# Chapter 4 The Cost Approach

## 4.1 Introduction

I

n real estate appraisal, the cost approach is one of the three basic valuation methods. The others are market, or sale comparison, and income approach. The cost approach is a set of procedures through which a value indication is derived for the fee simple interest in a property by estimating the current cost to construct a reproduction of, or replacement for the existing structure plus any profit or incentive, deducting depreciation from the total cost, and adding the estimated land value.

Under the cost approach to appraisal, the property is valued as a function of what it would cost to buy the land and construct the buildings. There would also be allowances made for depreciation as well, as will be discussed. The appraiser would base the appraisal on what it would cost to replace the existing facilities.

The cost approach historically has been known as the summation approach--that is, the sum of site (land) value plus improvement value equals property value--but that term is rarely used anymore. The fundamental premise of the cost approach is based on the principle of substitution which asserts that no prudent buyer or investor will pay more for a property than that amount for which the site could be acquired and which improvements that have equal desirability and utility can be constructed without undue/ unnecessary/ delay.

The philosophy in the cost approach to market value is unique compared to the other two approaches. The approach used the sales of comparable sites to develop a market value estimate of the site as if unimproved, to which is added a market value estimate of the improvements based on "cost new" less any and all depreciation (loss in value). The procedure for the development of market value of the improvements is the conversion of "cost to construct" figures to market value figures. Cost is not necessarily or automatically the equivalent of market value. The process of making such a conversion requires care, caution, and great skill.

## 4.1.1 Cost Approach Relation to Appraisal Principles

Knowledge of basic assumptions, postulates or premises that underlie cost appraisal methods is essential to an understanding of the purpose, methods and procedures of valuation. The cost approach is based upon the principle that no one would pay more for a property than the cost to buy land and build something equivalent, assuming a normal time to complete the development. There are also other principles that are considered to be the premise the cost approach. The following principles of value influences are the more important for a general understanding of the cost approach appraisal process.

*Principle of Substitution:*The principle of substitution states that when several similar or commensurate commodities, goods, or services are available, the one with the lowest price attracts the greatest demand and widest distribution. According to the principle of substitution, a buyer will not pay more for one property than for another that is equally desirable. The principle of substitutionis the basis for the cost approach to value. In cost approach, this principle affirms that no prudent buyer would pay more for a property than the cost to acquire a similar site and construct improvements of equal desirability and utility without undue delay.” This provides the rationale for developing the replacement cost of the subject building rather than the reproduction cost. In other words one would not spend $2,000,000 to purchase a new apartment complex if they could build it for 1,500,000.

*Principle of Supply and Demand:*In a real estate context, the appraisal principle of supply and demand states that the price of real property varies inversely, but not necessarily proportionately, with demand, and directly, but not necessarily proportionately, with supply. While this definition may premise the logic of upward and downward movements of the prices of certain line items of the cost approach (e.g., land). But, it states or implies nothing fundamental about the tendency of individuals to price properties consistent with the cost to produce alternate property with comparable utility.

*Principle of Balance*: This principle applies to relationships of the various property components as well as the relationship between the costs of production and the property’s productivity. Clearly, the principle of balance premises an aspect of the logic of the cost approach. It premises the choice of an individual to improve a site to a given extent in pursuit of optimal return.

*Principle of Externalities*: The principle of externalities states that factors external to a property have a positive effect on its value or a negative effect on its value. This principle clearly premises the logic that leads individuals to pay more for properties influenced by economies and less for properties influenced by diseconomies. But it states nothing about the logic individuals’ use that makes them choose to price property consistent with the cost to produce an alternate property with comparable utility. Therefore, this principle cannot fundamentally premise the crucial logic of the cost approach.

*Principle of Highest and Best Use***:** The principle of highest and best uses states that the reasonably probable and legal use of a vacant land or improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value.” Consider the occasional use of the cost approach as an analytic means of estimating which possible, proposed use of a site leads to the largest project budget, the largest developer’s profit, the greatest net benefit to the developer/owner, and hence, the highest and best use.

*Principle of Contribution***:** This principle holds that a component part of a property is valued in proportion to its contribution to the value of the whole property or by how much that part’s absence detracts from the value of the whole. The cost approach can be thought of as the sum of the parts. This separation is made for analytical purposes only; the goal is still the value of the property as a whole. Thus, the value of the subject property is a direct function of the combination of the site and improvements it contains. In cost approach context, the principle of contribution states that the cost of an improvement must be in proportion to the value of the site. The agent of production and the various components must be in a proper position if optimum value is to be achieved

*Principle* *of Stabilization*: The principle of stabilization as used in cost approach appraising is that the property income, occupancy and operating expense is stabilized. In due course, all material things go through the process of wearing or wasting away and eventually disintegrating. All property is characterized by four distinct stages: growth, stability, decline, and revitalization. It is evident this process is primarily affecting the total income attributable to the property, vacancy and collection loss and any operating expenses. The cost approach can be thought of as an estimate is made of the cost new of reconstructing the buildings and other improvements in stabilized market.

## 4.1.2 Assumptions, Applications and Limitations of Cost Approach

The Cost Approach is based on the assumption of the principle of substitution which asserts that no prudent buyer or investor will pay more for a property than that amount for which the site could be acquired and which improvements that have equal desirability and utility can be constructed without undue delay.  The cost approach is also based on the assumption that the replacement cost new normally sets the upper limit of value, provided that the improvement is new and represents the highest and best use to the land. It further assumed that a newly constructed building has advantages over existing buildings.

In general, cost approach is a method of appraising property based on the assumption that cost equals value. The reliability of the cost method depends on the validity of the assumption that cost and value are equal; there are many circumstances where such an assumption is not justified

Let us first consider applying the cost method to new buildings to eliminate any need for an estimate of depreciation. As long as the new buildings represent highest and best use, one would expect cost (including developer’s profit) and value to be equal. If the cost of constructing a building is greater than what it will be worth on completion, new development will cease until building values raise. Alternatively, if it costs less to construct a building than what the building will be worth on completion, there will be an increase in new development as developer’s profits are higher than would normally be anticipated. This increase in new development will cause construction costs to rise, or competition to expand, until a point is reached where the cost of constructing a building is equal to its value on completion (assuming no artificial restrictions on new construction exist) – principle of balance of supply and demand is once again achieved.

This concept is an over-simplification of the way in which the market works, but it illustrates the basics. However, there are exceptions to this generalization. For example, if a large hotel were built in a remote part of the Arctic Circle, the cost would not be recovered if the owner tried to sell it. The reason is obvious; the building is not required in that location and the cost spent is not justified by market demand (i.e., the structure is not the highest and best use of the land).

These unusual cases indicate that cost and value are likely to be equal only when the cost represents the kind of expenditure which conforms to the wishes and tastes of the market (principle of conformity). In other words, the building must represent the highest and best use of the site. Under any other circumstances, the value will not likely equal the costs.

The cost approach is useful in some situations and less so in others. For example, it may be useful for certain appraisal problems which require separate estimates of value for the land and improvements of a property (e.g., insurance or property tax assessment). The cost method is more applicable to appraisal problems where market data is lacking for the income or comparison approaches. Churches, public buildings, and other special use properties are usually appraised using the cost approach since the other approaches are inapplicable because of the lack of market daThe cost approach is best for new construction which represents a site's highest and best use. In the case of a new building, for example, there would normally be little or no depreciation to consider.  As a result, the cost approach is far more reliable for new buildings than for old buildings. In the case of old buildings, it becomes progressively more difficult to accurately determine the depreciation of the building as its age increases.

The general applicability of the cost approach provides that the cost approach is:

* to be used in conjunction with other value approaches;
* the preferred approach when neither reliable sales data nor reliable income data are available,
* when the income from the property is not so regulated as to make current replacement costs irrelevant to value; and
* particularly appropriate for construction work in progress and for property that has experienced relatively little depreciation.

However, there are situation where, the reliability of a value indicator determined by the cost approach may be severely limited. There are two situations where the value derived through the cost approach to appraisal is limited:

1. in any new property, the cost approach is likely to give a true indication of value; and
2. the accuracy of the estimate of depreciation.

An obvious difficulty in using the cost approach is in deciding whether, in relation to the subject property, cost and market value are likely to be approximately equal. Only when this condition is satisfied should serious consideration be given to the use of the cost method. In order to fulfill this condition, the property must represent highest and best use.

The second difficulty is based on the method to calculate depreciation, particularly incurable physical and functional depreciation. These two items require considerable judgment and experience from the appraiser because the criteria to be taken into account cannot be definitely expressed. Thus, it is difficult to objectively test the validity of the appraisal when much of the estimate relies on the appraiser's initial inspection and judgment. Both of these difficulties represent greater problems for the appraisal of older properties and, therefore, the cost approach is likely to provide a more reliable answer when applied to newer improvements.

## 4.1.3 Steps in Cost Approach

The cost approach can be thought of as the sum of the parts. Value of the whole property is derived by summing the value of the individual timber components (merchantable and non-merchantable young growth) with the value of the land. This separation is made for analytical purposes only; the goal is still the value of the property as a whole. Thus, the value of the subject property is a direct function of the combination of the site and improvements it contains.

Each steps of the cost approach should relies on market data, so it is important to be "plugged into" the market and know what is happening on a local, national, and international basis. It must be stressed again and again that nothing can replace market information, so the appraiser must always be on top of what is happening in the real estate field. This applies to information about vacant land, building costs, local lease rates, demand, expected profits for the type of proposed development, and how the market calculates the various types of depreciation.

In the context of real property, the steps employed in the cost approach can be summarized as follows:

1. Estimate the value of the land, or site, as if vacant and available for development to its highest and best use as of the valuation date
2. Estimate the total cost new of the improvements as of the valuation date.
3. Estimate the total amount of depreciation incurred by the improvements.
4. Subtract the total estimated depreciation from cost new to arrive at the depreciated cost of the improvements.
5. Add the land, or site, value to the depreciated cost of the improvements to arrive at a value indicator for the total property.
6. Add land value to the total depreciation cost of all the improvements
7. Determine the indicated market value of the property by cost approach

The following chart shows the classic procedures of cost approach to value property

|  |  |
| --- | --- |
| Step 1 | Estimate the value of the land or site |
| Step 2 | Selection of Cost basis : select one of the three |
|  | Reproduction cost | Replacement Cost | Historical cost |
| Step 3 | Estimate the total cost new of the improvements |
|  | Comparative –unit method | Unit-in-place | Quantity survey |
| Step 4 | Estimate depreciation |
|  | Market Extraction  | Age life  | Break down  |
| Step 5 | Add any contributory value of any remaining site improvement value |
| Step 6 | Add land value based on HBU |
| Step 7 | Market value by cost approach |

The cost approach begins with the determination of site value. Sales of vacant land with similar zoning, utility, and acquired for the same or similar use as the subject property being appraised, are analyzed. In markets where site sales are limited, other site sales of varying property type may be considered as long as they have core similarities in legally acceptable use. A land site should be made available to the users who can make the highest and best effective use of the site and maximize the site benefits for all people.

Once site value has been determined, the next step is estimating improvements as if the improvements were new. The cost approach views the value of the building at its cost of reconstruction as new on date of value, and therefore, the appraiser can either use replacement costs or reproduction costs. In practice, the choice of cost method primarily depends on the purpose of the valuation and the type of property that is to be valued, and an attempt at categorizing these is made in standard or contract term apply. Immediate reaction might suggest that the building to be valued is exactly as it exists at the date of the valuation (a duplicate). However, for older properties this may be unnecessarily difficult to apply. Instead, the appraiser may calculate the cost of building a modern equivalent of the subject, replacing the features that the market considers important. Thus, the appraiser must choose whether to use *reproduction cost* to provide an exact replica of the subject property or *replacement cost* to provide a modern substitute with equivalent utility.

While the cost new estimates can vary greatly between replacement cost and reproduction cost, theoretically the depreciated cost for each should be the same once depreciation from all causes is deducted. For newer buildings, with no functional obsolescence, replacement cost new will usually equate to reproduction cost new. However, a cost estimate may differ significantly depending on whether reproduction or replacement or is used, and the cost concept selected should be clearly understood. Therefore, it is important to understand the difference among these costs.

**Reproduction cost**

The term reproduction cost refers to the cost of building an exact duplicate of the existing structure. Reproduction cost including material, labor, and overhead, that would be incurred in constructing an improvement having exactly the same characteristics as the original improvement. The materials should be as similar as possible to those originally used; however, they do not have to be exactly the same. It may be used to measure functional obsolescence.

The challenge to using reproduction cost is that it may be impossible to provide an identical reproduction of an older building. Often the materials and equipment used years ago are not available today. If they are available, the specialized labour required may no longer exist. In addition to the changes in construction techniques, designs and tastes have also changed. Therefore, an exact replica might not only cost more to construct than its contemporary equivalent, but be worth less when finished. For example, years ago every room in a house had its own door. Modern houses generally have less doors and more open spaces. A house with separate doors for each room will cost more to build than one with fewer doors but may be worth less when completed since many buyers would look on this feature as outdated and inconvenient.

**Replacement cost**

The term replacement cost refers to the cost of constructing a building which would serve the same purpose, or have the same utility as the existing property. It assumes that the currently prevailing construction methods and materials are used for the construction. It includes the cost and overhead that would be incurred in constructing an improvement having the same utility as the original, without necessarily reproducing exactly the same characteristics of the property, but using today's materials, labor, and building techniques. In other words, replacement cost represents the cost to create an equally desirable substitute property. In theory replacement cost cures functional obsolescence.

It has to be stressed, however, that it is the concept of replacement cost that is validated by the principle of substitution, since, as discussed above, a rational person will pay no more for a property than the cost of acquiring a satisfactory—but not usually identical—substitute property

**The choice of reproduction or replacement cost.** Theoretically, reproduction cost is easier to use but as a matter of practicality, it becomes quite difficult to estimate for older improvements, because identical materials are not always available and construction methods and design are constantly changing. Therefore, although there is no clear cut standard, the replacement cost is the approach most often used because it uses the most modern materials and features, eliminating functional obsolescence, such as rooms of an undesirable size or high maintenance construction materials. The replacement cost is also usually lower than the reproduction cost.

From appraiser’s points of view, construction costs should be based on a modern equivalent building rather than an identical replacement or reproduction because it will avoid making difficult and time consuming estimate of the cost of old fashioned materials found in older construction. Also appraisers argued that replacement costs provide a direct rating of the market demand for standards, design, and layout. Replacement costs are what are listed in the cost manuals.

