Age and Life Definitions per
IAAO's "Glossary for Property Appraisal and Assessment"

Physical Life: *"The period over which a physical property is capable of functioning without being scrapped or reconstructed."* [Scrap value remains at the end of an asset's physical life.]

Economic Life: *"The period during which a given tangible asset, building, or other Improvement to property is expected to contribute (positively) to the value of the total property. This period is typically shorter than the period during which the improvement could be left on the property, that is, its physical life."* [Salvage value remains at the end of an asset's economic life.]

Service Life: *"The period of time (or service) for an asset from the date of its installation to the date of its retirement from service."*

Useful Life: *"Estimated normal operating life in terms of utility to the owner of a fixed asset or group of assets."*

Chronological Age: *"The number of years elapsed since an original structure was built. Synonyms are actual age and historical age."*

Effective Age: *"The typical age of a structure equivalent to the one in question with respect to its utility and condition, as of the appraisal date. Knowing the effective age of an old, rehabilitated structure or a building with substantial deferred maintenance is generally more important in establishing value than knowing the chronological age."*

- With regards to deriving and using physical deterioration depreciation tables, "life" is a term generally applicable to a class or group of properties and is a known quantity. "Age" is a term generally applicable to a specific property and is an ongoing phenomenon.

- In generally accepted appraisal practice, the use of effective age is preferable to actual age in physical deterioration depreciation considerations for any particular property. Average age is never a consideration as every property should be appraised based on its own characteristics and attributes. The use of an average age is only useful when appraising a group of properties in which all the properties in the group are identical (or at least similar) in age and expected remaining life.

- For properties that are more or less substantially rebuilt before the completion of an otherwise normal expected life cycle (through application of "sustaining capital"), effective age is typically less than actual age; i.e., the property is "newer" than actual age whereas less physical deterioration depreciation should be considered in the valuation process. The preferred method to recognize the additional value attained by the property's "newer" condition is to use effective age instead of actual age in the calculation of depreciation (i.e., application of higher percent good). Alternatively, a higher floor percent good value and/or longer economic life could be implemented to accomplish this same value recognition.

- The depreciable life of a depreciation percent good table should be based on the economic life typical or expected of the class or group of properties applicable to the table. This economic life is preferably derived by analysis of actual service lives experienced by the same or similar property similarly situated in utility, geography, and/or any other meaningful valuation attribute.

- Depreciation consideration in the appraisal of a group of properties, as opposed to separate appraisals for each property, is only possible when the group is composed of like properties; i.e., all the properties in the group must be of the same vintage and have the same remaining life expectancy. Otherwise, a mismatch will occur between the cost basis and the depreciation which is tied to an assumed age and life which will not correctly represent each property in the group; the resulting group value after depreciation will be distorted.

Expectancy Life (% Good) Factors*

Tax Year 0

0.0% Floor Depreciation**

8.0% Rate of Return**

		Service Life (yrs)										
Year Installed**	Age (yrs)	3	5	7	8	10	12	15	20	25	30	35
-1	1	0.6920	0.8295	0.8879	0.9060	0.9310	0.9473	0.9632	0.9781	0.9863	0.9912	0.9942
-2	2	0.3593	0.6455	0.7669	0.8044	0.8564	0.8904	0.9234	0.9545	0.9715	0.9816	0.9879
-3	3	0.0000	0.4466	0.6362	0.6948	0.7759	0.8289	0.8804	0.9291	0.9556	0.9713	0.9812
-4	4	0.0000	0.2319	0.4950	0.5764	0.6889	0.7626	0.8340	0.9015	0.9384	0.9602	0.9738
-5	5	0.0000	0.0000	0.3425	0.4485	0.5950	0.6909	0.7839	0.8718	0.9198	0.9482	0.9660
-6	6	0.0000	0.0000	0.1778	0.3103	0.4936	0.6134	0.7298	0.8397	0.8997	0.9352	0.9574
-7	7	0.0000	0.0000	0.0000	0.1611	0.3841	0.5298	0.6714	0.8050	0.8779	0.9212	0.9482
-8	8	0.0000	0.0000	0.0000	0.0000	0.2658	0.4395	0.6083	0.7676	0.8545	0.9061	0.9383
-9	9	0.0000	0.0000	0.0000	0.0000	0.1380	0.3420	0.5401	0.7271	0.8292	0.8898	0.9275
-10	10	0.0000	0.0000	0.0000	0.0000	0.0000	0.2366	0.4665	0.6834	0.8018	0.8721	0.9159
-11	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.1229	0.3870	0.6363	0.7723	0.8531	0.9034
-12	12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3011	0.5853	0.7404	0.8325	0.8899
-13	13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2083	0.5303	0.7060	0.8103	0.8753
-14	14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1082	0.4709	0.6688	0.7862	0.8595
-15	15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4067	0.6286	0.7603	0.8424
-16	16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3373	0.5852	0.7323	0.8240
-17	17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2625	0.5383	0.7021	0.8041
-18	18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1816	0.4877	0.6694	0.7827
-19	19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0943	0.4331	0.6341	0.7595
-20	20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3740	0.5960	0.7344
-21	21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3103	0.5549	0.7074
-22	22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2414	0.5105	0.6782
-23	23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1671	0.4625	0.6466
-24	24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0867	0.4106	0.6125
-25	25	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3547	0.5757
-26	26	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2942	0.5360
-27	27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2289	0.4931
-28	28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1584	0.4467
-29	29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0822	0.3967
-30	30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3426
-31	31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2842
-32	32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2211
-33	33	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1530
-34	34	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0794
-35	35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-36	36	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-37	37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-38	38	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-39	39	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-40	40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Expectancy Life Formula:

$$\%\ \text{Good} = \frac{(1+R)^{SL} - (1+R)^{Age}}{(1+R)^{SL} - 1}$$

, where R = Rate of Return (decimal)
SL = Service Life (yrs)
Age = Age (yrs)

