



INTEGRATED LIFE-CYCLE MANAGEMENT APPLIED TO PLAYGROUNDS

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ABSTRACT

Playground management should be viewed as an integrated life-cycle system [1]. What does this mean? The playground has a limited and optimum life. The life of the playground has a number of phases, namely: planning; definition; tendering; construction; handover; operating; and decommissioning. Life-cycle management encompasses the time from inception to disposal of the playground. One of the objectives of life-cycle management is to choose the most cost-effective approach from the many alternatives so that the lowest long-term cost ownership is achieved. This paper will discuss the various phases of the playground life-cycle and their management in a cost-effective manner.

INTRODUCTION

In engineering it is a standard operating procedure to scrutinize assets in terms of their total life from the cradle to the grave. All the costs associated with the asset including the procurement, capital cost and operational maintenance are considered against the organisations overall strategic plan. In an ideal world each procurement is considered separately on its own merit as a stand alone project that needs to be counted. There are many projects that any one organisation can undertake. Unfortunately each organisation has limited resources, both human and capital. Organisations cannot undertake every project, they need a systematic procedure to cull the list of possible projects down to a list of achievable projects.

Engineering assets as diverse as a car fleet, a highway, a telephone exchange, a power station, a coal mine, an oil rig or a cereal factory are defined, planned, operated and decommissioned according to life-cycles costing principles. A life-cycle model recognizes that children's playgrounds have a limited and optimum life. There comes a time in the life-cycle of any asset where the ongoing operating costs increase to a level where it is more cost effective for the organisation to plan for the decommissioning and replacement.

Playground management costing should include the depreciation associated with the asset. Generally the depreciation rates are controlled and limited by taxation law and accounting procedures. The depreciation may vary for different elements within the playground. Funding should incorporate discounted cash flow modelling based on the playground design life. The design life of a playground is generally estimated to be from 10 to 15 years. It is common for the funding allocation to include the capital costs for the procurement of the playground, but not include any funding allowance for the ongoing maintenance of the asset. Ideally the annual maintenance funding should be based on the actual depreciation for each element within the playground. The depreciation will differ for different playground elements and also dissimilar playgrounds. The location of the playground may also affect the depreciation. Playgrounds near the seaside will be subjected to the accelerated corrosion



influence of the salt air and will hence cost more to maintain relative to an identical playground that is not subjected to the corrosion effects of the sea. Life-cycle costing would consider this and the cost benefit analysis may conclude that, for this particular playground, it is more cost effective over the total life of the playground to design and manufacture the playground components from 316 stainless steel and incorporate sealed-for-life bearings in all moving parts. Similarly, playgrounds that are subject to a repetitive freeze-thaw cycle will require additional maintenance. The depreciation percentage applied to playgrounds that have a high-usage such as large regional playgrounds will be greater than those applied to smaller low-usage non-regional playgrounds. The budgeting should split the fixed and variable costs. It should also split the labour and material costs. This is important as funding models can optimise in-house and contracted staffing levels as in-house labour is always considered a fixed-cost since the organisation pays wages regardless of what the employees are doing. The use of cost accounting methods will also allow the tracking and creation of historical costing records for each play element and/or for each playground. Cost accounting is the general term given to the allocation of cost codes or cost centres for discrete elements within a project. An advantage of this is the accumulation of historical data that allow trend analysis and the generation of specific management costing reports. Some examples would include 'report the total maintenance cost with time for a particular playground' or 'compare the annual cost of all rotating equipment items on the asset register' or 'report the labour and material cost of maintaining bark for the life of a playground' or 'report the life cost (capital plus maintenance) of all rubber impact attenuating surfaces' or 'compare the average life cost of rubber to the average life cycle cost of bark'.

Playground management should begin at the definition and planning phases of the playground project. It should continue into the execution and delivery phases, and continue throughout the working life of the playground and finish when the playground is decommissioned and disposed.

DEFINITION AND PLANNING PHASES

The definition and planning phases should include the relevant approvals both internal and external. These approvals must involve all the relevant project stakeholders. It is also important that the relevant stakeholders should be involved with defining and developing the project scope. It is suggested that a project manager be appointed or assigned and made personally responsible for the project.

