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Impairment Of Asset's Value – Depreciation Of Tangible Assets & Amortization Of Intangible Assets - Overview

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Abstract: *In real estate economics, valuation of asset fixes transfer value. Valuation is simply the land value component added with infrastructure built over on this particular plot. The infrastructure may be a building or any other commercial structure. In the case of serviced buildings, the component of depreciation will come in to picture. According to type of assets, it may be tangible or intangible. Physical depreciation means loss in dimension due to continuous use or any other physical alteration. Depreciation is also termed as loss of value of the sum invested. Depletion is one among such depreciation as it is called as depletion of value invested or available. Alternately, in case of intangible assets like copy right, patent right, brand value etc, the values may hike or low down according to market. In physical assets, depreciation is assumed to be occurring at a uniform rate and gradually increases until life of asset ends. In practice, there is no gradual wear and tear and the rate of depreciation will never be uniform. The authors realize that the level of depreciation, in practical utility, is of minimum magnitude at initial stages and expands till complete utilization. The assets being employed in the full scale of utilization shows continuous loss of capital sum invested, which depends on how best or worst the asset utilized. The benefit out of this analysis helps to find out the depreciated value at any point of time, so that any renovation or refurbishment could be undertaken.*
keywords: *Depreciation - Rate of depreciation - Historical cost - Types of depreciation Category of Utility- Optimal utilization of asset - Accelerated Depreciation-Cumulative depreciation*

OBJECTIVES OF THIS STUDY:
- To examine the consistency of prevailing methods of computing the rate of depreciation
- To introduce modern ideology to analyses and depict the amenable rate of depreciation
- To undertake a comprehensive study by considering only two elements time and utility
- To find out the new thoughts developed under the compatible ideology

DEPRECIATION IN REAL ESTATE ASSETS: Under the Income Tax Act, a building is a structure with a roof and walls, such as a house or factory. However, based on various case laws and notifications, the following items can also be classified under buildings for the purpose of charging depreciation allowance under the Income Tax Act.

Residential building	-	5% per year
Non - Residential building	-	10% per year
Hotel Buildings	-	20% per year
Plant & machines	-	15% per year
Motor cars	-	20% per year
Computer	-	60% per year
Furniture	-	10% per year

Schedule 2 of the Companies Act, 2013 provides the details regarding the useful life of assets that are tangible in nature. Depreciation of any type of asset is calculated using its Written Down Value (WDV) and Straight-Line Depreciation (SLM) as per this act. Following is a table with the useful life and rates of depreciation of buildings as per the Companies Act, 2013:

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Asset type	Useful life as per the Companies Act	Depreciation rate	
	In years	WDV rate	SLM rate
Factory buildings	30 years	9.50%	3.17%
Fences, wells, tube wells	5 years	45.07%	19.00%
Buildings (other than factory building) RCC Frame Structure	60 years	4.87%	1.67%
Buildings (other than factory buildings) other than RCC Frame Structure	30 years	9.50%	3.17%
Others (including temporary structures etc.)	3 years	63.16%	31.67%

DEPRECIATION OF TANGIBLE ASSETS: Depreciation is the gradual decline in an asset's value brought on by damage, obsolescence, or other circumstances. Property depreciation is a decrease in value brought on by these elements.

Negative Depreciation	Positive Depreciation: (Appreciation)
Depreciation of property has a big impact on taxpayers since it changes their taxable income and how much tax they have to pay. The Income Tax Department sets the depreciation rate, which varies based on the kind of property. It is possible to subtract a property's depreciation from the owner's taxable income, which lowers the owner's tax obligation. Usually depreciation is continuous reduction of historic cost over a period of service	Land scarcity, particularly in areas with a high demand and a limited supply, the value of the land may increase over time. For example, in densely populated cities such as Mumbai, the limited land supply can drive up the property value, even if it is just a 400-500 square feet apartment. Furthermore, scarcity creates opportunities for existing properties' redevelopment or repurposing, increasing their value. Therefore land prices increases day by day, called appreciation. Another example, is a family home passed down through generations may have significant emotional value to the family, despite its age and potential physical or functional obsolescence. In such cases, the emotional attachment can offset or outweigh the usual depreciation of the property and may willing to incur maintenance costs and other expenses to maintain the property's sentimental value, and potential buyers may also be willing to pay a higher price due to the emotional significance of the property. The rate of appreciation is calculated as – (current value - Historical value) x100 /Historical value as percent

INTANGIBLE ASSETS - AMORTIZATION: In case of intangible assets, the value due to amortization happens to be either increasing or decreasing order. The accumulated value increases according market demand. But the periodicity of amortization may normally shrinks as and when compared to routine depreciation course.

