HKIS QSD CPD Event 2019059

International Construction Measurement Standards – ICMS explained

19:00 – 20:30, 28 June 2019
Surveyors Learning Centre

Presented by

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FHKIS RPS(QS) FSZCEA FHKIVM FCECA

A member since November 2015 of the Standards Setting Committee of ICMS which is responsible for drafting the 1st and 2nd Editions of ICMS, after being nominated by the HKIS.
A qualified quantity surveyor with over 42 years' professional quantity surveying experience.

International Construction Measurement Standards

- Measure what?
- A standard method of measurement for Bills of Quantities?
- A misnomer?
- A brother of International Property Measurement Standards.
- An Elemental Construction Cost Classification!
- Measure Costs.
- Why not called “Elemental”?

Need for Pre-construction Estimates

- Know the costs for investment decisions:
  - Calculate land bid price
  - Calculate acceptable rental
  - Evaluate the feasibility of the investment
- Establish a project (development) budget
- Obtain funding
- Borrow money from the bank
- Formulate a design brief which defines the scope and standard of the project
- Monitor the design development to control the costs within budget
- Evaluate and select between different design options

Need for Historic Cost Analyses

- Benchmark new projects
- Provide cost data for new estimates
- Provide cost parameters for new estimates

Best Time to Plan and Control the Costs

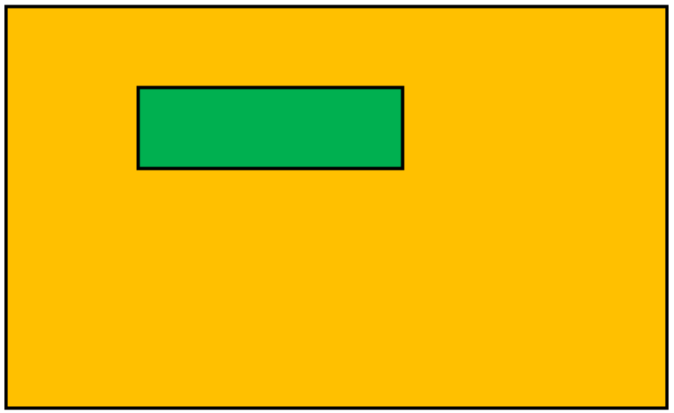
- As early as possible during the development process
- Better chances to make design changes to find a better solution
- To reduce abortive design costs

Ways to Calculate the Cost Estimates

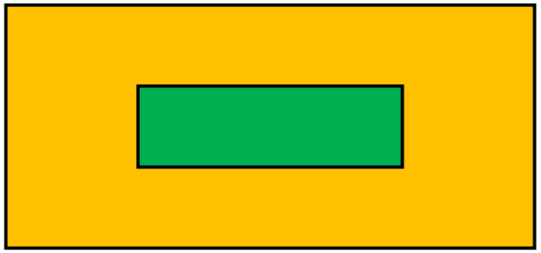
- Estimates should be done using expedient methods, approximations and shortcuts to reduce estimating time and costs in order to afford more estimates
- By unit cost per floor area / length / number estimates
- By measuring the most significant cost parameters
- By measuring elemental quantities
- By measuring approximate quantities
- By pricing the bills of quantities ready for issuance or already issued for tendering

Cost Geometry

SAME BUILDING



Big site



Small site

Costs of site works and external works very different between the two schemes.
They must be separated for cost estimating.

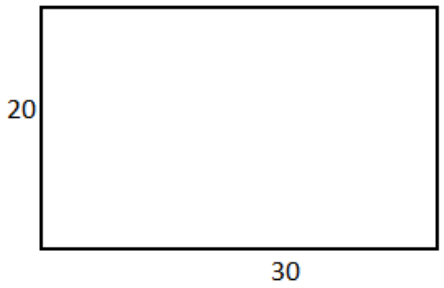
Cost Geometry (Cont'd)

One-storey building

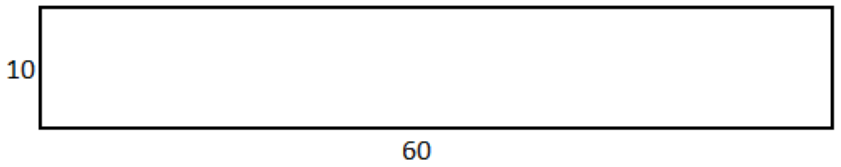
Two-storey building

Floor area doubled.
Roof costs the same.
Substructure costs would not be doubled.
Costs of roof and substructure must be separated.

Cost Geometry (Cont'd)



Area = 20 x 30 = 600
Perimeter = (20 + 30) x 2 = 100



Area = 10 x 60 = 600
Perimeter = (10 + 60) x 2 = 140

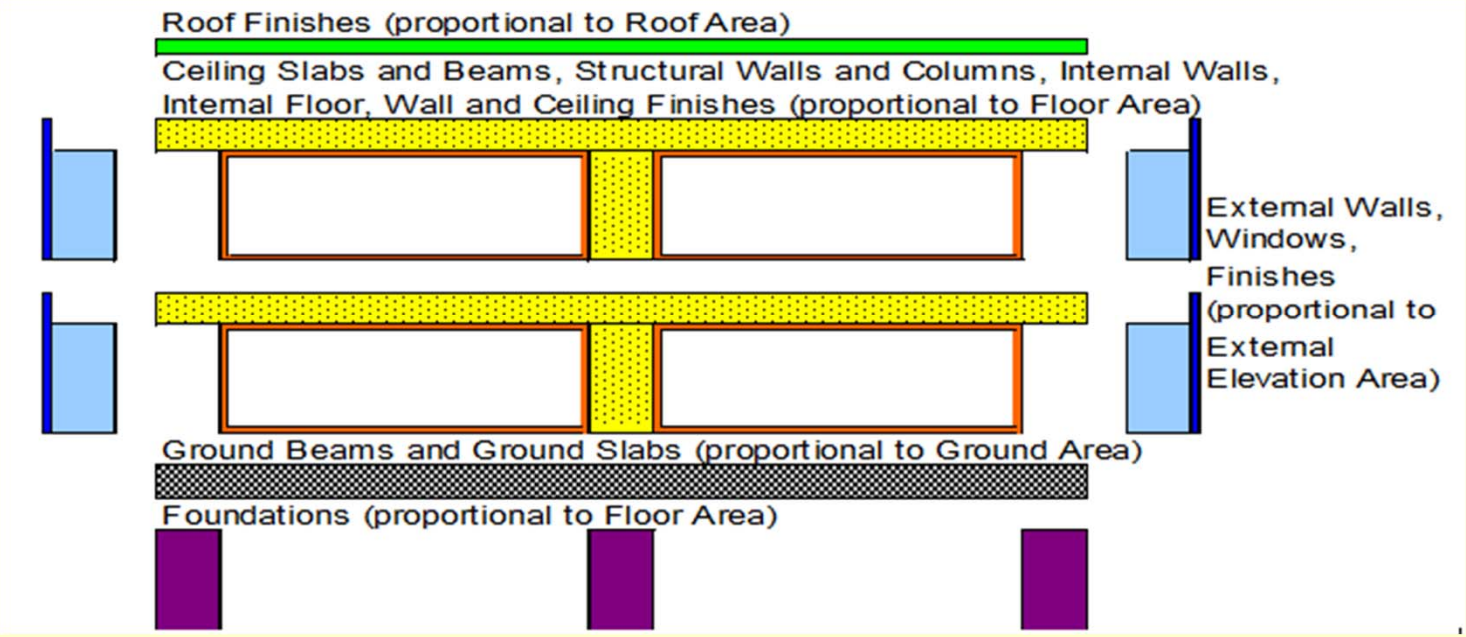
Perimeter / elevation areas different for the same floor area.
Costs of elevations must be separated.