Sometimes it is impossible to find the current cost of replacing an old asset with something identical. For example, the old washing machine may be of a kind which is no longer made. Common sense has to be used to find the cost of a reasonable equivalent modern replacement. The use of replacement cost provides a practical alternative. Replacement cost represents the funds required to build an equally desirable substitute improvement, not necessarily with similar materials or to the same specifications. The value of the property should normally be based on the cost of a modern equivalent asset that has the same service potential as the existing asset and then adjusted to take account of obsolescence. Accordingly, by using replacement cost instead of reproduction cost, some of the obsolescence or "in utility" present in the house with solid masonry walls should be eliminated from the estimate before deductions for accrued depreciation are made.

From the client’s point of view, however, estimation of construction costs based on reproduction cost is sometimes preferred. The current cost of building a replica of the subject structure, using the same materials and construction standards. This type of cost is used when a property needs to be built the same way it used to exist. A good example would be a historic property that burns down and needs to be built exactly how it was previously. Therefore, using reproduction cost requires appraisers to identify and describe the existing features of the building whether or not they contribute value and to explain judgment made concerning the amount of utility lost. Any value reduction from such nonmarketable features is thus exposed as specific depreciation allowance, instead of being hidden as they are in the replacement cost method.

Of course, appraisers almost always use replacement cost and then deduct a factor for any functional disutility associated with the age of the subject property. An exception to the general rule of using the replacement cost is for some insurance value appraisals. For example, if the intended purpose of valuation is to estimate the insurable value of the property, the value of property provided by definitions contained in an insurance contract or policy, then it is essential to read the policy to see how coverage is defined. In those cases, reproduction of the exact asset after the destructive event (fire, etc.) is may be the goal.

The challenge to applying replacement cost is that one is estimating the cost for a hypothetical building that replaces the utility of the subject property, incorporating modern construction materials and techniques. In so doing, most, if not all, of the elements of functional depreciation that may exist in the actual building are corrected through the use of replacement cost.

In the direct comparison approach, the appraiser uses substitution to estimate the subject's market value for a house, determine the value of houses providing the same amenity, convenience, and shelter. The theory underlying the use of replacement cost is similar, with the price a purchaser will pay equal to the cost of providing alternative accommodation with the same utility. From these points, it is clear that *current costs on a replacement basis* should normally be used when costing most single family residential properties. The main exceptions would be to use reproduction cost for older houses with historic value (noting that the historic value found may not equate to market value) or for unique, architect designed homes (but applied with care so as not to estimate value to the owner!). From a practical perspective, for newer houses, there would likely be no difference between the replacement cost new and the reproduction cost new.

**Discussion Point:**

Sheki Alhamudin built a luxury resort on Lake Tana in Bahir Dar city. Within the 37 million birr construction costs were incredibly expensive, unique technologies that likely went far beyond what the typical market participants want (even those in the luxury resort market). If appraising this property's market value with the cost approach, should the appraiser use reproduction or replacement cost?

* If seeking market value, the appraiser must focus on what the market demands - the extraordinary technical features like those in Sheki ' resort is likely value to owner, not market value.
* Building features that go far beyond what typical market participants demand are called superadequacy. They do not add to value, and in some cases may detract from value (e.g., the cost of building a fallout resort's basement).

**Cost estimate**

So far we have covered the type of cost to build a home, now in is the time to discuss about the construction components of the building. To arrive at cost estimation for property, all pertinent physical data regarding the improvements must be collected. The concept that costs, for appraisal purposes, may be thought of as "full economic costs." In general, full economic costs are the payments that must be made to secure the supply of all of the agents necessary for production. Full economic costs consist of all expenditures necessary to place the completed property in the hands of the buyer or ultimate consumer.

To develop cost estimates to the total building, appraisers must consider **f**ull economic costs necessary to construct real property and ready it for its intended use. Cost of Improvements includes (1) direct costs, (2) indirect costs, and (3) entrepreneurial profit.

**Direct costs**

Direct costs are sometimes also called as “hard costs”. Direct (hard) costs are general expenditures required for labor and materials used for construction of building improvements. The items that can be included in direct cost are: Labor (salaries and wages of your construction workers (unless your an owner builder); Materials (Items used to construct your property (wood, concrete, nails, etc); Subcontractors (plumbers, electricians, etc); Heavy equipment used by your contractors; Construction Oversight (your general contractor and their profit margins (usually no less than 10% of your overall project cost) and Utility charges.

I**ndirect costs**

Indirect costs are sometimes called "soft costs”. Indirect includes expenditures of items other than materials and labor that are necessary for construction but are not typically part of the construction contract. These indirect items can be: Architectural and engineering fees, appraisal, consulting, accounting, and legal fees, mortgage payments during construction, county or jurisdictional taxes during construction and administrative expenses of builder

**Profit Considerations**

When estimating the current cost to replace a property by reference to the current prices of a property’s labor and material components, it may be appropriate to add amounts for entrepreneurial services and other costs that would typically be incurred in bringing the property to a finished state

In this context, entrepreneurial profitrefers to a market-derived estimate of what the entrepreneur expects to receive for his/her contribution, i.e., the value of the "entrepreneurial services." Thus, entrepreneurial profit does not attempt to measure actual money outlays for entrepreneurial services; instead, it is an estimate of the cost to the entrepreneur of foregoing the opportunity to profit from providing his services to some other development project. In general, entrepreneurial profit reflects the developer’s expected reward for his or her expertise and risk-taking (i.e., his or her entrepreneurial services

The builder's profit is the profit associated with the actual construction activity.  It is the profit that would go to the general contractor, for example. The entrepreneurial profit is the profit that would go to the person or firm who "packages" the program. This is the person or firm who takes the risk to build the project and hopes to profit from its sale.

There is some controversy about whether or not to include builders and/or entrepreneurial profits in the estimation of costs. Some argue that these profits should not be considered because no profit is guaranteed. It is of course true that most contractors can tell stories about projects which generated a loss rather than a profit. Others argue that these profits must be considered because properties would not get into the hands of their ultimate owners without the expectation of these profits.

The application of the cost approach in the valuation of special use property entrepreneurial profit means either (1) the amount that a developer would expect to recover with respect to a property in excess of the amount of the development costs or (2) the difference between the fair market value of a property and the total costs incurred with respect to that property. Entrepreneurial profit should be a market derived figure but can sometimes be measured by the difference between the sale price of the property and a cost approach that excludes entrepreneurial profit. Such profit can be positive or negative. Also, cost-estimating services generally do not include entrepreneurial profit, so one must go to the market to determine the appropriate adjustment. The test for the existence of entrepreneurial profit is whether the total cost of the project, without entrepreneurial profit, is less than the market value of the completed project

Note that if the market value of the completed project is less than the total cost of the project, entrepreneurial profit is negative. The appropriate amount of entrepreneurial profit depends on factors such as competition, the difficulty of the project, market conditions and the wisdom of the developers plan. In some cases external or functional obsolescence prohibit entrepreneurial profit. The assessor, in valuing special use property, shall not add a component for entrepreneurial profit unless evidence is derived from the market that entrepreneurial profit exists and that it has not been fully offset by physical deterioration or economic obsolescence.

On the other hand, one of the practical problems with including builder's and entrepreneurial profits is that they can be difficult to estimate.  However, as discussed above, the best way to estimate profits is through access to complete and accurate data in the surrounding marketplace. This is more easily said than done, however. An appraiser can try calling contractors and asking them what their most recent profit margins have been, but is likely to meet with some reluctance.  Absent that sort of cooperation, appraisers must estimate the profits. One way to estimate these costs is to compare the sale price to the estimated construction costs, and to assume that any difference represents the entrepreneurial profit.

## 4.2 Building Cost Estimation

To apply the cost approach, an appraiser must prepare an estimate of the cost of the improvements as of the effective date of appraisal. Such an estimate can be prepared by an appraiser who understands construction plans, specifications, materials, and techniques and can access a variety of data sources or computer programs available for this purpose. Alternatively, the work can be done with the assistance of the expert cost estimators. In either case, the appraiser is responsible for the result. Existing improvements should be carefully reviewed and described by all individuals who are delegated to estimate costs.

Proposed improvements may be valued based on plans and specifications provided the appraiser discloses that the improvements have not yet been built and that their completion as specified is a hypothetical condition of the appraisal. Residential appraisers are commonly asked to provide an opinion of prospective value under the hypothetical condition that a property will be completed as planned. Non-residential appraisers are also asked to value property that has not yet been completed, and sometimes two prospective values are called for: the value at the time of completion and the value at the time stabilized occupancy and income are achieved.

In general, the first step in the cost approach to appraisal is to estimate the construction costs of the improvements. This estimate of building costs must be the cost to build the buildings today, not the original construction costs when the improvements were actually built.

There are four primary methods used by appraisers to estimate construction costs:

1. Comparative (square foot) method;
2. Unit-in-place method;
3. Trended Historical cost or index Method ; and
4. Quantity survey method.

**Comparative–Unit Method**

The most commonly used method of estimating building costs is the comparative method.  Under this approach, the cost of a building is determined by some measure of its size, usually its square footage. The cost per square-foot can be found from similar developments in the area or from published sources.

The comparative method assumes there are numerous similar buildings that can be grouped by design, type, and quality of construction. By developing average unit costs from known construction costs of new buildings in each group, replacement cost factors can be developed that will apply to the buildings in that group or class . The appraiser identifies costs of similar structures, adjusting those costs for differences in market conditions, location, and/or physical characteristics in comparison to the subject property.

It is the most common method of estimating costs used by residential appraisers.  Although units of measure other than the square foot may be used, the comparative unit method is often called the square foot method of estimating cost. The square foot method combines all the costs for a particular type and quality of structure into one value as a cost per square foot (or cubic foot). This method produces a value based on the floor area of the structure. This method produces a value based on the floor area of the structure. Contractor’s overhead and profit may be either included in the cost estimate per unit of area or computed separately. Indirect costs are usually computed separately, as is entrepreneurial profit.

The apparent simplicity of the square foot comparison method can be misleading. Unit cost varies with size; all else being equal, unit cost decrease as building increase in area. This is reflected with the fact that plumbing, heating system, doors, windows, and similar items do not necessarily cost proportionately more in a large house than in a small one. If a similar cost is spread over a larger area, the unit cost is obviously less. Therefore, dependable square foot cost figures require the exercise of care and judgment in the process of comparison with similar or standard houses for which actual costs are known. Inaccuracies may result from selection of a square foot cost that is not properly related to the house under appraisal. However, correct application of this procedure will provided estimates of reproduction or replacement cost that are reasonably accurate and entirely acceptable in appraisal practice.

**Cost derivation**

Deriving cost figures is perhaps the primary concern of comparative (square foot) method to estimate building costs. Although there are several methods used by appraisers to derive cost deriving cost from sales and publication are common

***Cost derivation from sales****:* One way that the cost per square-foot can be derived is by comparison with similar new construction in the area.  In its simplest form, the process would involve starting with the sales price of the property, subtracting the value of the lot, and then dividing this figure by the square footage of the improvements. Sometimes it also becomes necessary to make adjustments for differences between the subject building and the comparable sale. For example, if the comparable sale has one bathroom more than the subject property, that cost should be subtracted from the sales price as well, to get a more accurate picture.

Consider the following example: Appraiser Asegede Atnafu is using the cost approach to confirm the value received through direct sales comparison. To estimate the cost per square-foot, she has found three new homes which have recently sold in the area.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Subject property | Comparablesale #1 | Comparablesale #2 | Comparable sale #3 |
| Square-foot home | 1,550 | 1,400 | 1,550 | 1,650 |
| Square-foot lot | 6,000 | 6,000 | 6,000 | 6,000 |
| No. of bathrooms | 2 | 2½ | 2½ | 2 |
| sold price |  | $153,000 | $158,000 | $163,000 |

The lots are all valued at $50,000.  Appraiser Asegede estimates the cost of a ½ bathroom to be $4,000. The cost per square-foot for these properties can be determined as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Comparable sale #1 | Comparable sale #2 | Comparable sale #3 |
| Sale Price | $153,000 | $158,000 | $163,000 |
| - Lot | - 50,000 | - 50,000 | - 50,000 |
| - ½ Bath   | - 4,000 | - 4,000 | 0 |
| Bldg. Value | $ 99,000 | 104,000 | $113,000 |
| ÷  Sq. Ft. | ÷  1,400 | ÷    1,500 | ÷   1,650 |
| Cost/Sq.Ft | $  70.71 | $  69.33 | $  68.48 |

Since the subject property in this example is closest in size to Sale #2, the appraiser would use that result ($69.33) as the cost per square-foot of the subject property.  Based on this rate, the construction cost of the subject property would be $107,000 (rounded) = 1,550 X $69.33 = $107,451.50 or $107,000

In some cases, it could become necessary to interpolate figures, meaning to choose some figure between two comparable sales. Suppose, for example that the cost per square-foot of a 1,600 square-foot home is $72.50 and the cost per square-foot of a 1,800 square-foot home is $71.50.  If asked to determine the cost per square-foot of a 1,700 square-foot home, $72.00 would appear to be a reasonable estimate.

***Cost Derivation from Publications*:** Deriving cost figures from comparable sales are perhaps the most accurate way to estimate building costs, but it does present difficulties.  Perhaps the hardest part of the process is obtaining the information about the cost of the properties.  Owners or builders are not always willing to provide precise cost figures. Further, recent construction activity in the area might not be very comparable to the subject property.

In cases where no actual cost data is available appraisers rely on published data sources. These figures are then used by appraisers as a basis for estimating construction costs. When using published sources, the appropriate base rate is selected according to the size and quality of construction of the subject property. This base figure is then adjusted for such matters as roofing materials, subflooring, additional plumbing fixtures, fireplaces, heating and cooling systems, energy consumption considerations, foundations and built-in appliances. This derives an adjusted cost per square-foot. Consider the following example:

Appraiser Mr. Teshome is using the cost approach to confirm the value derived through direct sales comparison. The subject property is a one-story, single-family residence, of good quality construction and with 1,800 square-feet. The house has composite shingles, concrete slab subflooring, a fireplace; forced air heating and central air conditioning is located in a mild climate and has built-in appliances typical for the neighborhood.

