SASKATCHEWAN ASSESSMENT MANAGEMENT AGENCY

Market Value Assessment in Saskatchewan Handbook

Depreciation Analysis Guide

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Market Value Based Assessment Legislation in Saskatchewan

Saskatchewan has different assessment legislation[1] than other jurisdictions in Canada that must be taken into account when valuing properties for assessment and taxation purposes. There are specific definitions in Saskatchewan for "base date", "market value", "Market Valuation Standard" and "mass appraisal". It is important to understand how these definitions relate to one another and the requirement for market value based assessments to be determined in accordance with the Market Valuation Standard.

Base Date is defined as "...the date established by the agency for determining the value of land and improvements for the purpose of establishing assessment rolls for the year in which the valuation is to be effective and for each subsequent year in which the next revaluation is to be effective;"

Market Value is defined as the "...amount that a property should be expected to realize if the estate in fee simple in the property is sold in a competitive and open market by a willing seller to a willing buyer, each acting prudently and knowledgeably, and assuming that the amount is not affected by undue stimuli;".

Market Valuation Standard means the "standard achieved when the assessed value of property:

(i) is prepared using mass appraisal;

(ii) is an estimate of the market value of the estate in fee simple in the property;

(iii) reflects typical market conditions for similar properties; and

(iv) meets quality assurance standards established by order of the agency;"

Mass appraisal is defined as "…the process of preparing assessments for a group of properties as of the base date using standard appraisal methods, employing common data and allowing for statistical testing;".

Assessment legislation in Saskatchewan requires that non-regulated property assessments be determined pursuant to the Market Valuation Standard. Throughout this Handbook the term "market value based assessments" is used to refer to non-regulated property assessments. Unlike single property appraisals, market value based assessments must be prepared using mass appraisal and "...shall not be varied on appeal using single property appraisal techniques". All Handbook references to market value are subject to the requirements of the Market Valuation Standard.

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[1] The following Acts provide the statutory basis for property assessment in Saskatchewan:

- *The Assessment Management Agency Act*
- *The Interpretation Act, 1995*
- *The Cities Act*
- *The Municipalities Act*
- *The Northern Municipalities Act, 2010*

For more details on how to access this information refer to Appendix 2: Resources - Section 2a (Queen's Printer).

1.0 Overview

The purpose of this valuation guide is to explore the methods for recognizing and quantifying various types of depreciation and obsolescence, and in particular, its application for commercial properties where the cost approach to value is used. The proper application of these concepts is an essential part of the cost approach. The final objective of this process is an accurate market value based assessment.

In the appraisal field, depreciation is defined as:

> "a loss in utility and hence value from any cause."[2]

Similarly, depreciation is defined as:

> "a loss in value from the reproduction or replacement cost of an improvement due to any cause as of the date of the appraisal. It may also be defined as the difference between the reproduction or replacement costs of an improvement and its market value as of the date of appraisal".[3]

This valuation guide will explore property valuation by identifying the causes of depreciation and obsolescence and establishing techniques to estimate their effects on the market value based assessments.

A brief review of the cost approach procedure is presented below.

1.1 The Cost Approach Procedure

The principle of substitution is the fundamental principle used in the cost approach to value. The value of a property is equal to the cost of replacing it with a substitute of equal utility.

The following are the basic steps of the cost approach.

1) Estimate the land value as if vacant and available to be put to its highest and best use. This is usually established by preparing and analysing comparable market sales data.
2) Estimate the total reproduction or replacement cost new of the improvements as of the base date. In mass appraisal a building classification system is required to estimate cost and the following are examples of characteristics that may affect the estimate:
    a) design type;
    b) construction type;
    c) quality class;
    d) floor area, and;
    e) building shape.

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[2] Barber, A.M. ed, *Basics of Real Estate Appraising*, First Edition, (The Appraisal Institute of Canada, 1991, p. 284)

[3] *The Appraisal of Real Estate*, Ninth Edition, (The American Institution of Real Estate Appraisers, 1987, p. 377)

3) Estimate the total amount of depreciation, including:
    - Physical deterioration (curable and incurable)
    - Functional obsolescence (curable and incurable) and
    - External obsolescence (sometimes referred to as economic).
4) Deduct depreciation from reproduction or replacement cost.
5) Add the depreciated reproduction or replacement cost to the market value based assessment of the land to determine the market value based assessment of the property.

1.2 Reproduction versus Replacement Costs

There are two major concepts of cost that the assessor must be aware of to properly estimate cost new of the improvement and properly apply depreciation. These concepts are:

- Reproduction costs, and
- Replacement cost.

Reproduction Cost

Reproduction cost is the cost of replacing an existing property with a replica as of a particular date. Strictly construed, reproduction cost calls for determining the construction costs of identical materials and quality of workmanship.

This variation of the cost approach is of limited usefulness because it is frequently not possible or desirable to duplicate an existing property, either because of a lack of certain materials or trade skills, or the functional obsolescence of an older property.

Reproduction costs become more difficult to apply as a property ages. However, this difficulty can be overcome if depreciation is accurately estimated. If a reproduction cost analysis is used, the assessor must ensure that all forms of depreciation are considered to arrive at a market value based assessment. Note: For consistency, future references to "cost new" in this guide will refer to replacement cost new.

Replacement Cost

A replacement approach reflects what actually would be built if the improvements were to be reconstructed. Replacements are designed, therefore, to replace the existing functions and capacity of the property. Replacements take advantage of advances in technology in the design, layout, and construction of the improvements. As a result, replacement costs take into account many of the elements that give rise to the functional obsolescence inherent in the property. The replacement cost concept is the most meaningful as far as the principle of substitution is concerned.

In determining the cost for a building or structure for mass appraisal purposes, the replacement cost approach is an acceptable and appropriate method of arriving at market value based assessments.

1.3 Consolidating and Applying Depreciation

An assessment system incorporates a mass appraisal process. Generally, mass appraisal systems derive the value of a property in a normal, average, or typical situation. The discrepancies and characteristics of individual properties are analysed and adjustments are made to individual property values as variations come to light.

Normally, assessors do not have the time or resources to initiate analysis of all forms of depreciation on all properties in a jurisdiction and/or market area. For mass appraisal purposes, depreciation is usually estimated through the use of age-life depreciation tables with the addition of condition rating indicators.

There are a number of methods to determine the depreciation in a property. The valuation of a property using the cost approach may require elements of judgment regarding the property. Estimating these forms of depreciation is not necessarily straightforward, nor have all possible methods for identifying and quantifying depreciation been covered in this valuation guide. It is essential to recognize the obsolescence conditions and in some rational manner make allowance for these conditions in the valuation of the property.

In the process of determining the depreciation factors there are three questions to consider.

1) Is there a depreciation problem in the property?
2) Does it affect the market value based assessment?
3) How can this depreciation be quantified?

