ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

International Construction Measurement Standards Coalition

International Construction Measurement Standards:
Global Consistency in Presenting Costs

2nd edition

Incorporating Life Cycle Costs

ICMSC Consultation Draft
January 2019

Contents

Welcome to ICMS, 2nd edition: Global Consistency in Presenting Costs – Incorporating Life Cycle Costs

Life cycle costs play a pivotal role in the financial management of construction projects around the world. They allow critical decisions to be made about the importance of capital and longer-term costs that ultimately affect asset performance, longevity, disaster resilience and sustainability. It is for this reason that the **ICMS Coalition** has revised and extended the scope of International Construction Measurement Standards (**ICMS**) to incorporate this broader cost classification. This new edition supersedes the first edition of **ICMS** (July 2017) although this second edition can still be used solely for capital cost reporting.

Since inception, the driving principle behind **ICMS** has been that consistent practice in presenting construction costs globally will bring significant benefits to construction cost management. As such **ICMS** aim to provide global consistency in classifying, defining, measuring, analysing and presenting entire life cycle costs of construction projects at regional, state, national or international level. **ICMS** are a cost classification system. Globalisation of the construction business has only increased the need to make this meaningful comparative analysis between countries, not least by international organisations such as the World Bank Group, the International Monetary Fund, various regional development banks, non-governmental organisations and the United Nations.

Since its introduction to the market in 2017 **ICMS** has been already been adopted by a number of high-profile bodies seeking to benchmark project costs internationally. To date this includes large public sector project sponsors, global cost consultancies, constructors, and other construction sector stakeholders (for a list of business support partners visit icms-coalition.org).

ICMS has been created through a transparent, detailed and inclusive standard-setting process. The second edition has followed the same development method as the first. A second independent Standards Setting Committee (the **SSC**) was formed, including experts in life cycle costing as well as some of the experts who developed the first edition. The **SSC** worked virtually and met three times, once in Dubai and twice in London.

It is accepted that standards setting is a continuous and dynamic process. It will be listening closely to the global construction cost management community to ensure necessary updates are captured for continued improvement.

Many key stakeholders are being engaged in the process of implementation. A list of **ICMS**-supporting partners is shown on the I**CMS Coalition** website (https://icms-coalition.org/) – these organisations are committed to the adoption of **ICMS**.

For further information on **ICMS,** please visit the website (https://icms-coalition.org/).

On behalf of the **ICMS Coalition** Trustees:

Ken Creighton – (Royal Institution of Chartered Surveyors) – Chair

Craig Bye – (Canadian Institute of Quantity Surveyors) – Vice Chair

Julie dela Cruz – (Philippine Institute of Certified Quantity Surveyors) – General Secretary.

International Construction Measurement Standards Coalition (ICMSC)

The **Coalition** is a non-governmental, not-for-profit professional coalition. A wide range of professional organisations are represented in the **Coalition** and the **SSC**. They were generous in providing their national standards, which again provided the basis for the early deliberations of the **SSC**.

The **Coalition** originally formed on 17 June 2015 at the International Monetary Fund in Washington DC, USA. The **Coalition** aims to bring about consistency in construction cost reporting standards internationally through the development and adoption of **ICMS**.

The **Coalition** members for the second edition are:

Africa Association of Quantity Surveyors (AAQS)

Association for the Advancement of Cost Engineering International (AACE)

Association of Cost Engineers (ACostE)

Association of South African Quantity Surveyors (ASAQS)

Australian Institute of Quantity Surveyors (AIQS)

Brazilian Institute of Cost Engineers (IBEC)

Building Surveyors Institute of Japan (BSIJ)

Canadian Institute of Quantity Surveyors (CIQS)

Chartered Institute of Building (CIOB)

Chartered Institution of Civil Engineering Surveyors (ICES)

China Electricity Council (CEC)

China Engineering Cost Association (CECA)

Commonwealth Association of Surveying and Land Economy (CASLE)

Conseil Europeen des Economistes de la Construction (CEEC)

Consejo General de la Arquitectura Técnica de España (CGATE)

Construction Management Association of America (CMAA)

Dutch Association of Quantity Surveyors (NVBK)

European Federation of Engineering Consultancy Associations (EFCA)

Federation Internationale des Geometres (FIG)

Fiji Institute of Quantity Surveyors (FIQS)

Ghana Institution of Surveyors (GhIS)

Hong Kong Institute of Surveyors (HKIS)

Ikatan Quantity Surveyor Indonesia (IQSI)

Indian Institute of Quantity Surveyors (IIQS)

Institute of Engineering and Technology (IET)

Institute of Quantity Surveyors of Kenya (IQSK)

Institute of Quantity Surveyors Sri Lanka (IQSSL)

Institution of Civil Engineers (ICE)

Institution of Surveyors Kenya (ISK)
Institution of Surveyors of Uganda (ISU)
International Cost Engineering Council (ICEC)
Italian Association for Total Cost Management (AICE)
Korean Institution of Quantity Surveyors (KIQS)
New Zealand Institute of Quantity Surveyors (NZIQS)
Nigerian Institute of Quantity Surveyors (NIQS)
Pacific Association of Quantity Surveyors (PAQS)
Philippine Institute of Certified Quantity Surveyors (PICQS)
Property Institute of New Zealand (PINZ)
Real Estate Institute of Botswana (REIB)
Royal Institute of British Architects (RIBA)
Royal Institution of Chartered Surveyors (RICS)
Royal Institution of Surveyors Malaysia (RISM)
Singapore Institute of Building Limited (SIBL)
Singapore Institute of Surveyors and Valuers (SISV)
Sociedad Mexicana de Ingeniería Económica, Financiera y de Costos
Society of Chartered Surveyors Ireland (SCSI)
Union Nationale des Economistes de la Construction (UNTEC).

ICMS Standards Setting Committee (ICMS SSC)

The **SSC** comprises experts selected by the **Coalition** and representing a wide range of professional construction organisations in the built environment. The **SSC** acts independently from the **Coalition** and its members.

The SSC members and co-authors of ICMS, 1st edition (July 2017) are:

Ong See-Lian (Malaysia)	Chairman
Alan Muse (UK)	Vice-Chairman
Gerard O'Sullivan (Republic of Ireland)	Executive Secretary
Alexander Aronsohn (UK)	
Dainna Baharuddin (Malaysia)	
Tolis Chatzisymeon (Greece)	
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Ruya Fadason (Nigeria)	
Roger Flanagan (UK)	
Mark Gardin (Canada)	
Malcolm Horner (UK)	
Roy Howes (Canada)	
Guo Jing Juan (China)	
Philip Larson (USA)	
Patrick Manu (Ghana)	
Charles Mitchell (Republic of Ireland)	
Sinimol Noushad (UAE)	
Antonio Paparella (Belgium)	
David Picken (Australia)	
Anil Sawhney (India)	
Peter Schwanethal (UK)	
Koji Tanaka (Japan)	
Tang Ki-Cheung (Hong Kong).	

In January 2018, the **SSC** started drafting the second edition incorporating life cycle costs. Experts in life cycle costing therefore joined the **SSC**.

The **SSC** members and co-authors of the second edition are:

Ong See-Lian (Malaysia)	Chairman
Alan Muse (UK)	Vice-Chairman
Gerard O'Sullivan (Republic of Ireland)	Executive Secretary
Alexander Aronsohn (UK)	
Dainna Baharuddin (Malaysia)	
Tolis Chatzisymeon (Greece)	
Ruya Fadason (Nigeria)	
Andrew Green (UK)	
Malcolm Horner (UK)	
Roy Howes (Canada)	
Francis Leung (Hong Kong)	
Patrick Manu (Ghana)	
Brian McBurney (Canada)	
Charles Mitchell (Republic of Ireland)	
Sinimol Noushad (UAE)	
Antonio Paparella (Belgium)	
David Picken (Australia)	
Anil Sawhney (India)	

Koji Tanaka (Japan)
Tang Ki-Cheung (Hong Kong)
Luizviminda Villacan (Philippines).

Part 1 Context

1.1 Introduction

Research from the World Economic Forum and McKinsey Global Institute have shown that improvements in the design and construction process can be achieved by using international standards like ICMS to gain comparable and consistent data. **ICMS** provides a structure and format for classifying, defining, measuring, analysing and presenting construction and other life cycle costs. This will promote consistency and transparency across international boundaries. The **SSC** has focused only on issues directly related to the costs associated with the constructed asset, so that cross-boundary costs can be benchmarked and the causes of differences in costs identified.

The **ICMS** project followed work on the development of International Property Measurement Standards (**IPMS**). **IPMS** established standards for measuring the floor areas of buildings. For **ICMS** a key element was that **ICMS** would be compatible and accord with **IPMS**.

ICMS offer a framework against which construction costs and other life cycle costs can be classified, measured, recorded, analysed and presented. The hierarchical framework has four levels:

- Level 1: Project or Sub-Project
- Level 2: Cost Category
- Level 3: Cost Group
- Level 4: Cost Sub-Group.

The composition of Levels 2 and 3 is the same for all **Projects** and **Sub-Projects**, although discretion is allowed at Level 4. Examples of the contents of Level 4 are given in **Appendices A to E**.

These Standards provide definitions, scope, attributes and values, units of measurement and explanatory notes for each type of **Project**. Guidance is given on:

- how the Standards are to be used
- the level of detail to be included while presenting costs
- the method of dealing with **Projects** comprising different **Sub-Projects** and
- the approach for ensuring that like is compared with like, especially considering different currencies and timeframes.

For buildings, the existing cost analysis standards worldwide require the measurement of either gross external floor area (**GEFA**) or gross internal floor area (**GIFA**). This permits the representation of overall costs in terms of currency per **GEFA** or **GIFA**. Research shows that floor area measurement standards vary considerably between countries. The linking of **ICMS** with **IPMS** provides a valuable tool for overcoming these inconsistencies. **ICMS** require a cost report to include both **GEFA** (**IPMS 1**) and **GIFA** (**IPMS 2**) measured in accordance with the rules set out in **IPMS**. These are summarised in **Appendix H**.

For selected types of civil engineering projects, **ICMS** also provide units of measurement describing their physical sizes and functional capacities for comparison. The second edition extends the number of civil engineering **Projects** or **Sub-Projects** to include ‘Dams and reservoirs’, and ‘Mines and quarries’.

ICMS are high-level standards. The transparent and inclusive standards-setting process described has resulted in a full analysis and appreciation of standards and practices in many more countries than those directly represented by **SSC** members. **ICMS** are not a hybrid of those standards but do introduce some concepts that may be new to some markets. Markets

that do not have established standards are, however, encouraged to adopt **ICMS**. Markets that do have established local standards should adopt **ICMS** to compare cost data prepared using different standards from different markets on a consistent, like-for-like basis. The aim is not to replace existing local standards, but to provide an internationally-accepted consistent framework into which data generated locally can be mapped for the purposes of comparison. In time, it is expected that **ICMS** will become the primary basis for both global and local construction cost reporting.

In drafting **ICMS**, the **SSC** has been conscious of the need for compatibility with other established or emerging standards. It has striven to strike a balance between the need to be compatible with other standards and the need for flexibility to accommodate the different cost classification systems that exist across the world.

Thus, the types of **Project** are generally compatible with the United Nations *International Standard Industrial Classification of all Economic Activities*. The **Cost Sub-Groups** are generally compatible with the elements in ISO 12006-2:2015, *Building construction – Organization of information about construction works – Part 2: Framework for classification* and can be adapted to be compatible with most other cost classification systems. The **Cost Groups** and **Cost Sub-Groups** for **Life Cycle Costs** are generally compatible with ISO 15686-5:2017 *Buildings and constructed assets -- Service life planning -- Part 5: Life-cycle costing*.

In addition, it has been recognised that a work breakdown structure (WBS) approach to cost reporting is widely used around the world, particularly in civil engineering. Therefore, examples of mapping to and from various national standards and WBS are included on the **Coalition** website (https://icms-coalition.org/).

1.2 Aims

ICMS aim to provide global consistency in classifying, defining, measuring, analysing and presenting entire construction and other life cycle costs at a project, regional, state, national or international level. **ICMS** allow:

- construction and other life cycle costs to be consistently and transparently benchmarked (comparative benchmarking)
- the causes of differences in life cycle costs between projects to be identified (option appraisal)
- properly informed decisions on the design and location of construction projects to be made at the best value for money (investment decision making), and
- data to be used with confidence for construction project financing and investment, decision-making, and related purposes (certainty).

Part 4 provides definitions of terms commonly used throughout the Standards. Definitions specific to particular types of **Projects** are provided in **Appendices A to E.**

1.3 Use of the Standards

The second edition of **ICMS** can be used to present Acquisition Costs, Construction Costs, Renewal Costs, Operation Costs, Maintenance Costs, and End of Life Costs using the template provided in **Appendix G**. Those interested in simply presenting the Construction Costs can use the templates entitled ‘Construction Costs only’.

Where a cost report has been prepared in compliance with **ICMS**, this should be stated in the report.

ICMS can be used to report, analyse and compare historic, present and future construction and other life cycle costs of new build and **Major Adaptation** programmes and projects. This applies throughout the various stages of construction and/or after completion of construction through to the end of life or a shorter **Period of Analysis**.

Applications include, but are not limited to:

- global investment decisions
- international, national, regional or state cost comparisons
- feasibility studies and development appraisals
- project work including cost planning and control, cost analysis, cost modelling and the procurement and analysis of tenders
- dispute resolution work
- reinstatement costs for insurance and
- valuation of assets and liabilities.

Process flow charts set out the comprehensive steps for the use of the Standards and are provided in **Appendix F**.

The cost report should make clear precisely what costs have been included or excluded, to avoid confusion or omissions in comparing alternative project options and to inform decision making. The most appropriate available data sources should be used. These may be in the public domain or not, but the origin should be recorded.

Part 2 ICMS Framework

2.1 Overview

Figure 1 sets out the broader context and scope for ICMS, 2nd edition, including what is covered beyond the scope of the 1st edition.

Figure 1: ICMS Framework

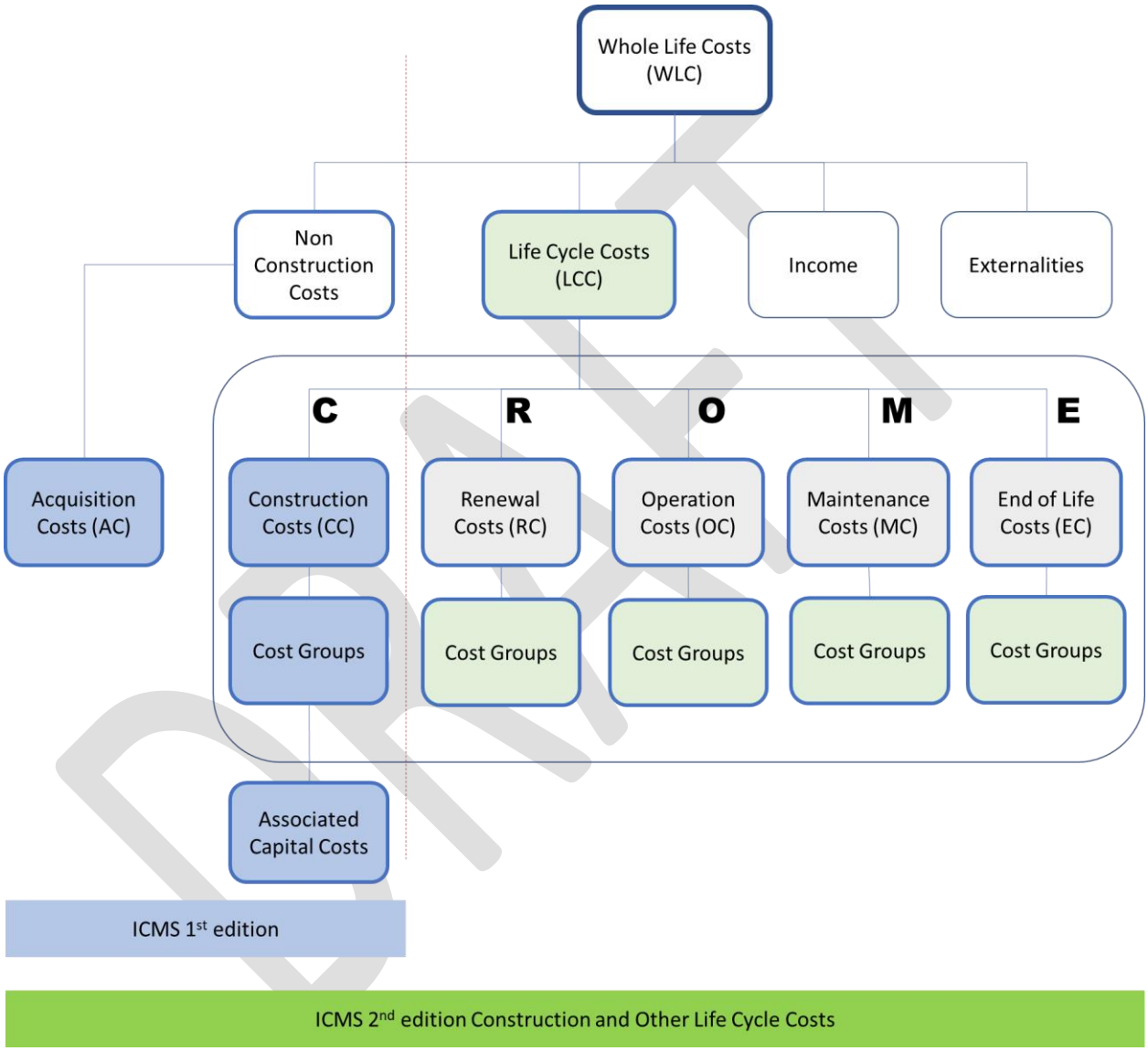
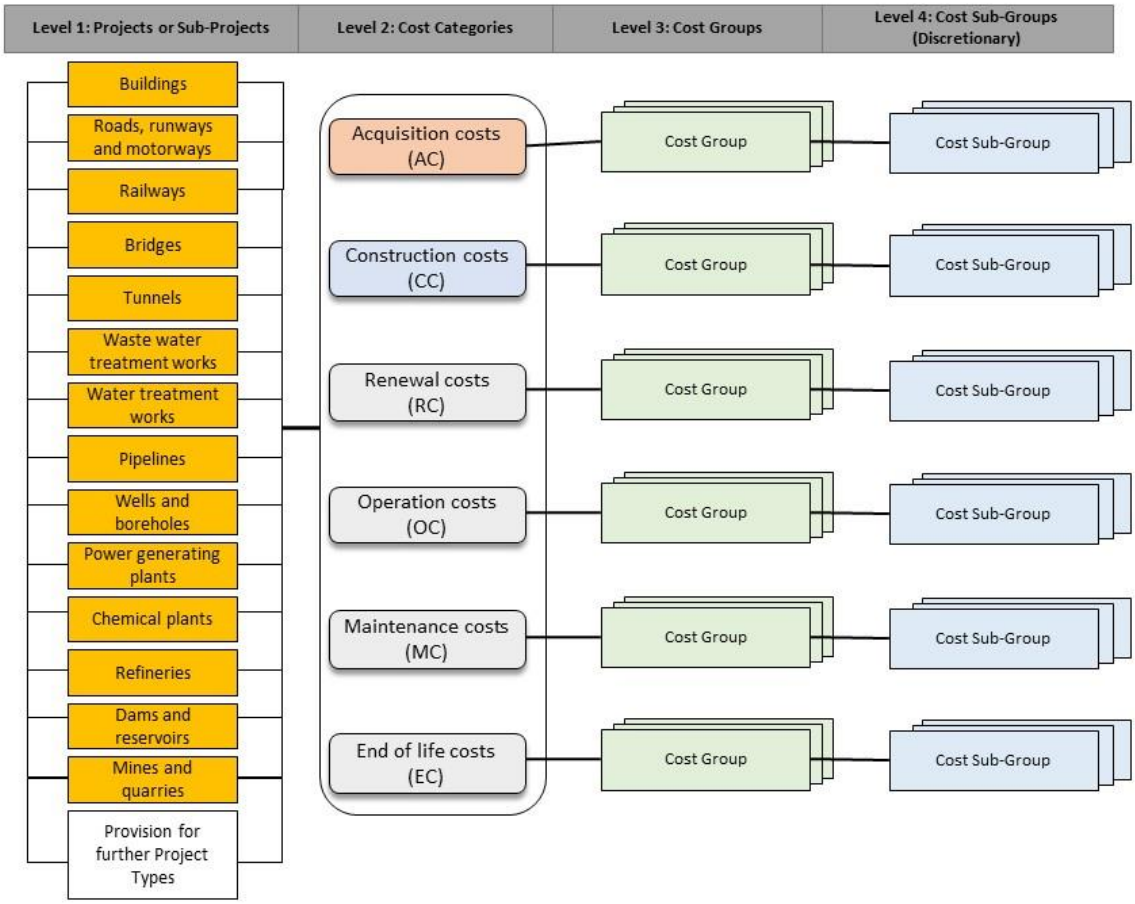