Cost Geometry (Cont'd)

Minimum parameters:

- Roof Area (= ground area)
- Floor Area
- External Elevation Area
- Ground Area

Without Basement

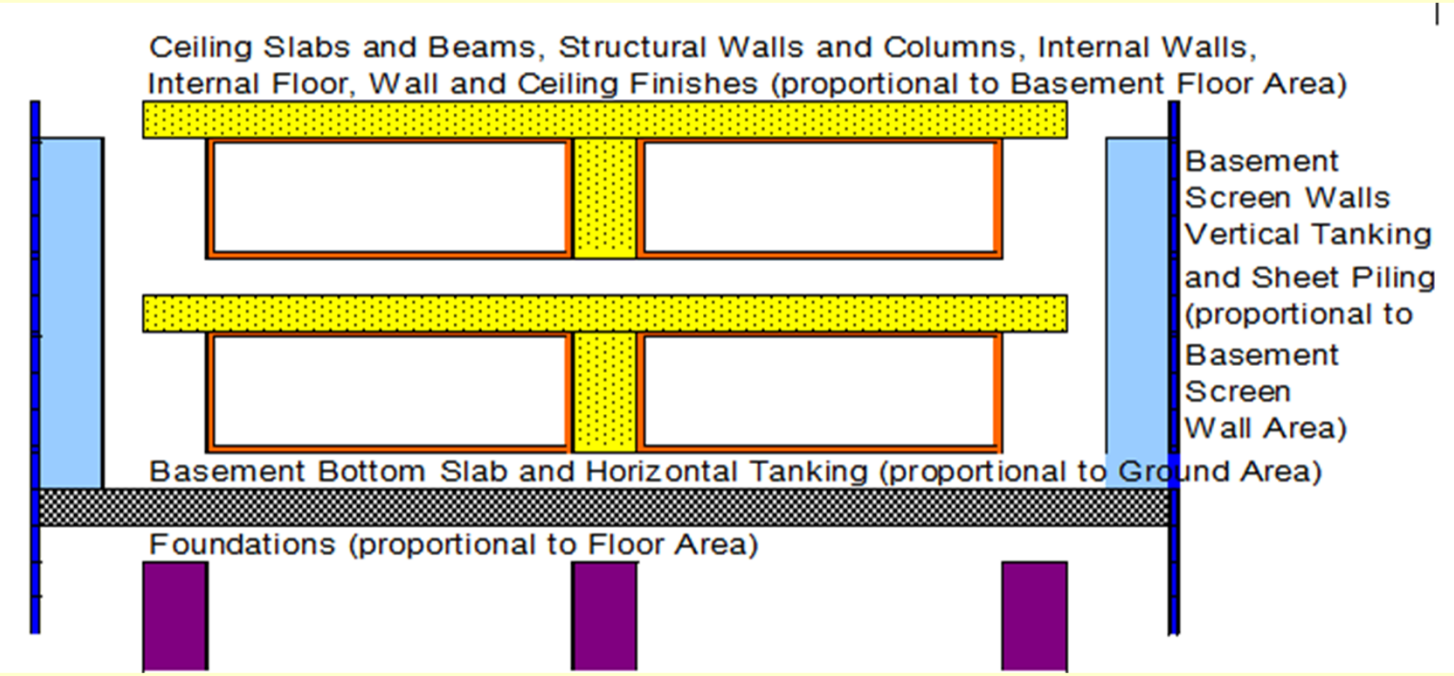


Cost Geometry (Cont'd)

Minimum parameters:

- Floor Area (whole building)
- Basement Floor Area
- Basement Screen Wall Area
- Ground Area

Basement



Cost Parameters

To enable quick estimating and to benchmark project costs:

- Floor Area (above ground + below ground)
- Ground Area (i.e. Roof Area)
- External Elevation Area
- Basement Screen Wall Area or more effectively the Basement Volume of Excavation
- Site Area
- Number of equipment
- Refrigeration Tonnage
- Other elemental quantities

Elemental Cost Classifications

- Many countries have elemental cost classification standards
- Hong Kong government projects use the elemental unit costs to benchmark new projects for funding approval
- Different countries' standards are quite similar in broad terms
- But the demarcation between different elements / groups of costs can be quite different
- This makes comparing and benchmarking costs estimated using different standards difficult
- Therefore, ICMS was incepted

ICMS - Aims

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 - Aims (Cont'd)

To 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).

ICMS - Significance

Global: co-existing with the locals

High level

For the first time, building works and civil engineering works are now also covered by the same classification at the high level

ICMS - Timeline

- 17 June 2015: Formation of ICMS Coalition – a non-governmental, not-for-profit professional coalition
- November 2015: Standards Setting Committee starting to work
- July 2016 – October 2016: Friends and family consultation of 1st Draft
- November 2016 and April 2017: 2 rounds of public consultations
- July 2017: Release of the 1st Edition covering capital construction costs
- 28 January 2019 – 22 March 2019: 1st public consultation of the 2nd Edition extended to cover other life cycle costs.
- 22 May 2019 – 3 July 2019: 2nd public consultation of the 2nd Edition.
- August 2019: Formal release of the 2nd Edition at the PAQS Congress in Malaysia

ICMS – Coalition Members

1. Africa Association of Quantity Surveyors (AAQS)
2. Association for the Advancement of Cost Engineering International (AACE)
3. Association of Cost Engineers (ACostE)
4. Association of South African Quantity Surveyors (ASAQS)
5. Australian Institute of Quantity Surveyors (AIQS)
6. Brazilian Institute of Cost Engineers (IBEC)
7. Building Surveyors Institute of Japan (BSIJ)
8. Canadian Institute of Quantity Surveyors (CIQS)
9. Chartered Institute of Building (CIOB)
10. Chartered Institution of Civil Engineering Surveyors (ICES)
11. China Electricity Council (CEC)
12. China Engineering Cost Association (CECA)
13. Commonwealth Association of Surveying and Land Economy (CASLE)
14. Conseil Europeen des Economistes de la Construction (CEEC)
15. Consejo General de la Arquitectura Técnica de España (CGATE)
16. Construction Management Association of America (CMAA)
17. Dutch Association of Quantity Surveyors (NVBK)
18. European Federation of Engineering Consultancy Associations (EFCA)
19. Federation Internationale des Geometres (FIG)
20. Fiji Institute of Quantity Surveyors (FIQS)
21. Ghana Institution of Surveyors (GhIS)
22. Hong Kong Institute of Surveyors (HKIS)
23. Ikatan Quantity Surveyor Indonesia (IQSI)
24. Indian Institute of Quantity Surveyors (IIQS)
25. Institute of Engineering and Technology (IET)
26. Institute of Quantity Surveyors of Kenya (IQSK)
27. Institute of Quantity Surveyors Sri Lanka (IQSSL)
28. Institution of Civil Engineers (ICE)
29. Institution of Surveyors Kenya (ISK)
30. Institution of Surveyors of Uganda (ISU)
31. International Cost Engineering Council (ICEC)
32. Italian Association for Total Cost Management (AICE)
33. Korean Institution of Quantity Surveyors (KIQS)
34. New Zealand Institute of Quantity Surveyors (NZIQS)
35. Nigerian Institute of Quantity Surveyors (NIQS)
36. Pacific Association of Quantity Surveyors (PAQS)
37. Philippine Institute of Certified Quantity Surveyors (PICQS)
38. Property Institute of New Zealand (PINZ)
39. Real Estate Institute of Botswana (REIB)
40. Royal Institute of British Architects (RIBA)
41. Royal Institution of Chartered Surveyors (RICS)
42. Royal Institution of Surveyors Malaysia (RISM)
43. Singapore Institute of Building Limited (SIBL)
44. Singapore Institute of Surveyors and Valuers (SISV)
45. Sociedad Mexicana de Ingeniería Económica, Financiera y de Costos
46. Society of Chartered Surveyors Ireland (SCSI)
47. Union Nationale des Economistes de la Construction (UNTEC)

ICMS – 1st and 2nd Editions

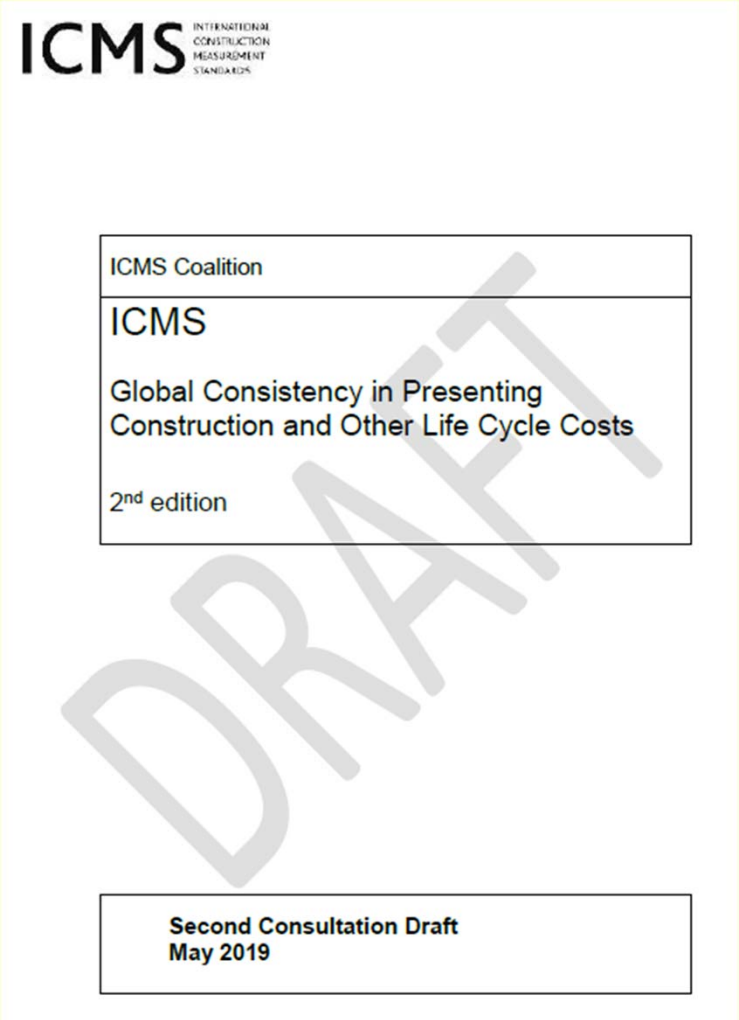

ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

International Construction Measurement Standards: Global Consistency in Presenting Construction Costs