The appraiser could refer to a cost manual for residential property, looking for good quality, one story construction, and use the following data and adjustments:

|  |  |
| --- | --- |
| **Item** | **Cost** |
| Base Cost | $49.07 |
| Composite Shingle | - 0.95 |
| Concrete slab subflooring | - 2.06 |
| Warm & Cooled air | + 1.20 |
| Energy, mild climate | - 1.01 |
| Foundation, mild climate | - 1.24 |
| Adjusted cost per square-foot | $45.01 |

This would result in construction costs of $81,018, as follows:

1,800 X $45.01 = $81,018

This cost would then have to be adjusted with lump-sum adjustments for the fireplace and the built-in appliances, as follows:

|  |  |
| --- | --- |
| Cost | $81,018 |
| Fireplace | + 2,600 |
| Appliances  | + 3,225 |
| Adjusted Cost   | $86,843 |

One final adjustment needs to be made.  The base costs are then adjusted for a location factor.  Since some areas are more expensive than others, adjustment factors are used to account for these differences.  Suppose that the location adjustment comes to 1.03, the cost of the home would be estimated as follows:

|  |  |
| --- | --- |
| Adjusted Cost   | $86,843 |
| X Location factor | X  1.03 |
| Estimated Cost | $89,448 |
| Rounded | $89,500 |

**Size-Cost Relationships**

There are a number of important relationships between the size of the building and the construction cost of the building.  One important relationship is that in general the cost per square-foot will decrease as the square-footage increases.

For example, the base cost per square-foot of a single-story 1,800 square-foot home of good quality was said above to be $49.07 before any adjustments. The base cost for a similar home of only 1,600 square-feet might be $50.06, a bit higher.

There are several reasons why the construction costs are higher for smaller homes. One of the major reasons has to do with the fact that the most expensive rooms in the house are the kitchen and the bathrooms. Any room which involves plumbing will have substantially higher costs than, say, a bedroom.  An extra bedroom would add some foundation and roof costs, as well as some interior walls. These costs are relatively inexpensive. However, even a small house must have a kitchen and at least one bathroom, but it will have less square-footage over which to spread the costs.

Another important consideration is the number of floors in the home. Suppose that a builder is considering two 1,800 square-foot homes, one of which is one-story and the other of which is two-story. The two-story home will be cheaper.  This is true because the second story shares the same foundation and roof as the first story. The two-story home would end up with less foundation and less roof than the one-story. For example, if the base cost of a single-story 1,800 square-foot house is $49.07, the base cost of a two-story 1,800 square-foot house is likely to be about $45.92.

**Quantity Survey Method**

**Quantity-Survey Method is one of t**he appraisal methods of estimating building costs by calculating the cost of all of the physical components in the improvements, adding the cost to assemble them and then including the indirect costs associated with such construction. Quantity Survey Methodis an item-by-item inventory of all costs, including the builder's profit. It is the most detailed, complex, time-consuming, and costly method, but is extremely accurate if done by a professional quantity surveyor.The quantity survey method requires that the appraiser create a detailed inventory of every item of material, equipment, labor, overhead, and fees involved in the construction of a property. To this list is applied the cost of each item as of the date of appraisal. Also estimated is the amount of labor hours needed to install each item, using current labor rates. Finally the indirect costs, overhead and profit items are added to the cost of material, equipment and labor. Thus, in the quantity survey method total material and labor costs are combined to indicate total direct costs of the subject building. All applicable indirect costs and entrepreneurial profit are then added to derive a total cost estimate.

The quantity survey method is more commonly used by contractors who bid jobs by distributing blueprints to subcontrac­tors who factor in the small details. Because of the expertise required to use this method, it is not often used by appraisers. This method is not routinely used by appraisers because it is extremely time consuming. The quantity survey method is time-consuming and may not be practical in mass appraisal, but because of its supporting data, may be well-suited to assessment appeals or appraisals of complex properties. This method comprehensively details the quantity, quality, and cost of all materials and labor required to construct a reproduction of the subject building.

This method is used even less than the unit-in-place method because of the time and cost involved. With the advent of comput­erized cost estimation, the quantity survey method may be more feasible than it once was, but appraisers still will not use it unless it is specifically requested by the client. There are a number of computer programs available that make the quantity survey method easier than it was before computers were in common use.  A pencil, calculator, and blueprint were the primary tools for estimating cost.

The following example summarizes a general contractor’s cost breakdown for an apartment building which has 149,000 of site value. It is important to note that the table provides only a summary of the results of the quantity survey, and does not show the computations for the materials that would be used in construction.

|  |  |
| --- | --- |
| **Building cost component**  | **Cost**  |
| **Direct costs**  |  |
| Foundation | $23,000  |
| Frame | 191,000  |
| Floor structure  | 223,000  |
| Floor cover  | 96,000  |
| Exterior walls  | 647,000  |
| Interior walls  | 433,000  |
| Electrical system  | 59,000  |
| Electrical fixtures  | 28,000  |
| HVAC | 242,000  |
| Roof structure  | 205,000  |
| Ceilings | 79,000  |
| Painting  | 18,000  |
| Plumbing system  | 65,000  |
| Onsite improvements and landscaping  | 1,205,000  |
| Permits and fees  | 290,000  |
| **Total direct costs**  | 3,804,000 |
| **Indirect costs**  |  |
| Architectural/engineering services  | $ 304,000  |
| Survey  | 8,000  |
| Toxic assessment  | 5,000  |
| Construction loan interest | 188,954  |
| Appraisals  | 16,000  |
| Legal  | 25,000  |
| Development consultants  | 148,000  |
| **Total indirect costs**  | 694,954 |
| Total improvement cost (direct cost plus indirect costs) | 4,498,954 |
| Entrepreneurial profit (15% of direct and indirect costs and site value)  | 697,193 |
| Total improvements cost new | **5,196,147** |
| Site value  | 149,000  |
| **Total Value Indication by the Cost Approach** | **5,345,147** |

Each item on the survey list is calculated in a similar manner and then totalled on a summary cost sheet. The costs include overhead items like unemployment insurance, workers compensation, vacation pay, general insurance, equipment rentals, permits, and a reserve for contingencies.

Although cost manuals or computerized costing services can provide a detailed, quantity-survey cost new estimate, they should only be applied by persons qualified to estimate costs in such detail.

**Unit–in–Place Method**

Unit-in-Place Method is a simplification of the quantity survey method. The unit-in-place method also called the segregated cost method. It finds the sum of the cost of installed materials using convenient units of measurement, such as the cost to install the foundation, roof, plumbing, wiring, heating, exterior walls, etc. The cost of building each unit would be specified, with the sum of the units representing the total cost of the building. This method is also very detailed and requires sophisticated estimating skill. Again, most appraisers would hire an expert to do these calculations.

The unit-in-place method is especially well suited for industrial buildings, because they vary greatly in size, shape and height.  The square-foot approach does not work very well because there is no consensus shape or size to industrial properties. The unit-in-place method is less detailed than the quantity survey method, but still reasonably accurate and complete

In the unit-in-place method, units of measure vary according to standardized costs for each component as installed. For example, floor covering may be counted on a square yard basis; baseboards or interior partitions on a linear foot basis; doors or plumbing on a door or plumbing fixture basis; air conditioning on a per ton basis; insulation, drywall, or paint on a square foot basis; and excavation on a cubic yard basis. Common sources of unit-in-place cost data are standard cost tables such as those published in a Board-approved cost guide.

Cost per square foot for roofs and walls, and linear foot costs of foundation walls are examples of the unit-in-place method. This method helps the appraiser compute the cost of a building when the comparative method is not practical. Perhaps this concept can best be understood through the use of an example. Consider the following two structures:

Suppose, for the sake of illustration, that the floor and foundations of these buildings costs $8.25 per square-foot; the roof costs $16.50 per square-foot; and the walls cost $275 per linear foot. Notice that both the square building and the rectangular building have 10,000 square-feet, but the square building has only 400 linear feet of walls (100' times 4) while the rectangular building has 500 linear feet of walls (50'+200'+50'+200').  Consider how this would affect the construction cost for each building:

|  |  |
| --- | --- |
| **Square Building** | **Rectangular Building** |
| Floor   (@ $8.25) |  $82,500 | Floor | $82,500 |
| Roof   (@ $16.50)      | 165,000 | Roof | 165,000 |
| Walls  (400 X $275)    | 110,000 | Walls (500 X $275) | 137,500 |
| Total Cost |  $357,500  | Total Cost |  $385,000 |

Given these different costs, notice the effect on the cost per square-foot:

|  |  |
| --- | --- |
| Square Building | Rectangular Building |
| Total Cost | $357,500 | Total Cost | $385,000 |
| ÷ Sq. Ft | ÷ 10,000 | ÷ Sq. Ft | ÷ 10,000 |
| Cost/Sq.Ft | $35.75 | Cost/Sq.Ft | $38.50 |

One advantage of the unit-in-place approach to cost estimation is that it would automatically take into account the shape of the building and its square-footage.

Consider an example of the unit-in-place cost approach. The subject property is a 7,000 square-foot warehouse, measuring 70' X 100'. The following are the costs of the various components, including the installation costs:

|  |  |
| --- | --- |
| **Building components** | **Installation costs** |
| Building Permit                                         | $  5,000 |
| Excavation : (2556 cubic yds.@$4.56) | 11,655 |
| Foundation: (7,000 sq.ft. @ $6.35) | 44,450 |
| Walls (340' @ $325)                                 | 110,500 |
| Roof Structure (7,000 sq.ft. @ $16.75)    | 117,250 |
| Roof Covering                                              | 8,500 |
| Plumbing piping (7,000 sq.ft. @ $3.23)      | 22,610 |
| Plumbing fixtures (11 fixtures @ $475)         | 5,225 |
| Sewer hookup                                              | 3,500 |
| Wiring and outlets (7,000 sq.ft. @ $4.33)   | 30,310 |
| Windows (27 @ $125)                                  | 3,375 |
| Heating (7,000 sq.ft. @ $1.75)                   | 12,250 |
| Sprinklers (7,000 sq.ft. @ $2.07) | 14,490 |
| Miscellaneous costs                                  | 25,000 |
| Total Costs                                       | $414,115 |

As one can imagine from looking at the example above, most appraisers rarely use this approach. In fact, unless an appraiser comes from a construction background, it is entirely possible to go through an entire career without using this approach. As stated earlier, most appraisers will use published construction cost guides.

**Trended Historical cost or index Method**

Cost index trending may be used to convert historical data into a current cost estimate. Cost indexes are published as part of a cost manual or computerized costing service. Also, other sources, such as Statistics Canada, publish statistics on construction costs. If the historical construction cost (including all hard and soft costs) is known, a cost index can convert that cost into an indication of cost new for the date of appraisal. As discussed above, this measure of cost may be used in estimating the value of property by the reproduction cost approach

The index approach is used in circumstances when the original construction cost of the existing improvements is already known. It is most frequently used in the case of unique or unusual buildings. This approach simply takes the original construction costs and updates them to today's costs through the use of published indexes of construction costs. Several companies publish this data.

In order to use this method, the appraiser needs to know the original construction costs of the building and the year in which it was completed. The appraiser then looks up the index value in the year of completion and at the current time.  These values are then used in the following formula: Original cost X Current Index/Historic Index = Current Cost

Consider the following example:

Appraiser Yirga has been given an assignment to appraise a library which was built in 1973 at a cost of $125,000.  Appraiser Yirga finds that the published index for 1973 is 718. The index for the current year is 1,497. The reproduction cost of the building would be calculated as follows:

|  |  |
| --- | --- |
| Current Cost Index  | 1,497 |
| Cost Index at date of original construction  | 718 |
| Change in index between date of original construction and current date | 1,497/718=2.08 |
| Original construction cost  | 125,000 |
| Indicated current construction cost | =125,000 X 2.08=260,625 |

When using the index approach to cost estimation, care must be taken to determine what, if any, work has been done to the property since it was first built. If there were any additions to the building or remodeling of the interior, the construction costs will need to be modified to consider the building as it now exists.

The index approach is probably the least accurate of any of the approaches to cost estimation. It is sometimes used in computer appraisal models used in such applications as mass appraisals for ad valorem tax purposes. The historical cost of a property may be significantly higher or lower than its market value at the time of construction. As the time span between initial construction and the date of value increases, the trended historical cost method yields less reliable indicators of value. Limitations notwithstanding, the trended historical (or original) cost method may be useful to the appraiser, particularly in dealing with unusual types of construction for which current data are not sufficiently available in the marketplace.

## 4.3 Estimation of Depreciation

A method that is commonly adopted in situations where market evidence is non-existent is the depreciated replacement cost method. As the name suggests, this involves estimating the Replacement cost as news of the property, which is the subject matter of the valuation, and making allowances for accrued depreciation. The allowance made for depreciation is important as it allows for the estimation of value that reflects the current state of the property.

Once the replacement or reproduction costs of the existing improvements have been estimated, the next step is to subtract the depreciation which the property has suffered.

The term "depreciation" is often used in terms of income taxes. For tax purposes, depreciation is an allowance for wear and tear of real or personal property which is held for the production of income or used as part of a trade or business. Income tax depreciation is a straightforward mathematical computation. The cost of the improvement(s) is divided by a recovery period which is specified in the Tax Code. For example, residential properties, such as apartment complexes, are depreciated over 27.5 years. Suppose that an investor purchased an apartment complex with an improvement cost of $550,000. The depreciation deduction would come to $20,000 per year, as follows:

550,000/27.5 = 20,000

It is important to understand that the Tax Code definition of the term "depreciation" is vastly different than the definition for purposes of an appraisal.

In the cost approach appraisal process one of the most difficult aspects is estimating depreciation. Depreciation may be thought of as the difference between the present value of the worn or outmoded subject property and the present value of a hypothetical, newly built, modern property of equivalent utility. In short, it is the difference between estimated replacement or reproduction cost new as of a given date, and market value as of the same date. Thus, in an appraisal sense, the term "depreciation" refers not to a decline in the original value of the subject property, but rather to a measurement of the extent to which the subject property is, at a particular point in time, worth less than a hypothetical new property.

There are a number of approaches by which depreciation either for accounting or valuation purposes can be estimated. Each method has its inherent advantages and problems. The accounting approach to depreciation is quite different from the appraisal approach. The appraiser does not use the accountant’s depreciation estimate in valuation, since it is not market derived. For instance, a method that is commonly adopted among accountants is the straight-line or age life method. Though it is simple and easy to adopt, it has the disadvantage of not correctly modeling the true impact of depreciation during the life of an asset.