Figure 2 presents the overall taxonomy used for ICMS, 2nd edition. The taxonomy consists of four levels with Level 1 through Level 3 being mandatory while Level 4 is discretionary.

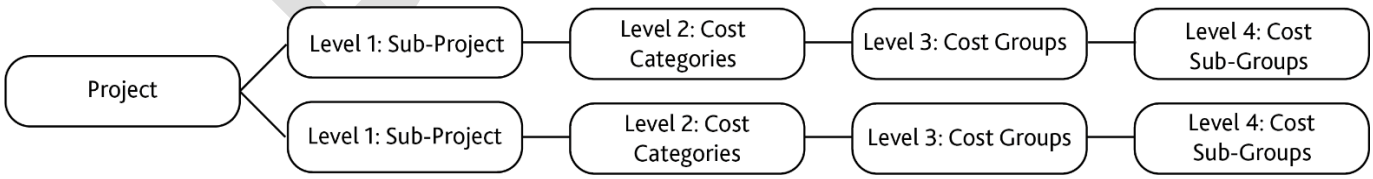
Figure 2: ICMS Framework including Level 1 Projects and Sub-Projects



2.2 Hierarchical Levels

Figure 3 shows the hierarchical links between the four levels of the ICMS taxonomy, from the highest to the lowest level of detail.

Figure 3: ICMS Hierarchy



The description of each level in Figure 3 is as follows.

Project and Sub-Project (Level 1)

ICMS classify **Projects** according to their essence and principal purpose. The **Projects** shown in the framework are not exhaustive and will be further developed in future editions of the Standards. **Projects** have been assigned the following codes:

01.	Buildings	08.	Pipelines
02.	Roads, runways and motorways	09.	Wells and boreholes
03.	Railways	10.	Power-generating plants
04.	Bridges	11.	Chemical plants
05.	Tunnels	12.	Refineries
06.	Waste water treatment works	13.	Dams and reservoirs
07.	Water treatment works	14.	Mines and quarries

When a **Project** is too large or complex to be described by a single set of **Project Attributes** and **Project Values**, it is to be subdivided for cost reporting into **Sub-Projects**, each described by a single set of **Project Attributes** and **Project Values**. A **Project** can have multiple **Sub-Projects**. It is also possible to use a combination of **Sub-Projects** within a **Project** to report a collection of **Projects** under the names of 'programme' or 'portfolio'.

Cost Categories and Cost Groups (Levels 2 and 3)

The **Cost Categories** at Level 2 and **Cost Groups** at Level 3, as defined in Table 1, are mandatory and standardised for all **Projects** to enable high-level comparison between different **Projects** and **Sub-Projects**.

Table 1: Definitions of Cost Categories (Level 2) and Cost Groups (Level 3)

- Accepted alternative terms are separated with a vertical slash (|).
- All individual costs reported should be those paid or payable by the **Client** and include the payees' overheads and profits where applicable.
- Different levels of Cost codes are to be linked together with a '.' in between.

Cost Code	Description
	Cost Categories (Level 2)
	Cost Groups (Level 3)
	Life Cycle Cost (CC plus NPV of RC, OC, MC, and EC)
1.	Acquisition Costs (AC) [Part of Non-Construction Costs]
2.	Construction Costs (CC)
3.	Renewal Costs (RC)
4.	Operation Costs (OC)
5.	Maintenance Costs (MC)
6.	End of Life Costs (EC)
1.	**Acquisition Costs (AC)**
01.	Site acquisition • Scope: All payments required to acquire the site, excluding physical construction.
02.	Administrative, finance, legal and marketing expenses • Scope: All other expenses associated with Project realisation, from inception to putting the Project into use.
2.	**Construction Costs (CC)**
3.	**Renewal Costs (RC)**
5.	**Maintenance Costs (MC)**
01.	Demolition, site preparation and formation • Scope: All necessary advance or facilitating work to prepare, secure and form the site to enable substructure [construction | renewal | maintenance]
02.	Substructure • Scope: All the load-bearing work underground or underwater up to and including the following (including related earthwork, lateral support beyond site formation, and non-load-bearing components forming an integral part of composite load-bearing work) and as illustrated in 4.2: – for buildings: lowest floor slabs, and basement sides and bottom including related waterproofing and insulation – for roads and motorways: sub-base to pavements – for railways: sub-base to rail track structures – for bridges: pile caps, footings, bases nearest ground level or water level if constructed in water – for tunnels: external faces of structural tunnel linings – for tanks and the like underground: external faces of tanks – for tanks and the like above ground: bases supporting tanks – for pipelines underground: beds and surrounds to underground pipes – for pipelines above ground: bases to structures supporting pipes – for wells and boreholes: bases to structures supporting well heads – for dams and reservoirs: seepage ditch, drainage layer/blanket, drain channels, foundation, base, footings, cut-off wall, heel and toe – for mines and quarries: Underground mines: bases to structures supporting shaft headgear; Open pit: bases to structures; Process: bases to structures, tanks, and bases to major process equipment.

Cost Code	Description
	Cost Categories (Level 2)
	Cost Groups (Level 3)
03.	Structure • Scope: All the load-bearing work, including non-load-bearing components forming an integral part of composite load-bearing work, excluding that included in Substructure and Architectural works | Non-structural works.
04.	Architectural works | Non-structural works • Scope: All architectural and non-load-bearing work excluding services, equipment and underground drainage.
05.	Services and equipment • Scope: All fixed services and equipment required [to put the completed project into use for Construction Costs | to sustain the use after completion of construction for Renewal and Maintenance Costs], whether they are mechanical, hydraulic, plumbing, fire-fighting, transport, communication, security, electrical or electronic, excluding external underground drainage.
06.	Surface and underground drainage • Scope: All external surface and underground drainage systems specifically serving the Project.
07.	External and ancillary works • Scope: All work outside the external face of buildings or beyond the construction entity required to fulfil the primary function of the Project and not included in other Cost Groups.
08.	Preliminaries | Constructors' site overheads | general requirements • Scope: Constructors' site management, temporary site facilities, site services, and expenses, not directly related to a particular Cost Group, but commonly required to be shared by all Cost Groups.
09.	Risk Allowances • Scope: As defined in section 1.2 but related to [Construction | Renewal | Maintenance] Costs and not included in other Cost Groups.
10.	Taxes and Levies • Scope: As defined in section 1.2 and not included in other Cost Groups.
11.	Work and utilities off-site • Scope: All payments to government authorities or public utility companies to connect l keep connected public work and utilities to the site, or services diversions, to enable the Project, including related risk allowances, taxes and levies.
12.	Post-completion loose furniture, fittings and equipment • Scope: Those provided for the Project to perform its function close to or after completion of construction, including related risk allowances, taxes and levies.
13.	Construction | Renewal | Maintenance -related consultancies and supervision • Scope: Fees and charges payable to Service Providers not engaged by the Constructors, including related risk allowances, taxes and levies.
4.	**Operation Costs (OC)**
01.	Cleaning • Scope: Periodic, routine and specialist cleaning of internal and external works.
02.	Utilities

Cost Code	Description
	Cost Categories (Level 2)
	Cost Groups (Level 3)
	• Scope: Fuel, including gas, electricity, fuel oil solid and other fuel, water and drainage including water rates, effluents sewerage drainage and other charges.
03.	Waste management • Scope: Collection, compaction, removal and disposal and/or recycling general and toxic waste from the constructed asset.
04.	Security • Scope: Physical security (such as access control, CCTV camera) including staff or contractors involved in providing security controls via remote support centres, to the constructed assets.
05.	Information and Communications Technology • Scope: Information communications systems (such as Public address and Communications cabling and IT support services built as constructed assets, as well as Technology used for monitoring assets (i.e. Building Management Systems) and physical sensors.
06.	Operators' site overheads | general requirements • Scope: Operators' site management, temporary site facilities, site services, and expenses, not directly related to a particular Cost Group, but commonly required to be shared by all Cost Groups.
07.	Risk Allowances • Scope: As defined in section 1.2 but related to Operation Costs and not included in other Cost Groups.
08.	Taxes and Levies • Scope: As defined in section 1.2 but related to Operation Costs.
6.	**End of Life Costs (EC)**
01.	Disposal inspection • Scope: Inspections carried out in connection with demolition, dilapidations or other contractual requirements.
02.	Decommissioning and decontamination • Scope: All post-occupation activities required to render the constructed asset ready for demolition.
03.	Demolition and reclamation • Scope: Demolition of the constructed asset at end of life or period of interest, and landfill and recycling or disposal.
04.	Reinstatement • Scope: Dealing with dilapidations, measures to comply with other contractual obligations to return the constructed asset to a required standard of repair.
05.	Constructors' site overheads | general requirements • Scope: Constructors' site management, temporary site facilities, site services, and expenses, not directly related to a particular Cost Group, but commonly required to be shared by all Cost Groups.
06.	Risk Allowances • Scope: As defined in section 1.2 but related to End of Life Costs and not included in other Cost Groups.
07.	Taxes and Levies • Scope: As defined in section 1.2 but related to End of Life Costs.

Cost Sub-Groups (Level 4)

The costs of components of a **Project** or **Sub-Project** under each **Cost Group** serving a specific function or common purpose are grouped into one **Cost Sub-Group**, such that the costs of alternatives serving the same function can be compared, evaluated and selected. **Cost Sub-Groups** are chosen irrespective of their design, specification, materials or construction.

These Standards do not mandate the classification of the **Cost Sub-Groups** (Level 4), but the following appendices provide examples of what might be included:

- Appendix A – Acquisition Cost Sub-Groups
- Appendix B – Construction | Renewal | Maintenance Cost Sub-Groups: Buildings
- Appendix C – Construction | Renewal | Maintenance Cost Sub-Groups: Civil Engineering Works
- Appendix D – Operation Cost Sub-Groups
- Appendix E – End of Life Cost Sub-Groups.

Users of these Standards may adopt a **Cost Sub-Group** classification based on trades, work breakdown structure or work results according to their local practice.

Cost codes

Cost codes are a unique identifier for digital purposes. They have been assigned to the **ICMS** hierarchy down to Level 4. However, since the classification of the **Cost Sub-Groups** at Level 4 is not mandatory, the cost codes there may be suitably adjusted.

2.3 Project Attributes and Project Values

To enable consistent and concise evaluation and comparison between different **Projects** or different design schemes, these Standards provide a set of **Project Attributes** and **Project Values** in Part 3 describing the principal characteristics of each **Project** or **Sub-Project**.

Costs should, as far as practicable, be stated in their payment currencies. When it is necessary to carry out a currency conversion, the exchange rates or conversion factors used and the applicable dates should be stated.

2.4 Life Cycle Cost Considerations

Setting the scope of the life cycle costs

Life cycle costing (LCC) is an economic evaluation method that takes account of all relevant costs over a time horizon (**Period of Analysis**). Presentation of life cycle costs should make clear the scope of those costs included or excluded (as defined in the **Cost Categories** and **Cost Group** tables) and the relevant level of costs for the LCC purpose, as well as dealing with the time value of money.

Life cycle costs may be reported at a lesser level of detail than the underlying analysis. For example, the detailed cost analysis may be at **Level 4 Cost Sub-Groups**, whereas reporting may be at **Constructed Asset Level 1 Project** or **Sub-Project Costs** or **Level 2 Cost Categories** or **Level 3 Cost Groups.**

Life cycle costing may be part of a wider economic project evaluation that considers the whole life costs (including non-construction costs such as finance, business income from sales and disposals, and externalities).

Expected asset life

The design life of the **Constructed Asset** is a key performance requirement and should be defined in the project brief. The estimated expected service life of the **Constructed Asset** should be at least as long as the design life.

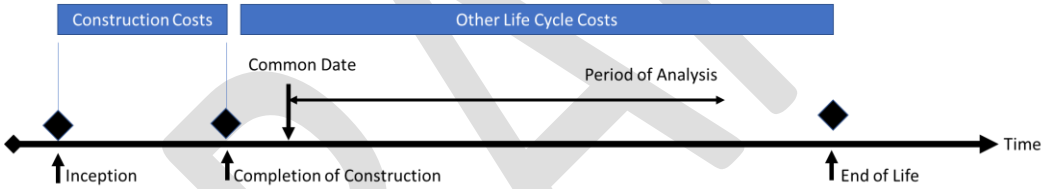
Renewals of **Constructed Assets** during the expected service life should be included in the life cycle cost's **Period of Analysis**, as well as any associated end of life or handback obligations.

Time value of money

The initial construction costs reported should be the forecast or actual final costs to complete the construction of the **Project**. Forecast costs should include an adjustment for price level fluctuations until the completion of the **Project** using published market indices and an agreed **Base Date**.

The rest of the life cycle costs should be the forecast costs after the completion of construction until the end of life or a shorter **Period of Analysis** (e.g. one to ten years). This should be defined in the project scope, discounted to a **Common Date** not earlier than the completion of construction and made using **Discount Rates** mandated by government authorities for public projects or published **Discount Rates** for the market where the **Project** is located for private projects or other rates such as those designated by the **Client**. These interrelated terms of LCC are illustrated in Figure 4.

Figure 4: LCC Calculations and Period of Analysis



ICMS can be used to record, collect and analyse actual costs. Actual costs should be recorded in the amounts paid. When historic actual costs are used for forecasting future costs, **Price Level Adjustments** should be made to bring the historic costs to the desired date of payment. Life cycle costing has certain cost variables. It is therefore important to record the purpose, scope, form and method of the economic appraisal as well as the **Common Date** and the underlying assumptions, risks and uncertainty, information and data sources.

Net Present Value Calculations

For option appraisal based on life cycle costs the **net present values** (**NPV**) of different options should be compared. The **NPV** of an option should be a single figure that sums up the present values of all relevant future life cycle costs occurring during the **Period of Analysis**. **NPV** is the normal measure for discounted life cycle costs.

To convert a future cost to the present value (cost) at the **Common Date,** the following formulae, using $ as an example currency, can be used:

- Present value = future cost × discounting factor
- R% = **Discount Rate** per annum
- Discounting factor for the same cost spent at the end of year N after the **Common Date**
  = PV of $1 after N years
  = $1 / (1 + R\%)^{N}$
  - Discounting factor for a cost spent annually for N years after the **Common Date**
    = PV of $1 per annum after N years
    = $[1 - 1 / (1 + R\%)^{N}] / R\%$

Part 3 Project Attributes and Project Values

This part of the standard sets out the **Project Attributes** and **Project Values** to be used when presenting costs. These attributes have been carefully selected and are limited to those that have a direct bearing on the costs. Cost comparisons are made possible within project types by these **Project Attributes**.

Notes:

1. All values should be given so long as the attributes are relevant.
2. Alternative values are separated with a vertical slash (|). More than one alternative value may be chosen. Some attributes are multi-valued requiring the entry of sets of sub-attributes and values, e.g. more than one set of dimensions or quantities are to be stated when more than one size is involved.
3. All quantities should be rounded to the nearest whole number unless considered inappropriate in special circumstances.
4. These **Project Attributes** and **Project Values** capture the minimum principal cost-significant characteristics of a **Project** or **Sub-Project**. Users may add more **Project Attributes** and **Project Values** to suit their needs.
5. The values of functional units refer to the designed values.

