A-H{1})	L{1}= B-J{1} L{2} = J{1}-J{2}	M{1} =((L{1}/2)+K{1})(C/100)	N{1} = L{1}+M{1}	P{1} = B-K{1}
H{n}	J{n}=(B/A)(A-H{n})	K{n}=(B/A)(A-H{n})	L{n} = J{n-1}-J{n}	M{n} =((L{n}/2)+K{n})(C/100)	N{n} = L{n}+M{n}	P{n} = B-K{n}

INCLUDING D.T.L. IMPACT

Year Placed	Straight Line Recovery (DGM. 5.1)	Net Carrying Amount (DGM. 5.2)	Capital Recovery Cost (DGM. 5.3)	Capital Remuneration Cost (DGM. 5.4 & 5.2.2)	Capital Consumption Cost (DGM. 5.5)	Recovery Reserve (DGM. 5.6)
H	J	K	L	M	N	P
H{1}	J{1}=(B/A)(A-H{1})	K{1}=(B/A)(A-H{1})	L{1}= B-J{1} L{2} = J{1}-J{2}	M{1} =(((L{1}/2)-(0+T{1})/2)+K{1})(C/100) M{2} =(((L{2}/2)-(T{1}+T{2})/2)+K{2})(C/100)	N{1} = L{1}+M{1}	P{1} = B-K{1}
H{n}	J{n}=(B/A)(A-H{n})	K{n}=(B/A)(A-H{n})	L{n} = J{n-1}-J{n}	M{n} =(((L{n}/2)-(T{n-1}+T{n})/2)+K{n})(C/100)	N{n} = L{n}+M{n}	P{n} = B-K{n}

INCLUDING D.T.L. IMPACT

Capital Cost Allowance (DGM. 5.3)	Net Fiscal Book Value	Deferred Tax Liability (D.T.L.) (DGM. 5.3.2)	Acc. D.T.L. (DGM. 5.3.3)
Q	R	S	T
Q{1} = B-R{1} Q{2} = R{1}-R{2} Q{n} = R{n-1}-R{n}	R{1} = B(100-E)/100 R{2} = R{1}(100-E)/100 R{n} = R{n-1}(100-E)/100	S{1} = (Q{1}-L{1})(D/100) S{n} = (Q{n}-L{n})(D/100)	T{1} = S{1} T{2} = S{1}+S{2} T{n} = S{n-1}+S{n}