Negative amortization	Positive amortization
Due to technological advancement, the assets lose its credibility of economic losses, hence usages in the diminishing order. Also, the manufacturers reluctant to produce such assets. Examples are software programs used in computers, certain brand values of products, outdated model, and excessive wear and tear caused, etc. Credit amortization refers to the process of gradually paying off a loan or debt over a specific period of time through regular payments. Each payment typically covers both the principal amount (the original loan amount) and the interest	Certain assets have a unique characteristic such as brand value, copy right, patent right, shares, bonds etc., have been appreciating value always. This positive growth increases the capital value invested in many ways. These assets have high market always. Here the value is market dependent. High potential value occurs when demand is more comparatively supply is less. Diamond, Gold, Uranium, etc.

charges. At one point of time, loan pre-closure might be beneficial	

REVIEW OF LITERATURE:

1934: Up to this point the estimation of the useful lives of depreciable assets was not very regulated. Then, during the Great Depression, the Treasury tightened controls to help finance public works. They began requiring taxpayers to prove that they were selecting appropriate useful lives for their depreciable assets.

1942: Bulletin F. Result of the Revenue Act, 1942 introduced gain from the sale of depreciable business property as "Capital Gain". This had the effect of slowing depreciation deduction to reduce the effect of Capital Gains.

1954: Congress authorized the use of accelerated depreciation methods, including 200% declining balance and sum of the years-digits. The availability of accelerated methods of depreciation encouraged taxpayers to buy and/or build new plants and equipment.

1962: Bulletin F Abandoned & Special Guidelines were adopted for the examination of depreciation deductions. These guidelines were issued to reduce taxpayer – IRS disagreements over selected recovery periods and to liberalize depreciation rates. The new rate table was based upon broad industry classes of assets. The 1962 Revenue Act also included a provision for taxing of the gain on sale of depreciable property as ordinary income.

1971: The class life asset depreciation range system (ADR) was introduced. This provided for class lives based upon broad classes of assets and a range from which a life could be selected for depreciation. Initially ADR only covered Machinery & Equipment, but the 1971 Revenue Act gave ADR legal authority which expanded it to include buildings and land improvements.

1981: The Accelerated Cost Recovery System (ACRS) was designed to simplify cost and recovery and stimulate capital formation. Congress wanted to reduce the size of the deficit and real estate tax shelters.

1984: Tax Reform Act of 1984 slowed the cost recovery of Real Property placed in service after 3/15/1984. Cost recovery on "luxury" automobiles was slowed with an annual cap and section 280F "listed" property was made less attractive when such property was used 50% or less for business.

1986: Modified Accelerated Cost Recovery System (MACRS) was an entirely new system for tangible property placed into service after 1986. Under MACRS, the cost is recovered over a number of years based on the asset's class. One of the major benefits of MACRS was to allow companies to take more depreciation at the beginning of an asset's life to increase the net present value of capital purchases and help stimulate spending.

NEED FOR THE STUDY: Here are key reasons why it's important to study depreciation:

1**. Accurate Financial Reporting**:Depreciation helps businesses report accurate financial statements by reflecting the actual wear and tear or usage of assets. Without depreciation, a company's income statement would overstate profits, as the cost of using assets (e.g., machinery, equipment, and buildings) would not be accounted for properly.

2. Tax Implications:Depreciation has significant tax implications. Businesses can often deduct depreciation expenses from their taxable income, which reduces the amount of taxes they owe. By understanding depreciation methods, businesses can optimize tax strategies to maximize their savings.

3. Cost Allocation: Depreciation helps allocate the cost of an asset over its useful life. This allocation provides a more accurate picture of the cost of doing business in each period. Without this allocation, it would be difficult to determine how much of the asset's cost should be recognized as an expense during a particular period.

4. Investment Planning: For companies, understanding the depreciation of assets aids in investment planning and budgeting. It allows businesses to anticipate future expenses for replacing or upgrading depreciating assets, which is crucial for maintaining operations and managing cash flow.

5. Asset Management: Studying depreciation helps businesses assess the value of their assets over time. This can assist in decision-making processes, such as when to replace outdated assets or whether to continue using an asset that has depreciated significantly.
6. Cash Flow Management:Depreciation is a non-cash expense, meaning it reduces taxable income but does not require an actual cash outflow. By studying depreciation, businesses can better manage their cash flows, as they can account for tax savings and plan for future expenditures without worrying about immediate cash requirements for replacing assets.
7. Valuation of Assets:Depreciation is often used in the process of determining the current value of assets. Businesses can assess the fair value of their assets, which is particularly useful in mergers, acquisitions, and the sale of assets. In mergers of different categories of assets during amalgamation of entities, there is a need to set out depreciated value of existing plants & machines including building infrastructures correctly evaluated for both parties of amalgamation
8. Compliance with Accounting Standards:Depreciation is required under various accounting standards, such as Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS). Studying depreciation ensures compliance with these standards, helping businesses avoid legal issues and penalties.
9. Better Decision-Making:Understanding the impact of depreciation helps businesses make informed decisions about their asset purchases, usage, and maintenance. It allows for better planning when it comes to replacing old assets, investing in new technologies, or evaluating the lifespan of equipment. In summary, the study of depreciation is important for accurate financial management, effective tax planning, sound investment decisions, and overall business sustainability. It helps businesses reflect the true cost of using assets and comply with regulatory requirements.

