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Standard Terminology of Building Economics[1]

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1. Scope

1.1 This terminology relates to the economic evaluation of building construction as used in other standards under the jurisdiction of ASTM Committee E-6 on Performance of Building Constructions, and does not necessarily correspond to the terminology used in other areas of accounting and economics.

DEFINITIONS

adjusted internal rate-of-return (AIRR)—the compound rate of interest that, when used to discount the terminal values of costs and benefits of a project over a given study period, will make the costs equal the benefits when cash flows are reinvested at a specified rate. (Syn. *financial management rate of return (FMRR)*)

annual value—a uniform annual amount equivalent to the project costs or benefits taking into account the time value of money throughout the study period (Syn. *annual worth, equivalent uniform annual value*).

annual worth—See **annual value**.

annually recurring costs—those costs that are incurred in a regular pattern each year throughout the study period.

base date—See **base time**.

base time—the date to which all future and past benefits and costs are converted when a present value method is used (usually the beginning of the study period) (Syn. *base date*).

benefit-cost analysis—a method of evaluating projects or investments by comparing the present value or annual value of expected benefits to the present value or annual value of expected costs.

benefit-to-cost ratio (BCR)—benefits divided by costs, where both are discounted to a present value or equivalent uniform annual value (Syn. *benefit-cost ratio*).

breakeven analysis—a technique for determining that value of a variable which results in benefits (savings) just equal to costs.

building decision—a decision regarding the design, financing, engineering, construction, management, or operation of a building.

building economics—the application of economic analysis to the design, financing, engineering, construction, management, operation, ownership, or disposition of buildings.

building system—an aggregation or assemblage of items joined in regular interaction or interdependence in buildings or building construction.

capital cost—the costs of acquiring, substantially improving, expanding, changing the functional use of, or replacing a building or building system.

cash flow—the stream of monetary (dollar) values—costs and benefits—resulting from a project investment.

certainty equivalent technique—a technique used to adjust economic measures of project worth to reflect risk exposure and risk attitude.

DISCUSSION—Estimated project returns are multiplied by a certainty equivalent factor (CEF) to determine the *certainty equivalent* amount a decision maker finds equally acceptable to the estimated project returns.

constant dollars—dollars of uniform purchasing power exclusive of general inflation or deflation.

DISCUSSION—Constant dollars are tied to a reference year.

construction contingency—the funds added to estimated and known costs in case of cost overruns during construction.

construction documents—materials that convey the physical, aesthetic, technical, performance, and administrative requirements necessary to initiate a contract for construction of the proposed project.

cost analysis—subdividing the project estimate into component parts to find and compare their relationship to previously established historical costs.

cost effective—the condition whereby the present value benefits (savings) of an investment exceeds its present value costs.

cost limitations—the budget boundaries for project elements.

cost model—the description of the project divided into discrete elements showing quantities and unit price for each element.

cost overruns—in project design or construction, or both, the unanticipated increase in cost due to factors such as unanticipated site conditions, changes in the cost of building materials, labor, weather, and labor disputes.

cost professional—in project design or construction, or both, a person engaged in the occupation of understanding, managing or estimating project costs, or a combination thereof.

current dollars—dollars of purchasing power in which actual prices are stated, including inflation or deflation.

[1] This terminology is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.81 on Building Economics.

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DISCUSSION—In the absence of inflation or deflation, current dollars equal constant dollars.

decision analysis—a technique for making economic decisions in an uncertain environment that allows a decision maker to include alternative outcomes, risk attitudes, or subjective impressions about uncertain events in an evaluation of investments.

design contingency—in project design/construction, the amount of funds added to the estimated construction costs to cover unanticipated construction costs due to the incompleteness of the design, where the contingency is inversely proportional to the level of completeness of the design documentation.

design development—the phase of a project consisting of drawings and document preparation to fix and describe the size and character of the building systems, material, and elements.

design program—the information detailing project function, purpose, and characteristics inclusive of floor area, functional spaces, equipment, and building systems.

differential price escalation rate—the expected percent difference between the rate of increase assumed for a given item of cost (such as energy), and the general rate of inflation.

discounting—a technique for converting cash flows that occur over time to equivalent amounts at a common time.

discount rate—the rate of interest reflecting the investor's time value of money, used to determine discount factors for converting benefits and costs occurring at different times to a base time.