In the accounting approach, the rate of depreciation is established when an asset is new, based on a pre-selected life span and standard periodic depreciation charge in order to write off the original cost. By the end of the asset’s life, the value of the asset has been depreciated to a typically nominal or zero salvage value. The book value shown on the accounting records is the asset’s acquisition cost reduced by the accrued depreciation charges against it for income tax purposes.

It is imperative to note that unlike the depreciation adopted for accounting purposes, the valuer, in adopting depreciation in the depreciated replacement cost method, is supposed to arrive at a value that represents the current market value of the property. By contrast, depreciation for appraisal purposes estimates actual loss in value incurred by the property in the market place. An appraiser estimates the market value of a building by adjusting its cost new for estimated depreciation. Market value is unlikely to equal the book value indicated by accounting records.

This requirement obviously rules out the possibility of adopting such simplistic methods as the straight-line method of depreciation. The approach that is adopted in many valuation exercises is to examine the property in question and take notes of its age, level of maintenance and obsolescence. The valuer then, makes a judgment using his professional expertise, to finally arrive at the rate of depreciation. In doing this, valuation professionals may rely on different models or mathematical relationships to guide them in estimating the rate of depreciation. There is however, no consensus on the model or approach which when used will help reduce the level of variations in the opinion of appraisers.

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

1. Is there a depreciation problem in the property?
2. Does it affect the real estate value?
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 estimate can only be completed after the issues of depreciation have been fully addressed and incorporated.

Depreciation can be either curable or incurable. It is important to note what is meant by the term "curable."  A deficiency is curable if the property would increase in value by an amount equal to, or greater than the amount spent to solve the problem. The appraiser's concern must not be simply whether a problem can be physically repaired, but whether the repair would make economic sense. For example, if spending $2,000 to repair a roof would add $2,000 or more to the value of the property, then the deterioration of the roof is said to be curable. If fixing the roof would only add $500 to value, then the condition of the roof would be said to be incurable.

## 4.3.1 Causes of Depreciation

Appraisers group various causes of depreciation into three categories:

1. Physical deterioration;
2. Functional obsolescence; and
3. Economic obsolescence.

**Physical Deterioration**

Physical deteriorationis a loss in value due to use or the forces of nature. The most obvious cause of depreciation is physical deterioration. Buildings will ultimately wear out due to the physical forces of nature working to destroy them. Physical deterioration is caused by wear and tear on the property from use.  Naturally, the amount and quality of maintenance performed on the property will influence how long the buildings last.

 Physical deterioration occurs to virtually all improvements as they age, lowering their utility and consequently reducing their value. Examples of physical deterioration are peeling paint, metal fatigue, flood damage, and termite infestation. Proper maintenance can slow a building’s rate of physical deterioration.

Physical deterioration may be classified as curable or incurable. Curable physical deterioration (also called deferred maintenance) occurs when the value added by a repair equals or exceeds the cost to cure the defect. Incurable physical deterioration occurs when the value added by the repair is less than the cost to cure the defect as of the valuation date—that is, it is not economically feasible to repair the item.

When estimating physical deterioration, the physical components of an improvement are divided into two types: short-lived components and long-lived components. Short-Lived Components are those components of a building that do not require annual replacement but wear out before the end of the building's useful life and must be replaced periodically. Short-lived components are generally recognized in a reconstructed cash flow statement using an allowance for reserves.  Estimation of the allowance for reserves may be done using the straight-line method or the sinking fund method. Short-lived components of an improvement (e.g., roof covering, elevators, or mechanical systems) are components that typically have useful lives shorter than the remaining economic life of the entire improvement (the concepts of useful life and remaining economic life are discussed below).

For example:  A roof may have an expected economic life of 20 years while the building may last 75 years.  Appliances may have an expected economic life of 15 years while the building is expected to last 60 years.

A long-lived item is a building component with an expected physical life that is equal to or greater than the remaining economic life of the property. Examples of long-lived items are likely that of the roof structure and framing will last as long as the building as a whole.

Listed below are factors that could lead to functional obsolescence. Physical deterioration resulting from:

* + Wear and tear from use
	+ Negligent care (sometimes termed “deferred maintenance”)
	+ Damage by dry rot, termites, etc.; and
	+ Severe changes in temperature.

**Functional Obsolescence**

A property’s functional utility reflects its overall usefulness or desirability—its ability to satisfy the wants and needs of the marketplace. Functional obsolescenceis the loss in utility and value due to a reduction in the desirability of the property. Functional obsolescence is caused by factors inherent to the property. This form of obsolescence may be attributable to changes in tastes and preferences within the marketplace, changes in building techniques or technology in general, or poor original design that is deficient or excessive when compared to current market standards.

As with physical deterioration, functional obsolescence is classified as curable or incurable, depending on whether or not the cost to cure the functional defect is less than or equal to the anticipated increase in property value resulting from correction of the defect. Functional obsolescence may be caused by a deficiency or a super adequacy. With a deficiency, the improvement is below standard as determined by the market; with a super adequacy, the improvement exceeds market standards.

Listed below are factors that could lead to functional obsolescence. The list is not intended to be all-inclusive, as many functional problems are property specific.

* Excessive floor space: Includes floor areas that are not used or required for current or foreseeable operations. Such space may or may not have a viable use and value under an alternate highest and best use.
* Piecemeal construction, inappropriate building layout, and disjointed production flow. Poorly laid out buildings may be the cause of extra operating costs in manpower, transportation and machines e.g., floors at different levels, rooflines at different levels, loading docks at inconvenient locations etc.
* Excessive operating costs: Factors such as excessive windows and openings, poor insulation, inadequate heating systems and inferior building services may generate excessive operating costs.
* Excessive heights
* Excessive or superior construction: A building may have originally been designed for certain roof loadings, floor loadings, or overhead cranes that no longer form part of the production process.
* 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
* 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.
* Bay size (column spacing)
* Poor lighting or poor installation of other services (generally considered curable)
* Site Restrictions: A site that does not permit rational expansion or appropriate access can cause functional problems, inefficiencies and excess operating costs.

**External Obsolescence**

External obsolescence(sometimes called economic obsolescence) is a loss in value caused by negative influences outside of the subject property that are generally beyond the control of the subject property owner or tenant.

Economic obsolescence can also be caused by regional factors, such as problems experienced by local industries. An example of this is how the hard times experienced by the automobile industry affected the economy of the State of Michigan. Economic obsolescence can also be caused by national factors, such as when a recession or a depression reduces property values. Examples of causes of economic obsolescence can include: change of flight patterns at a nearby airport; oversupply of properties with a similar purpose; and construction of a freeway near a property.

It should be noted that unlike physical deterioration and functional obsolescence, which are intrinsic to the property, external obsolescence is caused by extrinsic forces. Negative influences could be economic (e.g., erosion of a community’s economic base or a building supply that is in excess of demand), locational (e.g., placement of a medical center adjacent to a railroad crossing), or legal (e.g., a zoning variance that allows for industrial uses in a residential neighborhood, or a wetlands protection law that limits construction).

The presence and extent of external obsolescence can be identified by examining the overall market conditions of a property. External obsolescence can affect both a site and its improvements. External obsolescence is generally deemed to be incurable as of the valuation date, but may not be permanent.

The first two categories of accrued depreciation (physical and functional) are considered to be inherent within the property and may be curable or incurable. The third category is caused by factors external to the property and is almost always incurable.

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. Listed below are factors that could lead to external obsolescence. Like that of factors that could lead to functional obsolescence, the following list is not intended to be all-inclusive, as many external problems are beyond property specific.

* 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 can incur a corresponding drop in value.
* Change in the attractiveness 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.
* 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.
* Physical site restrictions: A community may desire an expansion, but due to zoning or physical restrictions this may not be possible. Anything from the unfulfilled need for more parking spaces to an inability to add loading docks in a building expansion may cause this form of external obsolescence.
* 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 a degree of external obsolescence.

## 4.3.2 Methods of Estimating Depreciation

Accrued depreciation is depreciation which has already occurred up to the date of value. Remainder depreciation is depreciation which will occur in the future. Accrued depreciation may be classified either as curable or incurable. The measure between curable and incurable is economic feasibility. It is possible to physically restore or cure most depreciation such as by expensive restoration of old homes. However, in most circumstances, cure of deficiencies is measured by the economic gain (increased rents) compared with the cost of the cure.

To explore the methods for recognizing and quantifying various types of depreciation and obsolescence, and in particular, its application for properties here the cost approach is used, identification of depreciation is an essential part of the cost approach. Of course, the final objective of this process is an accurate representation of market value.

The proper application of identifying depreciation require knowledge and understanding about how assessor in establishing depreciation; collecting information, age and life concept of property, investigating obsolescence, identifying factors that produce either functional or external obsolescence etc. Hence, cost approach to value is carried out through identifying the causes of depreciation and obsolescence and establishing techniques to estimate their effects on property value.

A brief review of concepts associated with identification of depreciation procedure is presented below.

**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. This includes understanding and examining of 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. This focus on functionality of the property; financial health of the business, and; use, potential use, and utility of the property.
3. Knowledge about economic conditions. This type of knowledge shall give emphasis on general economic conditions, and; economic conditions with respect to the particular industry.

**Information Gathering**

A site inspection is necessary to determine the condition and functionality of the property. This analysis includes the following actions. Discussions with Property Owner/Operator are often the best resource for information about the functionality and utility of a property. There are many ways to solicit information: the questions to ask, and appropriate interpretations of the answers are developed through experience and general knowledge of the property type. In addition to this, appraisers can make general market research. Information about general economic conditions can be determined by financial statistics that can be found in local newspapers or government publications, e.g., Census, or Bank of Ethiopia Review. More specific information dealing with real estate can often be determined from other sources, e.g., newspapers, libraries, real estate publications, etc.

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

**Age and life concepts**

Any measurement of depreciation must take account of the difference between the present value of the subject property and the present value of a hypothetical, new, substitute property. To do this, an appraiser makes use of specific appraisal concepts that allow comparisons between the expected entire "life" of a new property and the expected remaining "life" of a subject property.

In real property valuation, the overall concepts of deprecation rely on the age life relationship used to determine both total depreciation and physical deterioration of components from the improvement. For example, in estimation of total depreciation age life concept used for market extraction and age life includes: Effective age, Economic life and Remaining economic life. These concepts consider all element of depreciation in one overall calculation. On the other hand, in estimation of total physical deterioration breakdown- concept used includes: Actual age, Use life and Remaining use life .These concepts consider separation of all causes of depreciation.

The real estate agent who is determining values should understand the necessity for cost appraisal procedures should understand age life relation concepts to estimate accrued depreciation. These concepts, which include economic life and useful life, remaining economic life and remaining useful life, and actual age and effective age, all serve to represent depreciation as a function of time. These concepts are discussed below before dealing with the three methods of estimating accrued depreciation.

**Economic Life and Useful Life**

With respect to improvements to real property, *economic life* refers to the period of time over which an improvement or a component thereof contributes to the property’s value from the time it is new. To estimate economic life expectancy, the appraiser must identify and analyze all significant attributes of the subject property’s market, including typical quality and condition of construction; functional utility of improvements; changes in technology and building design; factors external to the subject property such as supply and demand conditions and the stage of a neighborhood’s life cycle.

*Useful life* is the period of time over which an improvement or a component thereof actually performs the function it was designed to perform. It is possible for useful life to extend far beyond economic life, as, for example, in the case of a well-maintained building demolished for development of the site to its highest and best use.

**Remaining Economic Life and Remaining Useful Life**

*Remaining economic life* is the estimated period of time from the valuation date that an improvement or a component thereof can be expected to continue to contribute to a property’s value. Remaining economic life extends from the valuation date of the improvement or component to the end of its economic life.

*Remaining useful life* is the estimated period of time from the actual age (discussed below) of an improvement or a component thereof to the end to the improvement’s or the component’s useful life expectancy.

**Actual Age and Effective Age**

The *actual age* of an improvement or a component thereof is simply its chronological age, or the actual number of years since it was constructed. In contrast, *effective age* refers to the stage of an improvement’s or components economic life as reflected by its actual condition and utility on the valuation date. If a subject building, for example, is better maintained than typical buildings in its market, the subject building’s effective age will probably be less than its actual age, and vice versa. Remodeling a building tends to reduce its effective age. Effective age is related to remaining economic life:

Effective age + Remaining economic life = Total economic life

Under the straight line or age-life method the effective age of the building is generally used instead of the actual age. Straight line or age-life method is depreciation which occurs annually, proportional to the improvement’s total estimated life. For example, an improvement with an estimated total life of 50 years would be said to depreciate at an equal rate of 2 percent per year. (2 percent x 50 years equals 100 percent depreciation.) The effective age of the building is generally used instead of the actual age. Effective age is the age of a similar and typical improvement of equal usefulness, condition and future life expectancy. For example, if a building is actually 25 years of age but is as well maintained and would sell for as much as adjoining 20-year-old properties, it would be said to have an effective age of 20 years.

**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 excess operating costs inherent to the property that would indicate functionality problems?
3. Is there any inefficiency in the use of space or the layout of the buildings?
4. Are there any external conditions affecting this property?
5. Could the existing facility be replaced with a more modern, efficient substitute that more adequately fulfils current and/or expected requirements? If so, what would constitute this modern unit?
6. How would a potential purchaser view this property?

**Techniques of Quantifying Depreciation**

Accrued depreciation may be estimated directly through observation and analysis of the components of depreciation affecting the property or through use of a formula based on physical or economic age-life factors. It may also be estimated indirectly by use of the income or market data approaches.

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. In quantifying depreciation it should be noted that:

* Depreciation is not necessarily related to the actual age of the property.
* It is ultimately the market that dictates the amount of depreciation in a property.
* There is not one correct or standard way to quantify loss in value from costs new because of the diverse nature of depreciation.

Appropriate market value evidence always provides 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. Appraisers and assessors are required to estimate the type and degree of depreciation present in a property. An accurate quantification of depreciation involves information supplied by the property owner. In the absence of such information, quantification must be derived using the depreciation tables from cost guides or handbooks.