International Construction Measurement Standards Coalition

July 2017

1st edition


ICMS INTERNATIONAL CONSTRUCTION MEASUREMENT STANDARDS

ICMS Coalition

ICMS

Global Consistency in Presenting Construction and Other Life Cycle Costs

2nd edition

DRAFT

Second Consultation Draft
May 2019

ICMS - Links

Link to ICMS Coalition website:

https://icms-coalition.org

Link to the 1st Edition:

https://icms-coalition.org/the-standard/

Link to the 2nd Edition consultation draft:

https://consultations.intstandards.org/consult.ti/icms2/consultationHome

ICMS 2 – Evolution of Cost Classification

- Structural
- Architectural
- M&E Services

- Substructure
- Structural
- Architectural
- M&E Services

- Enabling
- Substructure
- Structural
- Architectural
- M&E Services
- External

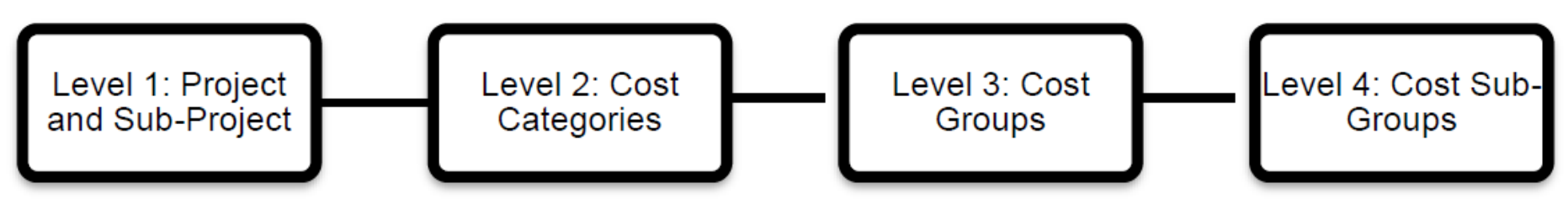
- Enabling
- Substructure
- Structural
- Architectural
- M&E Services
- External
- Preliminaries
- Risks
- Taxes and Levies

- Enabling
- Substructure
- Structural
- Architectural
- M&E Services
- External
- Preliminaries
- Risks
- Taxes and Levies
- Off-site
- FF&E
- Fees

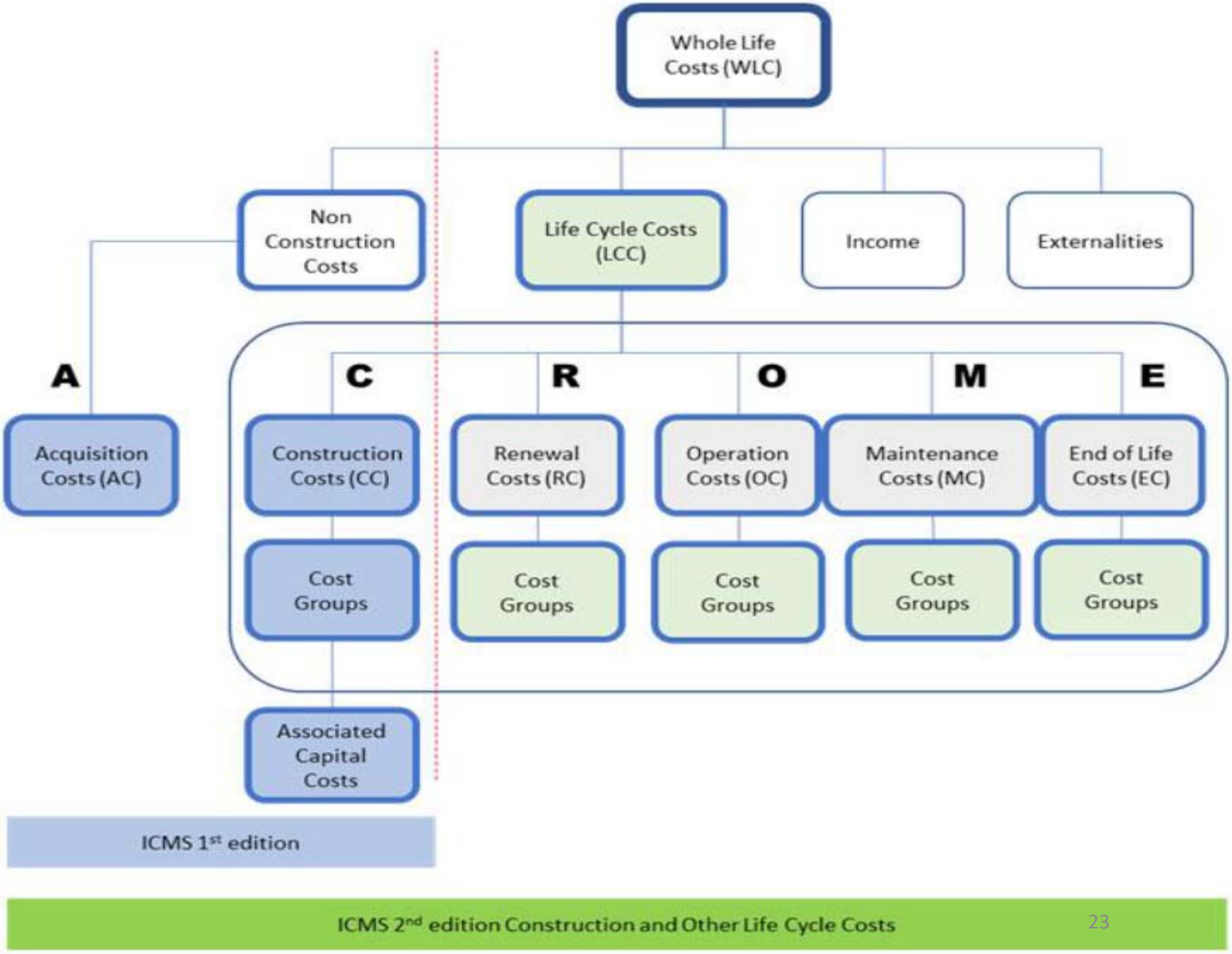
- Demolition, site preparation and formation
- Substructure
- Structure
- Architectural works | non-structural works
- Services and equipment
- Surface and underground drainage
- External and ancillary works
- Preliminaries | Constructors' site overheads | general requirements
- Risk Allowances
- Taxes and Levies
- Work and utilities off-site
- Post-completion loose furniture, fittings and equipment
- Construction-related consultants and supervision