To address these questions the assessor must ask, "How would a prospective purchaser, including the current owner, view this property?" The market value assessment can only be completed after the potential issues of depreciation have been fully addressed and incorporated.

2.0 Forms of Depreciation

Depreciation is a measure of the reduction in the value of a property from the cost new of a similar property. Three recognized sources of depreciation are physical deterioration, functional obsolescence and external obsolescence.

2.1 Physical Deterioration

All building improvements deteriorate over time and as a result have limited life spans. Therefore, physical deterioration generally relates to the age of the property. The loss in value from deterioration is a simple reflection of the fact that a prospective purchaser will pay less for an older building in poor condition than for a similar, newer one in good condition. Such depreciation is determined by establishing the current condition of the property and estimating the effective age and the remaining economic life of the improvements.

The following age and life relationships are important when either directly or indirectly estimating the depreciation of an improvement or component:

- Actual Age

Actual age is the number of years elapsed since an original structure was built.

- Effective Age

Effective age is the typical age of structures equivalent to the one in question with respect to condition and utility and reflects the remaining economic life of the building or structure. Effective age can be either shorter or longer than actual age.

- Economic Life

Economic life means, with respect to a building or structure, the period during which a given building or structure is expected to contribute (positively) to the value of the total property. This period is typically shorter than the period during which the improvement could be left on the property, that is, its physical life.

- Remaining Economic Life

Remaining economic life is the economic life less effective age. Renovation, remodelling, or rehabilitation can extend a building's physical life and can have an effect on its remaining economic life.

The two categories of physical deterioration are:

- Curable, and
- Incurable.

Curable Physical Deterioration

Curable physical deterioration is defined as:

> "… items of deferred maintenance; the estimate of curable physical deterioration applies only to items in need of repair on the date of the appraisal."[4]

A curable item would increase the property value and/or its economic life, more than or at least equal to, the cost of correcting the condition.

Incurable Physical Deterioration

Incurable physical deterioration is defined as:

> "… that which, as of the date of the appraisal, is not economical to repair or replace, that is, the cost of repair exceeds the gain in value". [5]

Incurable physical deterioration could include items such as structural framework, foundation or ceiling structures. Some building components have shorter life expectancies than the structure as a whole.

> A long-lived item is "a building component with an expected remaining economic life that is the same as the remaining economic life of the entire structure.
>
> A short-lived item is "a component with an expected remaining economic life that is shorter than the remaining economic life of the entire structure."[6]

Long-lived items are the structural elements of a building, and include such things as the foundation frame, floor and roof structures. Deterioration of long-lived items is generally incurable physical deterioration.

Short-lived items include finishes, mechanical and electrical systems and other elements that wear out faster than the rest of the property. This includes items that are not yet ready to be replaced.

2.2 Obsolescence

Depreciation as a result of obsolescence can be broken down into two components:

- Functional obsolescence, and
- External obsolescence (sometimes referred to as economic).

Such depreciation is not related to the age of the property but arises out of analysis of the functionality and external conditions that may affect the value of the property.

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[4] ibid., p. 383

[5] Eckert, Joseph K.(ed), *Property Appraisal and Assessment Administration*, (The International Association of Assessing Officers, 1990, p. 220)

[6] *The Appraisal of Real Estate*, Thirteenth Edition, (Appraisal Institute, 2008, p. 410)

Obsolescence is a reflection of the simple fact that people pay less for items or properties that have reduced functionality, diminished utility or locational quality.

Functional Obsolescence

Functional obsolescence is defined as:

> "a decrease in value caused by an inability of an improvement to perform its function efficiently; [it] may be attributable to deficiencies, defects, inefficiencies, or super-adequacies of a property."

It can also been defined as:

> "loss in value due to inability of the structure to perform adequately the function for which it is being used, as of the appraisal date. Functional obsolescence results from changes in demand, design, and technology and can take the form of deficiency…, need for modernization…, or superadequacy..."[7]

As with physical deterioration, functional obsolescence can be divided into two categories:

- Curable, and
- Incurable.

Curable Functional Obsolescence

Curable functional obsolescence refers to improvements where the cost of replacing the unacceptable or outmoded items is the same or less than the anticipated increase in value, or where the cost is offset by the increase in utility of the property. The following three measures of curable functional obsolescence are categorized by the cost to cure the depreciated condition.

1) Deficiencies - the property requires additions or improvements to fulfill its required function.
2) Modernization of deficiencies - the property requires re-modeling or renovation to adequately fulfill its required function.
3) Superadequacies - the building component is measurably greater than what is required to fulfill existing and intended functions, e.g., an outside stairwell to an upper floor that was never built.

Incurable Functional Obsolescence

Incurable functional obsolescence occurs when the cost to cure the deficiency exceeds any increase in value to the property. If a purchaser is willing to accept the problems associated with the property, they will do so at a lower rent or lower purchase price. Incurable functional obsolescence is best measured using the sales comparison approach and it can also be measured by capitalizing any income lost due to the obsolescence.

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[7] Eckert, Joseph K. (ed), *Property Appraisal and Assessment Administration*, (The International Association of Assessing Officers, 1990, pp. 220-221)

External Obsolescence

External obsolescence is defined as:

> "the loss in value as a result of impairment in utility and desirability caused by factors outside the property's boundaries."[8]

It can also be defined as:

> "a temporary or permanent impairment of the utility or salability of an improvement or property due to negative influences outside the property.[9]

Loss in value due to external obsolescence is conditional on the problem being long-term and generally beyond the control of the property owner. External obsolescence is generally caused by economic or locational factors and can arise due to a variety of reasons such as neighbourhood decline, changes in sources of supply, and changes in market conditions. Unlike physical deterioration, external obsolescence is considered to be incurable and is not age dependent. The factors are generally a result of actions taken by consumers, the competition, or regulatory agencies.

One cause of external depreciation is locational obsolescence that is, the "loss in value due to suboptimal siting of an improvement."[10] For example, locational obsolescence could occur to a residential property if a scrap yard were placed next to the residential development.

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[8] Ibid., p. 221

[9] *The Appraisal of Real Estate, op. cit.,* p. 392

[10] Eckert, *op. cit.*, p. 650

3.0 Identifying Depreciation

3.1 Recognizing Depreciation

There are three types of knowledge that will assist the assessor in establishing depreciation.

1) Knowledge about the physical nature of the property:
   - type of construction;
   - condition of improvements;
   - nature of the soil conditions; and
   - site configuration and building layout.
2) Knowledge about the operation of the property:
   - functionality of the property; and
   - use and utility of the property.
3) Knowledge about economic conditions:
   - general economic conditions; and
   - economic conditions with respect to the particular property type.

Information Gathering

The property valuation process may be easier and more accurate if the assessor incorporates a variety of sources of information. This provides a foundation for evaluating whether typical depreciation is appropriate or if further analysis should be undertaken.

