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## STANDARDIZED DATA COLLECTION MODEL FOR BUILDING LIFE-CYCLE COSTING

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### ABSTRACT

The Life Cycle Cost (LCC) concept as a supporting decision-making tool is addressed in various international and European normative documents. This paper proposes a model with a standardized structure to collect all costs involved in the life-cycle of a building. The structure follows the requirements of the European standards EN 15643-4 and EN 16627 and supports the economic performance assessment of buildings.

**Keywords:** life cycle cost, buildings, economic performance.

### INTRODUCTION

The future costs should be considered along with the initial capital if the best outcome is to be achieved (ANAO, 2001). LCC is a support tool to make decisions, reflecting the real impact of an investment.

There are several standards that highlight the importance of LCC to a better management of the Architecture, Engineering, Construction and Operation (AECO) sector. EN 15643-4 and EN 16627 are recent and important normative documents related to buildings economic performance.

EN 15643-4 (2012) provides specific principles, requirements and guidelines for the assessment of the buildings economic performance. These measures quantify economic aspects and impacts of the building, as well as the related costs. Several economic indicators are established to describe the economic performance.

EN 16627 (2015) was published in order to provide a calculation method for the assessment of the buildings economic performance. This standard, that intended to support the decision-making process, makes available documentation for the assessment and complements the framework as described in EN 15643-4.

### RESULTS AND CONCLUSIONS

The Model for Data Collection (MDC) throughout life cycle intends to simplify the assemble of the different costs involved in a building life cycle. The MDC organizes the economic information into modules, corresponding to the different life cycle stages. Each stage has cost categories that are discriminated in cost types.

The life cycle of a building is divided into 3 stages: before use stage (modules A0 to A5); use stage (after delivery of the building: modules B1 to B5, not related to the building in operation, and modules B6 and B7, related to the building in operation); after use stage or end of life (modules C1 to C4). The different stages have been divided into categories - which corresponded to the indicated modules - and these, in turn, are discriminated in cost types. The results are presented in Table 1.

Table 1 - Modular Structure of the MDC

STAGE		COST CATEGORIES		COST TYPES
wQBEFORE USE STAGE	Pre-construction	A0	Land	A0.1 - A0.3
	Product	A1	Material Supply	A1.1 - A1.3
		A2	Transport	A2.1 - A2.3
		A3	Manufacturing	A3.1 - A3.3
	Construction process	A4	Transport	A4.1 - A4.5
A5		Installation process	A5.1 - A5.17	
USE STAGE	Use stage	B1	Use	B1.1 - B1.6
		B2	Maintenance	B2.1 - B2.10
		B3	Repair	B3.1 - B3.4
		B4	Replacement	B4.1 - B4.5
		B5	Refurbishment	B5.1 - B5.7
		B6	Operational energy costs	B6.1 - B6.8
		B7	Operational water costs	B7.1 - B7.7
AFTER USE STAGE	End of life stage	C1	Deconstruction	C1.1 - C1.6
		C2	Transport	C2.1 - C2.4
		C3	Waste processing for reuse, recovery or and recycling	C3.1 - C3.5
		C4	Disposal	C4.1 - C4.4

EN 15643-4 is the framework for evaluation methodologies to be applied to all types of buildings. The followed approach expresses economic performance in terms of cost over the life cycle. In this concept, the “lowest LCC” building over its life cycle is the most economic one. In this approach only cost data needs to be gathered.

EN 16627 specifies methods and rules for cash flows calculations based on LCC analysis. Net Present Value (NPV) is a measure used in an LCC analysis. When only costs are taken into account, the NPV may be called the Net Present Cost (NPC). To calculate NPV/NPC is necessary to specify the discount rate to be used for the calculation. But first, the value of the different items of the economic assessment shall be calculated without any discount rate and only when the assembly of costs and its time occurrence is done may that rate be applied.

## REFERENCES

[1]-ANAO, 2001 - Life-cycle costing - Better Practice Guide. Australian National Audit Office ISBN 0 642 80608 X.

[2]-EN 15643-4:2012 - Sustainability of construction works - Assessment of buildings - Part 4: Framework for the assessment of economic performance. Brussels: Committee European Normalization (CEN).

[3]-EN 16627:2015 - Sustainability of construction works - Assessment of economic performance of buildings - Calculation method. Brussels: Committee European Normalization (CEN).