DISCUSSION—The discount rate may be expressed as nominal or real.

discount factor—a multiplicative number (calculated from a discount formula for a given discount rate and interest period) that is used to convert costs and benefits occurring at different times to a common time.

discounted payback (DPB) period—the time required for the cumulative benefits from an investment to pay back the investment cost and other accrued costs considering the time value of money.

economic evaluation methods—a set of economic analysis techniques that consider all relevant costs associated with a project investment during its study period, comprising such techniques as life-cycle cost, benefit-to-cost ratio, savings-to-investment ratio, internal rate of return, and net savings.

economic life—that period of time over which an investment is considered to be the least-cost alternative for meeting a particular objective.

engineering economics—the application of economic techniques to the evaluation of design and engineering alternatives.

equivalent uniform annual value—See **annual value**.

financial management rate-of-return (FMRR)—See **adjusted internal rate-of-return (AIRR)**.

first cost—costs incurred in placing a building or building subsystem into service, including, but not limited to, costs of planning, design, engineering, site acquisition and preparation, construction, purchase, installation, property taxes and interest during the construction period, and construction related fees (Syn. *initial investment cost, initial cost*).

function—a purpose of the entire project or some portion thereof determined by the needs or desires of the user/owner and expressed in two words, an active verb and a measurable noun.

function analysis—an examination of the project consisting of (*1*) the determination of the project functions; (*2*) the examination and sorting of these functions into categories; (*3*) the selection of the critical functions and arrangement into a logical order; and (*4*) the determination of the project cost allocated to performing each critical function.

function, basic—a function that is necessary to achieve the primary purpose of a building system or element.

future value—the value of a benefit or a cost at some point in the future, considering the time value of money (Syn. *future worth*).

future worth—See **future value**.

incremental cost (benefit)—the additional cost (benefit) resulting from an increase in the investment in a building project (Syn. *marginal cost (benefit)*).

inflation—a rise in the general price level, usually expressed as a percentage rate.

initial cost—See **first cost**.

initial investment cost—See **first cost**.

internal rate of return (IRR)—the compound rate of interest that, when used to discount study period costs and benefits of a project, will make the two equal.

investment cost—first cost and later expenditures which have substantial and enduring value (generally more than one year) for upgrading, expanding, or changing the functional use of a building or building subsystem.

life cycle—See **study period**.

life-cycle cost (LCC) method—a technique of economic evaluation that sums over a given study period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision (expressed in present or annual value terms).

maintenance and repair cost—the total of labor, material, and other related costs incurred in conducting corrective and preventative maintenance and repair on a building, or on its systems and components, or on both.

marginal cost (benefit)—See **incremental cost (benefit)**.

MasterFormat—a standard sequence of numbers and titles for organizing information about construction requirements, products, and activities (source 1995 edition of MasterFormat, published by CSI).

mathematical/analytical (M/A) technique—a technique of obtaining probability functions for economic measures of project worth without the repeated trials of simulation.

mean-variance criterion—a technique for evaluating the relative risk and return when choosing among competing projects that dictates that the project value with the higher mean (that is, expected value of project worth) and lower standard deviation be chosen.

minimum acceptable rate of return—the minimum percentage return required for an investment to be economically acceptable.

modified internal rate of return (MIRR)—See **adjusted internal rate of return (AIRR)**.

net benefits (savings)—the difference between the benefits and the costs—where both are discounted to present or annual value dollars.

nominal discount rate—the rate of interest reflecting the time value of money stemming both from inflation and the real earning power of money over time.

DISCUSSION—This is the discount rate used in discount formulas or in selecting discount factors when future benefits and costs are expressed in current dollars.

operating cost—the expenses incurred during the normal operation of a building or a building system or component, including labor, materials, utilities, and other related costs.

opportunity cost of capital—the rate of return available on the next best available investment of comparable risk.

overall rate of return (ORR)—See **adjusted internal rate of return (AIRR)**.

payback method—a technique of economic evaluation that determines the time required for the cumulative benefits from an investment to recover the investment cost and other accrued costs (see **discounted payback period; simple payback period**).

portfolio analysis—a technique used to seek the combination of assets with the maximum return for any given degree of risk (that is, variance of the return), or the minimum risk for any given rate of return.

present value—the value of a benefit or cost found by discounting future cash flows to the base time (Syn. *present worth*).

present value factor—The discount factor used to convert future values (benefits and costs) to present values (Syn. *present worth factor*).

present worth—See **present value**.

present worth factor—See **present value factor**.

program—See facility program.

rate of return—the percentage yield on an investment per unit time.

real discount rate—the rate of interest reflecting that portion of the time value of money related to the real earning power of money over time.