Discussions with Property Owner

A site inspection may be necessary to determine the condition and functionality of the property.

The property owner (or designated contact person) are often the best resource for information about the functionality and utility of a property.

Supporting Information

Sources of supporting information include real estate publications, government sources, library/internet sources etc.

Determination of Effective Age

Effective age can be established for each component of a building or improvement.

Determining the effective age of each component involves:

- Observed condition (inspection) of the item;
- Chronological age or year built;
- Physical life expectancy of the item; and
- General maintenance practices.

Determining the collective effective age of all the improvements may be a combination of the following elements.

- Weighted average age based on year built and cost of construction;
- Observed condition (inspection) of all improvements;
- General maintenance practices; and
- Life expectancy of improvements.

3.2 Obsolescence Investigation

Identifying and recognizing obsolescence conditions generally requires answers to the following questions.

If the answers to these questions deal with building functionality and usage, then functional obsolescence may be present.

If the answers to these questions deal with long-term over capacity, or poor financial performance due to depressed market conditions, then there may be external obsolescence present.

1) Are there any functional problems with the property?
2) Are there any inefficiencies in the use of space or the layout of the buildings?
3) Are there any external conditions affecting this property?
4) Could the existing facility be replaced with a more modern, efficient substitute that more adequately fulfills current and/or expected requirements? If so, what would constitute this modern unit?
5) How would a potential purchaser view this property?

Factors that Produce Functional Obsolescence

Listed below are some of the factors that could lead to functional obsolescence that may affect the typical occupant. The list is not intended to be all-inclusive.

1) Excessive floor space

   Includes floor areas that are not useable by the typical occupant.

2) Piecemeal construction, inappropriate building layout, and disjointed production flow.

   Poorly laid out buildings may be the cause of extra operating costs for the typical occupant e.g., floors at different levels, rooflines at different levels, loading docks at inconvenient locations etc.

3) Excessive operating costs

   Factors such as excessive windows and openings, poor insulation, inadequate heating systems and inferior building services may generate excessive operating costs.

4) Excessive heights compared to what the typical occupant would require.

5) Excessive or superior construction

   A building may have originally been designed for certain roof loadings, floor loadings, or overhead cranes that are no longer required by the typical occupant.

6) Inferior materials or construction

   A lack of quality in construction may lead to inefficiencies. For example, storage on a second floor where the lift construction does not permit the operation of a forklift.

7) Change in property use

   A manufacturing facility can require special services and designs to ensure that employees have a safe and comfortable working area, e.g., extra lighting, and environmental controls. If such a building is then converted to a warehouse, there may be redundant qualities in the services and structure that add nothing to the current property use.

8) Bay size (column spacing)

9) Poor lighting or poor installation of other services (generally considered curable)

10) Site Restrictions

    A site that does not permit rational expansion or appropriate access can cause functional problems, inefficiencies and excess operating costs.

Factors that Produce External Obsolescence

Typically a decline in sales volume, profits, or value of the company assets can result in external obsolescence. These decreases should be the product of long-term conditions and not a reflection of temporary market aberrations, poor management, or labour unrest.

1) Technological changes

   A decline in the price of a product due to new or increased competition, technological advances, or a permanent decrease in market demand can cause external obsolescence. Under these circumstances the property has lost some ability to generate income and therefore may incur a corresponding drop in value.

2) Change in the quality of the location

   A decline in value, commonly referred to as locational obsolescence, is caused by factors that change the attractiveness and subsequent value of a location. Incompatible development such as a scrap yard next to an apartment building, traffic being re-routed onto a new highway and from a retail strip, or the market for the goods moving away resulting in greater transportation costs, all result in locational obsolescence.

3) Change in government restrictions or regulations

   Property rezoning or changes to government regulations can affect land value. Situations such as a regulatory change in the amount of pollutants permitted in manufacturing may produce external obsolescence by restricting the amount of potential income or by increasing the cost of production without a corresponding increase to profit.

4) Changes in the sources of supply

   A steel mill may have been located close to an ore deposit to save on transportation costs. If the ore supply runs out the mill may suffer from external obsolescence.

4.0 Quantifying Depreciation

4.1 Overview

Property depreciation can begin the moment the construction crew leaves the site. Premature physical deterioration, poor design and external market forces can cause the immediate loss in property value. Conversely, 30-year-old buildings may be found in good repair and be normally functional with few negative influences. The value loss in older buildings may also be offset by the building's historical significance, architectural excellence, location, or a scarcity of supply.

1) Depreciation is not necessarily related to the actual age of the property.
2) It is ultimately the market that dictates the amount of depreciation in a property.
3) There is not one correct or standard way to quantify loss in value from cost new because of the diverse nature of depreciation. Appropriate market value evidence may provide some indication of depreciation. However, it is not always possible to directly compare the available market evidence to the property being valued.

Depreciation and market value are ultimately determined in the marketplace, yet adequate market information is not always available for every property. Assessors estimate the type and degree of depreciation present in a property. An accurate quantification of depreciation may involve information supplied by the property owner. In the absence of such information, quantification is typically derived using the depreciation tables from cost publications. However, these schedules are only a guide and may not always apply.

Hypothetical data and analysis are provided throughout this Valuation Guide in the narrative and in various examples, tables and forms. These examples are provided for illustrative purposes only. The exact form of the market value based assessment analysis is up to the discretion of the assessor subject to the Market Valuation Standard and other relevant legislation.

Figure 1: Example Property - SK Manufacturing

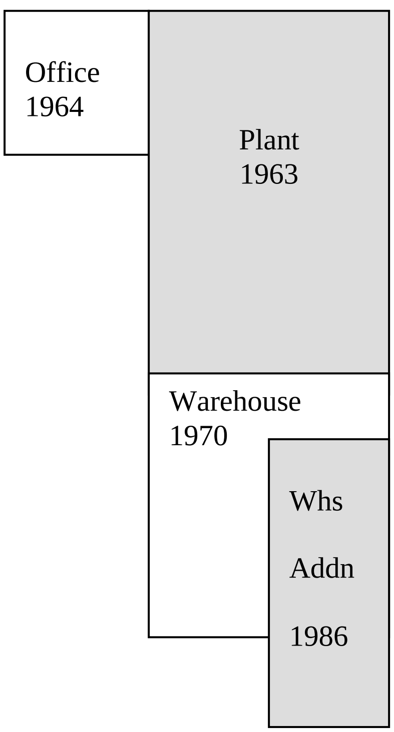
Note: Throughout the balance of this guide, examples of various methods used to estimate depreciation are provided using a hypothetical example property. In order to illustrate the various forms of depreciation, the examples that follow may provide greater detail for this single property example than would typically be used for mass appraisal purposes.