EMPIRICAL FORMULAE (IN PRACTICE):
1. Direct appraisal method: Arbitrary assumption of the rate of depreciation is based on the experience of a valuer, where wear & tear, repair cost, restoration costs, etc. which are not easily predictable
2. Written down value method:
Net Present Value = Original Capital cost x [1 – the rate of depreciation] $^{\text{age of asset in years}}$
3. Straight line method:
Net Pre. Value = Original Capital cost – [No of years x [(Original Capital cost – Scrap/Salvage Value)]]
The total life of the asset in years
4. Constant percentage method:
Net Present Value = Current replacement cost x [100 – the rate of dep]$^{\text{age of asset in years}}$
100
The rate of depreciation depends on the total life of the asset, 100/60 = 1.67, taken 60 years as life
5. Sinking fund method: Net Present Value = Replacement cost x Percent depreciation based on age
Percent Depreciation = 100 x Annual sinking fund x Accrued sum for Re 1
Annual sinking fund = Rate of Interest/ [(1+ Rate of Interest) $^{\text{Total life of the asset in years}}$ -1]
The accrued sum for Re 1 = [(1+ Rate of Interest) age of asset in years – 1]/ Rate of Interest
6. Sum of digit method: This method shows a lower depreciation rate in earlier years and higher in later periods. This is based on DIGIT derived by the summation of years of the total life of the asset.
Therefore, summation of DIGIT for 60 years = (1+60) x (60/2) = 1830
Rate of Depreciation = Summation of the age of the asset/DIGIT
Net Present Value = Original Capital cost x rate of depreciation
7. Declining balance method: Rate of Depreciation/year = Salvage Value$^{(1/\text{Total life of the asset})}$
Original Capital Value

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MODERN THEORY OF DEPRECIATION: Depreciation is the process of allocating the cost of a tangible asset over its useful life. Generally, for all purposes, we adopt rated depreciation throughout the life of the assets assigned by the builder/manufacturer. In practice, depreciation will not occur uniformly throughout the physical life of the assets. That is why, the authors modified the uniform rate of depreciation and formulated the alternate appropriate method. In fact, the rate of depreciation will be less at initial stages of the physical assets and the rate of depreciation will be more as we move towards the completion of its physical life. Mathematically, the rate of depreciation is greater in the latter part of the life of the assets than in the initial period of the physical assets, that is (ΔDL/DL) > (ΔDI/DI), Where ΔDL/DL, rate of depreciation in final stages, ΔDI/DI, rate of depreciation in initial stages. The main components of depreciation are:

Cost of the Asset: This is the initial purchase price of the asset, including any additional costs necessary to bring the asset into use (e.g., installation, transportation, or setup costs).

Residual Value (Salvage Value): This is the estimated value the asset will have at the end of its useful life, after accounting for depreciation. It represents the amount the asset can be sold for or its scrap value.

Useful Life: This refers to the period over which the asset is expected to be used. It can be expressed in years, months, or hours of usage, depending on the type of asset.

Depreciable Amount: This is the portion of the asset's cost that will be depreciated over its useful life. It is calculated as: Depreciable Amount = Cost of the Asset − Residual Value

The amount of depreciation of a building or machinery is determined by several factors such as the total life of the assets (both movable & immovable assets), served life of the assets, level and the pattern of utilization, rate of depreciation, functional and technical obsolescence, etc. The concept of depreciation may be expressed in the following equation

D = f (Life of the asset, Served Life of structure, Utilisation, Rate of Depreciation ...)

= f (L, SL, U, R...)

$D = a + b_1L_1 + b_2SL_2 + b_3U_3 + b_4R_4 + e$ ...