Now called:
Cost Groups

ICMS 2 – Hierarchy

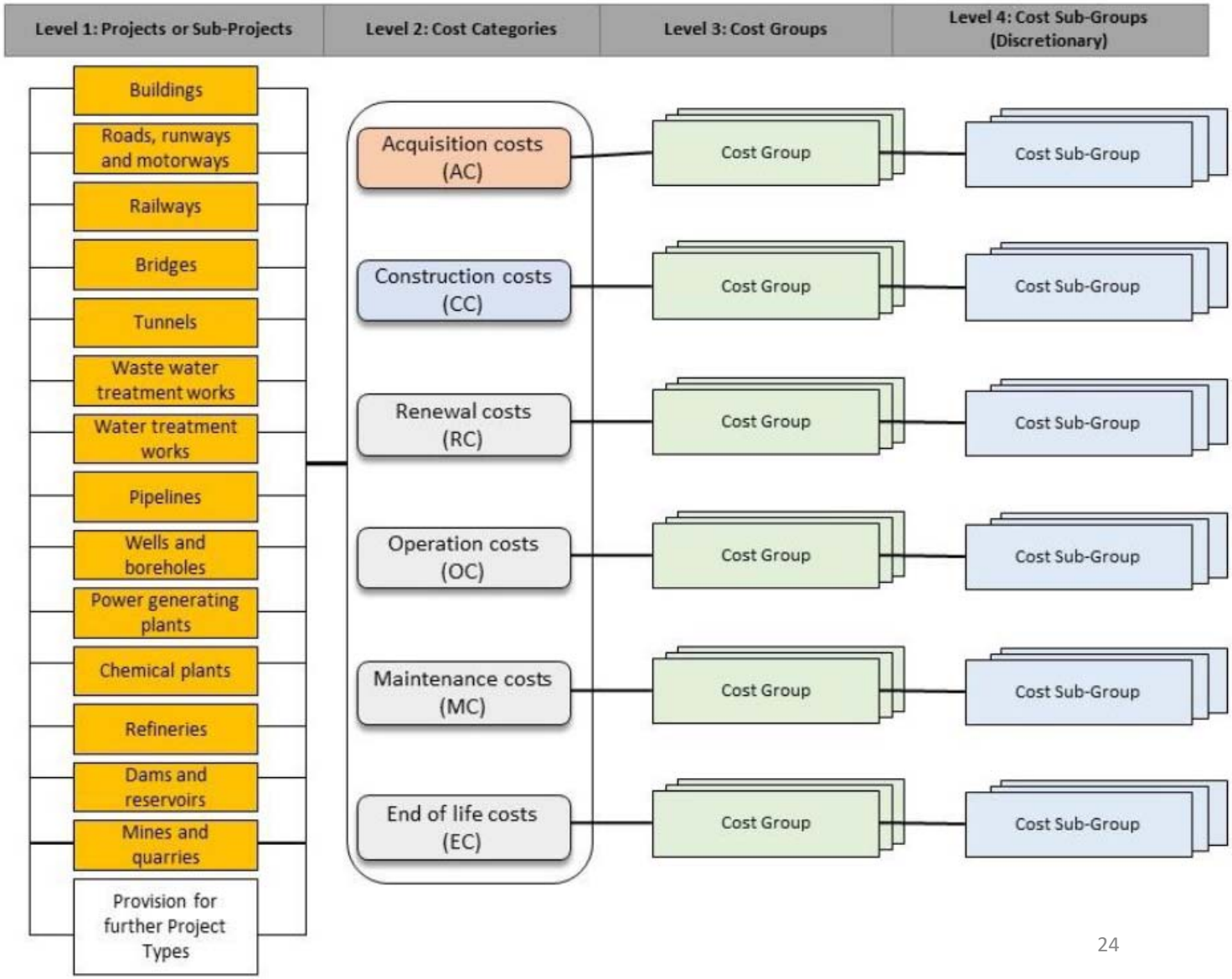


ICMS 2 – Relationship between ICMS, LCC and WLC

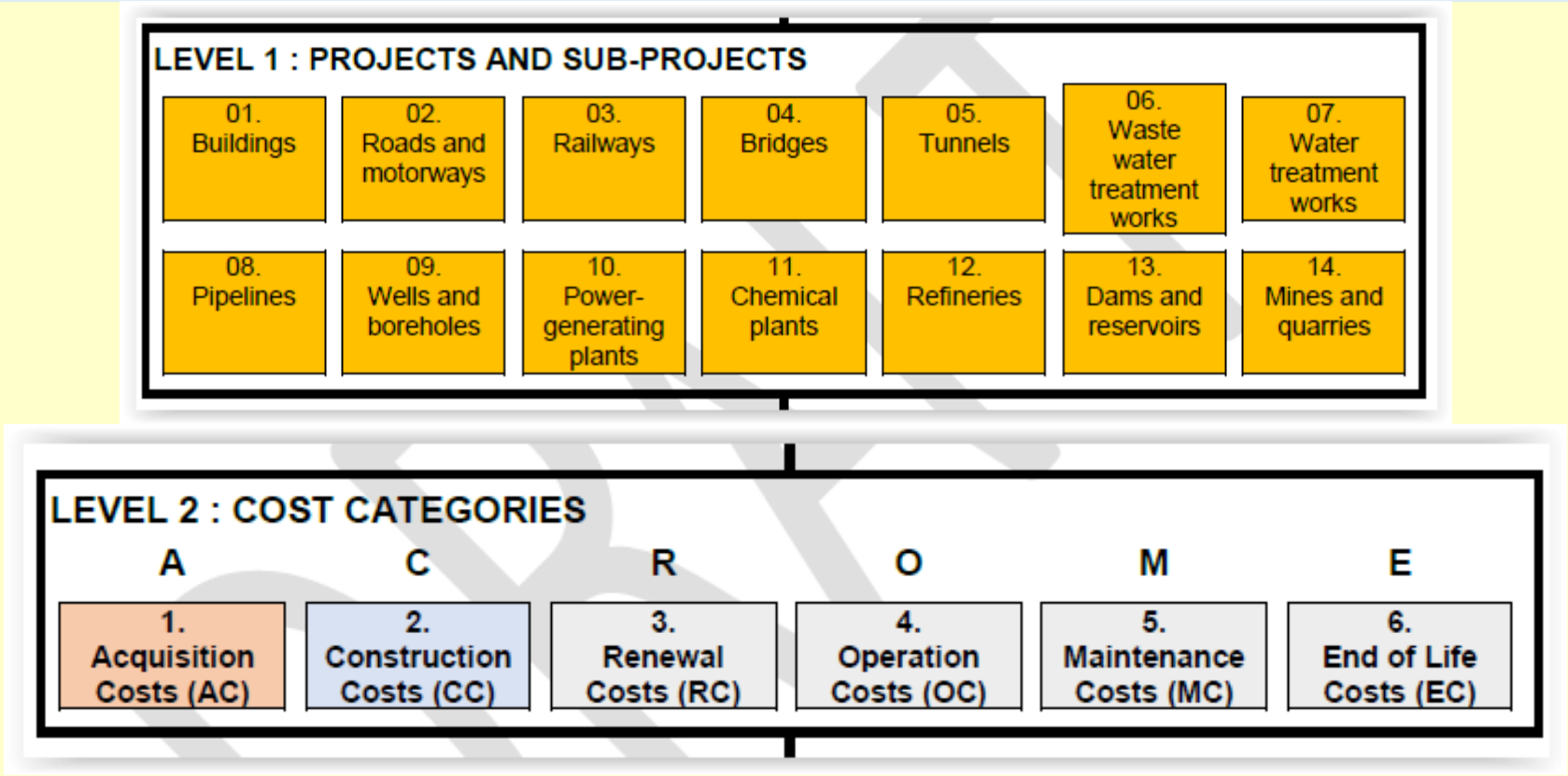


Compatible with ISO 15686-5:2017 Buildings and constructed assets – Service life planning – Part 5: Life-cycle costing

ICMS 2 – Framework



ICMS 2 – Framework at a glance



ICMS 2 – Framework at a glance (Cont'd)

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		

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

ICMS – Cost Codes

01.2.03.030.

meaning:

Level 1	Project Type	01.	Building
Level 2	Project Category	2.	Construction Costs
Level 3	Cost Group	03.	Structure
Level 4	Cost Sub-Group	030.	Frame and Slabs

ICMS 2 – Definitions of Cost Categories

	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)

2.	**Construction Costs (CC)**	Cost Categories CC, RC and MC use the same Cost Groups
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 Part 4.2:	

Cost Code	Description			
	Cost Categories (Level 2)	AC	CC	RC, OC, MC and EC
	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, excluding physical construction.			
2.	**Construction Costs (CC)**			Cost Categories CC, RC and MC use the same Cost Groups
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 Part 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.			