The example property is a small assembly plant referred to as "SK Manufacturing". The physical characteristics of SK Manufacturing are as follows:

> SK Manufacturing is a small manufacturing/assembly plant that makes parts used in oil exploration equipment. The plant is 30 years old and has grown over the years, adding warehousing space. The processing equipment was updated recently and can produce 100,000 parts per year. The security of the business relies upon the amount of ongoing oilfield exploration.
>
> The plant, office and first warehouse addition are typical cement block construction. The plant is a steel frame construction and the office and warehouse are built with load-bearing walls. The second warehouse addition in 1986 has insulated metal siding on steel frame construction.

Note: Examples and work presented in this Handbook assume that the highest and best use has not changed due to depreciated conditions inherent in the property.

Schematic Outline, Quantification and Replacement Cost - SK Manufacturing



Plant	Area (ft2)	Height	Volume (ft3)
Plant	12,440	24.0	298,560
Office	2,855	12.0	34,260
Warehouse	7,000	20.0	140,000
Whs Addition	4,120	36.0	148,320
Totals	**26,415**		**621,140**

Plant Costs	Area (ft2)	Rate	RCN*
Plant	12,440	$51.00	$634,440
Office	2,855	$60.00	$171,300
Warehouse	7,000	$42.00	$294,000
Whs Addition	4,120	$57.00	$234,840
Totals	**26,415**		**$1,334,580**

*
RCN = replacement cost new

4.2 Methods of Estimating Depreciation

There are various methods used to estimate depreciation such as the following:

1) Observed Condition (Breakdown) Method
2) Age-Life Method
3) Sales Comparison (Extraction) Method

1) Observed Condition (Breakdown) Method

The traditional breakdown approach involves the separate analysis of all forms of physical, functional and external depreciation. The required analysis and subjectivity to determine life expectancy and age of components, physical depreciation, functional obsolescence and external obsolescence make this approach challenging and time consuming.

In using this method, one judges the condition and expected remaining physical life of each building component, including short-lived items such as Heating Ventilation Air Conditioning (HVAC) systems, and long-lived items such as the walls and foundation. Some items may be curable (e.g. HVAC systems). Others may not be economically prudent to fix (e.g. walls).

This observed condition method when applied in a detailed manner has limited applicability for mass appraisal because it requires a great deal of analysis and judgement concerning the condition and expected life of each component. It may be of use for unique properties where other methods do not adequately measure the depreciation. The breakdown approach involves the following steps.

1) Items of curable physical deterioration are identified and the cost to cure these items is established.
2) Current age and physical life expectancy of all short-lived items are estimated and the physical depreciation is quantified.
3) Age and life expectancy of long-lived items are established and incurable physical depreciation is estimated.
4) Deductions for curable and incurable functional obsolescence are determined.
5) Conditions of external obsolescence are estimated.

Due to its complexity and time requirements, the Observed Condition (Breakdown) Method has limited applicability for use in mass appraisal.

2) Age-Life Method

The age-life method is also known as the straight-line depreciation approach. "A life expectancy is estimated and a constant annual percentage (equal wear or serviceability each year) is taken for depreciation so that at the end of that life the depreciation equals 100% of the initial cost."[11] For example, if a building has a life expectancy of 50 years, applying physical depreciation on a straight-line basis means a deduction of 2% per annum (100% ÷ 50 years = 2% per year).

For mass appraisal purposes, depreciation is usually estimated through the use of age-life depreciation tables with the addition of condition rating indicators. To apply this method of estimating depreciation the assessor typically reviews the condition of the property as a whole, determines its effective age and given the expectation of typical maintenance, determines the physical life expectancy of the buildings.

The depreciation inherent in a building is either below average or above average condition can be determined by adjusting the effective age of the improvement, upward or downward from the physical age, as required.

Calculating Effective Age

Determining the effective year built, or effective age of an entire property is mostly an arithmetic exercise. To determine the effective year built of a group of building sections forming an integrated property (i.e. a commercial warehouse built in four construction phases), a weighted average method is recommended. The calculation of such a weighted average is shown in *Figure 2*. It is assumed that all buildings receive average maintenance.

To establish the age of a property, there are two common weighting methods:

- By size, or
- By value.

Figure 2: Analysis of the Effective Physical Age – SK Manufacturing*

Building	Area (ft^2)	RCN	Year Built	Weighted Age by RCN Value	Weighted Age by Area
Assembly Plant	12,440	$634,440	1963	933.2	924.5
Office	2,855	$171,300	1964	252.1	212.3
Warehouse	7,000	$294,000	1970	434.0	522.1
Whs Addition	4,120	$234,840	1986	349.5	309.8
Totals	26,415	$1,334,580		1968.8	1968.7

** (Refer to Figure 1 for a detailed explanation of the hypothetical "SK Manufacturing" example property.)*

[11] *Marshall Valuation Service*, (Marshall & Swift/Boeckh, LLC, 2009, Section 97, p.1)

Weighted Age Calculations Examples *(Figure 2)*

- To calculate the Weighted Age by RCN Value:

  RCN ÷ Total RCN x Year Built

  i.e. Assembly plant: ($634,440 ÷ $1,334,580) x 1963 = 933.2

- To calculate the Weighted Age by Area:

  Area ÷ Total Area x Year Built

  i.e. Assembly plant: (12,440 s.f. ÷ 26,415 s.f.) x 1963 = 924.5

In the example of SK Manufacturing, the average physical age of the entire group of improvements weighted by size is 1968.6, rounded to 1969. The weighted average age based on value was 1968.7, rounded to 1969.

Applying Physical Depreciation

Apart from the *Marshall Valuation Service*, most commercial cost publications do not include depreciation tables. Generally, when depreciation tables are found in cost publications they are not based on the physical life of the improvements but on their expected economic life.

The longevity of improvements will depend on use, construction materials, maintenance and climatic conditions. The physical life expectancy of items that are periodically replaced such as roofing, plumbing elements, and heating components, are generally known. However, there is no completely reliable or consistent source of information on the physical life expectancy of long-lived components such as framing, foundations, etc.

The assessment process relies upon the economic age-life depreciation tables that incorporate normal physical depreciation based on age. Analysis of physical deterioration is typically established based on the observed condition and effective age of the property.

Economic Age-Life Analysis

Economic life is different from physical life with respect to a building or structure. Economic life means the period during which a given building or structure is expected to contribute (positively) to the value of the total property. This period is typically shorter than the period during which the improvement could be left on the property, that is, its physical life.

The analysis of economic life concentrates on utility and market considerations. It is a better reflection of depreciation due to market influences than the analysis of physical age. The remaining economic life of an improvement is determined in the market place. In valuing a property where elements of the improvements have lost their economic value due to a deficiency, two different considerations arise.

1) Is the deficiency curable, and curable at a reasonable cost?
2) Has the highest and best use of the property changed?

Depreciation Schedules and Tables from Cost Publications

Depreciation schedules are intended to reflect standard physical, functional, and age-related depreciation of a property. This method of estimating depreciation relies upon four separate points of analysis.