Project Attributes	Project Values
Common for all Projects and Sub-Project Types **(Project level only)**	
Report	
Project title	
Status of cost report	pre-construction forecast | at tender | during construction | actual costs of construction post-completion | renewal forecast during use | end of life forecast
Date of cost report	(month and year)
Revision number of cost report	
Brief description of the Project	
• client's name	
• main Project type (principal Sub-Project)	
• brief scope	
Location and country	International Organisation for Standardisation (ISO) country code (e.g. CN) | address of building site(s) | start and end locations for linear civil engineering works
Sub-Projects included	buildings | roads, runways and motorways | railways | bridges | tunnels | waste water treatment works | water treatment works | pipelines | wells and boreholes | power-generating plants | chemical plants | refineries | dams and reservoirs | mines and quarries | common | other stated

Project Attributes	Project Values
Common for all Projects and Sub-Project Types (Project level only)	
Construction Cost Price Level	
ISO currency code	(e.g. USD)
Base date of costs (if individual cost is exclusive of Price Level Adjustments after that date)	(month and year)
Price basis	fixed unit rates | unit rates subject to fluctuating adjustment
Construction Cost Currency Conversion	
Conversion date	
Exchange rates or other conversion factors (used to convert a cost report of multi-currencies into a single currency)	(numeric conversion and currency codes)
Construction Programme	
Project status	initiation and concept phase | design phase | construction and commissioning phase | complete
Construction period	
• number of months	
• start date (planned or actual)	Month and year
• end date (planned or actual)	Month and year
Site	
Existing site status	
• state of use	greenfield | brownfield
• type of use	urban | rural | agricultural
Legal status of site	freehold | leasehold | joint venture | not owned | other stated
Site topography	principally flat | principally hilly | mountainous | offshore | other stated
Ground conditions (predominant)	soft | rocky | reclaimed | submerged | swampy
Seismic zones (state more than one if applicable based on location)	
Site conditions and constraints	
• access problems	difficult | average | easy
• extreme climatic conditions	difficult | average | easy
• environmental constraints	difficult | average | easy
Construction Procurement	
Funding	private | public | public and private in partnership
Project delivery	

Project Attributes	Project Values
Common for all Projects and Sub-Project Types **(Project level only)**	
• pricing method	lump sum | stipulated price | re-measurement | cost reimbursement | other stated
• mode of procurement	design bid build | design and build (turnkey) | build operate and transfer | public private partnership | management contracting | construction management | engineer procure construct | target | other stated
• joint venture foreign Constructor	yes | no
• predominant source of Constructors	local | foreign
Life Cycle Cost Related	
Life cycle costing	
• purpose	for a business case | for option appraisals | for producing a sinking fund | for cost analysis | other (stated)
• method of presentation of costs	net present value
• common date (to which all costs are discounted or compounded)	(month and year)
• project status at common date	initiation and concept phase | design phase | construction and commissioning phase | in use | close to end of life
• discount rate	real discount rate | nominal discount rate (% per annum)
Expected constructed asset life span after completion of construction	design life | alternative life span (years)
Period of analysis for life cycle costing	
• until	end of life | end of interest
• from	(month and year)
• to	(month and year)
• number of months l years	(months l years)
Primary usage type constraints affecting expected life and life cycle costs (if applicable)	
• hours of operations (e.g. office hours 9 to 5.30 Monday to Friday)	
• access restrictions	
• environmental	
• statutory	
• contractual	
• others	
Renewals planned (during period of analysis)	

Project Attributes	Project Values
Common for all Projects and Sub-Project Types **(Project level only)**	
• scope of renewal (stating key Cost Groups/Sub-Groups included)	• (a) = • (b) = • (c) = • etc
• respective cycle (e.g. every 5 years)	• (a) = • (b) = • (c) = • etc (years)
• number of renewal cycles included (during the period of analysis)	• (a) = • (b) = • (c) = • etc
End of Life Costs	
• handback obligations at end of life / period of analysis (if applicable)	

Buildings

(A construction with a cover and enclosure to house people, equipment or goods)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	residential | office | commercial | shopping centre | industrial | hotel | car park | warehouse | educational | hospital | airport terminal | railway station | ferry terminal | plant facility | other stated
Nature	new build | major adaptation | temporary
Grade (qualitative description to be read in conjunction with the location)	ordinary quality | medium quality | high quality
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• structural (predominant)	timber | concrete | steel | load-bearing masonry | other stated
• external walls (predominant)	stone | brick/block | render/block | curtain walling | other stated
• environmental control	non-air conditioned | air conditioning
• degree of prefabrication	less than 25% | up to 50% | up to 75% | up to 100%, of Construction Costs
Project Complexity	
• shape (on plan)	circular, elliptical or similar | square, rectangular, or similar | complex
• shape (vertical section)	circular, elliptical or similar | square, rectangular, or similar | complex
• design	simple | bespoke | complex
• method of working	sectional completion | out-of-hours working | confined working | other stated
Design life	(years)
Average height of site above or below sea level	(m | ft)
Dimensions (overall length × width × height of each building to highest point of the building)	(m | ft)
Typical storey height (floor level to floor level)	(m | ft)
Other storey heights and applicable floors	(m | ft)

Buildings (A construction with a cover and enclosure to house people, equipment or goods)	
Number of storeys above ground (qualitative description to be read in conjunction with the location)	house | low rise | medium rise | high rise
Number of storeys above ground (quantitative)	specific number | 0–3 | 4–7 | 8–20 | 20–30 | 30–50 | over 50
Number of storeys below ground	specific number
Hotel grade	international below 4-star | international 4-star | international 5-star | international over 5-star | local below 4-star | local 4-star | local 5-star | local over 5-star
Project Quantities	
Site area (within legal boundary of building site, excluding temporary working areas outside the site)	(m^2 | ft^2)
Covered area on plan	(m^2 | ft^2)
Gross external floor area as IPMS 1	(m^2 | ft^2)
Gross internal floor area as IPMS 2	(m^2 | ft^2)
Functional units	number of occupants | number of bedrooms | number of hospital beds | number of hotel rooms | number of car parking spaces | number of classrooms | number of students | number of passengers | number of boarding gates | other stated

Roads, runways and motorways

(A pavement providing a thoroughfare, route, or way for vehicular traffic on land between two or more places including but not limited to alley, street, collector and rural roads, motorways, county and interstate highways, hardstandings. Elevated roads and motorways that are an integral part of bridges shall be included in bridges). Roads in tunnels shall be included in tunnels

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	motorway | highway | freeway | expressway | road | lane | runway l hardstanding
Nature	new build | major adaptation | temporary
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• position	at grade | in cutting | on embankment | elevated
• design speed	(km | miles per hour)
• number of carriageways	
• number of lanes per carriageway	
• lane width	(m | ft)
• hard shoulders	yes | no
• footways	yes | no
• footway width	(m | ft)
• surfacing	flexible construction | concrete pavement
• vertical profile	switchbacks | undulating | flat
• plan profile	straight | winding
Project Complexity	
• number of grade-separated intersections	
• number of at-grade intersections	
• number of crossings over other roads, railways, waterways, valleys and the like	
• number of access ramps	
Design life	(years)
Altitude	
• minimum height of passageway above or below sea level	(m | ft)
• maximum height of passageway above or below sea level	(m | ft)
Dimensions	

Roads, runways and motorways

(A pavement providing a thoroughfare, route, or way for vehicular traffic on land between two or more places including but not limited to alley, street, collector and rural roads, motorways, county and interstate highways, hardstandings. Elevated roads and motorways that are an integral part of bridges shall be included in bridges). Roads in tunnels shall be included in tunnels

• total width of metalled surface of each road or motorway (including hard shoulders but excluding footways)	(m | ft)
• total length (between two places, irrespective of number of lanes)	(km | miles)
Project Quantities	
Total paved area	(m^2 | ft^2)
Functional units	
• capacity	(vehicles per hour)

Railways

(A permanent way comprising a rail track composed of two parallel rails fixed to sleepers, or single monorail that includes spurs, sidings and turnouts for train traffic or the like, including tramways, metro rails, light rails and other rapid mass transit systems)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	high speed | express | light rail | tram | freight | mixed traffic | other stated
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• position	at grade | in tunnel | elevated | other stated
• design speed	(km | miles per hour)
• maximum axle loading of traffic	(t)
• train power systems	overhead AC | overhead DC | third or contact rail(s) DC | diesel electric | other stated
• number of tracks	
• track gauge	(m | ft)
• construction rigidity	flexible | rigid
• rail joints	fish-plated | welded
• control system	European Train Control System | in cab | block signalling | centralised traffic control | other stated
• signalling system	European Railway Traffic Management System | semaphore | coloured light
Project Complexity	
• number of intersections with roads and other railways	
• number of crossings over roads, other railways, waterways, valleys and the like	
Design life	(years)
Altitude	
• minimum height of track bed above or below sea level	(m | ft)
• maximum height of track bed above or below sea level	(m | ft)

Railways

(A permanent way comprising a rail track composed of two parallel rails fixed to sleepers, or single monorail that includes spurs, sidings and turnouts for train traffic or the like, including tramways, metro rails, light rails and other rapid mass transit systems)

Dimensions	
• average width of rail corridor between legal boundaries	(m | ft)
Project Quantities	
Route length (between two places, irrespective of number of tracks)	(km | miles)
Equated track length (being the length of all tracks along the route, including those in passing loops, sidings and depots reduced to a single length)	(km | miles)
Functional units	
• weight of traffic expressed as estimated gross million tonnes or tons per annum	(M tonnes | M tons/year)
• passenger journeys	(million journeys per year)

Bridges

(A structure designed to span across a physical obstacle)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type (serving)	roads | rail | conveyors | pipeline | canal | pedestrians | other stated
Nature	new build | major adaptation | temporary
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• support	arch | post and beam | cantilever | suspension | cable-stayed | other stated
• mobility	fixed | movable | temporary
• materials	natural materials | wood | concrete | steel | advanced materials | other stated
Types of obstacles crossed	river and canal | roads and motorways | railways | other stated
Project Complexity	
• curvature (predominant)	straight | curved
• number of access ramps	
• number each of abutments/piers/towers with foundations in water	
• number each of abutments/piers/towers with foundations not in water	
Design life	(years)
Altitude	
• average height of deck above or below sea level	above | below (m | ft)
Dimensions	
• width (including walkways, hard shoulders and the like)	(m | ft)
• maximum height above the lowest point land/water	(m | ft)
• minimum clearance height	(m | ft)
• deck length measured from face to face of abutments	(km | miles)
Project Quantities	
Surface area of deck	(m^2 | ft^2)
Functional units	

Bridges (A structure designed to span across a physical obstacle)	
• capacity	(vehicles | litres | gallons | tonnes | tons per hour)

Tunnels

(An artificial underground or underwater passageway, completely enclosed except for openings for entrance and exit, commonly at each end, and for ventilation)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	road | railway | pipeline | conveyor | other stated
Nature	new build | major adaptation | temporary
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• tunnelling method	cut and fill | tunnel-boring machine | drill and blast | immersed | other stated
• in compressed air	yes | no
• lining	iron | steel | concrete | not lined
• curvature (predominant)	straight | curved | other stated
• underwater	yes | no
• ventilated	yes | no
• number of passages separated by a dividing wall	
• number of shafts	
• average depth below water or ground level	(m | ft)
Project Complexity	
• number of intersections	
• horizontal profile (predominant)	flat | undulating
• cross sectional shape	circular | oval | rectangular | other stated
Design life	(years)
Altitude	
• minimum height of passageway above or below sea level	(m | ft)
• maximum height of passageway above or below sea level	(m | ft)
Dimensions	
• overall cross section area of the tunnel (range stated in case of varying cross sections)	(m^2 | ft^2)

Tunnels

(An artificial underground or underwater passageway, completely enclosed except for openings for entrance and exit, commonly at each end, and for ventilation)

• overall dimensions (width x height | diameter) (range stated in case of varying cross sections)	(m | ft)
• length (end to end)	(km | miles)
Project Quantities	
Volume of excavation	(m^3 | yd^3).
Functional units	
• capacity	(vehicles | litres | gallons | tonnes | tons per hour)

Waste water treatment works

(A facility for the cleaning and improvement of water that contains waste products, contaminants or pollutants to make it safe for discharge to land or water)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type (descriptions of primary, secondary and tertiary treatment processes)	
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• plant technology	
• number of processes	
• tank materials for each process	steel | concrete | other stated
• term of use	fixed | temporary
Project Complexity	
• standard of cleanliness of treated water	
Design life	(years)
Altitude	
• average height of site above or below sea level	(m | ft)
Dimensions	
• overall external diameter or length × width × height of each major structure	(m | ft)
Project Quantities	
Site area (area of land covered by permanent work, excluding temporary working areas outside the site)	(hectares | acres)
Functional units	
• capacity	(litres | gallons per day)

Water treatment works

(A facility for the cleaning and improvement of water to make it potable)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type (descriptions of processes involved)	screening | pre-ozonation | coagulation | flocculation | clarification | filtration | pH correction | chemical dosing | chlorination | other stated
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• plant technology	
• number of processes	
• tank materials for each process	steel | concrete | other stated
• term of use	fixed | temporary
Project Complexity	
• standard of cleanliness of treated water	
Design life	(years)
Altitude	
• average height of site above or below sea level	(m | ft)
Dimensions	
• overall external diameter or length × width × height of each major structure	(m | ft)
Project Quantities	
Site area (area of land covered by permanent work, excluding temporary working areas outside the site)	(hectares | acres)
Functional units	
• capacity	(litres | gallons per day)

Pipelines

(A series of pipes and tubing for the transfer of liquid, gas or powder)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type (for transporting)	liquid | gas | powder
Nature	new build | major adaptation | temporary
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• principal materials	steel | cast iron | precast concrete | uPVC | other stated
• minimum and maximum depths below ground	(m | ft)
• minimum and maximum heights above ground	(m | ft)
• drilling/boring method	cut and cover | directional drilling/boring | None
• insulation type, if insulated	
• corrosion protection measures	
Project Complexity	
• position	on land | underwater
• number of intersections	
• number of specials	
• number of crossings over roads, railways, waterways, valleys and the like	
• number of pumping stations, inspection points, pressure relief points	
Design life	(years)
Altitude	
• minimum height above or below sea level	(m | ft)
• maximum height above or below sea level	(m | ft)
Dimensions	
• length of each diameter of pipes	(m diameter x km long | ft diameter x miles long)
Project Quantities	
Total length of pipes	(km | miles)
Length from servicing inlets to outlets	(km | miles)
Functional units	

Pipelines (A series of pipes and tubing for the transfer of liquid, gas or powder)	
• capacity	(litres | gallons | m^3 | ft^3 per hour)

Wells and boreholes

(Process of drilling or boring in the ground for extraction of a natural resource or the injection of a fluid or for the evaluation/monitoring of subsurface formations)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type (for extracting)	water | gas | oil | other stated
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• lining material	steel | concrete | other stated
Project Complexity	
• position	onshore | offshore
• direction	vertical | directional
Design life	(years)
Altitude	
• commencing height above sea level	(m | ft)
• commencing height below sea level	(m | ft)
Dimensions	
• number of wells/boreholes	
• length of each diameter of vertical drilled/bored wells/boreholes	(m diameter x m long| ft diameter x ft long)
• length of each diameter of inclined or horizontal drilled/bored wells/boreholes	(m diameter x m long| ft diameter x ft long)
Project Quantities	
Total length drilled/bored	(m | ft)
Functional units	
• capacity	(m^3 | ft^3 | litres | gallons per hour)

Power-generating plants

(A facility for the generation of electrical power. Major buildings and civil engineering works shall be reported under separate Sub-Projects under a power-generating plant Project)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	nuclear | wind | solar | hydroelectric | geothermal | biomass | gas | coal | oil | other stated
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• generator containment material	concrete | steel | other stated
• coolant	water | gas | other stated
• cycle	open | closed
• number and size of turbines	(MW)
Project Complexity	
• cooling system	wind | water | other stated
Design life	(years)
Altitude	
• average height of site above or below sea level	above | below (m | ft)
Dimensions	
• overall external diameter or length × width × height of each major structure	(m | ft)
Project Quantities	
Site area (area of land covered by permanent work, excluding temporary working areas outside the site)	(hectares | acres)
Functional units	
• capacity	(MW)

Chemical plants

(A facility for the creation of chemical products excluding petro-chemicals. Major buildings and civil engineering works shall be reported under separate Sub-Projects under a chemical plant Project)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type (product description)	
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• principal processes (more than one if applicable)	oxidation | reduction | hydrogenation | dehydrogenation | hydrolysis | hydration | dehydration | halogenation | nitrification | sulphonation | ammoniation | alkaline fusion | alkylation | dealkylation | esterification | polymerisation | polycondensation | catalysis | other stated
• principal reactor materials	mild steel | stainless steel | concrete | other stated
Project Complexity	
• number of processes	
Design life	(years)
Altitude	
• average height of site above or below sea level	(m | ft)
Dimensions	
• overall external diameter or length × width × height of each major structure	(m | ft)
Project Quantities	
Site area (area of land covered by permanent work, excluding temporary working areas outside the site)	(hectares | acres)
Functional units	
• output of product	(m^3 | ft^3 | tonnes | tons | litres | gallons per day)

Refineries

(A downstream facility for the creation of petro-chemical products. Major buildings and civil engineering works shall be reported under separate Sub-Projects under a refinery Project. Wells and boreholes are upstream and Pipelines are midstream)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	oil | petrol | other stated
Nature	new build | major adaptation
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• principal processes	upstream | downstream
• principal reactor materials	mild steel | stainless steel | concrete | other stated
Project Complexity	
• number of processes	
• number of products	
Design life	(years)
Altitude	
• average height of site above or below sea level	above | below (m | ft)
Dimensions	
• overall external diameter or width x height of each major structure	(m | ft)
Project Quantities	
Site area (area of land covered by permanent work, excluding temporary working areas outside the site)	(hectares | acres)
Functional units	
• input of crude oil	(tonnes | tons | litres | gallons | barrels per day)
• output of product	(tonnes | tons | litres | gallons | barrels per day)

Dams and Reservoirs

(A barrier that stops or restricts the flow of water (i.e. fresh water, sea water, coral reef water) or underground streams. A reservoir created by dams may provide water for irrigation, human consumption, industrial use, recreation, aquaculture and navigation. Dams generally serve the primary purpose of retaining water.)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	fresh water | waste water | sea water
Functional purpose	power generation | water supply | stabilisation of water flow | flood prevention| land reclamation| irrigation l water diversion| navigation | other stated
Nature	new build | expansion of existing
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• structure	arch | gravity | embankment l barrage| other stated
• core	compaction | earth fill l clay l asphaltic l other stated (m^3 |cubic yard)
• facing	concrete | clay | other (m^2 |square feet)
• location	above ground| underground | other stated
• infrastructure	access roads | hydro-electric plant | site works| power supply | water supply | pipelines
• principal materials	rock fill | earth fill | concrete | timber | steel | clay | rock | other stated
Project Complexity	
• water balance	positive | negative | clean water | dirty water | spillway
Number of layers	
• geotechnical	natural depression | flat ground | slope design | thickness of dam wall | saddle dam (fill void between peaks)
• flow rate	(m^3 per second | cubic feet per second)
Design life	(years)
Altitude	
• average height of site	above or below sea level (m | ft)
Dimensions	
• number of dam structures	main wall | saddle dam walls Each
• principal dam wall height	(m | ft)
• principal dam crest length	(m | ft)

Dams and Reservoirs

(A barrier that stops or restricts the flow of water (i.e. fresh water, sea water, coral reef water) or underground streams. A reservoir created by dams may provide water for irrigation, human consumption, industrial use, recreation, aquaculture and navigation. Dams generally serve the primary purpose of retaining water.)