There are several methods of estimating depreciation. Four methods are discussed in this section:

1. Market extraction
2. Age-Life Method or The straight line method
3. Break down or cost-to-cure or observed condition method

Of the three, only the observed condition (breakdown) method measures depreciation according to its separate sources: physical deterioration, functional obsolescence, and external obsolescence. The other methods deal with the whole property and element of depreciations are implicit, not explicit. These method measure depreciation from all sources in a lump sum and don’t always distinguish between short term and long term lived item. Estimates derived using the market extraction and breakdown methods are time-consuming, and they may not be practical in mass appraisal (particularly the observed condition (breakdown) method). Nevertheless, these methods may be appropriate for selected assessment appeals or appraisals of complex properties. Conceptually, all methods of estimating depreciation result same result as far as they are applied effectively.

**Market Extraction Method**

YM

The market extraction method (also called the market or comparable sales data method) is the only method that uses comparable sales data to estimate depreciation. The estimate of depreciation for the subject property is based on the amount of depreciation incurred by comparable sales properties. The method requires sales of improved properties that are u; highly comparable to the subject property. It also requires comparable data concerning site values of the comparable properties and accurate estimates of cost new for the comparable properties. Application of the method is summarized in the following steps:

1. Identify comparable sales properties.
2. Adjust the comparable sales, if necessary, for any differences relating to property rights conveyed, financing, or non-real property items -=\
3. ][‘per included in the sales price. Adjustment for market conditions is not required; depreciation is estimated as of the sale date of the comparable. Adjustment for physical and location characteristics is also not required; presumably, these factors are the sources of depreciation in the comparable property.
4. Subtract the estimated value of the land, or site, as of the sale date, from each comparable sale in order to arrive at an estimate of the residual, depreciated value of the improvements.
5. Estimate the cost new of the improvements for each comparable property as of the sale date. The type of cost estimated (i.e., replacement or reproduction cost) should be the same as that used for the subject improvement.
6. Subtract the depreciated value of the improvements (item 3) from cost new (item 4) to arrive at a dollar estimate of total depreciation for each comparable sale property.
7. Convert each dollar estimate of total depreciation into a percentage by dividing it by the cost new of each comparable sale’s improvements. (The percentage may be expressed as either (1) overall rates of depreciation, to be applied to the lump sum cost new of the subject improvements, or (2) annual rates of depreciation, to be applied to the subject improvements according to their actual age. Annualizing the results introduces the assumption that depreciation occurs on a straight-line basis over time.) Reconcile the results and select an appropriate percentage to apply to the cost new of the subject property’s improvements; this produces the estimate of total depreciation for the subject property’s improvements.

The following example illustrates the application of the market extraction method:

**Example 1:**

|  |  |
| --- | --- |
| Sales price of comparable property................................................................ | $180,000 |
| Less estimated land value............................................................................. | - 55,000 |
| Improvement Value..................................................................................... | 125,000 |
| Less estimated value of secondary improvements and landscaping ………. | - 23,000 |
| Value of comparable residence.................................................................... | 102,000 |
| Divide by area of comparable residence....................................................... | ÷ 2,900 sq.ft. |
| Depreciated unit value of comparable residence........................................... | $35.17/sq.ft. |
| Multiply by size of appraised residence....................................................... | x 2,850 sq.ft. |
| Indicated depreciated value in place of appraised residence............................ | $100,234 |

**Application and limitation**

This method is the most accurate measure of depreciation from the market when sale data are plentiful. But the comparable should have similar physical, functional, and external characteristics as subject. Comparable should have incurred similar amount and type of depreciation as that of subject. If comparable have different in design, quality of construction, difficult to ascertain difference in value because of this or difference in depreciation. Many appraisers prefer the market extraction method of estimating depreciation over the others because it eliminates the problem of esti­mating the denominator of the age-life ratio. It also eliminates the prob­lem of over or underestimating overall depreciation commonly en­countered using the breakdown method, which will be covered later in this chapter.

The direct extraction of information from market data is usually the best indication of market behavior available; it is easy to understand and hard to refute. Thus, this method is not appropriate measure of depreciation from the market whenever the type and extent of depreciation is different among the comparables and subject.

It is sometimes difficult to obtain truly comparable market data in which sale analyses were affected by financing, besides occasionally difficult to accurately estimate land value and secondary improvement value for deductions for main residence value indication. Its usefulness depends on accurately estimate of land value and secondary improvement value and cost estimate of comparables. The market extraction method does not segregate the losses by clas­sification, making adjustments for dissimilar improvements more dif­ficult to gauge accurately. Because the calculations of overall deprecia­tion are based on estimates of land value and reproduction or replace­ment cost, any errors in those analytical steps may often be repeated in the later analysis. That is, if the appraiser underestimates the land value in the extraction technique, the same underestimation will commonly appear in the subject's cost approach

**Age-Life Method**

In the age-life method, percent depreciation is estimated simply by dividing the estimated effective age of the subject property’s improvements by the total economic life of those improvements. Depreciation is then converted to dollars by multiplying the percent depreciation by the cost new of the improvements.

The age-life method of estimating depreciation is based on the assump­tions that any improvement has a life span that can be estimated and that depreciation can be estimated by dividing the age of the improvement by the total length of its life. Actual age is usually an easily obtained fact, but effective age is an estimate by the appraiser. Effective age is higher than actual age when the improvements have had poorer-than-average main­tenance, and it is adjusted below actual age when the improvements have had better-than-average maintenance. The effective age rating relates more to the condition rating of the improvement than the actual age.

The basis is that the percentage effective ageis of the typical economic life is the same percentage the accumulated depreciation is of total reproduction cost. The effective age of the building is generally used instead of the actual age since Effective age is the age of a similar and typical improvement of equal usefulness, condition and future life expectancy. So the effective age and economic life expectancy are primary concern. Based on the assumption that any improvement has life span that can be estimated and that deprecation can be estimated by dividing the age of improvement by total length of its life:

Depreciation = Total Cost X Effective Age/ Total Economic Life

Steps:

1. Identify anticipated total economic life and estimate effective age from survey
2. Divide effective age by total anticipated economic life, apply the ratio to subject cost to estimate lump sum depreciation
3. Subtract lump sum estimate of depreciation from cost of improvement to get remaining contribution

Age-life techniques for estimating depreciation are best illustrated and applied to building components rather than to the entire improve­ment. The depre­ciation rate could not be applied to the entire property when some com­ponents in the building have short lives and others have long lives. Estimating the economic life of short-lived components is easy, but estimating the economic life of the entire structure is more difficult and harder to support. The market extraction method discussed earlier can be used for this purpose. Remember that the total economic life of an improvement is location-specific, and the rate of depreciation varies throughout the term. Therefore, extraction of the economic life for one property type in one market cannot be automatically extended to an­other property in another market.

The age-life method can be used to estimate either depreciation from all causes or a single form of depreciation. Care must be taken to define clearly in the appraisal what is being estimated. The following examples show how the estimates are made.

**Example 1**: A house has an estimated typical economic life of 50 years. Its chronological age is 20 years. Its effective age, based on its condition, design, and environment, is 25 years because it is in poor condition and is located near a gasoline service station.

 Depreciation rate in % = 25/50 = .50 or 50% depreciated

**Example 2:** Another house in the same neighborhood also has an estimated typical economic life of 40 years. Its chronological age is also 20 years. Its effective age, based on its condition, design and environment, is 20 years because it is in average condition and there are no unusual adverse environmental influences

 Depreciation rate in % = 20/40 = 0.40 or 40% depreciated

These examples show how three houses in the same neighborhood, all the same chronological age, can suffer from substantially different amounts of depreciation. As the building is found to be superior in construction, modernization and lack of negative environmental influences, its effective age is less than its chronological age manifest low rate of depreciation

The age-life method allows an estimate of depreciation to be expressed in annual terms. In the example above, since the improvements have a total economic life of 50 years the annual depreciation is 2 percent (i.e., the reciprocal of 50). However, while an estimate of depreciation is easily achieved, the result is an approximation based on the usually faulty assumption that property depreciates on a straight-line basis throughout its economic life. Therefore, care should be taken this method assumption.

For example, if an estimate of remaining economic life is required, it must be made considering some factors and qualified to recognize that any changes may extend or shorten the remaining economic life. For example,by using the age-life method, it is estimated that a 25-year old residence has depreciated at the rate of 2% per year and is now 50% depreciated; it is incorrect to say that the remaining economic life is 25 years. This will only be true if:

* The present rate of depreciation continues into the future on a straight line basis.
* There are no changes in the forces that affect the value of the property.
* There is no modernization, rehabilitation or remodeling.
* The property is "normally" maintained through its remaining economic life.

**Age-Life Method application**

**Example 1** A house similar to the subject property in size, layout and other physical characteristics has typical economic life of 50 years. The subject chronological age is 20 years. Its effective age, based on its condition, design, and environment, is 18 years because it is in poor condition and is located near a gasoline service station. The total replacement cost of and land value of a subject house is given as 668,175 and 180,000 respectively. By Using Age-Life Method of Calculating Depreciation indicate the value of the house based on cost approach

**Solution**

We can follow the following Steps:

* Effective age / total economic life = age-life ratio, i.e., identifies anticipated total economic life and estimate effective age from survey: that is 50 and 18 years respectively. Thus the ration is = 18/50 = 36%
* Cost new of the building x age-life ratio = accrued depreciation, i.e., apply the ratio to subject cost to estimate lump sum depreciation % = 668,175 x 36% = 240,543
* Cost new of the building - accrued depreciation = depreciated value of the building , i.e., subtract lump sum estimate of depreciation from cost of improvement to get remaining contribution 668,175 - 240,543 = 427,632

Therefore the cost approach is applied as follows

Total cost 668,175

Less to total depreciation - 240,543

Depreciated cost 427,632

Plus land value 180,000

**Indicated value 607,632**

Example 2

House has an actual physical age of 25 years with a remaining life of 25 years, thus depreciating at the rate of 2 percent a year. It is the opinion of the appraiser that the subject house is of the same condition and utility as similar houses that are only 20 years of age. Therefore, the house has been assigned an effective age of 20 years. The accrued depreciation would thus be 20 years times 2 percent or 40 percent.

Calculated cost new ............................................................... $120,000

Accrued depreciation (40 percent x $120,000)....................... 48,000

Depreciated value of improvement. ........................................ 72,000

Plus land value ...................................................................... 50,000

Indicated value by cost approach............................................. $122,000

Example 3

A purpose-built industrial property has an effective age of the structure is 8 years and total economic life of 60 years. The building structure could be reproduced today for $300,000. Estimate: age life ratio, accrued depreciation amount and the depreciated value of the structure.

Solution

|  |  |
| --- | --- |
| Age-life ratio = |  Effective age / total economic life **=8/60 = 13.33%**  |
| Accrued depreciation = | Cost new of the building x age-life ratio **= $300,000 X 13.33% = 40,000** |
| Depreciated value of the building = | Cost new of the building - accrued depreciation **=$300,000- 40000 = 260000**  |

**Application and limitation**

This method is the simplest way, easy to understand approach to estimate depreciation from the market when sale data are plentiful. The age-life ratio is a favorite analytical tool of appraisers because it supports an easy and consistent method of estimating depreciation. But estimating the total life of a structure can be difficult it because of vocational restraints and the complex relationship of the various build­ing improvements that make up a functional properly. While it is easy to estimate the life of a water heater, it can be hard to judge how long a retail center will last. Overall depreciation is best extracted directly from the market using the market extraction method

However, this method has limitation on its assumption such as: First, % of depreciation is represented by the ration of effective age to total economic life and assume that the buildings depreciate on the straight line basis over the course of its economic life. Second like market extraction doesn’t segregate its sources of depreciation and difficult to apply and third like market extraction doesn't recognize the short and long term lived item in design, quality of construction, difficult to ascertain difference in value because of this or difference in depreciation .

**Breakdown method or the cost-to-cure or observed condition method**

In the breakdown method, appraisers identify and estimate the differ­ent kinds of losses due to depreciation of the improvements. This method is the most comprehensive of the three depreciation methods discussed here. It is the only method that separately measures each source of depreciation. The method is complex; however, a working knowledge of it provides the appraiser with a better understanding of the causes of depreciation and the relationship between these causes and market value.

Under a traditional application of this method, an appraiser would attempt to measure depreciation from:

1. Estimate of cost to cure- Curable Physical Deterioration
2. Incurable Physical Deterioration (Long-lived items and short-lived items)
3. Curable Functional Obsolescence
4. Incurable Functional Obsolescence
5. External Obsolescence

The cost-to-cure or observed condition method (breakdown method) involves:

* Observing deficiencies within and without the structure and calculating their costs to cure. The cost to cure is the amount of accrued depreciation which has taken place.
* Computing an amount for physical deterioration or deferred maintenance for needed repairs and replacements.
* Determining and assigning a dollar value to functional obsolescence due to outmoded plumbing fixtures, lighting fixtures, kitchen equipment, etc.
* Measuring functional obsolescence which cannot economically be cured (e.g., poor room arrangements and outdated construction materials) and calculating the loss in rental value due to this condition.
* Calculating external obsolescence (i.e., caused by conditions outside the property) and determining the loss of rental value of the property as compared with a similar property in an economically stable neighborhood. The capitalized rental loss is distributed between the land and the building.

**Estimating physical deterioration**

As previously discussed, physical deterioration is a form of depreciation that reduces the value and utility of virtually all improvements as they age. In the observed condition (breakdown) method, the components of improvements are analyzed in three categories: curable physical deterioration, incurable physical deterioration (short-lived items), and incurable physical deterioration (long-lived items). Physical deterioration may occur in any of these categories. Each item of physical deterioration is separately estimated.

**Curable Physical Deterioration**

Curable physical deterioration, also referred to as deferred maintenance, consists of items in need of repair or replacement as of the valuation date. Typical examples of deferred maintenance are a leaky roof, peeling paint, a broken or stuck window, a non-working air conditioner, faulty plumbing, interior decorating, pest control, fire or safety hazards, etc.

There are two tests for determining whether physical deterioration is curable or not. First the appraiser must determine whether the cost to cure an item of deferred maintenance will result in added value equal to, or greater than, the cost to cure Second, even when the cost to cure exceeds the added value, if curing the item will allow the entire property to maintain its value, the item is generally considered curable. This type of physical deterioration is measured by the "cost to cure" the defect—that is, the cost to restore the item to new or relatively new condition. The cost to cure is sometimes higher than cost new. This occurs, for example, when costs are incurred to remove a non-working item before a replacement can be installed, or when a bulk unit discount is unavailable when replacing only one unit.