Where D refers the quantity of depreciation (the dependent variable)

L – Life of structure

SL – Served Life of structure or time period

U – Utilisation of assets

R – Rate of Depreciation,

b_1, b_2, b_3, b_4, – Independent variables

c – Error term & a– intercept

The cumulative pattern of the rate of depreciation is taken for analysis. Previously it was a straight line. Hence logarithmic scale is adopted on the vertical or Y-axis and the life span is plotted on the horizontal or X- axis

For a Straight line, the formula is y = mx + c, where "m" stands for the tangent of the line and "c" stands for a constant in the origin of the line, it is zero here since the line originating from zero

For a Curvilinear - Cumulative line, the formula is logy = mx + c, where "m" stands for the tangent of the line and "c" stands for a constant in the origin of the line, it is zero here since the line originating from zero

The plotted curve resembles a curvilinear pattern and now offers flexibility to modify or drag the shape of the curve according to the utility of assets. But this is not possible in the case of straight-line plotting

If the asset has been used under uniform service conditions, then half of the depreciation may occur at the mid-life span

If the asset has been used under optimal service conditions, then 60% of the depreciation may occur at the mid-life span

If the asset has been used under rugged service conditions, then 70% of the depreciation may occur at the mid-life span

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Once faster depreciation occurs, then the asset has to be withdrawn from service which is under severe damage

CONVENTIONAL STRAIGHT-LINE METHOD (IN PRACTICAL IMPLEMENTATION): Income tax act declares that the service life of a building is 60 years. In straight line method, the rate of depreciation is depicted as uniform throughout the service life or age of building. Therefore, 100% depreciation occurs in 60 years. Therefore, the annual depreciation is 100/60= 1.67 %. Accordingly, Table No: 01, has been prepared and plotted. The time element is linear and hence plotted as horizontal co-ordinate, x – axis. Similarly, the rate of depreciation is plotted @ y - axis.

TABLE No: 01

x (years)	y	x (years)	y		x (years)	y	x (years)	y
First-year	1.67	**16**	26.72		**31**	51.77	**46**	6.67
Second yr	3.34	**17**	28.39		**32**	53.44	**47**	78.33
3	5.01	**18**	30.06		**33**	55.11	**48**	80.00
4	6.68	**19**	31.73		**34**	56.78	**49**	81.67
5	8.35	**20**	33.04		**35**	58.45	**50**	83.33
6	10.02	**21**	35.07		**36**	60.12	**51**	85.00
7	11.69	**22**	36.74		**37**	61.79	**52**	86.67
8	13.36	**23**	38.41		**38**	63.46	**53**	88.33
9	15.03	**24**	40.08		**39**	65.13	**54**	90.00
10	16.70	**25**	41.75		**40**	66.80	**55**	91.67
11	18.37	**26**	43.42		**41**	68.47	**56**	93.33
12	20.04	**27**	45.09		**42**	70.14	**57**	95.00
13	21.71	**28**	46.76		**43**	71.81	**58**	96.67
14	23.38	**29**	48.43		**44**	73.33	**59**	98.33
15	25.05	**30**	50.10		**45**	75.00	**60**	100
Source: Estimated								

The uniform or linear relationship is actually theoretical concept and not acceptable for day-to-day usage. The utility varies according to need of production. Sometimes it may be 2 or 3 shifts to increase the production to acquaint the demand which is market oriented. When the demand is high, the utility will be fluctuating. It can be realized by applying mind that the physical depreciation will be of low order in the beginning functioning of asset (both Buildings and Plant & machines) and of high order at the fag of asset since the loosened parts outbreaks heavy noise in case of equipment or chemical decomposition of cementing materials loosened and expands heavy cracks in the components of building such as beams, slabs, columns and walls, etc

Accelerated depreciation means excessive utilization than the recommended which means continuous vibrating nature machines installed building structure working 24 hours in case of real estate assets. Similarly, machines engaged three shifts per day shows accelerated depreciation.

Cumulative depreciation refers uniform rated depreciation pattern as recommended by manufacturers and its depreciation is accounted cumulative or curvilinear pattern drawn in a semi log pattern. Till now, this pattern is assumed to be uniform and linear scale (adopting both x and y axis).

CATEGORY – I – RATED DEPTRECIATION:

Mid span bears half of depreciation (50% Depreciation). As usual, the depreciations are calculated and tabulated below. Now, instead of plotting y value (abscissa) in linear scale, semi log scaling is adopted to establish that the depreciation is cumulative as time proceeds. These coordinates were plotted (Diagram No: 01) and also Curvilinear in Semi log sheet (Diagram No: 02)