- Effective age of the improvements.
- Determination of the expected life of the improvements.
- Recognition that the property may be subject to other forms of depreciation.
- Maintenance/condition of the improvements.

The accuracy of depreciation tables and schedules will depend on the answers to the following questions.

1) What sales and types of properties were used to establish the depreciation table?
2) Is this information comparable to the type of property being valued?
3) Do the historical relationships between sales volumes and property age established in these tables, still reflect the current market?

Depreciation Analysis – Age-Life Depreciation Tables

SK Manufacturing, as presented in *Figure 2*, will be used for this example. *(Refer to Figure 1 for detailed explanation of the hypothetical "SK Manufacturing" example property.)* There are two methods to calculate typical age-related depreciation.

1) As one overall facility, on the premise that the entire property will close at the same time.
2) Component by component, on the premise that each individual component has a distinct economic life.

Generally the overall approach is preferred for mass appraisal purposes. The component by component method is typically not used in mass appraisal.

In Figure 2 the average overall effective age of SK Manufacturing's improvements were calculated to be 1969 (based on weighted value). As an example, assuming the property is in average condition and the assessor is determining the effective age as a July 1, 1999, the property would have an effective age of 30 years. Information from the *Marshall Valuation Service* indicates that the life expectancy of this type of property is 45 years. A portion of the depreciation table from the *Marshall Valuation Service (Section 97)* is presented in *Figure 3*.

Figure 3: *Marshall Valuation Service* 45-Year Life Depreciation Table

Effective Age in Years	% Depreciation
27	37%
28	40%
29	42%
30	45%
32	50%

The depreciation rate for a building that is expected to last 45 years with effective age of 30 years is 45%. Therefore, the typical overall depreciation suggested by *Marshall Valuation Service* is:

Cost new determination *(Refer to Figure 1.)*

Cost New - Depreciation = Value of Improvements

$1,334,580 - (1,334,580 x 0.45) = $734,019

This illustrates that the estimated market value based assessment of the improvements of SK Manufacturing, based on typical physical depreciation, would be $734,000 (rounded).

Note: Improvements suffering from other forms of abnormal depreciation and abandoned buildings are factors that must be dealt with on a case-by-case basis.

The recognition and analysis of some forms of depreciation require a level of knowledge and understanding of the property that may not be readily available to the assessor.

3) Sales Comparison (Extraction) Method

The sales comparison (extraction) method of estimating depreciation is particularly useful in mass appraisal. This method relies on the availability of comparable sales from which depreciation can be extracted.

Determination of Depreciation from Market Sales Evidence

One method of establishing the total amount of depreciation inherent in a property is by studying the sale of similar properties. There are a number of different techniques that can be used. One technique involves the development of a depreciation schedule that applies to that type of property that is established through the analysis of sales comparisons and the individual attributes associated with the property. The total amount of depreciation and hence the market value based assessment is determined by comparing these findings to the effective age of the property. Another technique is the calculation of a Market Adjustment Factor (MAF) that adjusts for all normal functional and external obsolescence not already accounted for in the replacement cost and through physical deterioration adjustments.

Depreciation and a Market Adjustment Factor (MAF)

A MAF can be calculated with fewer sales than are needed to create a depreciation curve. The MAF is determined by analysing all of the comparable market value sales and is then applied to all comparable improvements.

One example of how a MAF can be calculated is demonstrated by the following steps:

1) Identify potential sales comparables.
2) Establish sale date, sale price, building and site areas, and land values.
3) Determine net improvement values by subtracting estimated land values from the total sale price.

4) Divide the net improvement value by the replacement cost new less normal age/life depreciation, to create a market ratio that is expressed as a percentage of the replacement cost new less depreciation.

5) Array and stratify the market ratios for the sold properties, and use this to select a typical market ratio (MAF).

Depreciation and the Sales Comparison Approach

The advantage of a sales comparison approach, where total amount of depreciation is the difference between the costs new and the purchase price of the improvements, is that all forms of depreciation are taken into account. An informed buyer and an informed seller consider physical depreciation and functional and external obsolescence during the purchase of a property.

Sales Analysis Process

The value of the improvements should be distinguished from the value of the land to establish the depreciation schedule. The sales analysis involves several steps.

1) Identify potential sales comparables.

2) Establish sale date, sale price, building and site areas, and land values.

3) Determine net improvement values by subtracting estimated land values from the total sale price.

4) Determine the effective age of each property through analysis of property data.

Using the residual value of improvements, it is possible to construct tables showing how different types of buildings deteriorate over time. The mass appraisal process uses this information, the effective age and the type of construction to determine the typical depreciation of buildings.

Study of Warehouse Sales

An example of the typical level of total depreciation facing a group of warehouse properties is summarized in *Figure 4* and *Figure 5*. The information was determined through sales analysis of 56 warehouses between 1992 and 1997. The data is for illustrative purposes only.