Physical deterioration is usually curable. Routine maintenance expenditures are typical examples of curable physical deterioration, since these costs will increase the value by at least that much. For example, suppose that a house needs a paint job, which would cost about $5,000. A buyer would probably reduce his or her offer price by at least the $5,000 cost of painting. This paint job would be curable physical deterioration. Examples of curable physical deterioration would include needed paint jobs, roof repairs, deferred maintenance, needed repairs to the heating or cooling system, and so on

**Incurable Physical Deterioration**

Incurable physical deterioration is physical deterioration that is not economical to repair as of the valuation date—that is, the cost to cure the defect exceeds the added value of the repair. There are some types of physical deterioration which are incurable, however. For example, if the foundation of a building is cracked, or if bearing walls need to be replaced, that is considered incurable physical deterioration. Notice that it might be physically possible to repair these conditions, but usually the cost would be prohibitive. The costs would normally exceed whatever increase in value could be realized. When these problems occur, the owner is perhaps better advised to demolish the building and start over with a new one than to spend the money on the repairs.

Some appraisers use a separate category called "short-lived incurable physical deterioration." This category would include provisions for items which wear out faster than the improvements themselves. Most short-lived items will become deferred maintenance items before the end of the primary improvement’s remaining economic life expectancy. A long-lived component (e.g., a building’s structural and electrical systems) has a remaining useful life at least as long as the remaining economic life of the primary improvement. Since it is normally not economically feasible to replace such components before the economic life of the primary improvement ends, physical deterioration incurred by long-lived components is considered incurable.

For example, suppose that the original furnace in a home is not as desirable as newer, more energy-efficient furnaces which are now available.  Suppose, however, that the existing furnace is still in good working order. It might not be cost effective to replace the furnace today, since this expenditure might not be fully realized in the value of the property. However, when the existing furnace is completely worn out and needs to be replaced, then it will make sense to install the newer, more modern furnace. This is called short-lived incurable physical deterioration, because while it would not be feasible to repair it today, some day it will be economically feasible.

Some appraisers include this short-lived physical deterioration as being curable, rather than incurable. They do so because they say that it will eventually be repaired. Respectable people come down on both sides of this argument. Perhaps the more important consideration is that the appraiser should be consistent in this application. It is acceptable to consider this as either curable or incurable, as long as the same standard is used for the subject property and any and all comparable sales.

To measure the loss in value caused by physical deterioration for each short-lived component, the appraiser calculates an age-life ratio from its actual age and total useful life expectancy. The age- life ratio is then applied to the cost new to replace each item as of the valuation date. A similar procedure is followed for long-lived components; however, the actual age and useful life expectancy of the primary improvement may be assigned to all long-lived items. Thus, all long- lived items are analyzed together. Data sources for estimating total useful life of the primary improvement and all long-lived items include: (1) the age of other primary improvements (buildings) when torn down for redevelopment to a similar use; (2) information provided by construction experts; (3) data obtained from demolition permits; and, (4) analysis of sales comparables. Physical deterioration must be calculated separately for short-lived and long-lived components in order to avoid the double depreciation of short-lived components.

**Example: physical deterioration**

Example 1: A property has overhead garage door that is 13 years old. It costs 1,900 to replace .Because the inclement weather comes out of the North West, this door typically last 15 years if they face the west and 25 years if they face east. The door faces East. What is the amount left in this item?

**Solution**

|  |  |
| --- | --- |
| Garage door replacement cost  | 1,900 |
| Less depreciation @ 12/25 = 48.00%  | − 912 |
| Equals the amount left  | 988 |
| Note that: it is assumed that total economic life of similar structure minus effective age of the improvement will gives as remaining economic life. |

Example 2: A store building has a remaining economic life of 30 years and an effective age of 20 years. Present reproduction cost for the structure is $230,000. The roof is 75% deteriorated. A new roof will cost $10,000. The air conditioning and heating systems are 40% depreciated. Their installed cost new is $8,000. What is the total amount of physical deterioration?

**Solution**

The building, under the straight-line or age-life method, is 40% depreciated (20/50 = 40%). This 40% depreciation to the building is to be applied to the amount of the building’s reproduction cost less the depreciation already taken on the other components.

Depreciation to roof (.75 x $10,000).................................................. $7,500

Depreciation to air conditioning and heater (.40 x $8,000)................. $3200

Depreciation to rest of building (.40 x $212,000) .............................. $84,800

 212,000 = 230,000-10,000-8,000

Total physical deterioration.............................................................. $95,500

Example 3 : A store building has 21,500 ft2 refrigerated warehouse—5 loading docks. The building age is 18 years and the expected physical life is 60 years. Present reproduction cost for the structure is $40 per square foot (all improvements). The market shows that the building repairs required 1,200 loading dock repair cost and $1,700 Refrigeration equipment. In this example, effective ages and life expectancies of the remaining items are given below:

.

|  |  |  |  |
| --- | --- | --- | --- |
| **Short-Lived Items**  | **RCN\*(Dollars)** | **Effective Age (Years)**  | **Life Expectancy (Years)** |
| Roof covering  | 15 000  | 18 | 20 |
| Insulation | 6,500 | 3 | 15 |
| Plumbing | 4,100 | 18 | 25 |
| HVAC | 4,700 | 1 | 20 |
| Loading docks  | 6,000 | 2 | 15 |
| Refrigeration Equip. | 4,400 | 6 | 10 |

Given the assumption that there is no functional or external obsolescence, what is the total amount of physical deterioration?

**Solution**

**Curable Physical Deterioration**

|  |  |  |  |
| --- | --- | --- | --- |
| **Items**  | **RCN\*(Dollars)** | **Cost to Cure** | **Depreciation** |
| Loading docks  | 6,000 | $1200 | 1200  |
| Refrigeration Equip. | 4,400 | 1700 | 1700 |
| **Total Curable Physical Deterioration** | 2900 |
|  |  |

**Incurable Physical Deterioration**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Items**  | **Cost New** **(Remaining)** | **Effective age**  | **Physical age**  | **Ratio** | **Depreciation** |
| Roof covering  | 15 000 | 18 | 20 | 90% | $13500 |
| Insulation | 6,500 | 3 | 15 | 20% | $1300 |
| Plumbing | 4,100 | 18 | 25 | 72% | $2952 |
| HVAC | 4,700 | 1 | 20 | 5% | $235 |
| Loading docks  | 4,800 | 2 | 15 | 13.3% | $640 |
| Refrigeration Equip. | 2,700 | 6 | 10 | 60% | $1620 |
| **Totals:**  | **$37,800** |  |  |  | **$20,247** |

**Physical Depreciation Long-lived Items**

Total Reproduction Costs **…………………………………$860,000**

Less Reproduction costs of:

 Curable Items why? $2,900

 Other short-lived items $37,800

Reproduction costs long-lived items $819,300

Expected Economic Life: 60 years

Effective Age: 18 years

Ratio: 18/60 30%

**Total: Long-lived physical depreciation $245,790**

**Depreciation Summary – Breakdown Example**

Total Curable: **$2,900**

Total Short-lived Incurable: $20,247

Total Long-lived Incurable: $245,790

Functional obsolescence: $0

External obsolescence: $0

**Total Depreciation $268,937**

**Estimating functional obsolescence**

As defined previously, functional obsolescence is a loss in utility and value due to a reduction in the desirability of an improvement or a component thereof, as measured by market standards on the valuation date. Functional obsolescence may be curable or incurable and may result from a deficiency or a super adequacy. A deficiency results from an improvement component that is below market standards; a super adequacy results from an improvement component that exceeds market standards.

 The tests for determining the curability of functional obsolescence are the same as the tests for the curability of physical deterioration. That is, an item of

Functional obsolescence can be either curable or incurable. As was true in the case of physical deterioration, one must compare the cost of correcting the condition to the value added to the property. Functional obsolescence is considered curable if the value added will be equal to or greater than the cost to cure, and curing the item will allow the entire property to maintain its value. When it is possible to cure an item but without any economic advantage to do so, the item is considered incurable, i.e., if it costs more to fix than is added in value, the problem is considered incurable functional obsolescence As a result, most super adequacy are considered incurable.

In the case of functional obsolescence, it can make a difference whether the construction cost estimate is based on replacement costs or reproduction costs, especially as it relates to superadequacy. Suppose that a home has some design feature which is no longer in demand, such as a bomb shelter. If an appraiser is estimating the reproduction costs, then the cost of the bomb shelter must be included. The appraiser would then make a depreciation deduction for functional obsolescence caused by this bomb shelter, since few people now consider them necessary. If the appraiser is estimating replacement costs (the costs to build a home which would serve the same purpose), no consideration would be given to the bomb shelter unless the appraiser felt that it added some value to the property.

There are three types of curable functional obsolescence and two types of incurable functional obsolescence estimated in the observed condition (breakdown) method, as shown in the table below:

|  |  |
| --- | --- |
|  **Curable** |  **Incurable** |
| * A deficiency requiring addition of a new item
* A deficiency requiring replacement/modernization of an existing item
* A super adequacy that is economically feasible to cure
 | * A deficiency that is not economically feasible to cure; and
* A super adequacy that is not economically feasible to cure
 |

**Curable Functional Obsolescence**

As noted in the above table, there are three types of curable functional obsolescence: a deficiency requiring an addition, a deficiency requiring replacement or modernization, and a super adequacy economically feasible to cure.

**Deficiency Requiring an Addition** : This type of functional obsolescence is characterized by the lack of an item in the subject improvement that would typically be found in comparable improvement and that would be economically feasible to add. A deficiency requiring an addition is not included in the estimate of cost new. Depreciation in this case is measured by how much the cost of the addition exceeds the cost of the item if it had been installed during the construction of the improvement—this is sometimes called the "excess cost to cure."

**Deficiency Requiring Replacement/Modernization:** This type of functional obsolescence involves a property component needing replacement (e.g., an older HVAC system below current standards), where the obsolescence is curable.

A deficiency requiring replacement or modernization is included in the estimate of cost new. Depreciation is measured as the cost of the existing item in the cost new estimate, less any physical deterioration of the item already charged, less any salvage value of the replaced item, plus the cost to install the new item (including the removal costs for the old item).

**Super adequacy Economically Feasible to Cure:** This type of functional obsolescence involves a property component in excess of market standards that does not significantly contribute to value. Most superadequacies are incurable; that is, even when a cure is physically possible, there is typically no economic advantage to do so.

Depreciation caused by a curable superadequacy is measured differently depending on the cost basis used. If replacement cost is used, the cost of the superadequacy is not included in the estimate of cost new, and depreciation is simply the cost to cure the superadequacy—that is, the cost to remove the item, less any salvage value. If reproduction cost is used, the cost of the superadequate item is included in the estimate of cost new. In this case, the measure of depreciation is the cost new of the item, less any physical deterioration already charged, plus the removal cost of the item, less any salvage value of the item.

**Example 1:** A residential dwelling has only one bath in a market where two baths are expected. If the cost of building a second bath in the original structure would have been $8,000 and the cost of adding the bath in new construction would be $5,000, the excess cost to cure is $3,000. ($8,000 – $5,000 = $3,000).

**Example 2: A**ssume that in light of current market expectations, the three story office building appraised lacks elevator. The estimated cost of elevator as installed when the building built was 75000, but the cost to install it today $200,000. Similar property with same problem sold for 210,000 less than properties with elevators. The improvement is 14 years old the physical depreciation would 2% per year. Calculate the functional obsolesce

**Solution**

Cost on the date of appraisal to install the elevator is 200,000. The next step would be addressing the question: is it curable or incurable. The answer is easy, it is curable because 210,000 > 200,000. Only the excess cost of adding the item to the existing structure over the cost incorporating the item as part of a total building construction process represents the measure of accrued depreciation. Thus we need to deduct 75,000 the correct item if installed new as of appraisal date. Therefore the curable Functional obsolesce is equals to 200,000 – 75000 = 125,000. Hence buyer buys the subject property for 200,000 less (75000 + 125,000) calculate deprecation?

**Incurable Functional Obsolescence**

There are two types of incurable functional obsolescence: a deficiency that is not economically feasible to cure, and a super adequacy that is not economically feasible to cure.

**Deficiency Not Economically Feasible to Cure:** The most common type of incurable deficiency is a one that was not included in the estimated cost new but should have been. In this case, the depreciation, or loss in value, is measured by the loss in value attributable to the deficiency, less the cost of the deficient item had it been included in the estimate of cost new.

The loss in value attributable to the deficiency is generally measured in two ways: (1) capitalization of the net (i.e., after allowable expenses) income loss, or (2) analysis of otherwise comparable sales, with some containing the deficiency and others not containing it.

The annual income loss can be capitalized into an estimate of value loss using either direct capitalization or gross income multiplier analysis. This can be measured by the rent loss attributable to the deficiency capitalized by the market capitalization rate or multiplied by the gross monthly rent multiplier applicable to the property. Consider the following examples

Example 1: Estimating Incurable Functional Obsolescence by Capitalizing Rent Loss

A duplex unit without a garage rents for $100 per month less than a similar duplex unit with a garage. There is not enough land to add a garage. The capitalization rate is 12 percent.

 $100 × 2 units = $200

$200 × 12 months = $2,400 rent loss per year

$2,400 capitalized at 12% = $20,000.

The amount to deduct from the building value for incurable functional obsolescence is $20,000.

**Example 2**: Estimating Incurable Functional Obsolescence by Rent Loss multiplied by the gross monthly rent multiplies

|  |  |
| --- | --- |
| Monthly rental, House A with 3 bedrooms  | $285  |
| Monthly rental, House B with 2 bedrooms  | 265 |
| Difference |  $ 20 |

Your market analysis has established gross rental multiplier of 130 for neighborhood

The difference in value between A and B ($20 monthly rent loss x 130 GRM) is $2,600.

Example 3: Estimating Incurable Functional Obsolescence by Rent Loss multiplied by the gross monthly rent multiplies

Consider a house with only one bath in a market that requires two baths. Comparable rentals in the market indicate that a house with two baths and rents for $10 per month more than similar houses with one bath. The GRM indicated for this neighborhood is 135. The loss of value caused by the lack of a second bath is $1,350 ($10 monthly rent loss x 135 GRM). The amount of functional obsolescence is the difference between the cost of a house with and without the missing item

The second method attempts to isolate the value loss through direct sales comparisons; this method is also called paired sales analysis. Paired sales analysis, or paired data analysis, is a quantitative technique where nearly identical properties are analyzed to determine a single characteristic’s effect on value. This analysis is relevant, for example, where a comparable sale suffers the same negative influence as the subject property (e.g., proximity of residential property to large fuel tanks) and can be compared to a similar comparable sale located away from the negative influence. The accuracy of this method depends in part on the comparability of the properties. When land sales are used, paired sales analysis will measure external obsolescence attributable to the land value. But when improved property sales are used, they measure external obsolescence attributable to the property as a whole.