• principal dam min thickness	(m | ft)
• principal dam max thickness	(m | ft)
Project Quantities	
Site area (surface area of stored liquid at maximum capacity)	(square km | square miles)
Functional units	
• reservoir capacity	(million m^3 | million cubic yards)
• power generation capacity	MW

Mines and Quarries

(The identification of potential sites, the extraction by mining, quarrying or pumping of minerals and / or other geological materials from the earth, usually from an orebody, lode, vein, seam, reef or placer deposit, and the processing operation that uses heat and/or chemicals to separate the metal or other substance of interest. A quarry is similar to an open-pit mine from which minerals are extracted.)

Code	
Local functional classification standard	
• name of standard	
• code number of construction	
Works	
Functional type	diamonds | precious metals | base metals | natural solid inorganic material (i.e. alumina, bauxite, rock etc.) | organic material (coal etc.) | hydrocarbons (solid and liquid)
Nature	new build (greenfield) | major adaptation (brownfield)
Terrain	forest | desert l urban l rural
Region	
Depth to ore body	(m l ft)
Environmental grade	
• grade and name of environmental certification	
• status	targeted | achieved | none
Principal design features	
• excavation type	surface | underground (hard rock) | underground (coal and soft rock) | mineral sands | underwater
• metallurgical processes	beneficiation (comminution, concentration, material handling) | leaching and calcining | solvent extraction (ion exchange, carbon-in-pulp, carbon-in-leach, electrolytic) | smelter | waste handling and storage | other stated
• infrastructure	access roads | airstrips| port facilities | site works| power station |power line | water supply | desalination plant | fuel storage| solid waste disposal | communications| railroad | slurry pipeline | river | camp facilities| workshop facilities | administration | township
• waste handling and storage	waste handling | waste storage | tailings | management facility
• reclamation and closure	salvage |rehabilitation of land | pollution monitoring | other stated
Project Complexity	
• number of processes	
• number of products	
Design life	(years)
Altitude	

Mines and Quarries (The identification of potential sites, the extraction by mining, quarrying or pumping of minerals and / or other geological materials from the earth, usually from an orebody, lode, vein, seam, reef or placer deposit, and the processing operation that uses heat and/or chemicals to separate the metal or other substance of interest. A quarry is similar to an open-pit mine from which minerals are extracted.)	
• average height of site above or below sea level	above | below (m | ft)
Dimensions	
• number of shafts	
• average shaft diameter	(m l ft)
• average shaft depth	(m l ft)
• average drift and adit cross-section area	(m^2 l ft^2)
• total drift and adit length	(m l ft)
Project Quantities	
Site area (area of land covered by permanent work, excluding temporary working areas outside the site)	(hectares | acres)
Functional units	
• ore extraction	(tonnes | tons per annum)
• throughput of product	(tonnes | tons per day)

Part 4 Definitions

4.1 Defined Terms

Acquisition Costs: All payments or considerations required to acquire/lease/purchase the land, property or existing **Constructed Asset**, and all other expenses associated with the acquisition, excluding physical construction.

Base Date: The date used in conjunction with Construction Costs at which the costs in ICMS construction costs reports are considered to apply and for which no Price Level Adjustments are required. A different date (the Common Date) may apply for Life Cycle Costs.

Client: The entity who pays for the works and services provided.

Coalition: The International Construction Measurement Standards Coalition, comprising not-for-profit organisations, each with a public interest mandate.

Common Date: The date to be used in conjunction with life cycle costing, being a date not earlier than the completion of construction. All future cash flows occurring at different times are discounted or compounded as if the costs are incurred at that date.

Constructed Asset (or **Asset**): The output from any building or civil engineering project.

Construction Costs: Expenditure on labour, materials, plant, equipment, site and head office overheads and profit, including taxes and levies, incurred as a direct result of the construction intervention. It is the total price payable for work normally included in contracts to construct a building or civil engineering works, including any goods or materials supplied by the **Client** for the **Constructor** to fix. It also includes all temporary works required to undertake the construction works.

Constructor: The organisation (also commonly known as the Contractor) commissioned and paid by a **Client** to construct or implement the construction of a **Project** or part thereof including, in some cases, providing funding, design, management, maintenance and operation services. In the context of other life cycle costs after construction, it also means the organisation undertaking the renewal or maintenance works.

Conversion date: The date or dates at which any currency conversion was made.

Cost Category: A division of **Project** or **Sub-Project** costs into **Acquisition Costs**, **Construction Costs**, **Renewal Costs**, **Maintenance Costs**, **Operation Costs**, and **End of Life Costs**.

Cost Group: A division of costs under a **Cost Category** into a small number of broad groups to enable easy estimation or extraction of cost data for quick, high-level comparison by design discipline or common purpose.

Cost Management Professional: A **Service Provider** competent to calculate, interpret, analyse, apportion and report using **ICMS**.

Cost Sub-Group: A division of costs under a **Cost Group** according to their functions, services, or common purposes irrespective of their design, specification, materials, or construction to enable the costs of alternatives serving the same function or common purpose to be compared, evaluated and selected.

Discount Rate: Factor or rate reflecting the time value of money that is used to convert cash flows occurring at different times **(Source:** ISO 15686-5**).**

Discounted Cost: The resulting cost when the real cost is discounted by the real discount rate or when the nominal cost is discounted by the nominal discount rate **(Source:** ISO 15686-5**).**

End of Life Costs: The net costs or fees for disposing of an asset at the end of its service life, including costs resulting from disposal inspection, decommissioning and decontamination, demolition and reclamation, reinstatement, asset transfer obligations, recycling, recovery, and disposal of components and materials, and transport and regulatory costs.

External Costs: Costs associated with an asset that are not necessarily reflected in the transaction costs between provider and consumer and that, collectively, are referred to as externalities. These costs may include business staffing, productivity and user costs; these can be taken into account in a life-cycle cost analysis but are to be explicitly identified. **(Source:** ISO 15686-5**)**

Externalities: Quantifiable cost or benefit that occurs when the actions of organisations and individuals have an effect on people other than themselves. Example: Non-construction costs, income and wider social and business costs **(Source:** ISO 15686-5**)**.

GEFA: Gross external floor area measured according to **IPMS 1** as set out in **IPMS** and provided in **Appendix H**.

GIFA: Gross internal floor area measured according to **IPMS 2** as set out in **IPMS** and provided in **Appendix H**.

ICMS: International Construction Measurement Standards.

Income: Money received from sales and other activities during the life of an **Asset**.

Inflation/Deflation: Sustained increase/decrease in the general price level of resources. **(Source:** ISO 15686-5**)**

IPMS 1: The total of the areas of each floor level of a building measured to the outer perimeter of *External Walls*, *Sheltered Areas* and *Balconies,* as further defined and detailed in **Appendix H**.

IPMS 2: The total of the areas of each floor level of a building measured to the *Internal Dominant Face* of all *External Walls* and *Balconies* on each level, as further defined and detailed in **Appendix H**.

IPMS: International Property Measurement Standards. IPMS are the global standards that aim to enhance the transparency and consistency in the way Property is measured across markets. It was developed by the IPMS Coalition, an independent group of professional bodies from around the world.

Life Cycle Cost (LCC): Cost of a **Constructed Asset** or its parts throughout its life cycle from construction through use, operation, maintenance and renewal till the end of life or a shorter **Period of Analysis**, while fulfilling the performance requirements, as illustrated in Figure 1.

Maintenance Cost: The total of necessarily incurred labour, material and other related costs incurred to retain a building or its parts in a state in which it can perform its required functions. **(Source:** ISO 15686-5**).** Maintenance includes conducting corrective, responsive and preventative maintenance on a **Constructed Asset**, or its parts, and includes all associated management, cleaning, servicing, repainting, repairing and replacing of parts, where needed, to allow the **Constructed Asset** to be used for its intended purposes. It excludes **Renewal Costs**.

Major Adaptation: A one-off substantial modification/adaptation/extension of, or improvement to, the main parts of an existing building or civil engineering works that is not classified as a **Renewal**.

Net present value or cost: The sum of the discounted future cash flows. **(Source:** ISO 15686-5**)**

Nominal Cost: The expected price that will be paid when a cost is due to be paid, including estimated changes in price due to, for example, forecast change in efficiency, inflation or deflation and technology. **(Source:** ISO 15686-5**)**

Nominal Discount Rate: The factor or rate used to relate present and future money values in comparable terms taking into account the general inflation/deflation rate.

Non-Construction Costs: Include finance costs, service charges, parking charges and charges for associated facilities.

Occupancy Costs: Costs that arise exclusively as a result of the occupation of the **Constructed Asset,** including reception, library services and porterage.

Operation Costs: Costs incurred in running and managing the **Constructed Asset**, including administrative support services, rent, rates, insurances, energy and other environmental/regulatory inspection costs, local taxes and charges.

Operator: The entity responsible for the running and operation of the **Constructed Asset**, whose costs should be included under the **Operation Costs**.

Period of Analysis: Period of time over which life-cycle costs are analysed as determined by the **Client**. It may cover the entire life (physical, technical, economic, functional, social, or legal life) or a selected stage or stages or periods of interest as required by the **Client**.

Present Day Value: Monies accruing in the future which have been discounted to account for the fact that they are worth less at the time of calculation. **(Source:** ISO 15686-5**)**

Price Level Adjustment: An allowance for the increases or decreases in the price levels, due to inflation or deflation, over a defined period.

Project Attributes: The principal characteristics of a **Project** or **Sub-Project** relating to time, cost, the scope of works, design, quality, quantity, procurement, location and other contextual features that might impact its life cycle cost.

Project Complexity: The relative intricacy of a **Project** or **Sub-Project** by reference to its form, design, site constraints, method or timing of construction, renewal, operation, maintenance or end of life activities.

Project Quantities: The physical quantities (numbers, lengths, areas, volumes and weights), functional quantities (capacities, inputs, outputs) and degree of repetition required to be captured in the **Project Attributes** and **Project Values** such that the costs of different projects or design schemes can be converted to a unit cost per the desired **Project Quantity** for evaluation and comparison. Both physical and functional quantities are required for each **Project** or **Sub-Project**.

Project Values: A standard set of descriptions and/or measurements for each of the **Project Attributes**.

Project: A single or series of construction intervention(s) with a single purpose or common purposes to create a series of or single **Constructed Asset** commissioned by a **Client**, or group of **Clients**, with a defined start and end date. A **Project** may comprise a number of Sub-Projects.

Real Cost: The cost expressed as a value at the **Common Date**, including estimated changes in price due to forecast changes in efficiency and technology, but excluding general price inflation or deflation. **(Source:** ISO 15686-5**)**

Real Discount Rate: The factor or rate used to relate present and future money values in comparable terms, not taking into account the general or specific inflation in the cost of a particular asset under consideration. **(Source:** ISO 15686-5**)**

Renewal Costs: The costs of replacing a Constructed Asset and/or major components once they reach the end of their life, and which the **Client** decides are to be included in the capital rather than the revenue budget.

Reporting Date: The date at which the report describing construction or life cycle costs is compiled.

Risk allowance: A quantitative allowance set aside as a precaution against risks and future needs to allow for the uncertainty of outcome. A risk is an uncertain event or circumstance that, if it occurs, may affect the outcome of a **Project**.

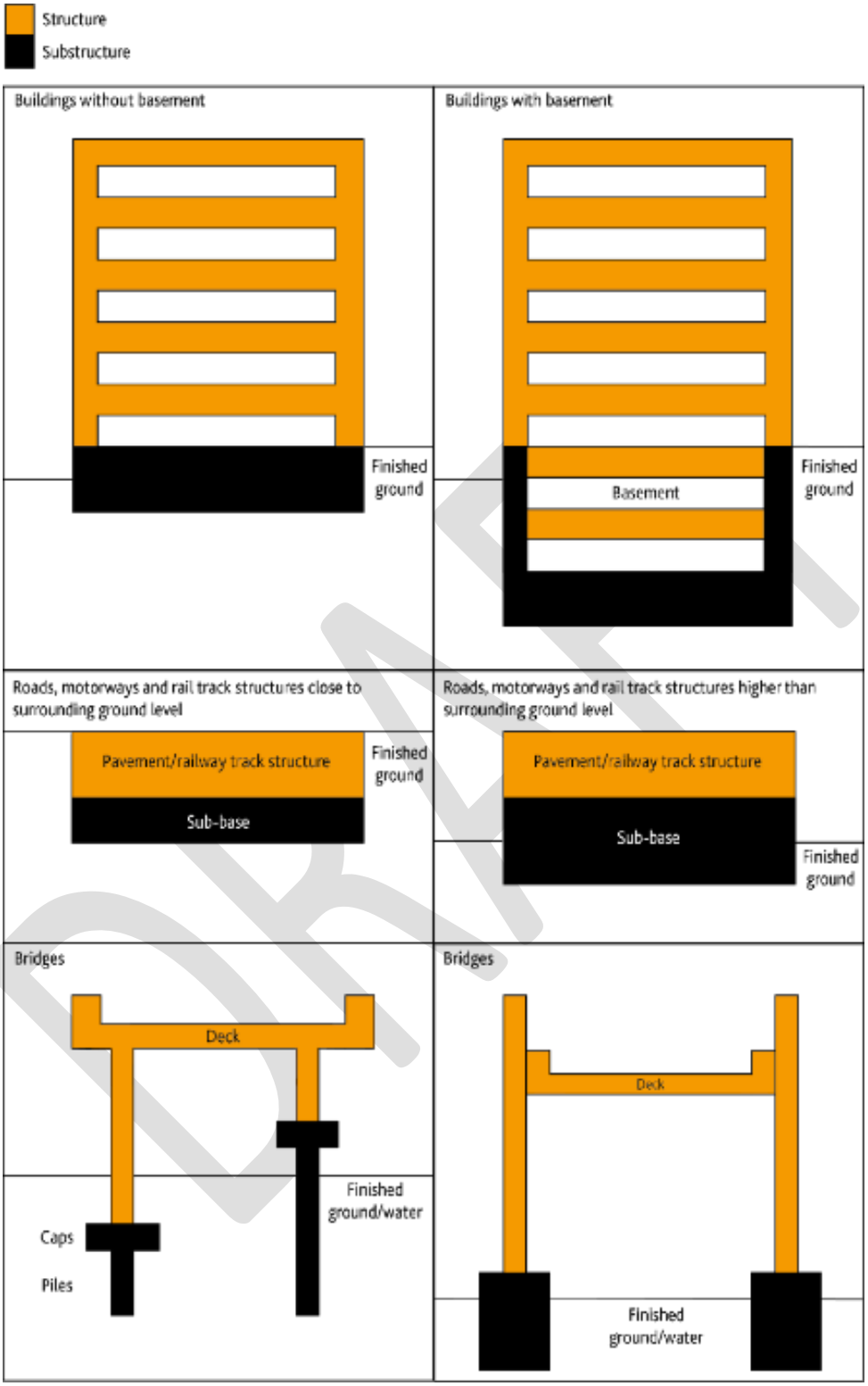
Risk: Probability of an event occurring multiplied by its consequences. Risks may have a positive or negative influence on a **Project's** outcome. **(Source:** ISO 15686-5**)**

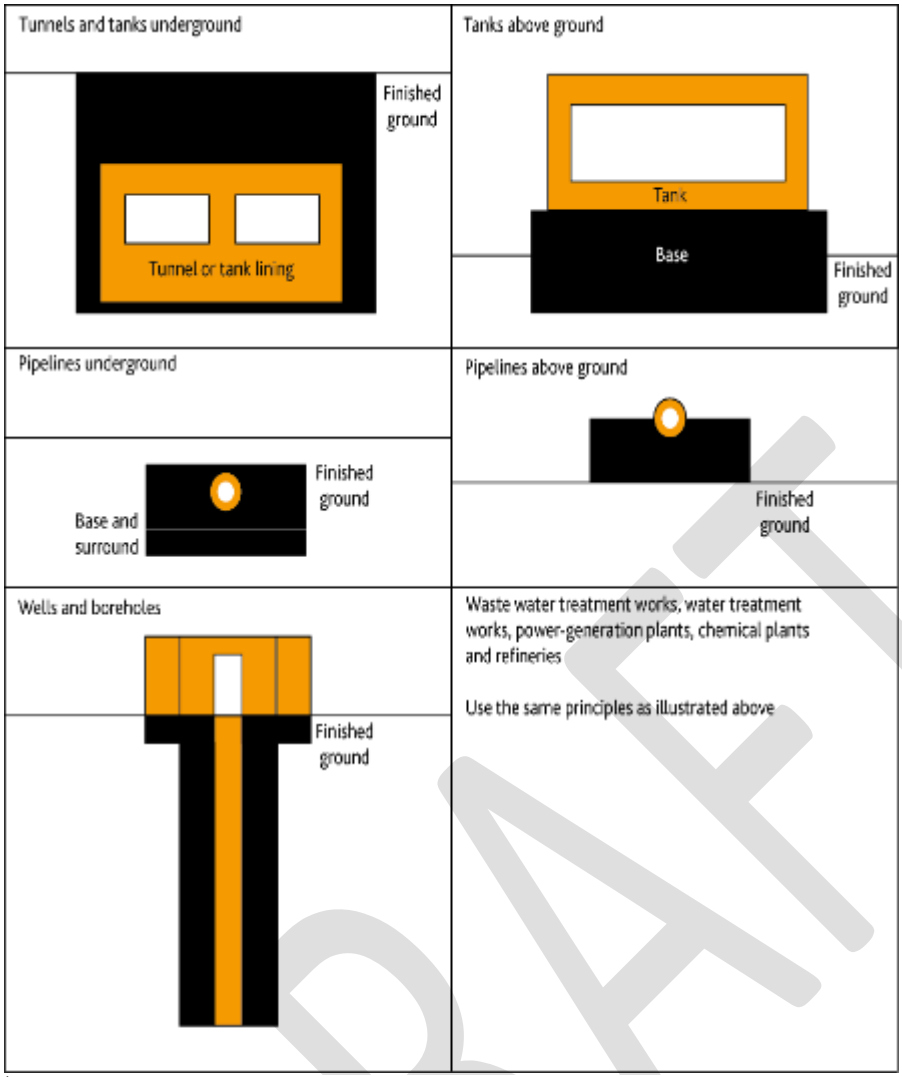
Service Provider: Any organisation or individual providing advice or a service to a **Client** at any point in a **Project's** life including, but not limited to, project managers, architects, engineers, technical architects or engineers, surveyors, **Cost Management Professionals**, constructors, facilities managers, planners, valuers, property managers, asset managers, agents and brokers.