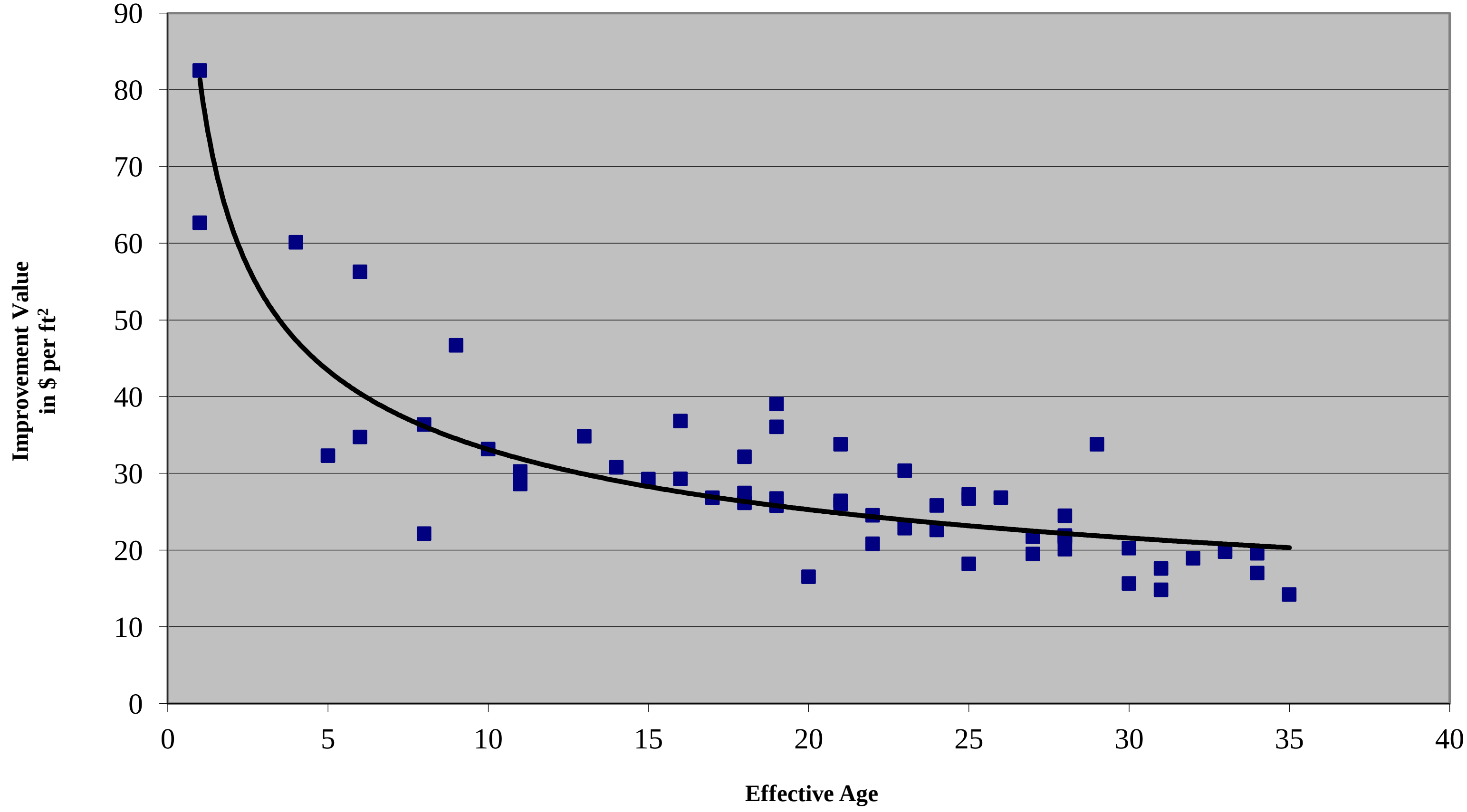
Figure 4: Age - Depreciation Analysis: Warehouses 22,000 - 30,000 ft^2

(Sales from January 1992 to December 1997)

Warehouse #	Size ft^2	Sale Price	Sale Date	Land Area Ac.	Land Value per Ac.	Effective Age (yrs)	Improvement Value per ft^2
1	23,880	$2,330,000	Mar-94	1.41	$255,000	1	$82.51
2	26,850	$2,200,000	Sep-97	1.99	$260,000	1	$62.67
3	24,000	$2,180,000	Sep-95	3.51	$210,000	4	$60.12
4	25,223	$1,255,000	Sep-96	1.88	$234,000	5	$32.31
5	27,330	$1,250,000	Sep-95	1.58	$190,000	6	$34.75
6	28,585	$2,330,000	Mar-94	2.83	$255,000	6	$56.27
7	25,000	$1,162,000	Nov-95	0.99	$255,000	8	$36.38

8	27,000	$1,000,000	Jan-95	2.00	$201,000	8	$22.15
9	22,939	$1,491,000	Sep-94	1.68	$250,000	9	$46.69
10	28,000	$1,373,480	Feb-94	2.34	$190,000	10	$33.17
11	23,000	$1,000,000	Jun-94	2.01	$170,000	11	$28.62
12	27,000	$1,325,000	Oct-95	2.31	$220,000	11	$30.25
13	26,000	$1,270,150	Aug-93	1.55	$235,000	13	$34.84
14	28,200	$1,500,000	Dec-97	3.24	$195,000	14	$30.79
15	24,680	$1,105,000	May-94	2.32	$165,000	15	$29.26
16	25,000	$1,290,000	Nov-95	1.42	$260,000	16	$36.83
17	25,658	$1,080,000	Apr-96	1.24	$265,000	16	$29.29
18	25,945	$1,082,500	May-95	2.10	$184,000	17	$26.83
19	25,296	$1,189,100	Mar-93	1.59	$236,000	18	$32.17
20	26,910	$1,005,000	Mar-95	1.18	$255,000	18	$26.16
21	28,977	$1,275,000	Mar-96	1.83	$262,000	18	$27.45
22	22,281	$1,310,000	Jun-94	1.76	$250,000	19	$39.05
23	22,300	$1,050,000	Apr-97	1.26	$195,000	19	$36.07
24	25,020	$1,025,000	May-96	1.38	$275,000	19	$25.80
25	25,802	$1,100,000	Sep-97	1.52	$270,000	19	$26.73
26	29,464	$1,050,000	Apr-95	3.01	$187,000	20	$16.53
27	23,620	$1,120,000	Nov-97	1.43	$225,000	21	$33.80
28	23,777	$1,093,742	Oct-93	1.90	$250,000	21	$26.02
29	25,000	$1,000,000	Jun-93	1.55	$219,000	21	$26.42
30	24,467	$1,000,000	Sep-93	2.06	$238,000	22	$20.83
31	27,232	$1,100,000	Nov-97	1.57	$275,000	22	$24.54
32	26,570	$1,305,000	Oct-97	1.69	$295,000	23	$30.35
33	27,898	$1,020,000	Jun-92	1.47	$260,000	23	$22.86
34	25,986	$907,760	Oct-93	1.39	$230,000	24	$22.63
35	27,800	$1,188,000	Jul-97	1.71	$275,000	24	$25.82
36	26,000	$1,050,000	Apr-95	1.48	$240,000	25	$26.72
37	27,800	$1,200,000	Aug-93	1.92	$230,000	25	$27.28
38	28,000	$1,200,000	Nov-96	2.51	$275,000	25	$18.21
39	23,700	$1,042,800	Dec-94	1.66	$245,000	26	$26.84
40	23,527	$840,000	Dec-94	1.86	$205,000	27	$19.50
41	28,500	$1,150,000	Aug-97	1.86	$285,000	27	$21.75
42	22,000	$1,125,000	Dec-95	2.30	$255,000	28	$24.48
43	25,821	$1,050,000	Jun-93	2.08	$233,000	28	$21.90
44	26,135	$1,200,000	Apr-96	2.36	$268,000	28	$21.71
45	27,298	$955,255	Sep-94	1.44	$250,000	28	$21.81
46	29,070	$1,100,000	Sep-96	2.02	$255,000	28	$20.12
47	29,000	$1,550,000	Feb-92	2.11	$270,000	29	$33.80
48	24,000	$776,630	Jan-94	1.67	$240,000	30	$15.66
49	28,000	$1,010,000	May-94	2.27	$195,000	30	$20.26
50	22,519	$719,018	Jan-94	1.54	$250,000	31	$14.83
51	24,618	$861,630	Sep-94	1.74	$246,000	31	$17.61
52	27,126	$949,200	Sep-94	1.77	$246,000	32	$18.94
53	24,000	$775,000	Jan-92	1.09	$275,000	33	$19.80
54	23,490	$882,150	Sep-94	1.93	$250,000	34	$17.01
55	27,135	$1,050,000	Aug-94	2.16	$240,000	34	$19.59
56	24,000	$840,000	Dec-94	2.14	$233,000	35	$14.22
Averages	25,793					20.3	$28.91

Figure 5: Depreciation Schedule: Warehouses from 22,000 to 30,000 ft^2



Conclusions - Depreciation Derived from Market Sales

Analysis of the sales data presented in *Figure 4* and the graph on *Figure 5* produce the following conclusions.