For example, House A, a one-story contemporary style house with living room, dining room, kitchen, three bedrooms and two full baths, sold for $77,200. Similar House B sold for $79,000. The significant difference between the two houses is that B has a two-car garage and only a bath. In this market, houses with a two-car garage sell for $3,000 more than houses with no garage. The value of the difference between 2 full baths and one bath can be calculated as shown

Example 1: Estimating Incurable Functional Obsolescence Using Matched Pair of Sales

|  |  |
| --- | --- |
| Sale price, House A with 2 full baths, no garage  | $77,200 |
| Sale price, House B with 1 bath, 2-car garage  | 79,000  |
| Difference |  $ 1800 |

Your market analysis has established that Value of 2-car garage indicated by market is $ 3,000. Therefore, Indicated difference in value between 2 full baths and 1 bath is $ 1,200.

The measure of functional obsolescence in this example is the difference between the cost of the extra bath, less all other forms of depreciation, and the value difference indicated by the market.

**Super adequacy Not Economically Feasible to Cure: T**he second type of incurable functional obsolescence is caused by super adequacy. Probably only a small percentage of houses exist that has some such obsolescence. This type of functional obsolescence involves a property component in excess of market standards, for which there is no apparent economic advantage to cure. The presence of a super adequacy can create additional costs of ownership such as higher utility, maintenance, and repair expenses.

The number of super adequacy tends to increase as a house gets older and the occupants improve it with features suited for their individual living style. Super adequacies are not only improvements made after construction but also anything initially built into the house that does not add value at least equal to its cost. An example is a master bedroom, 16 x 18 feet, which cost $500 more to build than a bedroom 14 x 16 feet. If the extra size only adds $300 value, the lost $200 is functional obsolescence, super adequacy (again, assuming there are no other forms of depreciation).

Almost all super adequacies are incurable in houses. (In commercial and investment properties sometimes it pays to remove them because of excess operating costs). For example, a new house suffering from no physical deterioration or economic obsolescence has a swimming pool that cost $10,000 to install. It adds only $6,000 value, so $4,000 is functional obsolescence-super adequacy. Super adequacies are measured in the same manner as deficiencies, by finding a matched pair of sales from the market. If a rent differential can be attributed to the super adequacy, it can be capitalized to indicate the value of the super adequacy. The difference between this value and the cost, less other forms of depreciation would be the depreciation classified as functional obsolescence-super adequacy.

It should be noted that, sometimes an entire structure can become functionally obsolete because of its location, for example, a large, custom-built house in a moderately priced neighborhood or a small, low-quality house in a high-priced neighborhood. Caution should be used by the appraiser to accurately measure such depreciation based on market analysis.

**Estimating external obsolescence**

External obsolescence is a loss in property value caused by external forces. 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. A decline in sales volume, profits or a decline in the value of company assets can lead to external obsolescence.

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. Additionally, a long-term loss in business value can ultimately have negative effects on the value of the property. 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.

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.

Depreciation resulting from external obsolescence is generally estimated using the two methods described above under incurable functional obsolescence: namely, capitalization of the net income loss or market comparison (i.e., paired sales analysis).

However, a different method is used because part of the rent loss caused by economic obsolescence must be allocated to the land. External obsolescence generally affects the entire property—that is, both land and improvements—but obviously only the loss in value attributable to the improvement should be counted as depreciation. Correctly estimated, land, or site, value used in the cost approach should already reflect the portion of value loss attributable to the site. Thus, with external obsolescence that affects the entire property, it is necessary to make an allocation of a portion of the total value loss to the improvement in order to avoid a double counting of depreciation. Difficulties in quantifying obsolescence also arise if there is not an established market place to form comparative judgments.

Capitalization of income loss is the most commonmethods to determine the effect of external (economic) obsolescence. With appropriate income information, external obsolescence can be quantified by capitalizing the loss in income.

**Example 1:**  the market indicates that houses next to gasoline stations rent for $10 less than other houses. The GRM for the neighborhood is 130. The land-to-improvement ratio in this neighborhood typically shows that land 15%, improvements, and 85%. Some of the rent loss must be allocated to the land, which in this case is 15%

Estimating Economic Obsolescence

Total rent loss GRM 130 × $10 (rent loss ) $1,300

Loss allocated to land (1300 x .15) 195

Loss allocated to improvement $1,105

Economic obsolescence $1,105

**Example 2:** A single-family residence is located in a neighborhood in transition to commercial use. The marketability for this house has been adversely affected. Similar houses rent for $850 per month. The subject property will rent for no more than $700 per month. Market analysis indicates that the capitalization rate is 12 percent

Monthly rent of unaffected property $ 850

Monthly rent of affected property - 700

Estimated monthly rent loss =$ 150

$150 × 12 months = $300 rent loss per year

$300 capitalized at 12% = $2500.

The amount to deduct from the building value for external obsolescence is $2500.

Economic obsolescence can also be calculated by finding matched pairs of sales. The pair must consist of one sale that is affected by the influence causing economic obsolescence and another sale that is not so affected. First all other differences are adjusted for and any remaining difference is attributed to economic obsolescence.

Example 1: Estimating Economic Obsolescence Using Matched Paired Sales

House D is a new, one-story ranch style house with a two-car garage. It is two blocks from the local school. House E is very similar to House D except that it has a one-car garage and is next door to the school. House D sold for $48,000. House E sold for $44,500. Two-car garages in this market add $3,000 value to houses in this neighborhood and one-car garages add $1,000 value. Lots in this neighborhood are about 20% of total value of typical property

|  |  |
| --- | --- |
| Sale price, House D with 2-car garage, away from school  | $78,00 |
| Sale price, House E with 1-car garage, next to school | -74,500 |
| Difference  | 3500  |
| Difference between value of 2-car garage and 1-car garage | -2000  |
| Indicated difference in value caused by school  | $ 1,500 |
| Value loss allocated to improvements ($1,500 x 80%)  | $ 1,200 |

As the above discussion demonstrates, the estimation of depreciation using the observed condition (breakdown) method is a relatively complicated undertaking. The essence of the method is that each type of depreciation, or loss in value, is estimated separately, taking care to not double count any depreciation. The measure of depreciation in a given circumstance may be affected by the cost basis used—i.e., replacement or reproduction cost—and whether the item was or was not included in the estimate of cost new. Again, the reader is referred to standard appraisal texts for more information regarding this method.

**Application and limitation**

This is the most refined method of examining complex causes and cures of depreciation. The breakdown method can be used to segregate and label particu­lar types of depreciation if overall depreciation is known. Working the other way, the breakdown method can be used to develop an overall estimate of depreciation by estimat­ing and adding up all the separate forms of depreciation found in a market. This requires appraisers to identify and measure each form of depreciation for all components of a building. This tech­nique is limited by the difficulty of estimating losses to long-lived im­provements and external obsolescence, but it is appropriate and accu­rate when coupled with the market extraction method.

However, the breakdown method is not widely used because it is time taking, expensive, laborious and difficult to support when many calculations are necessary. In most mar­ket value appraisals depreciation can be estimated using the sales com­parison (market comparison) or age-life techniques, so the more time-consuming breakdown method is not popular. Also, it requires apprais­ers to know what types of depreciation exist and to measure each one. Applicable for appraisal assignment is to examine each forms of depreciation can be difficult to calculate minor or obscure depreciation accurately. Also, measurement by rental loss is sometimes difficult to substantiate. It is not usually more accurate despite the extra time and effort involved.

**Total accumulated depreciation**

Up until this point, depreciation has been looked at in terms of its causes. What is ultimately important in the estimation of value via the cost method is total accrued depreciation. How do we estimate total accrued depreciation given the fact that none of the methods discussed so far incorporates all the causes of depreciation? The approach being proposed here is to combine the impact from the various causes of depreciation. That is to say whatever rate is arrived at as accumulated depreciation should take account of age, condition of the property (i.e. level of maintenance) and functional obsolescence.

In estimating total accumulated depreciation, we first estimate the depreciation rates for the individual causes of depreciation. In this instance, the reverse sum of the year’s digits is adopted for age and functional obsolescence whiles physical depreciation (curable) is estimated using the schedule of maintenance approach. The second step is to combine these rates by taking into account the contribution of each of these to total depreciation. This involves first accounting for the curable physical depreciation before any reduction is made for incurable physical depreciation and functional obsolescence. Such an approach as is important because the estimate for incurable items must be based on the assumption that all curable items are repaired.

In estimating total accumulated depreciation the three causes of depreciation of interest to appraisers should be explicitly incorporates all these elements in the process of estimating depreciation. Such an approach provides perhaps the values best estimate of accumulated depreciation for any particular property. Despite there is an attempt of developing or adopting a single model that will allow for a more objective estimation of total accumulated depreciation from all sources, one or more of these approaches are used in all estimations of depreciation ; the approaches employed depend on availability of market derived data , the intended aim of calculating amount of depreciation : overall depreciation or segregate and label particu­lar types of depreciation etc.

For example a combination of the age life or straight line and cost-to-cure methods may be used to determine total accumulated depreciation.

To illustrate how the these methods being proposed could workconsider the three stories building which is located to next to gasoline stations used for multipurpose. It is 20 years old and has a remaining life estimated at 40 years for a total life of 60 years, thus depreciating at a rate of 1.67 percent a year. Effective age due to condition estimated at 15 years. Cost of new improvement is estimated to be $105,000. The cost of restoring the new roof, exterior painting is $5,000. Assume that in light of current market expectations, the building has deficiency, i.e. modernize bathroom that cost $3,900. Due to poor room arrangement results in rental loss of $40 per month when compared to normal multipurpose building. The market indicates that monthly gross multiplier 100. The market also indicates that building next to gasoline stations rent for $50 less per month than other building. Capitalization rate applicable to properties in ideal neighborhood (ratio of annual rent to value) is 10.5 percent. The land-to-improvement ratio in this neighborhood is : land -30 percent, building -70 percent. Some of the rent loss must be allocated to the land, which in this case is 30%.

Problem

1. Estimate total depreciation of the improvement and allocate to physical, functional and external.
2. Estimate depreciated value of the building

**Solution**

|  |  |
| --- | --- |
| Cost New...................................................................................... | $105,000 |
| 1. **Normal deterioration**:

 1.67 percent x 15 years = 25 percent 25 percent x $105,000 =.......................................... | $26,250 |
| 1. **Excessive physical deterioration**:

 New roof, exterior painting...................................... | $5,000 |
| 1. **Functional obsolescence, curable**:

 Modernize bathroom................................................ | $3,900 |
| 1. **Functional obsolescence, incurable:**

 Poor room arrangement results in rental loss of $40 per month when compared to normal house. Monthly gross multiplier 100. 100 x $40 a month =................................................ | $4,000 |
| 1. **External obsolescence**:

Estimated rental loss due to external causes...................... | $50 |
|  Yearly rental loss is 12 x $50 = $600Capitalization rate applicable to properties in ideal neighborhood (ratio of annual rent to value) = 10.5 percentCapitalized rental loss:$600 ÷ 10.5 percent = $5,700 Ratio of land to building value:in ideal neighborhood, land 30 percent, Building 70 percent. |  |
| **Economic obsolescence**:70 percent x $5,700........................................... | $3,990 |
| TOTAL ESTIMATED DEPRECIATION................................ | $43,140 |
| DEPRECIATED VALUE OF BUILDING............................... | $61,860 |

## 4.4 Layout of Cost Approach

As discussed earlier in this chapter, there are five basic steps to the cost approach. Essentially they provide for an estimate of the site (land) value, to which is added the depreciated reproduction cost or replacement cost (new) of the improvements as of the date of the appraisal.

Up until this point, we have seen three steps ( 1) estimates the value of the site (land) in its highest and best use as if vacant ; 2) estimates the reproduction cost or replacement cost new of all improvements (excluding any that were included as part of the site value) and 3) estimates accrued depreciation from all causes. So we have left two steps: deducting the total of ccrued depreciation (Step 3) from the cost new f the improvements (Step 2) to arrive at a depreciated value of the improvements recognized as the market value and finally to adds the site (land) value (Step 1) to the depreciated value of the improvements (Step 4) to arrive at a market value of the property indicated by the cost approach.

The following is summary of cost approach:

|  |
| --- |
| Market Value of Land |
| + Replacement cost new of improvements |
| - All forms of depreciation |
| + Entrepreneurial Profit |
| = Market Value via the Cost Approach |

Example:

For example, an apartment which has 6,947 square foot building improvement, 567 square foot Canopy and other improvements is being appraised. The building actual age is 20, effective age is 15, remaining economic life is 30 years and the expected physical life is 45years.Based on the market analysis, the present reproduction cost of improvement is 8 and 25 per square foot for the building improvement and Canopy respectively. The market also indicated that to install other improvements it will cost 32,000

The market shows that the physical curable defect of the building repairs required 2,500. In this example, Physical, Uncured (Anticipated Future) items of the building new cost and the building under the straight-line or age-life method depreciation percent for short lived items are given below

|  |  |  |
| --- | --- | --- |
| **Short lived Items**  | **Cost New** | **% of depreciation**  |
| Roof | $ 25,000 | 33% |
| Mechanical | $ 20,000 | 33% |
| Floor Cover | $ 8,000 | 50% |
| HVAC | $ 48,000 | 30% |

When estimating the current cost to replace building improvement, canopy and other improvements include only reference to the current prices of direct and indirect cost which doesn’t include cost for entrepreneurial services. It is therefore appropriate to add amounts for entrepreneurial services costs that would typically be incurred in bringing the property to a finished state. In this example, entrepreneurial profit refers 15% of a market-derived estimate of direct and indirect costs and site value.

Given the assumption that there is no functional or external obsolescence, what is the total amount of physical deterioration?