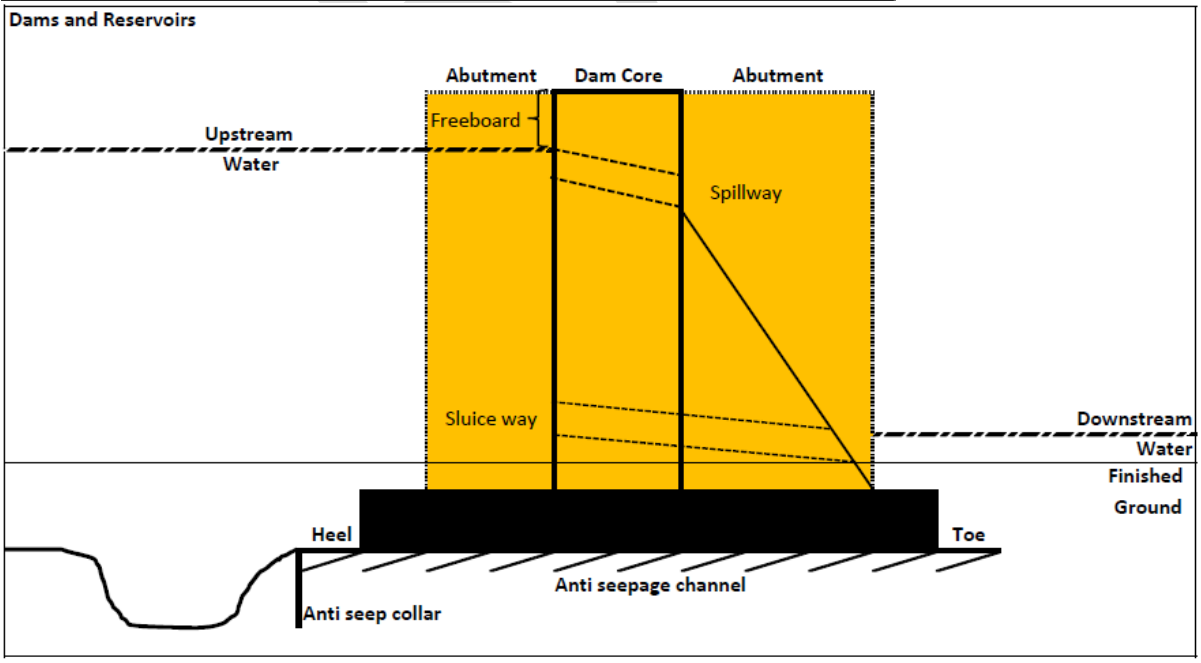
Sub-Project: A subdivision of a **Project** that can be described by a single set of attributes and values.

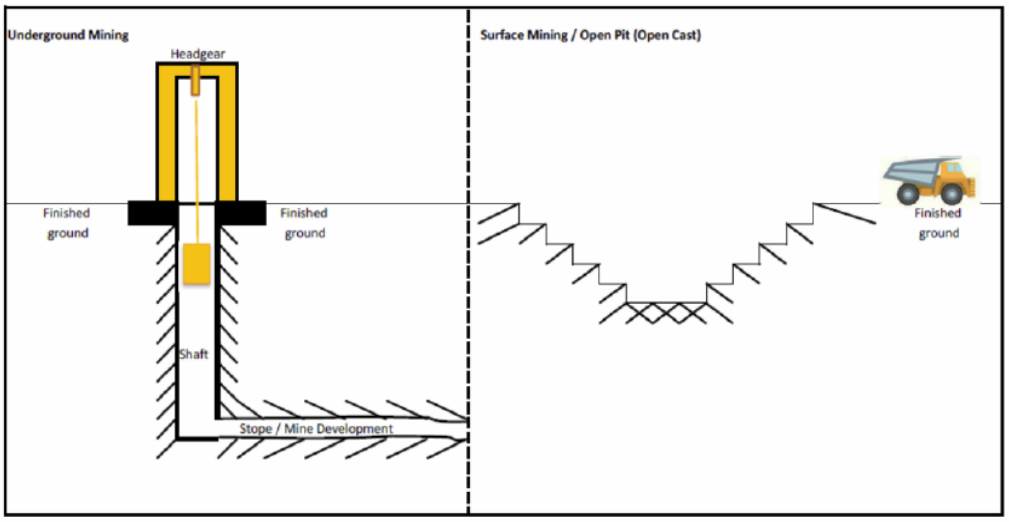
Taxes and Levies: Mandatory costs taxed or levied in connection with any phase of the Project by national governments, states, municipalities or governmental organisations, whether paid by the **Client** or the **Constructor** or the **Operator**.

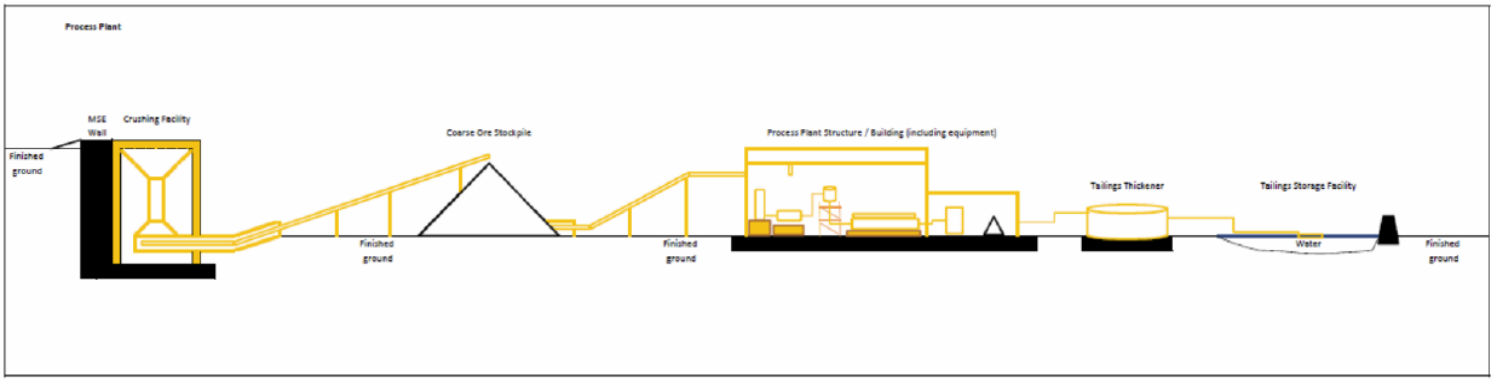
4.2 Substructure and Structure Delineation




Tunnels and tanks underground
Finished ground
Tunnel or tank lining
Tanks above ground
Tank
Base
Finished ground
Pipelines underground
Base and surround
Finished ground
Pipelines above ground
Finished ground
Wells and boreholes
Finished ground
Waste water treatment works, water treatment works, power-generation plants, chemical plants and refineries
Use the same principles as illustrated above


Dams and Reservoirs
Abutment
Dam Core
Abutment
Freeboard
Upstream Water
Spillway
Sluice way
Downstream Water
Finished Ground
Heel
Toe
Anti seepage channel
Anti seep collar


Underground Mining
Headgear
Finished ground
Finished ground
Shaft
Stope / Mine Development
Surface Mining / Open Pit (Open Cast)
Finished ground


Process Plant
MSE Wall
Crushing Facility
Finished ground
Coarse Ore Stockpile
Finished ground
Finished ground
Process Plant Structure / Building (including equipment)
Tailings Thickener
Tailings Storage Facility
Water
Finished ground

Appendices

General notes

a. Accepted alternative terms are separated with a vertical slash (|). Bullet points under **Cost Sub-Groups** serve to illustrate the scope but without limitation.

b. In the case of projects where there are sub-projects, allocate costs to their most relevant **Sub-Project**, **Cost Group** and **Cost Sub-Group** as far as possible without omissions or duplications. Add a separate **Sub-Project** called 'Common' to capture costs that are common to all or most **Sub-Projects** and which should better be shown separately to permit reallocation in the appropriate way when the specific need arises.

c. Add a **Cost Sub-Group** 'All Other Costs' within the relevant **Cost Group** to take account of the costs of those **Cost Sub-Groups** whose value is insufficient to warrant a separate **Cost Sub-Group** (typically whose value is less than 5% of the relevant **Cost Group**). The **Cost Code** should end with '.999'.

d. All costs should represent those payable by the **Client** and include the payees' overheads and profits where applicable.

e. Include design fees payable by the **Constructor** under **Construction | Renewal | Maintenance Costs**.

f. Group costs of preparatory or enabling work with the principal items they are serving.

g. Group costs of ancillary items, such as temporary lateral supports/temporary drainage/dewatering/slope treatment and protection for earthwork, falsework/formwork/reinforcement for concrete work, ironmongery/hardware, fixing accessories, inline fittings for pipes/drains/conduits/cables, painting/coating, etc. with their principal items unless otherwise shown as a **Cost Sub-Group**. Group costs of testing and commissioning with the relevant services.

h. Round off costs suitably and commensurate with the accuracy of the amounts.

i. State 'Excluded' if the cost exists but is not reported. State 'N/A' (not applicable) if the cost does not exist.

j. Apportion the costs of cost code [2 | 3 | 5].08–[2 | 3 | 5].10 into cost code [2 | 3 | 5].01–[2 | 3 | 5].07 in case of simplified presentation.

k. As the **Project** develops, the **Risk Allowances** under cost code [2 | 3 | 5].09 may be gradually expended and the expended costs would be reflected in the costs of other items. The allowances may be explicitly shown in the **Constructor's** contract sum build-up or reserved in the **Client's** own budget not known to the **Constructor**. For cost reports on actual costs after construction, any surplus allowances should not be included.

l. The 'Design development allowance' under cost code [2 | 3 | 5].09 is an allowance in a pre-construction forecast estimate or cost plan for unforeseen extra costs due to the development of the design as it evolves. Once the design is complete, this allowance should become zero.

m. The 'Construction contingencies' under cost code [2 | 3 | 5].09 is an allowance for unforeseen extra costs during construction. Typically, it is to cover unforeseen events after awarding a construction contract. After the completion of the final account for the construction contract, this allowance should become zero.

n. Typically, a pre-construction cost estimate may be prepared based on the price level at a certain date, which may be current at the time of preparing the estimate or at an earlier base date, with or without allowance for the possible increases or decreases due to inflation or deflation during construction. A construction contract may be priced based on the price levels at a certain **Base Date** around the time of tendering and permit adjustments for rises or falls in the costs during construction. A provisional allowance should be made inside or outside the contract for the possible increase or decrease and

should gradually be replaced with the actual outcome. The '**Price Level Adjustments** under cost code [2 | 3 | 5].09 are to allow for the aforesaid possible change until the time of tendering, and further change during construction.

Appendix A – Acquisition Cost Sub-Groups

Cost code	Description		Note
	Cost Category (Level 2)	AC	
	Cost Group (Level 3)		
	Cost Sub-Group (Level 4)		
1.	**Acquisition Costs (AC) (each Cost Group includes relevant Taxes and Levies)**		
01.	Site acquisition		
01.010	Costs and premium required to procure site		
01.020	Compensation to existing occupiers		
01.030	Demolition, removal and modification of existing properties by way of payment to existing owners instead of carrying out physical work		
01.040	Contributions for the preservation of heritage, culture and environment		
01.050	Related fees to agents, lawyers, and the like		
01.060	Related taxes and statutory charges		
02.	Administrative, finance, legal and marketing expenses		
02.010	Client's general office overheads		
02.020	Client's project-specific administrative expenses: 010 – in-house project management and design team 020 – supporting project staff 030 – project office venue, furniture and equipment if not included in Constructor's preliminaries | site overheads 040 – stores and workshops 050 – safety and insurances 060 – staff training 070 – accommodation and travelling expenses for in-house team and external parties		
02.030	Interest and finance costs		
02.040	Legal expenses		
02.050	Accounting expenses		
02.060	Sales, leasing, marketing, advertising and promotional expenses		
02.070	Taxes and statutory charges related to sales and lease		
02.080	License and permit charges for operation and use		

Appendix B – Construction | Renewal | Maintenance Cost Sub-Groups: Buildings

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
2.	**Construction Costs (C)**			
3.	**Renewal Costs (RC)**			
5.	**Maintenance Costs (MC)**			
	(All sharing the same Cost Groups below, so far as applicable. Those separated by 'I' in [ ] are respective alternative terms.)			
01.	Demolition, site preparation and formation			
01.010	Site survey and ground investigation			
01.020	Environmental treatment			
01.030	Sampling of hazardous or useful materials or conditions			
01.040	Temporary fencing			
01.050	Demolition of existing buildings and support to adjacent structures			
01.060	Site surface clearance (clearing, grubbing, topsoil stripping, tree felling, minor earthwork, removal)			
01.070	Tree transplant			
01.080	Site formation and slope treatment			
01.090	Temporary surface drainage and dewatering			
01.100	Temporary protection, diversion and relocation of public utilities			
01.110	Erosion control			
02.	Substructure			
02.010	Foundation piling and underpinning: 010 – mobilisation and demobilisation 020 – trial piles and caisson 030 – permanent piles and caisson 040 – pile and caisson testing 050 – underpinning			
02.020	Foundations up to top of lowest floor slabs: 010 – excavation and disposal 020 – lateral supports 030 – raft footings, pile caps, column bases, wall footings, strap beams, tie beams 040 – substructure walls and columns 050 – lowest floor slabs and beams (excluding basement bottom slabs) 060 – lift pits			
02.030	Basement sides and bottom: 010 – excavation and disposal 020 – lateral supports 030 – bottom slabs and blinding 040 – sides 050 – vertical waterproof tanking, drainage blanket, drains and skin wall 060 – horizontal waterproof tanking, drainage blanket, drains and topping slab 070 – insulation 080 – lift pits, sump pits, sleeves			

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
03.	Structure			
03.010	Structural removal and alterations			
03.020	Basement suspended floors (up to top of ground floor slabs): 010 – structural walls and columns 020 – beams and slabs 030 – staircases			
03.030	Frames and slabs (above top of ground floor slabs): 010 – structural walls and columns 020 – upper floor beams and slabs 030 – roof beams and slabs 040 – staircases 050 – fireproofing to steel structure			
03.040	Tanks, pools, sundries			
04.	Architectural works | Non-structural works			
04.010	Non-structural removal and alterations			
04.020	External elevations: 010 – non-structural external walls and features 020 – external wall finishes except cladding 030 – facade cladding and curtain walls 040 – external windows 050 – external doors 060 – external shop fronts 070 – roller shutters and fire shutters			
04.030	Roof finishes, skylights and landscaping (including waterproofing and insulation): 010 – roof finishes 020 – skylights 030 – other roof features 040 – roof landscaping (hard and soft)			
04.040	Internal divisions: 010 – non-structural internal walls and partitions 020 – shop fronts 030 – toilet cubicles 040 – moveable partitions 050 – cold rooms 060 – internal doors 070 – internal windows 080 – roller shutters and fire shutters 090 – sundry concrete work			
04.050	Fittings and sundries: 010 – balustrades, railings and handrails 020 – staircases and catwalk not forming part of the structure, cat ladders 030 – cabinets, cupboards, shelves, counters, benches, notice boards, blackboards 040 – exit signs, directory signs 050 – window and door dressings 060 – decorative features 070 – interior landscaping 080 – access panels, fire service cabinets 090 – sundries			