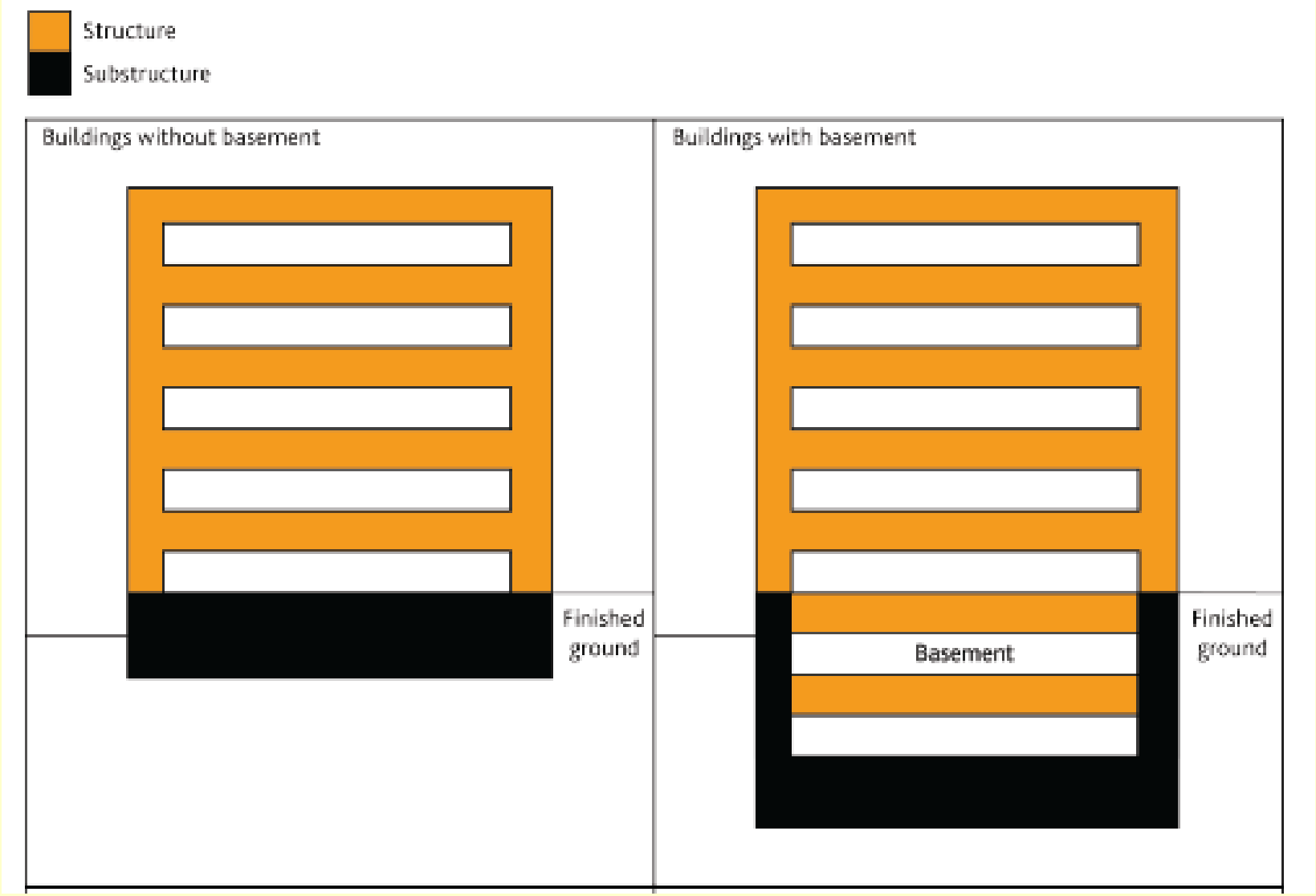
ICMS 2 – Definitions of Cost Categories (Cont'd)

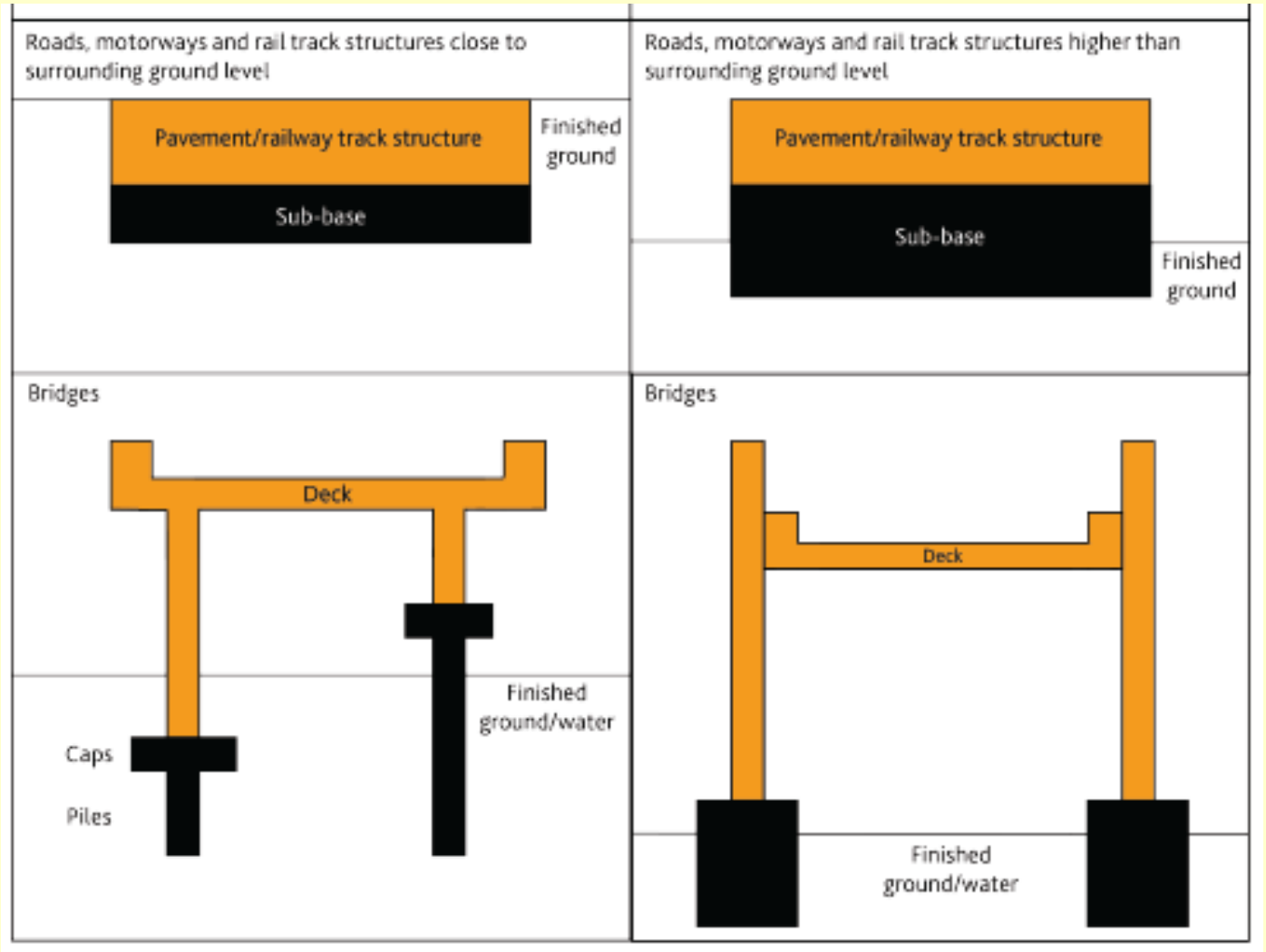
Cost Code	Description	AC	CC	RC, OC, MC and EC
	Cost Categories (Level 2)			
	Cost Groups (Level 3)			
03.	Structure • Scope: All the load-bearing work, including non-load-bearing components forming an integral part of composite load-bearing work, excluding that included in Substructure and Architectural 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 Part 4.1 but related to [Construction | Renewal | Maintenance] Costs and not included in other Cost Groups.			
10.	Taxes and Levies • Scope: As defined in Part 4.1 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 | 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	AC	CC	RC, OC, MC and EC
	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 asset.			
05.	Information and Communications Technology • Scope: Information communications systems (such as Public address and Communications cabling and IT support services built as constructed asset, 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 Part 4.1 but related to Operation Costs and not included in other Cost Groups.			
08.	Taxes and Levies • Scope: As defined in Part 4.1 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 Part 4.1 but related to End of Life Costs and not included in other Cost Groups.			
07.	Taxes and Levies • Scope: As defined in Part 4.1 but related to End of Life Costs.			