**Solution: Cost Approach Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **Improvement**  | **Sq.ft** | **@** | **Cost**  |
|  Building improvement | 6,947 sq.ft | 8 sq.ft | 594,778 |
|  Canopy | 567 sq.ft | 25 sq.ft | 14,175 |
|  Other improvements |  |  | 3,200 |
|  **Estimated Replacement Cost New** |  |  | **640,953** |
| Estimate Of Physical Depreciation |  |  |  |
| 1. Curable Physical Deterioration
 | 2500 |  |  |
|  **Total Physically Curable** |  |  | 2500 |
| B. Physical, Uncured (Anticipated Future) |  |  |  |
| **Short lived Items**  | Cost New | % of dep  | Depreciation  |
|  Roof | $ 25,000 | 33% | $ 8,250 |
|  Mechanical | $ 20,000 | 33% | $ 6,600 |
|  Floor Cover | $ 8,000 | 50% | $ 4,000 |
|  HVAC | $ 48,000 | 30% | $ 14,400 |
|  **Sub Total**  | 101,000 |  |  |
| Physically Uncured (Short Lived) |  |  | 33,250 |
| **Physical Depreciation Long-lived Items** |  |  |  |
| Total Replacement Costs |  |  |  **640,953** |
| Less Replacement Costs of |  |  |  |
|  Curable Items | 2500 |  |  |
|  Other short-lived items | 33,250 |  |  |
|  **Sub Total** |  |  | 103,500 |
| **Replacement cost of long lived**  |  |  | 537,453 |
|  Expected Economic Life | 45 |  |  |
|  Effective Age | 15 |  |  |
|  Ratio | 33.33% |  |  |
| **Total: Long-lived physical depreciation**  | $ 537,453X33.33% | 179,133 |
| **Total Physical Depreciation** |  | 214,833 |
| Estimate Of Functional And External Obsolescence |  |  |
|  Functional Obsolescence |  | 0.00 |
|  External Obsolescence |  | 0.00 |
| **Total Estimate Of Accrued Depreciation** |  | **214,833** |
| Total improvement new cost  |  | **426,120** |
| **Estimated value based on cost approach**  |  |  |
|  Site Improvements |  | **156,000** |
| Total improvement cost (direct cost plus indirect costs) |  | **426,120** |
| Entrepreneurial profit (10% of direct and indirect costs and site value)  |  | **58,207** |
| Total improvements cost new including Entrepreneurial profit |  | **484,327** |
| Site value  |  | **156,000** |
| **Total Value Indication by the Cost Approach** |  | **640,327** |

Following is a summary of the cost approach

|  |  |
| --- | --- |
|  Market Value of Land | 156,000 |
| + Replacement cost new of improvements |  640,953 |
| - All forms of depreciation | 214,833 |
|  Total Curable | 2,500 |
|  Total Short-lived Incurable | 33,250 |
|  Total Long-lived Incurable | 179,133 |
| Total Estimate Of Accrued Depreciation | 214,833 |
| + Entrepreneurial Profit | 58,207 |
| **Value Indication by the Cost Approach** | **640,327** |

Example 2: Assume once again a 100,000 square foot warehouse that is 5 years old. The economic life is 30 years. It sits on 150,000 square feet of land, enough for truck turns and docking and with some parking. It is multi-tenant and set up for several different tenants. There is enough parking for 100 cars in addition to 10 truck docking doors. There is not enough land for more parking but there is a raw land parcel next door that could be purchased and prepped for $10 per square foot. The current level of parking required for more labor intensive retail distribution firms suggests enough parking be added for 50 more cars. This means 11,250 more paved area at a finished cost of $12 per square foot or $135,000 dollars beyond the land cost. Without the additional parking half the building will remain vacant. Economic life on similar bulk warehouses is 30 years. Warehouse has 32 foot ceilings. Similar buildings cost $50 per square foot new including hard costs, soft costs and normal fees. Lease up costs estimated to require $60,000 in commissions/ marketing; $50,000 in capital carry costs. What is the value via the cost approach and considering the extra parking required?

**Solution to problems**

|  |  |
| --- | --- |
| cost of new Value =  | = 150,000 \* ($10) = $1,500,000 |
| Cost New building = | = 100,000 \* $50 = $5,000,000 |
| Accrued Depreciation = |  5/30 \* $5,000,000 = (833,333)  |
| Lease Up and Carry Cost | = $110,000 Net Cost New = $5,776,667 |

Here we could stop and can suggest the value is roughly $5.776 million, but there is a problem with parking relative to current market requirements. The property has a functional deficiency of 50 parking spots and without this parking will be worth much less then the net cost new. A present value of the lost rent over 25 years based on 50,000 additional empty square feet at $7.50 per square foot per year net discounted at 10% is approximately $3.4 million. So the parking expansion is a must

|  |  |
| --- | --- |
| Cost of New Value =  | = $5,776,667 |
| Less Functional Depreciation  | = (3,400,000) w/o pkg |
| AS IS Value  | = $2,366,667 |
| Cost New Value with the additional parking | = $5,776,667  |
| Additional Parking Cost or Functional Depreciation  | = ($12 land+$10 prep) \*11,250 sq ft = (247,500)  |
| Total cost new and value as expanded at the same rent | = $5,529,167 value |

Example 4: You have been retained to appraise a 640 acre farm. Improvements include a shop and livestock handling faculties. Given the following information use the cost approach to estimate the value of this subject property

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  RCN  | Curable Deterioration | Effective Age  | Remaining Economic Life | Total Expected Economic Life |
| Shop | $50,000  | $ 12,000  | 15 years  | 35 years | 50 years  |
| Livestock Facilities  | $36,000  | $ 2,500  | 20 years  | 30 years | 50 years  |

An analysis of comparable sales in the area indicate that the value of similar land is $ 475 per

Acre:

1. Estimate the accrued depreciation for the improvements.
2. Estimate the contributory value of the improvements.
3. What is the estimated value of the ranch using the cost approach?

**Solution**

From the given data we can calculate ratio as follows

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Effective Age  | Remaining Economic Life | Total Expected Economic Life | Ratio |
| Shop | 15  | 35 years | 50 years  | 0.30 |
| Livestock Facilities  | 20  | 30 years | 50 years  | 0.40 |
| You estimate the following curable repairs on short lived items: |
| Shop | 12,000 |  |  |  |
| Livestock facilities  | 2,500 |  |  |  |
| Total Curable Depr | 14,500 |  |  |  |
|  |  |  |  |  |
|  |  |  | Incurable Depreciation |
| Shop | 50,000 - 12,000 = $38,000 \* 0.30 | 11,400 |
| Livestock Facilities  | 36,000 - 2,500 = $23,100 \* 0.200 | 13,400 |
|  Total Incurable Depr | $24,800 |
| A. Total Depreciation: $ 14,500 + $24,800 = $39,300 |
| B. Contributory Value = $86,000 - $39,300 = $46,700 |
| C. Property Value = Land Value ($475/acre \* 640) = $304,000 |
|  Improvement Contributory Value = $ 46,700  Total Property Value = $350,70 |

## 4.5 Application of cost approach: advantage and disadvantage

The truthfulness of any valuation process depends on the adoption of appropriate value basis and methodology. In the case of the cost approach, debate has more or less overlooked a fundamental gap in logic between the cost approach and appraisal principles. While some appraisal principles do premise aspects of the cost approach, none fundamentally premise the crucial logic of pricing based on the cost of producing an alternate property of comparable utility—the essence of the cost approach.

Currently, the practice indicated that the cost approach has fallen in and out of favor several times since the Great Depression and the beginning of the appraisal profession. The most recent versions of the standard residential appraisal forms do not include the cost approach, which would imply that this approach is currently out of favor with that segment of the profession. Hence the application of cost approach is limited because no principle of appraisal methodology fundamentally premises the analytic means of the cost approach. In turn, appraisal estimates may be rendered invalid when an appraiser relies on the cost approach significantly during reconciliation. Since the rational of appraisal requires principles that fundamentally premise analytic means, and since the cost approach is the only one of the three basic approaches to value that lacks such a premise, a principle is proposed to bridge the logic gap

It is also argued that very often cost does not equal market price. Economic theory says in the long run, cost should be related to value. Something that takes a week to build should cost less than something that takes a year to build. Supply will adjust until price equals cost at equilibrium. But property markets are seldom at equilibrium so, in general, cost does not equal price. Supply adjustments involve long time lags. If market prices are above equilibrium, there is a potential developer profit, which can be quite substantial. $1 of land plus $1 of building might equal $3 of market value. In a property bust, cost may be much greater than current prices.

Supply and demand rule short-run prices. Sales transactions are necessary to reveal the current relationship of costs to prices. The tendency will be for markets to adjust towards equilibrium—if prices are above costs, then new supply will tend to be created and prices will fall. If prices are below costs, construction will cease until demand increases or buildings are removed from the stock. But because adjustments are slow, at any given time, the market is likely to be out of equilibrium. Therefore, the cost approach should only be used as a last resort. It should be used only where there is no useful or relevant evidence of recent market transactions due to the specialized nature of the property. The specialized nature may be a result of the size or location of the property, as well as the service provided. But it does not follow that, where the cost approach has been the valuation method in the past, it remains appropriate to use the cost approach for the latest valuation, since there might be sufficient evidence of an emerging market.

In general, the use of cost approach to value property has the following advantage and disadvantage

**Advantage of the Cost Approach**

The advantage of the cost approach is

* People can understand it easily
* It is often the best approach in the appraisal of special purpose properties and properties that are not frequently exchanged in the market
* It is the best approach when the function of the report is for insurance purposes
* There is relative ease in making cost calculations
* It can often be a convincing test of value for new construction that shows no signs of depreciation
* It can use to estimates value of fee simple interest
* This approach derives information needed in the direct comparison or income approaches to value (e.g., cost to cure items of deferred maintenance)

**Disadvantages of the Cost Approach**

On the other hand, the cost approach and its estimates has found to be disadvantageous because,

* It is difficult to accurately estimate accrued depreciation, and as buildings get older, the possibility of error becomes greater
* Relies on the assumption that cost equals value, which is not always true
* Costs are constantly changing
* From five cost estimates, it is possible to get five answers
* Value estimate needs to be adjusted to reflect other than fee-simple interest
* It usually does not incorporate the expected economic benefits or the income generating potential of the asset.
* It doesn’t take into account the factors of risk and uncertainty associated with realizing the economic benefits

Cognizant of these facts, it can be conclude that the cost approach should be included whenever individual buyers and sellers would tend to rely on it significantly. More specifically, the cost approach should be included in situations when alternative production is feasible at values less than those indicated by the income and sales comparison approaches—in other words when individuals would tend to consider production as a feasible alternative. It may also be used when other approaches are not feasible. In other situations, however, the cost approach adds no insight into value because the logic of individuals represented by the principle of production predisposes them not to consider the cost approach. In those situations, the cost approach should be dismissed.

**Summary**

In cost approach value of property is estimated as the current cost of reproducing or replacing the improvement minus the loss in value from depreciation plus land or site value. The philosophical basis of the cost approach is based on the assumption that anyone buying a completed property will pay no more than the value of the land or fee interest plus the cost of improvements on it, adjusted by an allowance for depreciation and obsolescence. This simply involves adding to the land value all the hard costs and all the soft costs, including estimates for debt costs and builder’s profit. Although the cost approach is helpful, it is often not very precise because of the general methods used to calculate hard costs. Furthermore, if you have other project proposals that are similar in type and scope to the one you are focused on, you can make your own top-down estimates.

To appraise property using cost approach, appraisals require information’s on cost of land, cost of building (improvement) and cost of depreciation. The cost method valuation is based on the cost of building *less* obsolescence and depreciation *plus* the site value. The approach recognizes the value of the site for the particular use, but as there is no market then it is the cost of the building that is taken into account. This produces a value for a new building; older building costs will require an adjustment to represent depreciation (the wearing out of the building fabric) and obsolescence (the inability of older building to facilitate optimum performance, as expected by current standards of design and technology and the present-day economics of location and use).

The quantity survey method itemizes in great detail all of the direct and indirect costs of each item in the construction of a building. Because it is so time-consuming, this method is rarely used by an assessor, even though it is extremely reliable. Assessors may encounter quantity survey estimates in the appeals process. The unit-in-place method is a variation of the quantity survey method. It combines the direct and indirect costs into a single unit cost. This unit cost is then multiplied by the area of the portion of building being priced. The square-foot or cubic-foot methods are based on floor area or volume of a structure. Although not as accurate as the first two methods, they are easy to use and understand. The cost per square-foot or cubic-foot is simply multiplied by the total area or volume to arrive at a total indication of value. The factored historical cost method is used to value one-of-a-kind or special purpose structures. The date of construction and the original cost must be known and a conversion factor used to bring the value up to date.

Depreciation is the difference between the cost new of the improvements and their value as of the effective date of appraisal. Depreciation can be classified as physical, functional, or external. Year and tear or the effects of the passage of time usually cause physical deterioration. Improvements that are not consistent with the demands of the market suffer functional losses. This means the market wants something other than what the subject offers. Losses attributed to external obsolescence are caused by factors outside the subject property. These can be catego­rized further as vocational and economic losses. Vocational losses are caused by the proximity of adverse factors, e.g., a noisy railroad track next to a residential property. The noise will affect U1e land and build­ing values negatively. Economic losses are related to market supply and demand. For example, when mortgage interest rates rise and de­mand falls off rapidly, the prices paid for real estate will be affected. The loss in value would be reflected in the cost approach as external obsolescence. This loss in value would also be reflected in the sales comparison approach in the prices of properties subject to the same economic conditions.

The difficult of estimating depreciation in older properties may diminish the reliability of the cost approach in that context. Cost may be estimated on two different bases-replacement cost or reproduction cost. Specific types of obsolescence would be precluded by a replacement cost estimate. The proper estimation of depreciation for valuation purposes within the cost approach to value estimate is of crucial importance not only in arriving at correct estimate of value but also has the potential to reduce the variation that usually exist between values declared by valuers on the same property.

The cost approach is most applicable in valuing new or proposed construction when the improvements represent the highest and best use of the land and land value is well supported. This method is used for certain types of building or uses where the properties rarely change hands in the market, or the properties may form part of a larger commercial transaction where the property element is only a small part. In these circumstances, analysis of prices in the market will provide little evidence for a useful valuation. Properties of this type are only offered on the open market where the building use has expired and the building or site can then be developed for a different use. The market is thus for an alternative use for the property, such as the conversion of a redundant church for residential use. Depending on the purpose of the appraisal assignment, the cost approach can be used to develop an opinion of the market value or use value of special-purpose properties and properties that are not frequently exchanged in the market.