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TABLE No: 01

x (years)	y	x (years)	y		x (years)	y	x (years)	y
First-year	1.67	**16**	26.72		**31**	51.77	**46**	6.67
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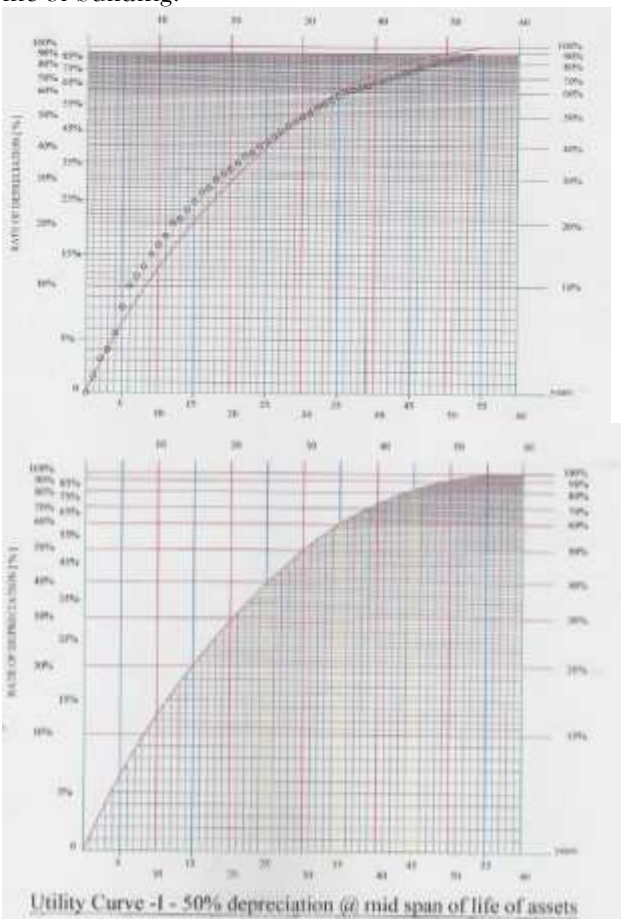
15	25.05	**30**	50.10		**45**	75.00	**60**	100

Source: Estimated

Utility–Depreciation curves were also developed for buildings based on 60% & 70 % respectively @ mid life of building.



Utility Curve -I - 50% depreciation @ mid span of life of assets

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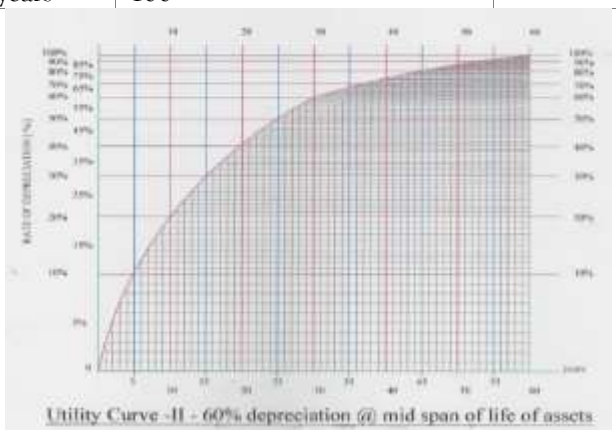
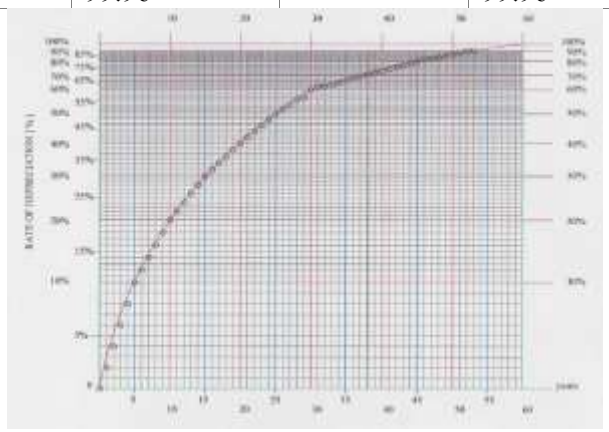
https://www.theaspd.com/ijes.php