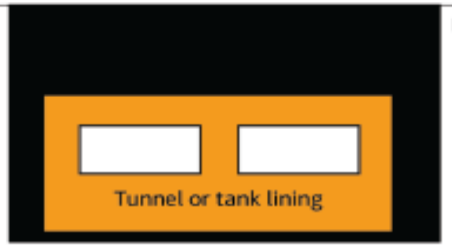
Substructure and Structure

("SUPERSTRUCTRE" not used)


Structure
Substructure
Buildings without basement
Finished ground
Buildings with basement
Basement
Finished ground


Roads, motorways and rail track structures close to surrounding ground level
Pavement/railway track structure
Sub-base
Finished ground
Roads, motorways and rail track structures higher than surrounding ground level
Pavement/railway track structure
Sub-base
Finished ground
Bridges
Deck
Caps
Piles
Finished ground/water
Bridges
Deck
Finished ground/water

Tunnels and tanks underground

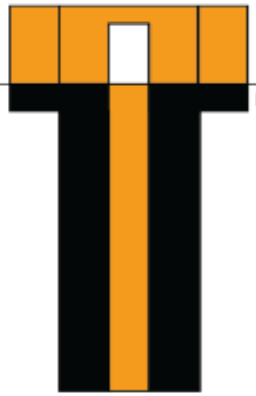


Tanks above ground

Pipelines underground

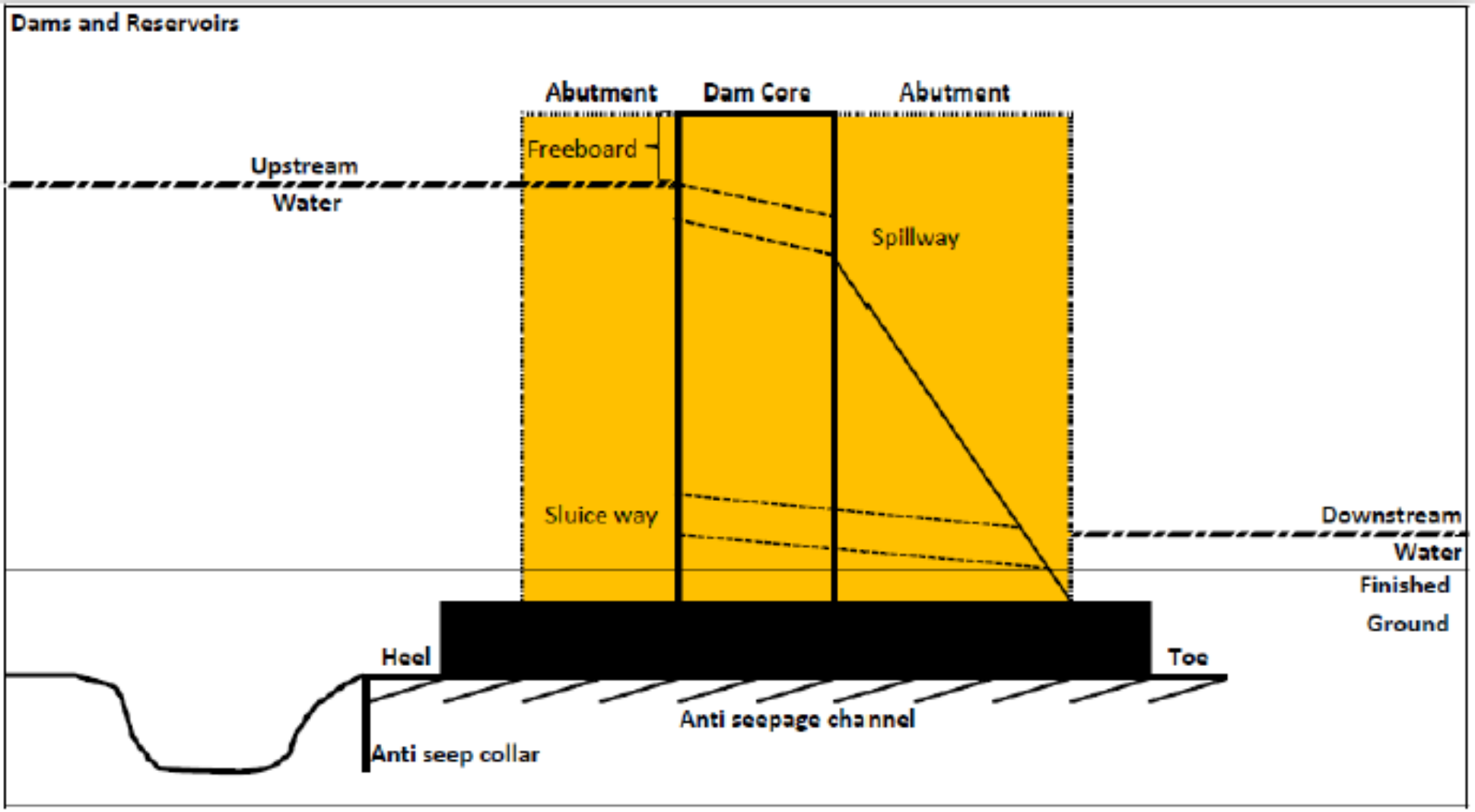
Pipelines above ground

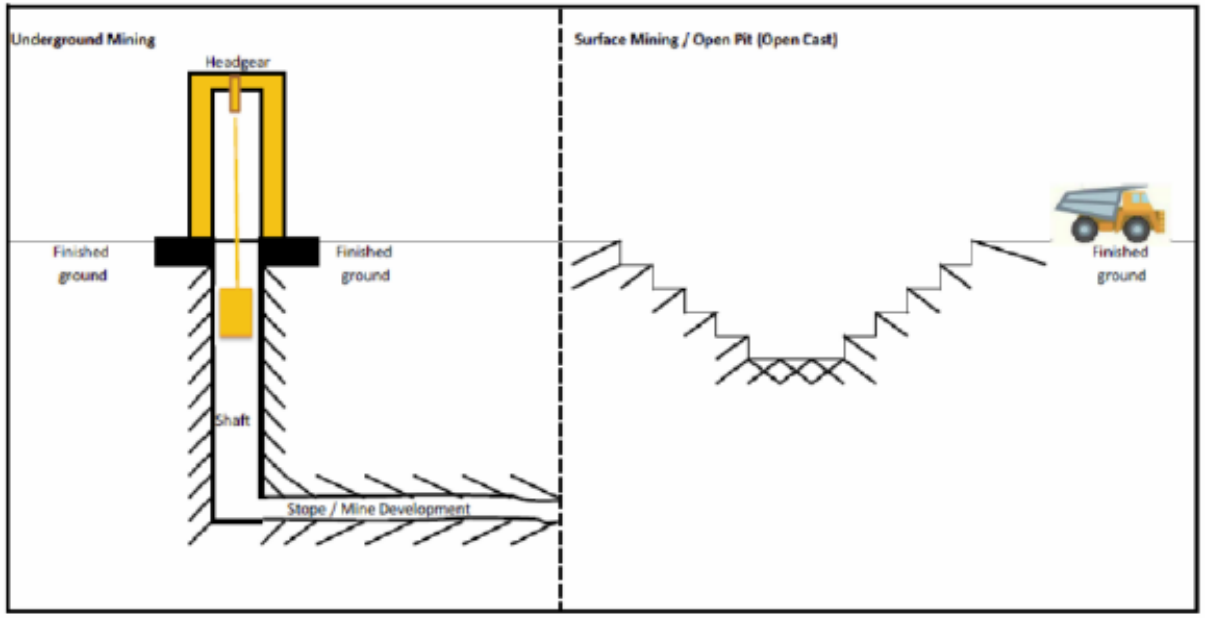
Wells and boreholes

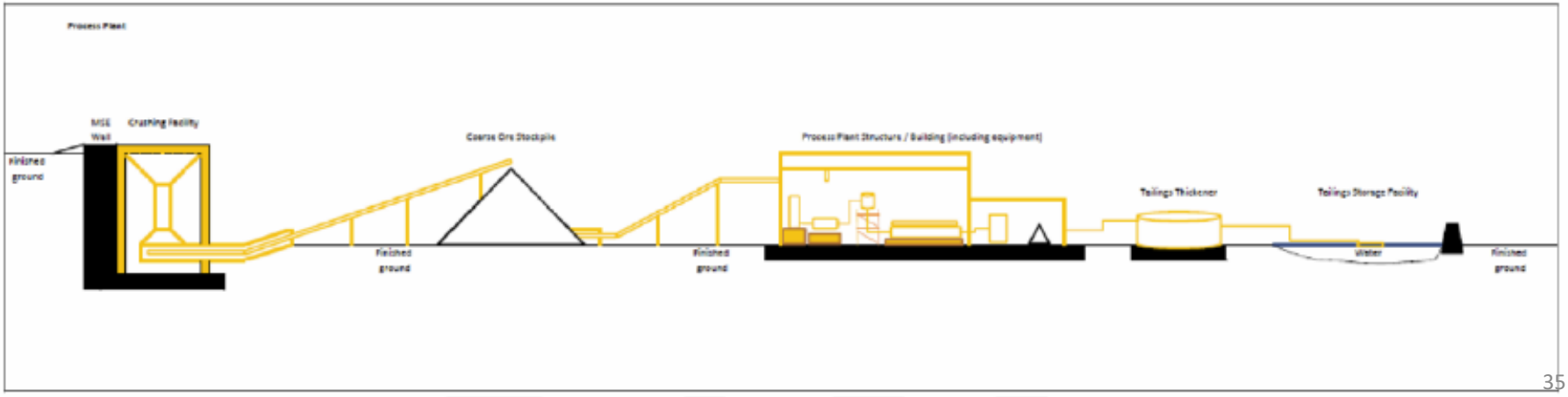


Waste water treatment works, water treatment works, power-generation plants, chemical plants and refineries

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

ICMS 2 – Some Building Cost Sub-Groups deserving attention

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

This is for the area without or outside basement.