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
04.060	Finishes under cover: 010 – floor finishes (internal and external) 020 – internal wall finishes and cladding 030 – ceiling finishes and false ceilings (internal or external)			
04.070	Builder's work in connection with services: 010 – plinth, bases 020 – fire-proofing enclosure 030 – hoisting beams, lift pit separation screens, lift shaft separator beams 040 – suspended manholes 050 – cable trenches, trench covers 060 – sleeves, openings and the like not allowed for in 'Fittings and sundries'			
05.	Services and equipment			
05.010	Heating, ventilating and air-conditioning systems/air conditioners: 010 – seawater system 020 – cooling water system 030 – chilled water system 040 – heating water system 050 – steam and condensate system 060 – fuel oil system 070 – water treatment 080 – air handling and distribution system 090 – condensate drain system 100 – unitary air-conditioning system 110 – mechanical ventilation system 120 – kitchen ventilation system 130 – fume-extraction system 140 – anaesthetic gas-extraction system 150 – window and split-type air conditioners 160 – air-curtains 170 – fans 180 – related electrical and control systems 190 – submissions, testing and commissioning			
05.020	Electrical services: 010 – high-voltage transformers and switchboards 020 – incoming mains, low-voltage transformers and switchboards 030 – mains and submains 040 – standby system 050 – lighting and power 060 – uninterruptible power supply 070 – electric underfloor heating 080 – local electrical heating units 090 – earthing/lightning protection and bonding 100 – submissions, testing and commissioning			
05.030	Fitting out lighting fittings			

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
05.040	Extra low voltage electrical services: 010 – information and communications technology system 020 – staff paging/location 030 – public address system 040 – building automation 050 – security and alarm 060 – close circuit television 070 – communal aerial broadcast distribution and the like 080 – submissions, testing and commissioning			
05.050	Water supply and above ground drainage: 010 – cold water supply 020 – hot water supply 030 – flushing water supply 040 – grey water supply 050 – cleansing water supply 060 – irrigation water supply 070 – rainwater disposal 080 – soil and waste disposal 090 – planter drainage disposal 100 – kitchen drainage disposal 110 – related electrical and control systems 120 – submissions, testing and commissioning			
05.060	Supply of sanitary fittings and fixtures (installation included in 'Water supply and above ground drainage' unless not separable from costs of 'Fittings and sundries')			
05.070	Disposal systems: 010 – refuse 020 – laboratory waste 030 – industrial waste 040 – incinerator 050 – submissions, testing and commissioning			
05.080	Fire services: 010 – fire hydrant and hose reel system 020 – wet risers 030 – sprinkler system 040 – deluge system 050 – gaseous extinguishing system 060 – foam extinguishing system 070 – audio/visual advisory system 080 – automatic fire alarm and detection system 090 – portable hand-operated appliances and sundries 100 – related electrical and control systems 110 – submissions, testing and commissioning			
05.090	Gas services: 010 – coal gas 020 – natural gas 030 – liquid petroleum gas 040 – medical gas/laboratory gas 050 – industrial gas/compressed air/instrument air 060 – vacuum 070 – steam 080 – submissions, testing and commissioning			

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
05.100	Movement systems: 010 – lifts | elevators 020 – platform lifts 030 – escalators 040 – travellators | moving walkways 050 – conveyors 060 – submissions, testing and commissioning			
05.110	Gondolas			
05.120	Turntables			
05.130	Generators			
05.140	Energy-saving features			
05.150	Waste water treatment			
05.160	Fountains, pools and filtration plant			
05.170	Powered building signage			
05.175	Audio/visual entertainment system			
05.180	Kitchen equipment			
05.190	Cold room equipment			
05.200	Laboratory equipment			
05.210	Medical equipment			
05.220	Hotel equipment			
05.230	Car park or entrances access control			
05.240	Domestic appliances			
05.250	Other specialist services			
05.260	Builder's profit and attendance on services			
06.	Surface and underground drainage			
06.010	Surface water drainage			
06.020	Storm water drainage			
06.030	Foul water drainage			
06.040	Drainage disconnections and connections			
06.050	CCTV inspection of existing or new drains			
07.	External and ancillary works			
07.010	Permanent retaining structures			
07.020	Site enclosures and divisions			
07.030	Ancillary structures			
07.040	Roads and paving			
07.050	Landscaping (hard and soft)			
07.060	Fittings and equipment			
07.070	External services: 010 – water supply 020 – gas supply 030 – power supply 040 – communications supply 050 – external lighting 060 – utility disconnections and connections			
08.	Preliminaries | Constructors' site overheads | general requirements			(j)

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
08.010	Construction management including site management staff and support labour			
08.020	Temporary access roads and storage areas, traffic management and diversion (at the Constructors' discretion)			
08.030	Temporary site fencing and securities			
08.040	Commonly shared construction plant			
08.050	Commonly shared scaffolding			
08.060	Other temporary facilities and services			
08.070	Technology and communications: telephone, broadband, hardware, software			
08.080	Constructor's submissions, reports and as-built documentation			
08.090	Quality monitoring, recording and inspections			
08.100	Safety, health and environmental management			
08.110	Insurances, bonds, guarantees and warranties			
08.120	Constructor's statutory fees and charges			
08.130	Testing and commissioning			
09.	Risk Allowances			(j), (k)
09.010	Design development allowance			(l)
09.020	Construction contingencies			(m)
09.030	Price Level Adjustments: 010 – until tendering 020 – during construction			(n)
09.040	Exchange rate fluctuation adjustments			
10.	Taxes and Levies			(j)
10.010	Paid by the Constructor			
10.020	Paid by the Client in relation to the construction contract payments			
11.	Work and utilities off-site (including related risk allowances, taxes and levies)			
11.010	Connections to, diversion of and capacity enhancement of public utility mains or sources off-site up to mains connections on-site: 010 – electricity 020 – transformers 030 – water 040 – sewer 050 – gas 060 – telecommunications			
11.020	Public access roads and footpaths			
12.	Post-completion loose furniture, fittings and equipment (including related risk allowances, taxes and levies)			
12.010	Production, process, operating and loose furniture, furnishing and equipment not normally provided before completion of construction			
13.	Construction-related consultants and supervision (including related risk allowances, taxes and levies)			

Cost code	Description			Note
	Cost Category (Level 2)	CC	RC or MC	
	Cost Group (Level 3)			
	Cost Sub-Group (Level 4)			
13.010	Consultants' fees and reimbursable: 010 – architects (architectural, landscape, interior design, technical, etc.) 020 – engineers (geotechnical, civil, structural, mechanical, electrical and plumbing, technical, etc.) 030 – project managers 040 – surveyors (quantity surveying, land surveying, building surveying, cost engineering, etc.) 050 – specialist consultants (environmental, traffic, acoustic, facade, BIM, etc.) 060 – value management studies			
13.020	Charges and levies payable to statutory bodies or their appointed agencies (in connection with planning, design, tender and contract approvals, supervision and acceptance inspections)			
13.030	Site supervision charges (including their accommodation and travels)			
13.040	Payments to testing authorities or laboratories			

Appendix C – Construction| Renewal | Maintenance Cost Sub-Groups: Civil Engineering Works

Note: A bullet indicates that the **Cost Sub-Group** is likely to apply. **Cost Sub-Groups** without a bullet can also be included if applicable.

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC | RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
2.	**Construction Costs (CC)**														
3.	**Renewal Costs (RC)**														
5.	**Maintenance Costs (MC)**														
	(All sharing the same Cost Groups below, so far as applicable. Those separated by '|' in [ ] are alternative terms for respective Cost Groups.)														
01.	Demolition, site preparation and formation														
01.010	Site survey and ground investigation	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.020	Environmental treatment	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.030	Sampling of hazardous or useful materials or conditions	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.040	Temporary fencing	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.050	Demolition of existing structures and support to adjacent structures	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.060	Site surface clearance (clearing, grubbing, topsoil stripping, tree felling, minor earthwork, removal)	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.070	Tree transplant	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.080	General site formation and slope treatment	•	•	•	•	•	•	•	•	•	•	•	•	•	

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC | RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
01.090	Temporary surface drainage and dewatering	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.100	Temporary access roads and storage areas (provided under an advance contract)	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.110	Temporary protection, diversion and relocation of public utilities	•	•	•	•	•	•	•	•	•	•	•	•	•	
01.120	Erosion control	•	•	•	•	•	•	•	•	•	•	•	•	•	
02.	Substructure														
02.010	Embankments/cuttings	•	•	•	•								•	•	
02.020	Excavation, disposal and lateral supports (specifically to receive any substructure construction but excluding general site formation and slope treatment)	•	•	•	•	•	•	•	•	•	•	•	•	•	
02.030	Trenching	•	•	•	•	•	•	•	•	•	•	•	•	•	
02.040	Drilling/boring				•			•	•				•	•	
02.050	Piling/anchoring	•	•	•		•	•			•	•	•	•	•	
02.060	Structural backfill/ground remediation	•	•	•	•	•	•	•	•	•	•	•	•	•	
02.070	Earth-retaining structures	•	•	•	•								•	•	
02.080	Abutments/wing walls	•	•	•									•	•	
02.090	Pile caps/footings/bases (nearest to the ground level or water level if constructed in water)	•	•	•	•	•	•	•	•	•	•	•	•	•	
02.100	Sub-base to pavements and rail track structures	•	•											•	
02.110	Bases to supports for tanks, pipes, well heads and the like					•	•	•	•	•	•	•		•	

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC / RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
02.120	Beds and surrounds to underground pipes					•	•	•	•	•	•	•			•
03.	Structure														
03.010	Piers and towers			•										•	•
03.020	Suspension system			•										•	•
03.030	Decks			•											
03.040	Bearings			•											
03.050	Tunnel lining				•									•	•
03.060	Road/track base	•	•	•	•									•	
03.070	Pavement	•	•	•	•										
03.080	Service roads and approaches	•	•	•	•										
03.090	Parapets/edge treatment	•	•	•	•										
03.100	Main structures					•	•	•	•	•	•	•	•	•	
03.110	Tanks, rigs, storage containers and the like					•	•	•	•	•	•	•		•	
03.120	Supports for tanks, pipes and the like					•	•	•	•	•	•	•		•	
03.130	Civil pipework					•	•	•	•		•	•	•	•	
03.140	Valves and fittings					•	•	•	•		•	•	•	•	
04	Non-structural works														
04.010	Non-structural removal and alterations	•	•	•	•	•	•	•	•	•	•	•	•	•	
04.020	Non-structural construction					•	•	•	•	•	•	•	•	•	
04.030	Running surface	•	•	•	•								•		
04.040	Signage, markings and the like	•	•	•	•								•	•	
04.050	Gantries and the like	•	•	•	•									•	
04.060	Safety facilities	•	•	•	•	•	•	•	•	•	•	•	•	•	
04.070	Barriers/rails and means of access	•	•	•	•	•	•	•	•	•	•	•	•	•	
04.080	Special equipment and fittings	•	•	•	•	•	•	•	•	•	•	•	•	•	
04.090	Interior landscaping	•	•	•	•	•	•	•	•	•	•	•	•	•	
04.100	Builder's work in connection with services	•	•	•	•	•	•	•	•	•	•	•	•	•	
05	Services and equipment														
05.010	Mechanical systems	•	•	•	•	•	•	•	•	•	•	•	•	•	

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC / RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
05.020	Lighting systems	•	•	•	•	•	•	•	•	•	•	•	•	•	
05.030	Illuminations	•	•	•	•									•	
05.040	Low-voltage power supply	•	•	•	•	•	•	•	•	•	•	•		•	
05.050	High-voltage power supply	•	•	•	•	•	•	•	•	•	•	•		•	
05.060	Cables/cable trays	•	•	•	•	•	•	•	•	•	•	•	•	•	
05.070	Other electrical services	•	•	•	•	•	•	•	•	•	•	•	•	•	
05.080	Control systems and instrumentation	•	•	•	•	•	•	•	•	•	•	•	•	•	
05.090	Pipe racks/supports	•	•	•	•	•	•	•	•	•	•	•	•	•	
05.100	Water supply and above ground drainage	•	•	•	•	•	•			•	•	•	•	•	
05.110	Fire services	•	•	•	•	•	•			•	•	•	•	•	
05.120	Movement systems: lifts/elevators/ conveyors	•	•	•	•	•	•			•	•	•	•	•	
06	Surface and underground drainage														
06.010	Surface water drainage	•	•	•	•	•	•	•	•	•	•	•	•	•	
06.020	Storm water drainage	•	•	•	•	•	•	•	•	•	•	•	•	•	
06.030	Foul water drainage	•	•	•	•	•	•	•	•	•	•	•	•	•	
06.040	Pumping systems	•	•	•	•	•	•	•	•	•	•	•	•	•	
06.050	Drainage connections	•	•	•	•	•	•	•	•	•	•	•	•	•	
07.	External and ancillary works														
07.010	Site enclosures and divisions	•	•	•	•	•	•	•	•	•	•	•	•	•	
07.020	Ancillary structures	•	•	•	•	•	•	•	•	•	•	•	•	•	
07.030	Roads and paving (not amounting to a Sub-Project)	•	•	•	•	•	•	•	•	•	•	•	•	•	
07.040	Landscaping (hard and soft)	•	•	•	•	•	•	•	•	•	•	•	•	•	
07.050	Fittings and equipment	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.	Preliminaries | Constructors' site overheads | general requirements														(j)

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC / RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
08.010	Construction management including site management staff and support labour	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.020	Temporary access roads and storage areas, traffic management and diversion (at the Constructors' discretion)	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.030	Temporary site fencing and securities	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.040	Commonly shared construction plant	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.050	Commonly shared scaffolding	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.060	Other temporary facilities and services	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.070	Technology and communications: telephone, broadband, hardware, software	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.080	Constructor's submissions, reports and as-built documentation	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.090	Quality monitoring, recording and inspections	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.100	Safety, health and environmental management	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.110	Insurances, bonds, guarantees and warranties	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.120	Constructor's statutory fees and charges	•	•	•	•	•	•	•	•	•	•	•	•	•	
08.130	Testing and commissioning	•	•	•	•	•	•	•	•	•	•	•	•	•	
09.	Risk Allowances														(j), (k)

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC | RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
09.010	Design development allowance	•	•	•	•	•	•	•	•	•	•	•	•	•	(l)
09.020	Construction contingencies	•	•	•	•	•	•	•	•	•	•	•	•	•	(m)
09.030	Price level adjustments 010 – until tendering 020 – during construction	•	•	•	•	•	•	•	•	•	•	•	•	•	(n)
09.040	Exchange rate fluctuation adjustments	•	•	•	•	•	•	•	•	•	•	•	•	•	
10.	Taxes and Levies														(j)
10.010	Paid by the Constructors	•	•	•	•	•	•	•	•	•	•	•	•	•	
10.020	Paid by the Client in relation to the construction contract payments	•	•	•	•	•	•	•	•	•	•	•	•	•	
11.	Work and utilities off-site (including related risk allowances, taxes and levies)														
11.010	Connections to, diversion of and capacity enhancement of public utility mains or sources off-site up to mains connections on-site: 010 – electricity 020 – transformers 030 – water 040 – sewer 050 – gas 060 – telecommunications	•	•	•	•	•	•	•	•	•	•	•	•	•	
11.020	Public access roads and footpaths	•	•	•	•	•	•	•	•	•	•	•	•	•	
12.	Post-completion loose furniture, fittings and equipment (including related risk allowances, taxes and levies)														

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC | RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
12.010	Production, process, operating and loose furniture, furnishing and equipment not normally provided before completion of construction	•	•	•	•	•	•	•	•	•	•	•	•	•	
13.	Construction-related consultants and supervision (including related risk allowances, taxes and levies)														
13.010	Consultants' fees and reimbursable: 010 – architects (architectural, landscape, interior design, technical, etc.) 020 – engineers (geotechnical, civil, structural, mechanical, electrical and plumbing, technical, etc.) 030 – project managers 040 – surveyors (quantity surveying, land surveying, building surveying, cost engineering, etc.) 050 – specialist consultants (environmental, traffic, acoustic, facade, BIM, etc.) 060 – value management studies	•	•	•	•	•	•	•	•	•	•	•	•	•	
13.020	Charges and levies payable to statutory	•	•	•	•	•	•	•	•	•	•	•	•	•	

Cost code	Description	Roads and motorways	Railways	Bridges	Tunnels	Waste water treatment	Water treatment works	Pipelines	Wells and boreholes	Power generating plants	Chemical plants	Refineries	Dams and Reservoirs	Mines and Quarries	Note
	Cost Category (Level 2) CC / RC or MC														
	Cost Group (Level 3)														
	Cost Sub-Group (Level 4)														
	bodies or their appointed agencies (in connection with planning, design, tender and contract approvals, supervision and acceptance inspections)														
13.030	Site supervision charges (including their accommodation and travels)	•	•	•	•	•	•	•	•	•	•	•	•	•	
13.040	Payments to testing authorities or laboratories	•	•	•	•	•	•	•	•	•	•	•	•	•	