The definition phase of the life-cycle is the phase when the following activities occur:

- the asset funding and costing are considered and agreed;
- the budgets are determined and agreed, the project objective is defined;
- the deliverable is defined, the major milestones are established;
- the project timing and scheduling are established;
- the technical requirements are defined; and
- the project limits and exclusions are defined.

The definition and planning phases should include site selection, equipment selection, equipment configuration and spacing, children's play and circulation patterns, and a whole host of other considerations. It should consider fall heights and fall surfaces. It should include the drainage of the fall surface and the drainage of the sub-surface. It should include an evaluation as to what type of surfacing system is appropriate for this particular playground, should it be constructed from a natural material, from an artificial material, or from a combination of natural and artificial materials. It should consider maximum traffic zones and their potential wear. It should consider the design life and on-going maintenance.



These are the phases in the playground life-cycle where the majority of the eventual costs are locked in. The early stages in the life-cycle represent the period when the opportunity to maximise the impact on whole-of-life cost is greatest. Decisions made during the early phases will have a lasting impact on later expenditure. For example, although only approximately 0.1% of the costs have been incurred approximately 90% of the expenditure has been determined. The ability to influence costs falls rapidly during the design stage, so that decisions and changes made later are more costly.

EXECUTION PHASES

The execution phase should include the selection of the Form of Contract one chooses to engage a playground contractor. It should include an informed decision about whether to bundle the surfacing contract with the equipment contract, or have separate but integrated contracts.

The execution phase should include the process of obtaining competitive tenders from a number of reputable and competent installation companies. During the on-site construction it should also include regular inspections by appropriate qualified inspectors during installation to ensure that the contractor is installing the playground equipment and playground surfacing in a tradesman-like manner and that this is being done in accordance with the contract documents. It may be appropriate for off-site inspection to be conducted for purpose designed and built equipment so that non-compliance issues are identified and rectified prior to delivery to site. Off-site inspection has the advantage of reducing rework costs and scheduling delays.

The contract should include performance clauses including mandatory comprehensive inspections to EN 1176 and impact testing in accordance with EN 1177 by an independent and professional inspector. The contract should include a retention clause that allows for the withholding payment until full compliance with the contract is achieved.

DELIVERY PHASE

When the on-site installation and construction has been completed the playground equipment and playground surfacing need to be formally transferred to the owner/client. In project management this is termed the hand-over.

This phase normally commences with more regular site meetings that include the generation of a checklist of outstanding work. As hand-over approaches defects and rectification lists are produced.

The delivery phase includes commissioning where necessary and the final acceptance inspection and testing of the equipment and surfacing to EN 1176 and EN 1177. Ideally the delivery phase includes owner/client maintenance training on the specific equipment and surfacing that was supplied.

The delivery phase is when the operations manuals, maintenance manuals, spare parts, and the as-built documents are also transferred to the owner/client.

Finally, just prior to handover to the owner/client the playground equipment and playground surfacing should be inspected and a Certificate issued. This Certificate should be issued by an accredited independent third party inspector.

It is extremely important that at no time should the owner/client accept hand-over or open the playground to the public until all the major defects are rectified and the Compliance Certificate issued. It is worth noting that the term 'practical completion' as used in most contracts is defined as when the deliverable can be safely used for its intended purpose. The intended purpose of a



playground is somewhat different to that of most deliverables. It is strongly recommended that the purpose of a playground be defined in the contact document and that this statement include reference to the supply of 'a hazard free play space' or that practical completion is defined as compliance to EN 1176 and EN 1177.

OPERATIONAL PHASE

The Operational Phase commences immediately after handover. It is important that the owner/client take out insurance immediately prior to this milestone event so that there is no lapse in coverage.

While inspection and reporting is not compulsory, play space providers have many reasons to ensure they comply with and beyond the Standards. These include ensuring children's playgrounds are safe and minimising the risk of a death or serious injury. They help in maintaining play equipment for its serviceable life to get best value from costly capital investments.

The working life phase of the playground should include inspections and maintenance. EN 1176-7 [2] specifies three levels of playground inspection, namely:

- Routine visual inspection;
- Operational inspection; and
- Annual main inspection.