This is for the basement sides and bottom only.

ICMS 2 – Some Building Cost Sub-Groups deserving attention (Cont'd)

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)

This includes all internal and external structural walls. Structural staircases also included.

This does not include external structural walls.

ICMS 2 – Some Building Cost Sub-Groups deserving attention (Cont'd)

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

All in one Cost Sub-Group instead of many elements.

Basically all the metal work and joinery.
Interior landscaping also included here.

ICMS 2 – Some Building Cost Sub-Groups deserving attention (Cont'd)

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'

Floor and ceiling finishes whether internal or external are included.

05.030	Fitting out lighting fittings

Treated as part of "Services and Equipment".

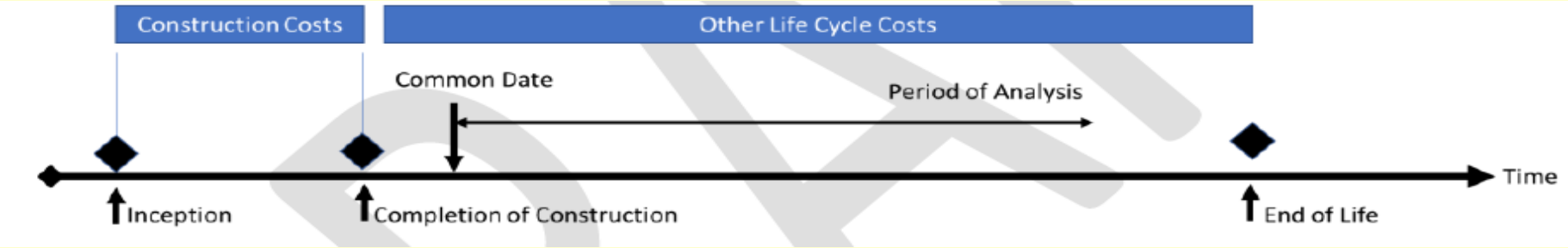
05.060	Supply of sanitary fittings and fixtures (installation included in 'Water supply and above ground drainage' unless not separable from costs of 'Fittings and sundries')

Ditto.

05.250	Other specialist services
05.260	Builder's profit and attendance on services

Ditto.

ICMS 2 – LCC Calculations and Period of Analysis



Base Date for Construction Costs
Common Date for LCC
Period of Analysis
Discount Rates (nominal and real)
Net Present Values

ICMS 2 – Project Quantities

Projects	Project Quantities (Physical)	Project Quantities (Functional)
Buildings	• Gross external floor area as IPMS 1 (m² | ft²) • Gross internal floor area as IPMS 2 (m² | ft²)	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 and motorways	Paved area (m² | ft²)	capacity (vehicles per hour)
Railways	Route length (between two places, irrespective of number of tracks) (km | miles)	• weight of traffic expressed as estimated gross (million tonnes or tons per annum) • passenger journeys (million journeys per year)
Bridges	Surface area of deck (m² | ft²)	capacity (vehicles | litres | gallons | tonnes | tons per hour)
Tunnels	Volume of excavation (m³ | yd³)	capacity (vehicles | litres | gallons | tonnes | tons per hour)
Waste water treatment works	Site area (area of land covered by permanent work, excluding temporary working areas outside the site) (hectares | acres)	capacity (litres | gallons per day)
Water treatment works	Site area (area of land covered by permanent work, excluding temporary working areas outside the site) (hectares | acres)	capacity (litres | gallons per day)
Pipelines	• Total length of pipes (km | miles)	capacity (litres | gallons | m³ | ft³ per hour)
	• Length from servicing inlets to outlets (km | miles)	
Wells and boreholes	Total length drilled/bored (m | ft)	capacity (m³ | ft³ | litres | gallons per hour)
Power generating plants	Site area (area of land covered by permanent work, excluding temporary working areas outside the site) (hectares | acres)	capacity (MW)
Chemical plants	Site area (area of land covered by permanent work, excluding temporary working areas outside the site) (hectares | acres)	output of product (m³ | ft³ | tonnes | tons | litres | gallons per day)
Refineries	Site area (area of land covered by permanent work, excluding temporary working areas outside the site) (hectares | acres)	• input of crude oil (tonnes | tons | litres | gallons | barrels per day) • output of product (tonnes | tons | litres | gallons | barrels per day)
Dams and reservoirs	Site area (surface area of stored liquid at maximum capacity) (square km | square miles)	• reservoir capacity (million m3 | million cubic yards) • power generation capacity (MW)
Mines and quarries	Site area (area of land covered by permanent work, excluding temporary working areas outside the site) (hectares | acres)	• ore extraction (tonnes | tons per annum) • throughput of product (tonnes | tons per day)

ICMS 2 – Project Quantities (Cont'd)

(Incomplete extract only)

IPMS-E: Gross external floor area	IPMS-I: Gross internal floor area
Use	
IPMS-E is used for measuring the area of a building including *External Walls*. **IPMS-E** is a whole building measurement and is consistent for all building types.	**IPMS-I** is a whole building measurement that is used for measuring the interior boundary area of a building. **IPMS-I** is a whole building measurement and is consistent for all building types.
Selected Definitions	
IPMS-E 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-E is the same for all classes of building.	**IPMS-I** 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*.	

ICMS 2 – Project Quantities (Cont'd)

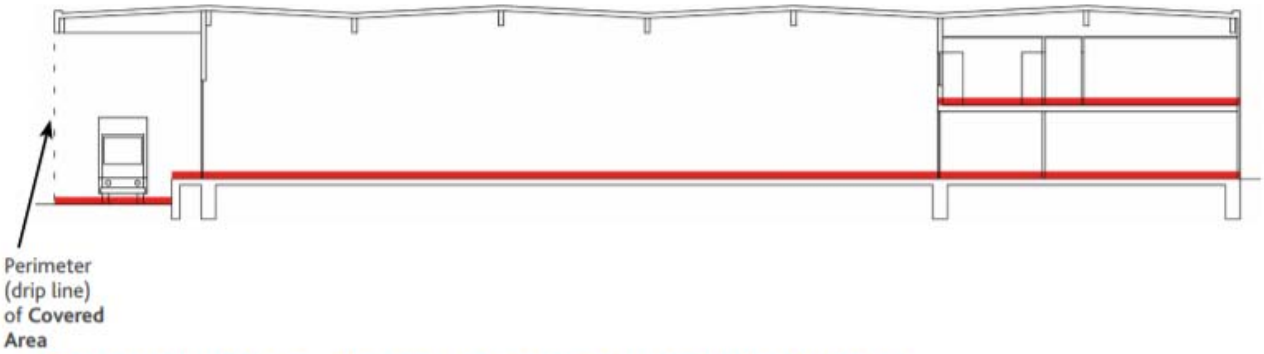


Diagram 1: IPMS 1 – Total Floor Area of Level 0 and Level 1

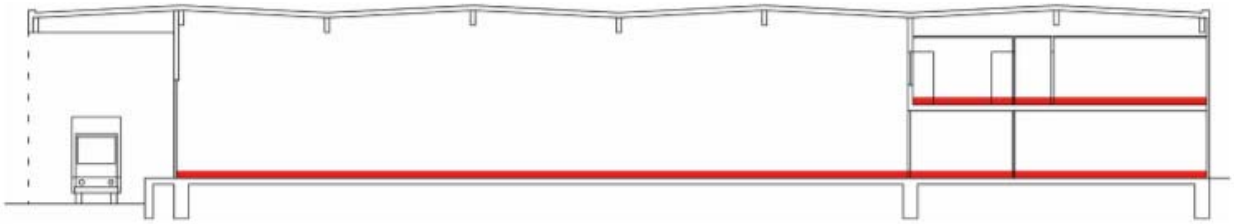


Diagram 4: IPMS 2 – Industrial – Total Floor Area of Level 0 and Level 1

(Source: IPMS Industrial Buildings)

ICMS 2 – Project Quantities (Cont'd)

IPMS Internal Dominant Face
(source: IPMS Industrial Buildings)