Appendix D – Operation Cost Sub-Groups

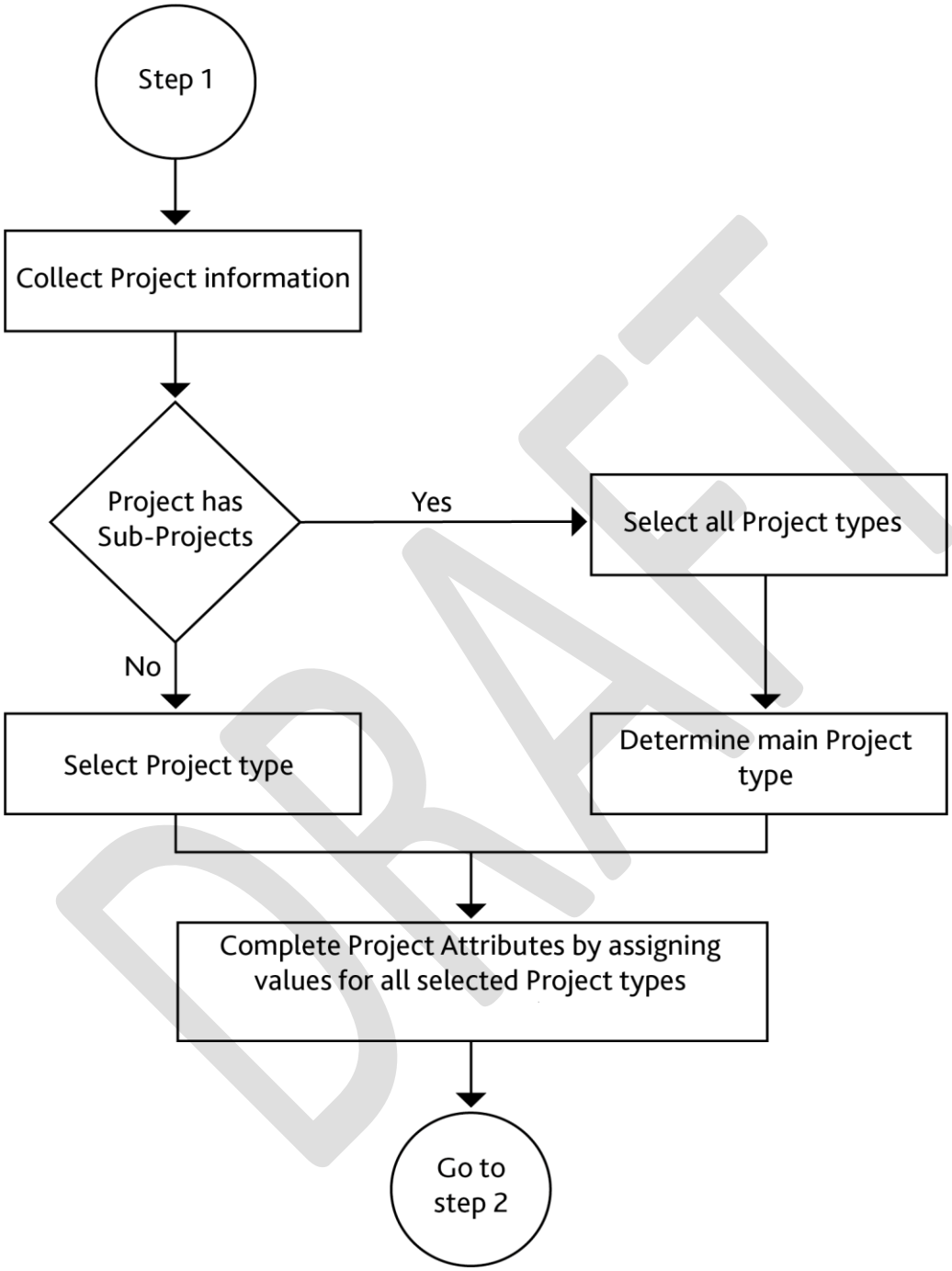
Cost code	Description	
	Cost Category (Level 2)	OC
	Cost Group (Level 3)	
	Cost Sub-Group (Level 4)	
4.	**Operation Costs (OC)**	
01.	Cleaning	
01.010	External cleaning (routine and periodic)	
01.020	Internal cleaning (routine and periodic)	
01.030	Specialist cleaning (define type)	
02.	Utilities	
02.010	Fuel (state type: gas/electricity/ oil and other fuel sources)	
02.020	Water, drainage and sewerage	
03.	Waste management	
03.010	Waste collection and disposal	
03.020	Recycling and savage	
04.	Security	
04.010	Physical security	
04.020	Remote monitoring	
05.	Information and communications technology	
05.010	Communication systems	
05.020	Specialist technology / sensors	
06.	Operators' site overheads | general requirements	
06.010	Administration	
06.020	Property insurance	
07.	Risk Allowances	
07.010	Operation related (user definable)	
07.020	Contractual obligations	
08.	Taxes and Levies	
08.010	Taxes	
08.020	Levies	

Appendix E – End of Life Cost Sub-Groups

Cost code	Description	
	Cost Category (Level 2)	EC
	Cost Group (Level 3)	
	Cost Sub-Group (Level 4)	
6.	**End of Life Costs (EC)**	
01.	Disposal inspection	
01.010	Dilapidations report	
01.020	Contractual handback obligations	
02.	Decommissioning and decontamination	
02.010	Shutdowns and decommissioning	
02.020	Decontamination	
03.	Demolition and reclamation	
03.010	Demolition	
03.020	Reclamation	
04.	Reinstatement	
04.010	Agreed reinstatement works	
04.020	Contractual obligations	
05.	Constructors' site overheads | general requirements	
05.010	Administration	
05.020	Overheads (project specific)	
06.	Risk Allowances	
06.010	End of life specific (user definable)	
06.020	Abnormal risks (user definable)	
07.	Taxes and Levies	
07.010	Taxes	
07.020	Levies	
07.030	Credit for grants	

Appendix F – Process Flow Charts

The process flow charts in this appendix provide the steps needed to present life cycle costs for a project, programme or portfolio.



Step 2

A single project or a collection / programme / portfolio of projects

Divide each into the following Sub-Projects as appropriate, or other Sub-Projects following the same principle

Complete Project Attributes by assigning values for all selected Sub-Projects (Part 3)

LEVEL 1 : PROJECTS AND SUB-PROJECTS

01. Buildings	02. Roads and motorways	03. Railways	04. Bridges	05. Tunnels	06. Waste water treatment works	07. Water treatment works
08. Pipelines	09. Wells and boreholes	10. Power-generating plants	11. Chemical plants	12. Refineries	13. Dams and reservoirs	14. Mines and quarries

Divide each into the following Cost Categories

LEVEL 2 : COST CATEGORIES

A	C	R	O	M	E
1. Acquisition Costs (AC)	**2. Construction Costs (CC)**	**3. Renewal Costs (RC)**	**4. Operation Costs (OC)**	**5. Maintenance Costs (MC)**	**6. End of Life Costs (EC)**

Build up each from the Cost Groups on the next page

LEVEL 3 : COST GROUPS

Acquisition Costs	Construction Costs or Renewal Costs or Maintenance Costs	Operation Costs	End of Life Costs
01. Site acquisition	01. Demolition, site preparation and formation	01. Cleaning	01. Disposal inspection
02. Administrative, finance, legal and marketing expenses	02. Substructure	02. Utilities	02. Decommissioning and decontamination
	03. Structure	03. Waste management	03. Demolition and reclamation
	04. Architectural works | non-structural works	04. Security	04. Reinstatement
	05. Services and equipment	05. Information and Communication Technology	05. Constructors' site overheads | general requirements
	06. Surface and underground drainage	06. Operators' site overheads | general requirements	06. Risk Allowances
	07. External and ancillary works	07. Risk Allowances	07. Taxes and Levies
	08. Preliminaries | Constructors' site overheads | general requirements	08. Taxes and Levies	
	09. Risk Allowances		
	10. Taxes and Levies		
	11. Work and utilities off-site		
	12. Post-completion loose furniture, fittings and equipment		
	13. Construction-related consultants and supervision		

Classify each into detailed Cost Sub-Groups as appropriate

LEVEL 4 : COST SUB-GROUPS (Discretionary for each Cost Group)

Appendix G – Reporting Templates

Specific notes for Appendix G

- **Project Attributes** and **Project Values** are not shown in this example but should be provided in the actual cost report.
- '$M' = $ million.

Mixed project – Grand Summary

- All costs are brought to the Common Date, which is assumed to be not earlier than the completion of construction.
- Whether the payments at the time of payment are based on Real Costs or Nominal Costs should be stated. The discounting factors should take that into account.

Item	Description	AC	CC	RC	RC	RC	OC	MC	EC	Total Cost
	Single year of payment after construction for RC and EC			<P>	<Q>	<R>			<S>	
	Number of years of annual payments after construction for RC and EC					<T>			<T>	
A		**Project Qty and Discount Rate**								
1	Buildings	IPMS 1 and 2 Floor Area (m2)								
2	Roads and motorways	Paved Area (m2)								
3	Railways	Route Length (km)								
4	Bridges	Surface Area of Deck (m2)								
5	Tunnels	Volume of Excavation (m3)								
6	Dams and reservoirs	Reservoir capacity (million m3)								
7	Common	IPMS 1 and 2 Floor Area (m2)								
8	Others	Discount rate used (% per annum)								
B	**Total Cost $M brought to the Common Date (= D x E)**									
1	Buildings									
2	Roads and motorways									
3	Railways									
4	Bridges									
5	Tunnels									
6	Dams and reservoirs									
7	Common									
8	**Total**									
C	**Unit cost $ / Project Qty (= B/A)**									
1	Buildings									
2	Roads and motorways									
3	Railways									
4	Bridges									
5	Tunnels									
6	Dams and reservoirs									
7	Common									
D	**One time or one annual payment $M at the time of payment**									
1	Buildings									
2	Roads and motorways									
3	Railways									
4	Bridges									
5	Tunnels									
6	Dams and reservoirs									
7	Common									

Item	Description	AC	CC	RC	RC	RC	OC	MC	EC	Total Cost
	Single year of payment after construction for RC and EC			<P>	<Q>	<R>			<S>	
	Number of years of annual payments after construction for RC and EC					<T>			<T>	
E	**Discounting factor to bring one time or one annual payment from year of payment to the Common Date (using present value factor for RC and EC and present value in annuity factor for OC or MC)**									
1	Buildings									
2	Roads and motorways									
3	Railways									
4	Bridges									
5	Tunnels									
6	Dams and reservoirs									
7	Common									

A Building project – Construction Costs only

- Columns for the unit cost calculated using additional project quantities may be added if required.

Cost code	Description	Buildings			
		$M	$/m²	$/m²	%
	Project Quantity				
			IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)	
2.	**Construction Costs (CC)**				100%
2.01.	Demolition, site preparation and formation				
2.02.	Substructure				
2.03.	Structure				
2.04.	Architectural works | non-structural works				
2.05.	Services and equipment				
2.06.	Surface and underground drainage				
2.07.	External and ancillary works				
2.08.	Preliminaries | Constructor's site overheads | general requirements				
2.09.	Risk Allowances				
2.10.	Taxes and Levies				
2.11.	Work and utilities off-site				
2.12.	Post-completion furniture, furnishing and equipment				
2.13.	Construction-related consultants and supervision				

A project – Total Capital Cost

Cost code	Description	<insert Project Type>			
		$M	$/Qty	% by Category	% of Total
	Project Quantity				
			(insert Project Qty Attribute)		
	Total Capital Cost (AC+CC)				100%
1.	Acquisition Costs (AC)				
2.	Construction Costs (CC)				
1.	**Acquisition Costs (AC)**			100%	
1.01.	Site acquisition				
1.02.	Administrative, finance, legal and marketing expenses				
2.	**Construction Costs (CC)**			100%	
2.01.	Demolition, site preparation and formation				
2.02.	Substructure				
2.03.	Structure				
2.04.	Architectural works | non-structural works				
2.05.	Services and equipment				
2.06.	Surface and underground drainage				
2.07.	External and ancillary works				
2.08.	Preliminaries | Constructor's site overheads | general requirements				
2.09.	Risk Allowances				
2.10.	Taxes and Levies				
2.11.	Work and utilities off-site				
2.12.	Post-completion furniture, furnishing and equipment				
2.13.	Construction-related consultants and supervision				

A project – Life Cycle Costs

Cost code	Description	<insert Project Type>			
		$M	$/Qty	% by Category	% of Total
	Project Quantity				
			(insert Project Qty Attribute)		
	Life Cycle Cost (CC plus NPV of RC, OC, MC, and EC)				100%
1.	Acquisition Costs (AC) [Part of Non-Construction Costs]				
2.	Construction Costs (CC)				
3.	Renewal Costs (RC)				
4.	Operation Costs (OC)				
5.	Maintenance Costs (MC)				
6.	End of Life Costs (EC)				
1.	**Acquisition Costs (AC)**			100%	
1.01.	Site acquisition				
1.02.	Administrative, finance, legal and marketing expenses				
2.	**Construction Costs (CC)**			100%	
2.01.	Demolition, site preparation and formation				
2.02.	Substructure				
2.03.	Structure				
2.04.	Architectural works | non- structural works				
2.05.	Services and equipment				
2.06.	Surface and underground drainage				
2.07.	External and ancillary works				
2.08.	Preliminaries | Constructors' site overheads | general requirements				
2.09.	Risk Allowances				
2.10.	Taxes and Levies				
2.11.	Work and utilities off-site				
2.12.	Post-completion furniture, furnishing and equipment				
2.13.	Construction-related consultants and supervision				
3.	**Renewal Costs (RC)**			100%	
3.01.	Demolition, site preparation and formation				
3.02.	Substructure				
3.03.	Structure				
3.04.	Architectural works | non- structural works				
3.05.	Services and equipment				
3.06.	Surface and underground drainage				
3.07.	External and ancillary works				
3.08.	Preliminaries | Constructors' site overheads | general requirements				
3.09.	Risk Allowances				
3.10.	Taxes and Levies				
3.11.	Work and utilities off-site				
3.12.	Post-completion furniture, furnishing and equipment				
3.13.	Construction-related consultants and supervision				
4.	**Operation Costs (OC)**			100%	
4.01.	Cleaning				
4.02.	Utilities				
4.03.	Waste management				
4.04.	Security				

Cost code	Description	<insert Project Type>			
		$M	$/Qty	% by Category	% of Total
	Project Quantity				
			(insert Project Qty Attribute)		
4.05.	Information and Communication Technology				
4.06.	Operators' site overheads | general requirements				
4.07.	Risks Allowances				
4.08.	Taxes and Levies				
5.	**Maintenance Costs (MC)**			100%	
5.01.	Demolition, site preparation and formation				
5.02.	Substructure				
5.03.	Structure				
5.04.	Architectural works | non- structural works				
5.05.	Services and equipment				
5.06.	Surface and underground drainage				
5.07.	External and ancillary works				
5.08.	Preliminaries | Constructors' site overheads | general requirements				
5.09.	Risk Allowances				
5.10.	Taxes and Levies				
5.11.	Work and utilities off-site				
5.12.	Post-completion furniture, furnishing and equipment				
5.13.	Construction-related consultants and supervision				
6.	**End of Life Costs (EC)**			100%	
6.01.	Disposal inspection				
6.02.	Decommissioning and decontamination				
6.03.	Demolition and reclamation				
6.04.	Reinstatement				
6.05.	Constructors' site overheads | general requirements				
6.06.	Risks Allowances				
6.07.	Taxes and Levies				

Comparison between two design schemes

- Additional columns may be added as appropriate.

Cost code	Description	Scheme A			Scheme B			B-A	
		$M	$/Qty	% of Total	$M	$/Qty	% of Total	$M	$/m²
	Project Quantity								
			(insert Project Qty's Attribute)			(insert Project Qty's Attribute)			(insert Project Qty's Attribute)
	Life Cycle Cost (CC plus NPV of RC, OC, MC, and EC)			100%			100%		
1.	Acquisition Costs (AC) [Part of Non-Construction Costs]								
2.	Construction Costs (CC)								
3.	Renewal Costs (RC)								
4.	Operation Costs (OC)								
5.	Maintenance Costs (MC)								
6.	End of Life Costs (EC)								
1.	**Acquisition Costs (AC)**								
1.01.	Site acquisition								
1.02.	Administrative, finance, legal and marketing expenses								
2.	**Construction Costs (CC)**								
2.01.	Demolition, site preparation and formation								
2.02.	Substructure								
2.03.	Structure								
2.04.	Architectural works | non-structural works								
2.05.	Services and equipment								
2.06.	Surface and underground drainage								
2.07.	External and ancillary works								
2.08.	Preliminaries | Constructors' site overheads | general requirements								
2.09.	Risk Allowances								
2.10.	Taxes and Levies								
2.11.	Work and utilities off-site								
2.12.	Post-completion furniture, furnishing and equipment								
2.13.	Construction-related consultants and supervision								
3.	**Renewal Costs (RC)**								
3.01.	Demolition, site preparation and formation								
3.02.	Substructure								
3.03.	Structure								
3.04.	Architectural works | non-structural works								
3.05.	Services and equipment								
3.06.	Surface and underground drainage								
3.07.	External and ancillary works								
3.08.	Preliminaries | Constructors' site overheads | general requirements								
3.09.	Risk Allowances								
3.10.	Taxes and Levies								

Cost code	Description	Scheme A			Scheme B			B-A	
		$M	$/Qty	% of Total	$M	$/Qty	% of Total	$M	$/m²
	Project Quantity								
			(insert Project Qty's Attribute)			(insert Project Qty's Attribute)			(insert Project Qty's Attribute)
3.11.	Work and utilities off-site								
3.12.	Post-completion furniture, furnishing and equipment								
3.13.	Construction-related consultants and supervision								
4.	**Operation Costs (OC)**								
4.01.	Cleaning								
4.02.	Utilities								
4.03.	Waste management								
4.04.	Security								
4.05.	Information and Communication Technology								
4.06.	Operators' site overheads | general requirements								
4.07.	Risks Allowances								
4.08.	Taxes and Levies								
5.	**Maintenance Costs (MC)**								
5.01.	Demolition, site preparation and formation								
5.02.	Substructure								
5.03.	Structure								
5.04.	Architectural works | non-structural works								
5.05.	Services and equipment								
5.06.	Surface and underground drainage								
5.07.	External and ancillary works								
5.08.	Preliminaries | Constructors' site overheads | general requirements								
5.09.	Risk Allowances								
5.10.	Taxes and Levies								
5.11.	Work and utilities off-site								
5.12.	Post-completion furniture, furnishing and equipment								
5.13.	Construction-related consultants and supervision								
6.	**End of Life Costs (EC)**								
6.01	Disposal inspection								
6.02	Decommissioning and decontamination								
6.03	Demolition and reclamation								
6.04	Reinstatement								
6.05	Constructors' site overheads | general requirements								
6.06	Risks Allowances								
6.07	Taxes and Levies								

Project with Sub-Projects

- Additional columns for other **Sub-Projects** may be added as appropriate.
- A set of columns for 'Common' may be added before the 'Total' to show the costs that may be spread across all or most **Sub-Projects**. These costs may be shown separately to permit reallocation in the appropriate way when the need arises.