The routine visual inspection enables the identification of obvious hazards that can result from vandalism, use or weather conditions. Examples of hazards include broken parts or broken glass bottles. For playgrounds subject to heavy use or vandalism, daily inspection is recommended. The operational inspection is a more detailed inspection to check the operation and stability of the equipment, especially for any wear. This should be carried out every 1 to 3 months, or as indicated by the manufacturer's instructions. The annual main inspection is done to establish, at intervals not exceeding 12 months, the overall level of safety of equipment, foundations and surfaces. Examples include: effects of weather; evidence of rotting or corrosion; and any change in the level of safety of the equipment as a result of repairs made; or of added or replaced components. The annual main inspection of the equipment should be carried out by competent persons in strict accordance with the manufacturer's instructions.

The inspections and maintenance should also include regular inspections and appropriate maintenance of the undersurfacing. In the case of natural surfaces such as bark and sand these inspections would be daily and would include a visual inspection, raking and a check of the material depth. For artificial surfaces these inspections may be less frequent. For all types of surfaces it is recommended that a Level 2 impact attenuation test be conducted every 3 months and that this be incorporated into a managed maintenance program. It is also strongly recommended that all types of playground surfacing be subjected to a full Compliance and Certification (Level 1) check no less than every 3 years.

DECOMMISSIONING AND DISPOSAL PHASE

The Operational-life Phase is inevitably preceded by the Decommissioning and Disposal Phase in the playground life-cycle. All playgrounds age with usage no matter how well they are maintained. This may be because the playground has gone beyond its economic life. It may be that the playground is considered dangerous and does not comply with the present safety standards – the cost of compliance is too onerous. It may be because children no longer find the playground exciting when compared to new and innovative designs. Or it may simply be that the costs associated with



operating and maintaining the playground are soaring due to the high cost of obtaining appropriate spare parts or the high frequency of equipment component failure.

At some point a decision has to be made to decommission and plan for the playground replacement. Who makes this decision and when is this decision made? The better managers make this decision many years before the decommissioning occurs. They make it in a proactive and not reactive manner. They take into consideration the existing and projected needs of the local community. The decommissioning and disposal phase needs to be planned just like any other phase in the life of the playground.

Finally, the playground equipment and the playground surfacing need to be disposed of in an environmentally sustainable manner.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion it is suggested that only when the playground industry matures and it is common practice to consider playground management as an integrated lifecycle system will we truly see the incorporation of appropriate playground surfacing.

Life-cycle costing when used in conjunction with cost accounting can be used by playground asset owners to make informed decisions based on actual whole of life costs. The days of basing procurement decisions solely on the initial capital cost have long gone. Local government and Parish Councils can no longer take the risk of ignoring maintenance and standards compliance. They can also not afford an open cheque-book approach to playground maintenance. The professional solution is to look at the whole-of-life asset cost. It is no longer a question of whether you can afford to carry out life-cycle costing, but whether you can afford not to.

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REFERENCES

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BIOGRAPHY:

Dr David Eager is an Associate Professor at UTS, a Fellow of Engineers Australia, Councilor on the Board of Kidsafe. He is a PLA NSW Board Member and an Associate Editor for the Australasian Parks and Leisure Journal.

David has a PhD in the area of Occupational Health and Safety, a 1st Class Honours Degree in Engineering, and a Graduate Certificate in Dispute Resolution.

David holds representative positions on the Australian Standards Committees for:

- Children's Playground Equipment CS/005;
- Amusement Rides and Devices ME/051;
- Indoor Play Areas ME/051-03 (Chair);
- Trampolines CS/100 (Chair);
- Sports and Recreational Equipment CS/101; and
- Artificial Climbing Structures and Challenge Course Equipment SF/047 (Chair).

David also holds representative positions on International Standards Committees for:

- European Standards Committee CEN/TC 136 Sports, Playground and other recreational equipment;
- ASTM International Committee F08 Sports Equipment and Facilities Technical Committee and Subcommittees: F08.21 Playground Surfacing Systems; F08.36 Soft-Contained Play Systems; and F08.43 Soccer Goal Safety; F08.64 Natural Playing Surfaces; and F08.65 Artificial Turf Surfaces and Systems; and
- ASTM International Committee F15 Consumer Products Technical Committee and Subcommittees: F15.09 Home Playground Equipment; F15.29 Playground Equipment Public Use.