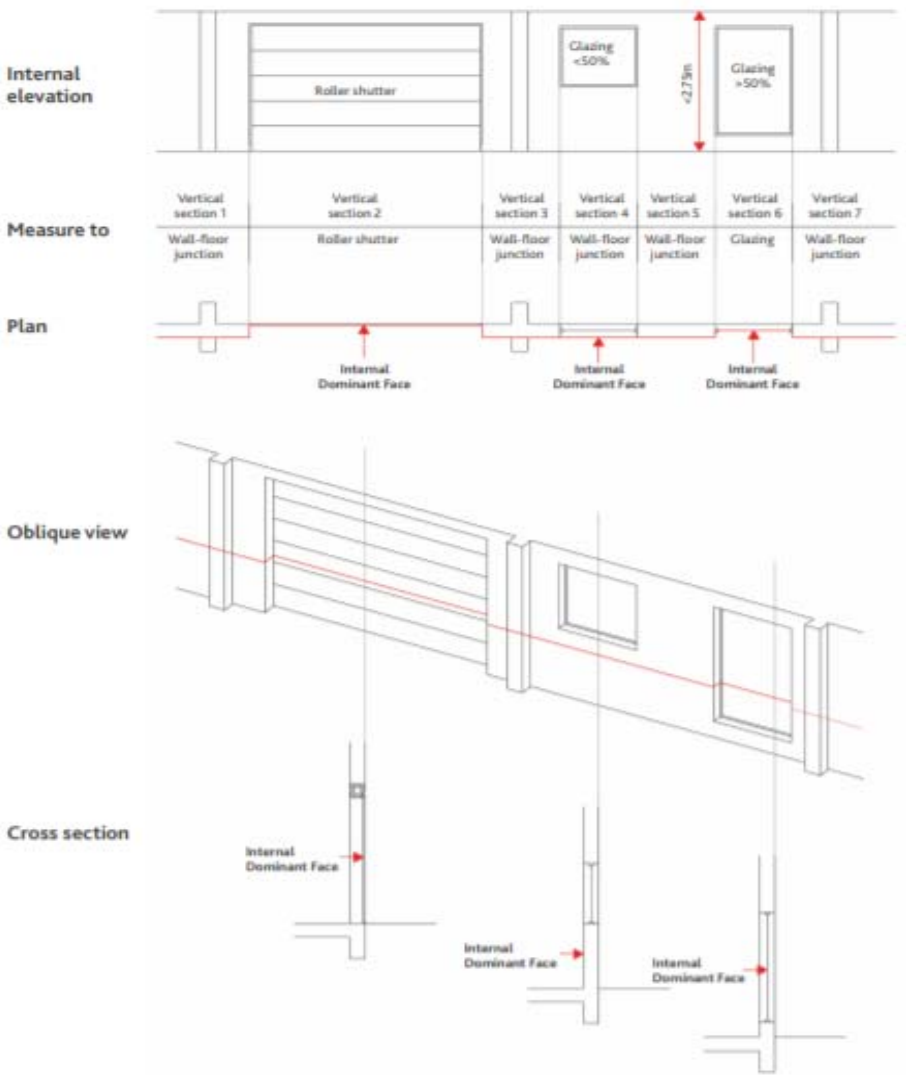


Diagram 11: Internal Dominant Face

Reporting Templates

(Incomplete extract only)

Construction Costs only – a project

- Add columns for unit costs calculated using additional **Project Quantities**, if required.
- Replace 'Qty' in '$/Qty' with the unit of the **Project Quantity**.
- The **Project Quantity** may be **IPMS-E or IPMS-I** floor area, paved area, route length, surface area of deck, volume of excavation, reservoir capacity, etc.
- Give totals in the heading row.

Cost code	Description	<insert Project Type>		
		$M	$/Qty	%
	Project Quantity		(insert Qty)	
			(insert 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			

Construction Costs only – column headings for a building project

- Show unit costs per two **Project Quantities**, **IPMS-E** and **IPMS-I** Floor Areas.

Cost code	Description	<insert Building Type>			
		$M	$/m²	$/m²	%
	Project Quantity		(insert area)	(insert area)	
			IPMS-E Floor Area (m²)	IPMS-I Floor Area (m²)	

Life Cycle Costs – a project

- $M NPV = $M as paid × Discounting Factor.
- $M as paid = amount at the time of payment.
- Discounting Factor should take into account the effect of different times of payments more than once.

Cost code	Description	<insert Project Type>					
		$M as paid	Discounting Factor	$M NPV	$/Qty	% by Category	% of Total
	Project Quantity				(insert Qty)		
					(insert Qty's 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)						

Total Capital Cost – a project

- Give sub-totals and totals in the heading rows.

Cost code	Description	<insert Project Type>			
		$M	$/Qty	% by Category	% of Total
	Project Quantity		(insert Qty)		
			(insert Qty's 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				

Life Cycle Costs – a project

- $M NPV = $M as paid × Discounting Factor.
- $M as paid = amount at the time of payment.
- Discounting Factor should take into account the effect of different times of payments more than once.

Cost code	Description	<insert Project Type>					
		$M as paid	Discounting Factor	$M NPV	$/Qty	% by Category	% of Total
	Project Quantity				(insert Qty)		
					(insert Qty's 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						
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						

Grand Summary - mixed project

- Bring all costs to the **Common Date**, which is assumed to be not earlier than the completion of construction.
- State whether the payments at the time of payment are based on **Real Costs** or **Nominal Costs**. Take this into account when determining the discount rate and discounting factors.
- <P>, <Q>, <R>, <S> are different numbers of years lapsed.
- <T> is number of years of annual payments.

Item	Description	AC	CC	RC	RC	RC	OC	MC	EC	Total Cost
	Years lapsed after construction to incur one-time payment			<P>	<Q>	<R>			<S>	
	Number of years of annual payments after construction						<T>	<T>		
A	**Project Qty and Discount Rate**									
1	Buildings	IPMS-E and IPMS-I 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-E and IPMS-I 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									

Item	Description	AC	CC	RC	RC	RC	OC	MC	EC	Total Cost
	Years lapsed after construction to incur one-time payment			<P>	<Q>	<R>			<S>	
	Number of years of annual payments after construction						<T>	<T>		
5	Tunnels									
6	Dams and reservoirs									
7	Common									
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									

Use of more columns – comparison between two design schemes

- Add columns for other schemes as appropriate.
- Only Construction Costs used for illustration.

Cost code	Description	Scheme A			Scheme B			B-A	
		$M	$/Qty	% of Total	$M	$/Qty	% of Total	$M	$/Qty
	Project Quantity		(Insert Qty)			(Insert Qty)			(Insert Qty)
			(Insert Qty's Attribute)			(Insert Qty's Attribute)			(Insert Qty's Attribute)

Handling 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					(insert Qty)	
		A	B	C	A x C + B	(insert Qty's Attribute)	

Use of more columns - a project consisting of various parts

- A 'part' may be:
  - a project within a collection, a programme, a portfolio, etc. of projects; or
  - a Sub-Project of a project; or
  - apartment blocks, hotel blocks, and external works of a mixed development; or
  - basement, podium, and tower of a building; or
  - a phase or contract package of a project; or
  - in-situ construction and pre-fabricated construction of a project; or
  - any other sub-division to suit the need of the project.
- Add a set of columns for 'Common' before the 'Total' to show the costs that may be commonly shared by all or most parts, and worthwhile to be shown separately for the time being to permit reallocation in the appropriate way when the need arises.
- Use landscape paper as appropriate.
- A pre-fabricated construction module may integrate different construction elements across different **Cost Groups** and **Cost Sub-Groups** and may be priced as one item in contract. Split the cost amongst the **Cost Groups** and **Cost Sub-Groups** as much as possible to enable like to like comparison with in-situ construction and other pre-fabricated construction.
- Only Construction Costs used for illustration.

Cost code	Description	Part A			Part B			Common			Total	
		$M	$/Qty	% of Total	$M	$/Qty	% of Total	$M	$/Qty	% of Total	$M	$/Qty
	Project Quantity		(insert Qty)			(insert Qty)			(insert Qty)			(insert Qty)
			(insert Qty's Attribute)			(insert Qty's Attribute)			(insert Qty's Attribute)			(insert Qty's Attribute)

ICMS 2 – Project Attributes and Values

To provide information to help understand the substance of the costs reported

Sections covered:

COMMON	EACH PROJECT TYPE
• Report • Construction Cost Price Level • Construction Cost Currency Conversion • Construction Programme • Site • Construction Procurement • Lift Cycle Cost Related	• Code • Works • Project Quantities

ICMS 2 – Project Attributes and Values (Cont'd)

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

ICMS 2 – Project Attributes and Values (Cont'd)

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

ICMS 2 – Project Attributes and Values (Cont'd)

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 | 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

End. Thank you!