Cost code	Description	Sub-Project								Total	
		Hotel			Apartment			Roads and motorways			
		$M	$/m²	$/m²	$M	$/m²	$/m²	$M	$/m	$M	% of Total
	Project Quantity										
			IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)		IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)		Road Length (m)		
	Life Cycle Cost (CC plus NPV of RC, OC, MC, and EC)										100%
1.	Acquisition Costs (AC) [part of non-construction costs]										
2.	Construction Costs (CC)										
3.	Renewal Costs (RC)										
4.	Operation Costs (OC)										
5.	Maintenance Costs (MC)										
6.	End of Life Costs (EC)										
1.	**Acquisition Costs (AC)**										
1.01.	Site acquisition										
1.02.	Administrative, finance, legal and marketing expenses										
2.	**Construction Costs (CC)**										
2.01.	Demolition, site preparation and formation										
2.02.	Substructure										
2.03.	Structure										
2.04.	Architectural works | non- structural works										
2.05.	Services and equipment										
2.06.	Surface and underground drainage										
2.07.	External and ancillary works										
2.08.	Preliminaries | Constructors' site overheads | general requirements										
2.09.	Risk Allowances										
2.10.	Taxes and Levies										
2.11.	Work and utilities off-site										

Cost code	Description	Sub-Project								Total	
		Hotel			Apartment			Roads and motorways			
		$M	$/m²	$/m²	$M	$/m²	$/m²	$M	$/m	$M	% of Total
	Project Quantity										
			IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)		IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)		Road Length (m)		
2.12.	Post-completion furniture, furnishing and equipment										
2.13.	Construction-related consultants and supervision										
3.	**Renewal Costs (RC)**										
3.01.	Demolition, site preparation and formation										
3.02.	Substructure										
3.03.	Structure										
3.04.	Architectural works | non- structural works										
3.05.	Services and equipment										
3.06.	Surface and underground drainage										
3.07.	External and ancillary works										
3.08.	Preliminaries | Constructor's site overheads | general requirements										
3.09.	Risk Allowances										
3.10.	Taxes and Levies										
3.11.	Work and utilities off-site										
3.12.	Post-completion furniture, furnishing and equipment										
3.13.	Construction-related consultants and supervision										
4.	**Operation Costs (OC)**										
4.01.	Cleaning										
4.02.	Utilities										
4.03.	Waste management										
4.04.	Security										
4.05.	Information and Communication Technology										
4.06.	Operators' site overheads | general requirements										
4.07.	Risks Allowances										
4.08.	Taxes and Levies										

Cost code	Description	Sub-Project								Total	
		Hotel			Apartment			Roads and motorways			
		$M	$/m²	$/m²	$M	$/m²	$/m²	$M	$/m	$M	% of Total
	Project Quantity										
			IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)		IPMS 1 Floor Area (m²)	IPMS 2 Floor Area (m²)		Road Length (m)		
5.	**Maintenance Costs (MC)**										
5.01	Demolition, site preparation and formation										
5.02	Substructure										
5.03	Structure										
5.04	Architectural works | non- structural works										
5.05	Services and equipment										
5.06	Surface and underground drainage										
5.07	External and ancillary works										
5.08	Preliminaries | Constructors' site overheads | general requirements										
5.09	Risk Allowances										
5.10	Taxes and Levies										
5.11.	Work and utilities off-site										
5.12.	Post-completion furniture, furnishing and equipment										
5.13.	Construction-related consultants and supervision										
6.	**End of Life Costs (EC)**										
6.01.	Disposal inspection										
6.02.	Decommissioning and decontamination										
6.03.	Demolition and reclamation										
6.04.	Reinstatement										
6.05.	Constructors' site overheads | general requirements										
6.06.	Risks Allowances										
6.07.	Taxes and Levies										

A project – Construction Costs only, involving two currencies

- Additional column may be added to show the conversion date.

Cost code	Description	<insert Project Type>					
		Payment Currency A	Payment Currency B	Conversion Factor from A to B	Equivalent Currency A	Equivalent Currency A/Qty	%
	Project Quantity						
		A	B	C	A x C + B	(insert Project Qty's Attribute)	
2.	**Construction Costs (CC)**						100%
2.01.	Demolition, site preparation and formation						
2.02.	Substructure						
2.03.	Structure						
2.04.	Architectural works | non-structural works						
2.05.	Services and equipment						
2.06.	Surface and underground drainage						
2.07.	External and ancillary works						
2.08.	Preliminaries | Constructor's site overheads | general requirements						
2.09.	Risk Allowances						
2.10.	Taxes and Levies						
2.11.	Work and utilities off-site						
2.12.	Post-completion furniture, furnishing and equipment						
2.13.	Construction-related consultants and supervision						

A project – Construction Costs only, involving many currencies

- Additional column may be added to show the conversion date.

Cost code	Description	<insert Project Type>				
		Payment Currency	Conversion Factor to A	Equivalent Currency A	Equivalent Currency A/Qty	%
	Project Quantity					
		M	N	M x N	(insert Project Qty's Attribute)	
2.	**Construction Costs (CC)**					100%
2.01.	Demolition, site preparation and formation					
	Currency B					
2.02.	Substructure					
	Currency B					
2.03.	Structure					
	Currency B					
2.04.	Architectural works | non-structural works					
	Currency A					
	Currency B					
	Currency C					
2.05.	Services and equipment					
	Currency A					
	Currency B					
	Currency C					
2.06.	Surface and underground drainage					
	Currency B					
2.07.	External and ancillary works					
	Currency B					
2.08.	Preliminaries | Constructor's site overheads | general requirements					
	Currency A					
	Currency B					
2.09.	Risk Allowances					
	Currency A					
2.10.	Taxes and Levies					
	Currency B					
2.11.	Work and utilities off-site					
	Currency B					
2.12.	Post-completion furniture, furnishing and equipment					
	Currency A					
	Currency B					
	Currency C					
2.13.	Construction-related consultants and supervision					
	Currency A					

Cost code	Description	<insert Project Type>				
		Payment Currency	Conversion Factor to A	Equivalent Currency A	Equivalent Currency A/Qty	%
	Project Quantity					
		M	N	M x N	(insert Project Qty's Attribute)	
	Currency B					
	Currency C					
	Check sum					
	Currency A					
	Currency B					
	Currency C					

Appendix H – ICMS Coding Structure

Level 1: Projects and Sub-Projects

01.	Buildings	08.	Pipelines
02.	Roads, runways and motorways	09.	Wells and boreholes
03.	Railways	10.	Power-generating plants
04.	Bridges	11.	Chemical plants
05.	Tunnels	12.	Refineries
06.	Waste water treatment works	13.	Dams and reservoirs
07.	Water treatment works	14.	Mines and quarries

Level 2: Cost Categories

1.	Acquisition Costs (AC) [Part of Non-Construction Costs]
2.	Construction Costs (CC)
3.	Renewal Costs (RC)
4.	Operation Costs (OC)
5.	Maintenance Costs (MC)
6.	End of Life Costs (EC)

Level 3: Cost Groups (under Cost Category Acquisition Costs)

01.	Site acquisition
02.	Administrative, finance, legal and marketing expenses

Level 3: Cost Groups (under Cost Categories Construction Costs, Renewal Costs, and Maintenance Costs)

01.	Demolition, site preparation and formation
02.	Substructure
03.	Structure
04.	Architectural works | Non-structural works
05.	Services and equipment
06.	Surface and underground drainage
07.	External and ancillary works
08.	Preliminaries | Constructors' site overheads | general requirements
09.	Risk Allowances
10.	Taxes and Levies
11.	Work and utilities off-site
12.	Post-completion loose furniture, fittings and equipment
13.	Construction | Renewal | Maintenance -related consultancies and supervision

Level 3: Cost Groups (under Cost Category Operation Costs)

01.	Cleaning
02.	Utilities
03.	Waste management
04.	Security
05.	Information and Communications Technology
06.	Operators' site overheads | general requirements
07.	Risk Allowances
08.	Taxes and Levies

Level 3: Cost Groups (End of Life Costs)

01.	Disposal inspection
02.	Decommissioning and decontamination
03.	Demolition and reclamation
04.	Reinstatement
05.	Constructors' site overheads | general requirements
06.	Risk Allowances
07.	Taxes and Levies

Level 4 Cost Sub Groups are discretionary and no formal codes are assigned.

Appendix I – Interface with International Property Measurement Standards (IPMS)

Measurement of Floor Areas for Buildings for ICMS Cost Reports

The various cost analysis standards worldwide require the measurement of a gross floor area (either external (**GEFA**) or internal (**GIFA**)) or similar variations thereof to permit the representation of overall costs in terms of currency per floor area. However, even though the use of these terms is commonly understood, the definitions and interpretations of these terms are also subject to considerable regional variations. Measurement guidelines and definitions vary considerably between countries. Linking **ICMS** with **IPMS** provides a valuable tool for overcoming these inconsistencies. **ICMS** require a cost report to include both **GEFA** (**IPMS** 1) and **GIFA** (**IPMS 2**) measured in accordance with the rules set out in **IPMS**. **IPMS** are evolving on a building-sector basis (offices, residential, retail, etc.). These rules are summarised below, but reference to the specific Standards, for the building type, is recommended.

IPMS 1: Gross external floor area	IPMS 2: Gross internal floor area
Use	
IPMS 1 is used for measuring the area of a building including *External Walls*. **IPMS 1** is a whole building measurement and is consistent for all building types.	**IPMS 2** is a whole building measurement that is used for measuring the interior boundary area of a building. **IPMS 2** is a whole building measurement and is consistent for all building types.
Selected Definitions	
IPMS 1 is the total of the areas of each floor level of a building measured to the outer perimeter of *External Walls*, *Sheltered Areas* and *Balconies*. The definition for IPMS 1 is the same for all classes of building.	**IPMS** 2 is total of the areas of each floor level of a building measured to the *Internal Dominant Face* of all *External Walls* and *Balconies* on each level.

Balcony: An external platform at an upper floor level with a *balustrade* to the open sides projecting from or recessed from an External Wall and including in this definition generally accessible rooftop terraces.

Balustrade: A protective barrier formed by a solid wall, railings or other features.

Catwalk: An internal or external walkway above the surrounding area that provides higher level access.

Covered Area: The extent of the area of a building covered by one or more roof(s) and the perimeter of which is sometimes referred to as the drip line, being the outermost permanent structural extension, exclusive of ornamental overhangs.

External Wall: The enclosing element of a building, including windows and walls, that separates the exterior area from the interior area.

Finished Surface: The wall surface directly above the horizontal wall-floor junction, ignoring skirting boards, cable trunking, heating and cooling units, and pipework.

Floor Area: The area of a normally horizontal, permanent, load-bearing structure for each level of a building.

IDF (Internal Dominant Face) Wall Section: The extent of each section of an *External Wall* where the inside finished surface area of each part of a window, wall or other external construction features varies from the inside finished surface area of the adjoining window, wall or external construction feature, ignoring the existence of any columns.

Internal Dominant Face (IDF): The inside surface area comprising more than 50% of the first 2.75 metres measured vertically from the floor, or to the ceiling if lower, for each *IDF Wall Section*. If such does not occur, then the *Finished Surface* is deemed to be the *IDF*.

Loading Bay(s): Area(s) designed for vehicle access next to or adjacent to a *Loading Dock*.

Loading Dock(s): Elevated platform(s) at an opening of a building designed for receiving or dispatching goods or equipment.

Mezzanine: An intermediate or partial floor, other than a *Catwalk*, that is usually fully or partially open on one or more sides.

Sheltered Area: Any part of the *Covered Area* that is not fully enclosed, but excluding insignificant areas under the eaves.

IPMS 1: Gross external floor area	IPMS 2: Gross internal floor area
Structure: A construction that provides shelter or serves an ancillary function but is not necessarily fully enclosed. *Temporary Structure:* A physical element within a building installed on an interim or permanent basis, the removal of which would not damage the physical integrity of the building. *Veranda:* An open or partly enclosed area on the outside of a building at ground level (Level 0) and covered by a roof that is an integral part of the building.	
Inclusions	
• all areas, walls and columns • enclosed walkways or passages between separate buildings, available for direct or indirect use • enclosed void areas such as atria - only included at their lowest floor level • exterior wall thickness of basement – estimated if there are no available plans for a basement • to follow the principal external perimeter line of the building across roller shutters and other openings	• all internal areas, including internal walls and columns • enclosed void areas such as atria - only included at their lowest floor level
Measurements included (but each area must be stated separately)	
• *Balconies* and *Mezzanines* - measured to the outside edge of the floor construction • *Sheltered Areas* - measured to the *Covered Area* • *Verandas*	• *Balconies* and *Mezzanines* – measured to the inner face of the balustrade, but not beyond the outside edge of the floor construction • internal *Loading Bays* • enclosed walkways or passages between separate buildings, available for direct or indirect use
***Exclusions (*each area must be stated separately if measured)**	
• *Temporary Structures* • open light wells or the upper level voids of an atrium • open external stairways that are not an integral part of the building, for example, an open framework fire escape • any *Structure* beyond the *Covered Area* • any other ground-level areas or structures beyond the *Covered Area*	• Same a IPMS 1
	• areas outside the *External Wall* such as *Sheltered Areas* and external *Loading Bays*
	• *Sheltered Areas* - measured to the *Finished Surface* of any walls or otherwise to the outer perimeter of the *Covered Area*

Appendix J – Revision Notes for the second edition

1. Expanded to incorporate the full scope of Life Cycle Costs of Constructed Assets, adding Renewal Costs, Operation Costs, Maintenance Costs and End of Life Costs.
2. Extended to include Dams and reservoirs, and Mines and quarries as Project types.
3. 'Site Acquisition and Client's Other Costs' changed to 'Acquisition Costs'.
4. Definition of 'Base Date' revised to match the General Notes in the Appendices.
5. 'Capital Construction Costs' changed to 'Construction Costs'.
6. Associated Capital Costs merged as Cost Groups under Construction Costs.
7. Cost code assigned for Projects and Sub-Projects and re-numbered for Cost Categories.
8. 'major refurbishment' as a nature of Works changed to 'major adaptation'
9. A note added to Part 3 (formerly Schedule 1) to clarify that some attributes are multi-valued requiring the entry of sets of sub-attributes and values.
10. Project Attribute 'Ground conditions' qualified with 'predominant'.
11. Project Attribute 'Seismic zones' added under Common Attributes.
12. Life Cycle Cost Related Project Attributes added under Common Attributes.
13. Project Attribute 'Hotel grade' added for Buildings.
14. Project Attribute 'shape (vertical section)' added for Buildings.
15. Hardstandings included in the scope of Roads, runways and motorways.
16. Project Attribute 'spans' for Bridges deleted.
17. Project Attribute 'number each of abutments/piers/towers with foundations not in water' added for Bridges.
18. Project Attribute 'number of shafts' added for Tunnels.
19. Project Attribute 'number and diameter of each pipe' changed to 'length of each diameter of pipes' with corresponding change of Project Quantity for Pipelines.
20. Project Attribute 'Length of pipes (sum of number x each length)' changed to 'Total length of pipes' for Pipelines.
21. Project Attribute 'number of wellheads' changed to 'number of wells/boreholes' for Wells and boreholes.
22. Project Attribute 'number of each diameter of drilled/bored holes' deleted from Wells and boreholes.
23. Project Attribute 'vertical length drilled/bored (sum of number x each depth)' changed to 'length of each diameter of vertical drilled/bored wells/boreholes' with corresponding change of Project Quantity for Wells and boreholes.
24. Project Attribute 'inclined or horizontal length drilled/bored (sum of number x each depth)' changed to 'length of each diameter of inclined or horizontal drilled/bored wells/boreholes' with corresponding change of Project Quantity for Wells and boreholes.
25. Project Attribute 'Length of drilled/bored depth' changed to 'Total length drilled/bored' for Wells and boreholes.
26. Note added that more than one pre-set option may be selected for Project Attribute 'principal processes' for Chemical plants.
27. Order of Appendices adjusted.
28. Appendices A to D expanded to Appendices A to E with subsequent Appendices re-numbered.
29. Cost Sub-Group 'Site survey and investigation' changed to 'Site survey and ground investigation' to include ground investigation.
30. Cost Sub-Group 'Sampling for construction, geophysical, geological or similar purposes' renamed as 'Sampling of hazardous or useful materials or conditions'.
31. Cost Sub-Group 'Erosion control' added under 'Demolition, site preparation and formation'.
32. Appendix H has been added to explicitly define the coding structure of ICMS, 2nd.
33. Item 'hoisting beams, lift pit separation screens' changed to 'hoisting beams, lift pit separation screens, lift shaft separator beams' under Builder's work in connection with services.

34. Item ‘communications’ changed to ‘information and communications technology system’ under Extra Low Voltage Electrical Services.
35. Cost Sub-Group ‘Supply of sanitary fittings’ changed to ‘Supply of sanitary fittings and fixtures’ with explanatory note added.
36. Item ‘portable hand-operated appliances’ changed to ‘portable hand-operated appliances and sundries’ under Fire services.
37. Cost Sub-Group ‘Audio/visual entertainment system’ added under Services and equipment Cost Category.
38. Reporting Templates showing life cycle costs and currency conversion added.
39. Interface with IPMS updated and tabulated.
40. Bibliography updated.
41. Colouring of tables revised.

Appendix K – Bibliography

Eurostat: http://ec.europa.eu/eurostat

International Property Measurement Standards (IPMS): www.ipmsc.org

International Standard Industrial Classification of all Economic Activities (ISIC Rev,.4): http://unstats.un.org/unsd/cr/registry/ regcst.asp?Cl=27

Prices and purchasing power parities: www.oecd.org/std/prices-ppp/

ISO 12006-2: 2015, *Building construction – Organization of information about construction works. Part 2: Framework for classification*

ISO 3166-2: 2013, *Codes for the representation of names of countries and their subdivisions – Part 2: Country subdivision code* • ISO 4217: 2015, *Codes for the representation of currencies*

ISO 6707-1: 2014, *Buildings and civil engineering works – Vocabulary – Part 1: General terms*

ISO 15686-5:2017, *Buildings and constructed assets – Service life planning – Part 5: Life-cycle costing.*