DISCUSSION—This is the discount rate used in discount formulas or in selecting discount factors when future benefits and costs are expressed in constant dollars.

real dollars—See **constant dollars**.

reconciliation—a comparison of two or more estimate values by independent cost professionals for the purpose of reaching consistency in the estimate assumptions, parameters, and scope of work.

replacement cost—building component replacement and related costs, included in the capital budget, that are expected to be incurred during the study period.

resale value—the monetary sum expected from the disposal of an asset at the end of its economic life, its useful life, or at the end of the study period.

retrofit—the modification of an existing building or facility to include new systems or components.

risk-adjusted discount rate (RADR)—a discount rate that has been adjusted to account for risk.

DISCUSSION—When using the RADR technique, projects with anticipated high variability in distributions of project worth have their net benefits or returns discounted at higher rates than projects with low variability.

risk analysis—the body of theory and practice that has evolved to help decision makers assess their risk exposures and risk attitudes so that the investment that is *best for them* is selected.

DISCUSSION—This definition is restricted to the types of analyses described in ASTM Building Economics Standards, and is not necessarily consistent with how the term is used in reference to analyses in such areas as the environment or health.

risk attitude—the willingness of decision makers to take chances or gamble on investments of uncertain outcome.

DISCUSSION—Risk attitudes are generally classified as risk averse, risk neutral, or risk taking. Risk averse decision makers would prefer a sure cash payment to a risky venture with known expected value greater than the sure cash payment. Risk neutral decision makers act on the basis of expected monetary value. They would be indifferent between a sure cash payment and a risky venture with expected value equal to the sure cash payment, and would therefore accept a fair gamble. Risk takers prefer a risky venture with known expected value to a sure cash payment equal to the expected value.

risk averse (RA)—See **risk attitude**.

risk exposure—the probability of investing in a project whose economic outcome is different from what is desired (the target) or what is expected.

risk neutral (RN)—See **risk attitude**.

risk taking (RT)—See **risk attitude**.

salvage value—the value of an asset, assigned for tax computation purposes, that is expected to remain at the end of the depreciation period.

savings-to-investment ratio (SIR)—either the ratio of present value savings to present value investment costs, or the ratio of annual value savings to annual value investment costs.

schematic design—the phase of a project during which the initial solutions to the program are prepared by the design professional through the use of plans and sections and system's descriptions.

sensitivity analysis—a test of the outcome of an analysis by altering one or more parameters from an initially assumed value(s).

simple payback (SPB) period—the time required for the cumulative benefits from an investment to pay back the investment cost and other accrued costs, not considering the time value of money.

study period—the length of time over which an investment is analyzed (Syn. *life cycle, time horizon*).

sunk cost—a cost that has already been incurred and which should not be considered in making a new investment decision.

target cost—the planning expenditure, determined in cooperation with the cost professionals and the design team, for project elements.

task outline—a general plan of the estimating work to be performed.

time horizon—See **study period**.

time value of money—the time-dependent value of money stemming both from changes in the purchasing power of money (that is, inflation or deflation), and from the real earning potential of alternative investments over time.

uncertainty—lack of certain, deterministic, values for the variable inputs used in an economic analysis of a building or building system.

useful life—the period of time over which an investment is considered to meet its original objective.

utility function—a function that shows how utility (that is, satisfaction) varies with money or income.

DISCUSSION—The utility function shows the decision maker's risk attitude.

value analysis (VA)—the procedure for developing and evaluating alternatives to a proposed economical design that best fulfills the needs and requirements of the user/owner of the building. (Also referred to as *value engineering*.)

value analysis team leader (VATL)—the individual who facilitates the **value analysis**.

workshop effort—the exclusive, intense concentration of the VA team on the project during the workshop period.

worth—the value as defined in monetary terms of a specific function identified.