1) The relationship between age and typical value is a progressive one: as properties age the difference in value changes (curved line).
2) The graph identifies the improvement value of a 30-year-old property as typically $20.50.
3) If costs new are approximately $60.00 as suggested by the sales evidence, then a 30-year-old property retains approximately 34% ($20.50 / $60.00) of its value or is 66% depreciated. (Further study of costs new would be required to finalize the conclusions suggested by this data).

4.3 Conclusions of Value SK Manufacturing* – Market Sales Depreciation Schedule

The market derived depreciation findings in this example indicate a 66% depreciation rate for a 30-year old manufacturing property. Using this rate, the total market depreciation for SK Manufacturing is estimated as follows.

Replacement Cost New	$1,334,580
Less Depreciation from market (66%)	$880,823
Sub-total	$453,757
Market Value Based Assessment of Improvements	$453,000

** (Refer to Figure 1 for a detailed explanation of the hypothetical SK Manufacturing example property.)*

5.0 Quantifying Functional Obsolescence

Functional obsolescence is a loss in property value caused by the inability of the improvement to perform its function. This loss may be caused by defects in design, style, size, layout, a deficiency, the need for modernization, a superadequacy, and or change in consumer expectations.

Functional obsolescence can be further broken down into curable and incurable obsolescence. Curable obsolescence is a deficiency of an improvement that can be remedied through addition or modernization. Incurable obsolescence occurs when the cost to cure the deficiency exceeds any in value to the property.

5.1 Methods of Quantifying Functional Obsolescence

The following are examples of some methods available for determining the amount of loss in value due to functional obsolescence:

1) Elemental Baseline Method
2) Replacement Model Approach
3) Excess Operating Costs

1) Elemental Baseline Method

The elemental approach considers the functionality and utility of each improvement on an item-by-item basis. This method requires a building-by-building evaluation of the property (or floor by floor) assessing the functionality and utility of each element (e.g. it may be that 20% of the floor space is unused in one building or there is 5’ excess height in the ceiling of another).

This process requires a judgment on each component of the property improvements and their effect on its remaining economic life and functionality with respect to the rest of the property. This method is extremely detailed and costly to apply in a mass appraisal environment and it does not necessarily address factors that affect the value of the property as a whole (e.g. piecemeal site construction, inefficient site layout, etc.).

The elemental approach is not typically used in a mass appraisal system. It may be of use for unique properties where other methods do not adequately measure the depreciation.

2) Replacement Model Approach

The replacement cost method estimates the costs associated with an improvement or building with similar utility as that for which an assessment value is being sought. This approach begins by determining the replacement cost of the existing property which takes into account the advantage of technological advances to produce a modern and competitive facility. A realistic evaluation of the requirements and capabilities of the existing property is needed. The cost new of the replacement model sets the value for the improvements and represents the maximum amount that a potential purchaser would pay for a modernized facility.

If completed properly, the functional obsolescence in the existing property will be the difference between the cost new of the existing plant and the cost new produced using the replacement model approach. This process may also measure the following:

- Functionality;
- Excess operating costs, and;
- Excess construction costs.

Designing a Model

The major requirement of the model is that the design must capture the functionality of the existing plant. This includes:

1) the plant's current functions; and
2) any other functions that the existing property is capable of and are planned in the foreseeable future.

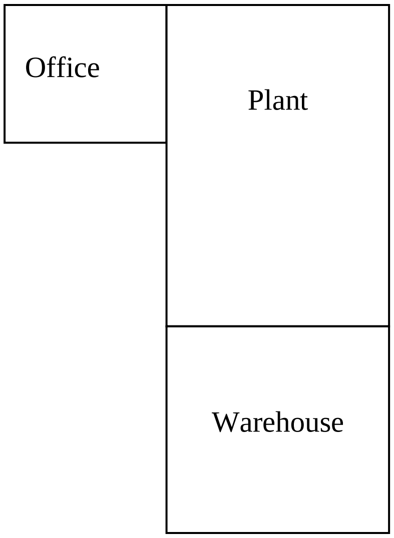
Due to changes in technology, in many cases a model will also represent an improvement over the capability and functionality of the existing property. The assessor should remember that the objective of the exercise is to determine the value of the existing property. Therefore, the model should reflect the same functionality as the existing plant.

Example: Replacement Cost Approach - SK Manufacturing*

In-depth research into the functionality and utility of the SK Manufacturing plant reveals that a state-of the-art facility would be designed to have smaller office and warehouse areas. The height of the assembly plant area would be reduced to 16 feet and the new warehouse addition would be at 36 feet. The volume of warehouse space stays the same at 288,000 cubic feet, but better layout increases the utility of the space. *Figure 6* illustrates the manner in which the existing plant as described in *Figure 1* has been modernized.

** (Refer to Figure 1 for a detailed explanation of the hypothetical SK Manufacturing example property.)*

Figure 6: Replacement Model Analysis – Functional Obsolescence – SK Manufacturing*



Plant	Area (ft²)	Height	Volume (ft³)
Plant	12,440	16.0	199,040
Office	2,650	11.0	29,150
Warehouse	8,000	36.0	288,000
Totals	**23,090**		**516,190**

Plant Costs	Area (ft²)	Rate	RCN
Plant	12,440	$42.50	$528,700
Office	2,650	$60.00	$159,000
Warehouse	8,000	$57.00	$456,000
Totals	**23,090**		**$1,143,700**

** (Refer to Figure 1 for a detailed explanation of the hypothetical SK Manufacturing example property.)*

The replacement model approach estimates part of the functional obsolescence inherent in the construction of the SK Manufacturing property as the difference between the cost of the existing plant and the cost of the model.

The table below summarizes the depreciation at SK Manufacturing to this point in the analysis.

Summary of Depreciation: After Replacement Model-SK Manufacturing

Replacement Cost New (of existing facility exhibiting functional obsolescence)	$1,334,580
Less Functional Obsolescence 14.3%	- $190,880
Replacement Cost New (of new facility determined by Replacement Model Approach)	$1,143,700
Less Cost to cure the roof	- $45,000
Sub-total	$1,098,700
Less Physical Depreciation (42.0%**)	- $461,454
Sub-total Market Value Based Assessment of Improvements	$637,246 $637,000

** The physical depreciation rate was adjusted from 45% to 42% due to the overall improvement in the effective age arising from the roof repair. The owner improved the effective age of the property by one year to 29 years of age. (*Refer to Figure 3.*)

Replacement Model and Double Counting Functional Obsolescence

The replacement model cost reflects the cost new of the most functionally equivalent replacement for the property, i.e., replacement costs. It does not account for other forms of depreciation such as normal physical deterioration and external obsolescence that require consideration.