CATEGORY – I– 50% Depreciation @ MidLife span

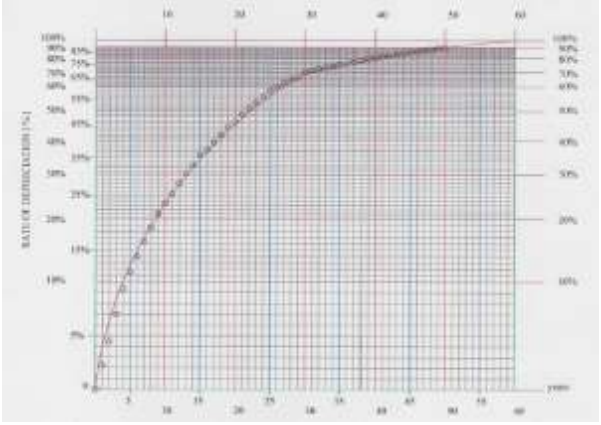
Table No: 02 Different levels of depreciation based on abve categorised utilisation of assets for complete 60 years					
Physical Life	**RATED (50 % Depreciation occurs during Mid span of Physical life) by** Conventional Straight-line method	**ACCELERATED**			
		60 % Depreciation occurs during Mid-life span		**70 % Depreciation occurs during Mid-life span**	
	Category - I	Category - II		Category - III	
	logy = c + mx, c= constant = 0 m = 100/60 = 1.67, Y = 100%, X = 60 years	$logy_1$ = c + m_1x = 2x m_1 = 60/30 = 2	log(Y-y_1) = c + m_2x = 1.33x m_2 = 40/30 = 1.33	$logy_2$ = c + m_3x = 2.33 x m_3 = 70/30 = 2.33	logy = c + m_4x = 1.00 M_4 = 30/30 = 1
First-year	1.67	2		2.33	
2 years	3.34	4		4.66	
3 years	5.01	6		6.99	
4 years	6.68	8		9.32	
5 years	8.35	10		11.65	
6 years	10.02	12		13.98	
7 years	11.69	14		16.31	
8 years	13.36	16		18.64	
9 years	15.03	18		20.97	
10 years	16.70	20		23.30	
11 years	18.37	22		25.63	
12 years	20.04	24		27.96	
13 years	21.71	26		30.29	
14 years	23.38	28		32.62	
15 years	25.05	30		34.95	
16 years	26.72	32		37.28	
17 years	28.39	34		39.61	
18 years	30.0	36		41.94	
19 years	31.73	38		44.27	
20 years	33.04	40		46.60	
21 years	35.07	42		48.93	
22 years	36.74	44		51.26	
23 years	38.41	46		53.59	
24 years	40.08	48		55.92	
25 years	41.75	50		58.25	
26 years	43.42	52		60.58	
27 years	45.09	54		62.91	
28 years	46.76	56		65.24	
29 years	48.43	58		67.57	
30 years	50.10	60.00		69.90	
31 years	51.77		61.33		70.90
32 years	53.44		62.66		71.90
33 years	55.11		63.99		72.90
34 years	56.78		65.32		73.90
35 years	58.45		66.65		74.90
36 years	60.12		67.98		75.90

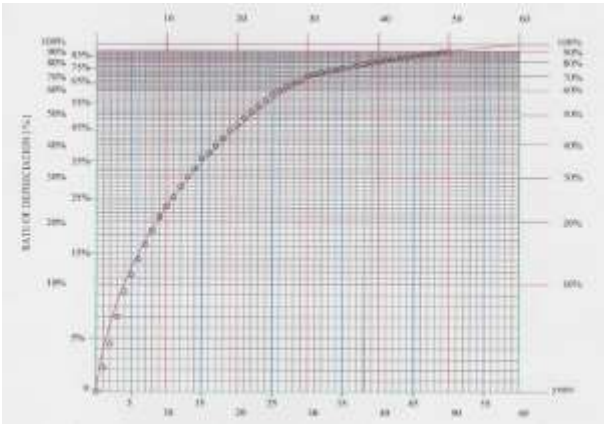
37 years	61.79		69.31		76.90
38 years	63.46		70.64		77.90
39 years	65.13		71.97		78.90
40 years	66.80		73.30		79.90
41 years	68.47		74.63		80.90
42 years	70.14		75.96		81.90
43 years	71.81		77.29		82.90
44 years	73.33		78.62		83.90
45 years	75.00		79.95		84.90
46 years	76.67		81.28		85.90
47 years	78.33		82.61		86.90
48 years	80.00		83.94		87.90
49 years	81.67		85.27		88.90
50 years	83.33		86.60		89.90
51 years	85.00		87.93		90.90
52 years	86.67		89.26		91.90
53 years	88.33		90.59		92.90
54 years	90.00		91.92		93.90
55 years	91.67		93.25		94.90
56 years	93.33		94.58		95.90
57 years	95.00		95.91		96.90
58 years	96.67		97.24		97.90
59 years	98.33		98.57		98.90
60 years	100		99.90		99.90





(Diagram No: 03) (Curvilinear) CATEGORY – II– 60% Depreciation @ Mid San





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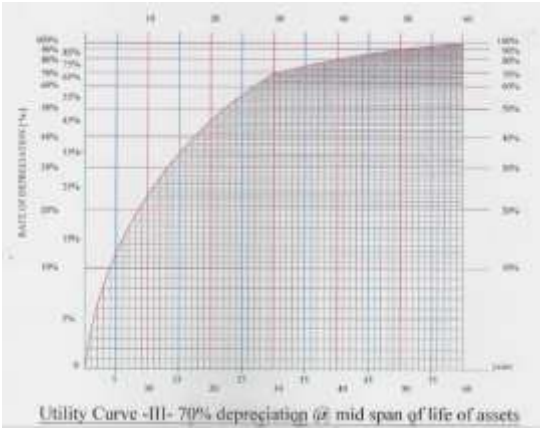