* Expectancy Life Factor for any particular year is the inverse of allowed percentage depreciation, converted to decimal form. For example, using a 0.80 expectancy life factor (80% Good) is equivalent to allowance of 20% depreciation. Age-life methods of depreciation are based on the principle of remaining useful life of a property and use calculations related to the accrual of funds necessary to replace the non-salvageable portion of the property over a stated period of time assuming a typical rate of return. The fund balance at any point in time represents the cumulative depreciation the subject property has experienced. A greater assumed rate of return implies less depreciation is taking place, because less accrual of funds is needed over that stated time period to build the replacement cost of the assets. These methods relate to the concept of value as measured by the present worth of the future returns from a property's continued use. This concept is opposed to accounting methods that are used primarily for IRS cost allocation (tax write-off) purposes. For a complete discussion of valuation depreciation, please reference "Engineering Valuation and Depreciation" by Marston, Winfrey and Hempstead.

** For illustrative purposes only. Different categories of property may have different floor depreciation rates and rates of return. Figures in "Year Installed" column are relative to current tax year.

The Modified Chilton Factor for Utilization as used by Pritchard & Abbott, Inc.

Basis

The original Chilton factor is an equation that dates back to approximately 1950. This factor was created for estimating construction costs of industrial processes and plants based on production capacity. The Chilton equation recognizes the exponential relationship encountered when scaling a known cost by using a ratio between a known and a proposed production capacity. In simpler terms, the Chilton formula is based on economies of scale. Constructing a facility that has twice the production capability does not double the construction cost, for example.

The original equation below was created to estimate construction cost based on a different production capacity:

$$\text{Cost Scale Factor as a Percent} = \left[\left\{\frac{\text{Capacity } B}{\text{Capacity } A}\right\}^{n}\right] \times 100$$

Where *Capacity A* = Proposed Design Capacity;

Capacity B = Known Production Capacity;

and n = exponent or scale factor.

The exponent *n* in the above equation is normally 0.6 or 0.7 depending on the type of facility or equipment. This equation has been adopted by many appraisers without modification to create an economic obsolescence factor based on “utilization.” There are even several appraisal books that promote the use of this equation in this fashion – in error, in our opinion.

Problems

There are several reasons why it is wrong to apply this equation directly to appraisals to account for production changes. First, this equation is based on the cost for building plants of different sizes and does not take into account that reducing the production of an existing plant does not normally translate into an equivalent portion of equipment being out of service. Secondly, taking this equation to the extreme of zero production (zero utilization compared to capacity) would produce an economic obsolescence factor of 100%, leading to a conclusion of zero value for the equipment or facility. We submit this is an absurd result in the vast majority of cases. Simply turning off or shutting down a piece of equipment does not automatically mean that it must have zero value. Finally, by using the "Chilton" adjustment directly you would be fully recognizing the effects of management's operational decisions that may or may not be solely a result of external economic issues.

Solution

It is generally accepted that equipment readily available to be utilized (i.e., is still functional) that happens to be temporarily idle still retains at least half of its depreciated value. One way to adjust for the amount of production, to provide a lower limit of 50%, and to limit the effect of specious or obtuse management decisions is to average the existing facility with one that is available to be operated at full capacity but is not for temporary causes using the equation below:

$$Economic\ Obsolescence\ Factor\ as\ a\ Percent = \frac{\left[\left\{\frac{Capacity\ B}{Capacity\ A}\right\}^{n} + 1\right]}{2} \times 100$$

Where *Capacity A*	=	Design capacity;
Capacity B	=	Actual production;
and n	=	exponent or scale factor.

This equation has a natural lower limit of 50%. This equation is only intended for working equipment that is temporarily idle. If the equipment is not capable of operation without repair, or if the idle status is for obviously more than a temporary period, then some additional obsolescence may be warranted.

Exceptions

If the equipment is easily moved, these equations may not apply at all. Movable equipment can be sold as long as there is a market for it. For example, take the situation where a business has two identical forklifts manufactured in the same year. One of the forklifts is used 5 days a week and the other is used 7 days a week. When the forklifts are to be sold, they will normally have the same market value. If equipment is not used because an employer does not want to pay high enough salaries to attract enough employees to operate the equipment full time, then that is a business decision that does not affect the underlying value of the equipment.

On the other hand, if there is not enough work available in the market to keep the equipment busy, then there should be additional economic obsolescence (other than that derived by the modified utilization formula above) applied.

Conclusion

When the origins of the Chilton equation and its various shortcomings for use in appraisal work are understood, it becomes apparent that the original formula should not be used directly to estimate economic obsolescence. It is more appropriate to apply a factor that averages the Chilton equation with a hypothetical plant that is available to operate at full capacity but is not for temporary or extraneous causes to estimate a more accurate amount of economic obsolescence.