Since the normal (economic age-life) depreciation rate applied in the valuation of SK Manufacturing arises from depreciation tables that are based on sales data, the rate takes into account typical functional obsolescence associated with the property. As such, there may be double counting if both forms of depreciation (replacement model and economic age-life percentage deduction) are fully applied. To prevent double counting, the age-life deduction may require a reduction if the replacement model is also used. Without detailed knowledge of how the age-life depreciation schedule was calculated it is very difficult to determine the adjustments that would be needed to balance this type of depreciation.

3) Excess Operating Costs

A prudent purchaser will take into account all cash outlays when considering the price of a property. The choice for the purchaser is a decision between buying an old property with inefficiencies or building a new property. There will be a lower price at which an older property becomes as attractive in relation to the higher costs of a new property.

Excess operating costs result from inefficiencies in a plant. They negatively impact the value and, can be measured by capitalizing the amount of excess costs. For example, a plant may have an old heating system that adds $5,000 per annum to the heating bill. This extra heating cost makes the property less attractive than a plant with an efficient system.

What Constitutes Excess Operating Costs?

Excess operating costs or inefficiencies attributable to the real estate (improvements or site) are considered forms of depreciation. Costs related to the business (labour, management, machinery, etc.) should not be considered part of the functional obsolescence in the property valuation process. Typically the following factors generate excess operating costs.

- Inefficient heating, air conditioning and/or ventilation systems.
- Poor property design or layout causing excess materials handling costs.
- Poor property design and/or excess space causing extra maintenance cost.

6.0 External Obsolescence Issues

6.1 Overview

External obsolescence is a loss in property value caused by external forces. External obsolescence is generally caused by economic or locational factors. The loss is conditional on the problem being long-term and beyond the control of the property owner. Unlike physical depreciation, external obsolescence is not related to the age of the property.

It is often easier to identify obsolescence than to determine and quantify its affect on property value. Generally, external obsolescence is a result of actions taken by consumers, the competition, or regulatory agencies. It is necessary for the assessor to determine whether the negative condition affecting a property is a cause for a loss in property value or simply reflects a loss in business value. The best method to evaluate a loss in business value versus a loss in property value is to take the perspective of the potential purchaser.

The steps to estimate external obsolescence:

1) Identify the obsolescence problem.
2) Determine whether it affects the business or the real estate value (or both).
3) Quantify the obsolescence.
4) Adjust the property value accordingly.

6.2 Methods of Quantifying External Obsolescence

For an income property, external obsolescence often causes a loss in property value due to a negative effect on the income stream i.e., decreased rent. In the valuation of other properties, external obsolescence must be quantified in some manner and deducted from the cost value to assess the property. Difficulties in quantifying obsolescence also arise if there is not an established market place to form comparative judgments.

Note: Poor economic conditions or other external obsolescence factors may negatively affect the value of the land. This condition can be analysed through a study of land sales.

The following are examples of some methods of determining the amount of loss in value due to external obsolescence:

1) Capitalization of Income Loss
2) Market Data Analysis

1) Capitalization of Income Loss

With appropriate income information, external obsolescence can be quantified by capitalizing the loss in income.

External obsolescence may result in a loss of income attributable to the real estate. For example, a lower rent for office space located on the side of a building next to a scrap yard can be established by comparing rental rates for a similar office not exposed to this problem. The loss in value is established as the annual difference in rent capitalized.

Four important tasks are involved in this analysis.

- Determine the annual income loss for the real estate, due to the externally imposed condition(s).
- Establish that the income loss is long-term and not a result of business or other cycles.
- Determine the appropriate capitalization rate. The best way to establish an appropriate capitalization rate is to analyse the sales of similar income properties.
- Convert the annual income loss to a deduction for the cost value of the property.

2) Market Data Analysis

This method may be used to determine external obsolescence through the use of paired data analysis. Typical property sales that are located in close proximity to factors that may create a loss in value are compared to similar properties where such factors are absent. For example, sales of residential properties located adjacent to an industrial plant could be compared to similar sales that are not impacted by an industrial plant. Assuming all other factors are the same, the difference in value would be attributable to external obsolescence.

7.0 Double Depreciation

In a situation such as the one illustrated in the SK Manufacturing example, care must be taken not to double count any forms of depreciation.

7.1 Physical Quantities and Condition

In the SK Manufacturing example, the effects of a roof in need of repair were recognized and the deduction for this condition was adapted to correspond with the analysis of replacement costs. *(Refer to Figure 1 for a detailed explanation of the hypothetical SK Manufacturing example property.)* If, in the replacement cost model, the value was reduced to reflect a smaller roof, then it would be double counting to deduct the entire roof repair amount.

The same process does not hold true for excess operating costs. Regardless of the size or design of the replacement, any operator of this property will encounter excess operating costs in comparison to a more efficient property. The general rule is where the depreciation reflects a physical condition, adjustments that take into account the physical quantity or condition of the property will interrelate. Some adjustments may be required to avoid double counting.

7.2 Order of Deduction

Another common cause for double counting depreciation is the order of deduction. The general rules for this process are as follows.

1) Where all deductions are expressed as a percentage of the total reproduction costs new, the order of deduction does not matter.
2) Where all deductions are made in dollar amounts, the order of deduction does not matter.
3) Where some deductions are expressed as dollar amounts and others are percentage amounts, the order of deduction matters. In such cases, first establish the replacement costs new, then deduct any dollar amounts before applying the percentage reductions.

Order of Deduction Examples

Mixed Deduction Example – A

Cost New	$1,500,000
Less Obsolescence	- $500,000
Sub-total	$1,000,000
Less Normal Depreciation 40%	- $400,000
Market Value Based Assessment of Improvements	$600,000

In Example A the market value of the improvements was correctly determined to be $600,000.

Mixed Deduction Example – B

Cost New	$1,500,000
Less Normal Depreciation 40%	- $600,000
Sub-total	$900,000
Less Obsolescence	- $500,000
Market Value Based Assessment of Improvements	$400,000

In Example B, the order of deduction was reversed and the market value based assessment of the improvements was determined to be $400,000.

The $500,000 deduction for obsolescence should have been applied first, or the amount could be converted into a percentage of the cost new ($500,000 ÷ $1,500,000 = 33.3%). The revised calculation is shown below.

Cost New	$1,500,000
Less Normal Depreciation 40%	- $600,000
Sub-total	$900,000
Less Obsolescence 33.3%	- $300,000
Market Value Based Assessment of Improvements	$600,000

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