(Diagram No: 04) (Curvilinear)CATEGORY – III– 70% Depreciation @ Mid-span

RESULTS OF ANALYSIS/ CONCLUSIONS:

1. Extent of Deterioration of building: The area under curvilinear graph depicts the extent of deterioration, using Simpsons one third rule method (of finding the area for a given set of points by the method of numerical integration). Second order differential equation can also be used. This will enable to decide that whether to renovate/ refurbish/ repair or alteration/demolition/ modifiction of use.

Simpsons 1/3rd Rule= h/3 [(First Value + last value + 4 * (Sum of odd values) + 2 * (Sum of even values)]

$$\int_a^b f(x)dx = \frac{h}{3}[(y_0 + y_n) + 4(y_1 + y_3 + \ldots + y_{n-1}) + 2(y_2 + y_4 + \ldots + y_{n-2})]$$

Where, h = (60 - 0)/12 = 5

TABLE No: 03

Category	**Rated** (50 % depreciation)	**Accelerated** (60 % depreciation)	(70 % depreciation)
Simpsons 1/3 rule	= 5/3 [0+100 + 4 (8.35+25.05+41.75+ 58.45 +75.00+91.67) + 2 (16.70+33.04+50.10 + 66.80+83.33)] = 5/3 [100+1201.08 +249.97] = 2586.28 units	= (12/3) [0+100 + 4 (10+30+50+66.65 +79.95+93.25) +2 (20+40++60 +73.30+86.60)] = 5/3 [100+999.63 +559.80] = 2,765.71units	12/3 [0+100 + 4 (11.65+34.95+58.25 +74.90+84.90+94.90) +2 (23.30+46.60+69.90 +79.90+89.90)] = 5/3 [100+1438.20 +619.20] = 3595.67 units
Extent of deterioration	= 2586.28 x100/ (12 x 5 x 100) = 43.10 %	= 2,765.71x100/ (12 x 5 x 100) = 46.10 %	= 3595.67 x100/ (12 x 5 x 100) = 59.92 %
Value of Deterioration	43.10% of Historic Value	46.10 % of Historic Value	59.92 % of Historic Value
Salvage Value of asset	56.90 % of Historic Value	53.90 % of Historic Value	41.08 % of Historic Value

Source: Estimated

2. REFURBISHMENT OF ASSETS(BOTH REAL ESTATE & MACHINES): Apart from the study of depreciation, the idea of refurbishment or remodeling of real estate assets is also possible by proper observation of depreciation pattern. At some point, say middle of its service span, the asset's life can be enhanced further or servicing stimulates extended period. This ideology is based survivor curve of life of plants, wherein certain components or machines might have exhausted its service span of physical life. By replacement with latest model components/machines or refurbishment improves further economics to certain extent beyond its designated life. By doing this, savings in terms of capital investment is possible. Therefore, it becomes necessary the optimal service time, refurbishment can be adopted will

be calculated scientifically. Still arbitrary selection of critical point of refurbishment is chosen at the will and wish of Engineer concerned. An attempt has been tried by fitting various level of depreciation at mid span life of asset and thereby an optimal or critical pint of rehabilitation of real estate assets is analyzed to create a scientific reasoning. Here is the table containing the different levels of depreciation ranging from 20 % to 80% at mid-life span of building followed plotted in the graphs as stipulated. Here, since the depreciation is cumulative, the salvage value is also cumulative and plotted in semi log scale. X – axis time span which is uniform throughout the entire physical life and salvage value (also depreciation) is cumulative and plotted in Y – axis in semi log scale. The point of intersection enumerates the stage at which rehabilitation or refurbishment can be undertaken to avail economic benefits

3. Salvage value:

The optimal utility of an asset can be found at the break-even point where the Depreciation level meets @ Midlife span i.e it can be ascertained that at 50% depreciation level at the midlife span depicts the rate of depreciation is acceptable and economically feasible. Both Depreciation and salvage have equal value, i.e at 50%, hence optimal. On the other hand, if we consider salvage value, it can be higher at a 20% level of depreciation reverting the asset is under-utilized. Contrary to this 80% rate of depreciation results in only 20% salvage which is not economical while modifying the assets, since the cost of alteration may exceed the current salvage value, hence not advisable

4. Depreciated Value of asset at any point of time:

In the case of buildings, fixing 60 years as life span and depreciation took place 100% at the end of 60 years on completion of physical life. The percent of depreciation can be computed using the formula logy = mx + c, where "m" stands for the tangent of the line and "c" stands for a constant in the origin of the line, it is zero here since the line originating from zero. Also, the percent of accumulated depreciation at the end of any year during its utilization can be ascertained by the above formula. Thereby value coefficients for any point of time can be computed by multiplying historical value as a ready reckoner. The depreciation at any point of time during its service condition to find out its resaleable cost. This phenomenon will be useful to buy and sell of used assets. Depreciation at any point in time (log y) = slope of curve x time elapsed. Depreciated Value at any point in Time = Historic Cost [100 - Percent depreciation at any point in time] /100. Salvage Value at any point in Time = Historic Cost - Depreciated Value at any point in Time

5. Effective/Ideal utilization of an asset:

Another attempt is to assess the optimal extent of deterioration corresponding to the best level of depreciation so that both values of depreciation and the value of salvage must have high values. To find the optimal percent of depreciation, assuming various levels of a percent to occur midlife span of assets, a table has been prepared for different levels of depreciation ranging as 20%,30%,40%,50%,60%,70% & 80%.

6. Optimum Depreciation:

The optimal utility of an asset can be found at the break-even point where the Depreciation level meets @ Midlife span i.e it can be ascertained that at 50% depreciation level at the midlife span depicts the rate of depreciation is within acceptable limit and economically feasible. Both Depreciation and salvage have equal value, i.e and hence optimal. On the other hand, if we consider salvage value, it can be higher at a 20% level of depreciation reverting the asset is under-utilized. Contrary to this 80% rate of depreciation results in only 20% salvage which is not economical while modifying the assets, since the cost of alteration may exceed the current salvage value, hence it is not advisable. When we adopt refurbishment, the useful physical life of the asset can be extended so that still put in to efficient production. This analogy is also adopted in real estate assets. Additionally, suppose if the refurbishment is delayed beyond 50% depreciation for some reasons, accelerated depreciation either 60% or 70% can be safely decided to undertake refurbishment or renovation of buildings according to accumulation of reduced salvage value.

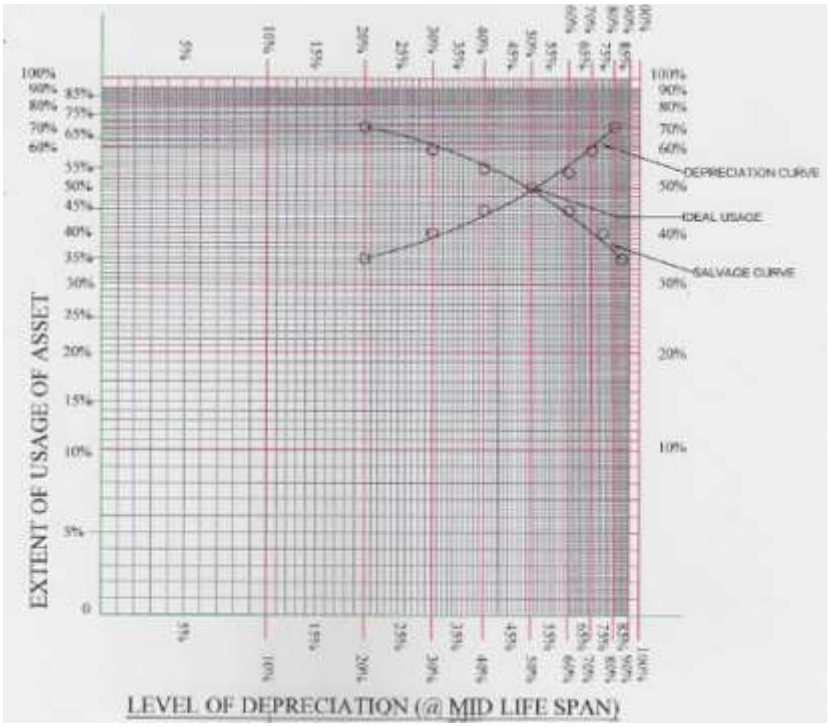

Figure: Utilization (both logarithmic scale) – Depreciation & Salvage Curves

SOURCES:

1. **J Koshar**,DEPRECIATION GURU,July 1, 2009.
2. CFI TEAM, FEBRUARY,25 2022, Depreciation Methods.
3. CAFAANZ, Depreciation theory in the 1960s.
4. MANAGEMENT GURU, Aug 24th, 2014.
5. Gabriel A. D. Preinreich, ECONOMETRICA: JULY 1938, Volume 6, ISsue 3.
6. THE ECONOMETRIC SOCIETY.
7. Annual Survey of Economic Theory: The Theory of Depreciation.
8. TAX DOSE. COM Causes of Depreciation.