LIFE CYCLE COSTING APPROACH

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LIFE CYCLE COST APPROACH

Since 1922 the UK construction industry has used the RICS SMM for the cost management of capital building works. However, until now the maintenance industry has never had any accepted standard methodology for the life cycle costing of annualized maintenance and renewal programmes

LIFE CYCLE COST APPROACH

BS 8544 Guide for life cycle costing of maintenance during the in use phases of buildings.

Provides a standardized methodology for the life cycle costing of maintenance that fully integrates the cyclical process of creating and implementing two plans " Maintain and Renewal"

LIFE CYCLE COST APPROACH

- Step to be taken:

i. Define the brief in terms of scoping the specific requirements for LCC of maintenance
ii. Capture the appropriate asset information for specific LCC outcomes
iii. Evaluate and prioritise the maintenance works, when budgeting and undertaking funding scenarios

LIFE CYCLE COST APPROACH

- Step to be taken:

iv. Implement the LCC programmes of works and unlock robust benchmark data for future maintenance planning

LIFE CYCLE COST APPROACH

Basic LCC Calculation

i. Initial Cost
ii. Current Value of Operational Cost
iii. Current Value of Maintenance Cost
iv. Current Value of Replacement Cost
v. Current Value of Refurbish, Renovation and Upgrading
vi. Current Value of Disposal Cost
vii. Current Value of Income
viii. Current Value of Waste Management

LIFE CYCLE COST APPROACH

COST ELEMENT (ACTIVITY)
PROCUREMENT

Planning:

i. Consultant Cost
ii. Management Cost
iii. Lab Value Mangement Cost
iv. R&D Cost
v. Other related cost

LIFE CYCLE COST APPROACH

- COST ELEMENT (ACTIVITY)
  PROCUREMENT

  Design:

  i. Consultant Design Cost ie: Civil, Structural, Mechanical, Electrical, Architect, QS, IT and related person in design stage.
  ii. Other related cost

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COST ELEMENT (ACTIVITY) PROCUREMENT

Procurement:

i. Preparation of document cost.
ii. Advertisement cost
iii. Tender evaluation cost
iv. Other related cost

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COST ELEMENT (ACTIVITY)
PROCUREMENT

Construction:

i. Construction Cost.
ii. Variation order cost
iii. Safety and security cost
iv. Environment management cost
v. Land acquisition cost
vi. Other related cost

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- COST ELEMENT (ACTIVITY)
  PROCUREMENT

  Testing and Comissioning:

  i. Testing cost i.e. functional and testing cost abroad
  ii. Comissioning cost
  iii. Other related cost

LIFE CYCLE COST APPROACH

COST ELEMENT (ACTIVITY)
PROCUREMENT

Hand over :

i. Production of document i.e manual
ii. Training and specialist cost
iii. Other related cost

LIFE CYCLE COST APPROACH

- COST ELEMENT (ACTIVITY) OWNERSHIP

Operational :

i. Utility Cost
ii. Energy cost
iii. Other related cost

LIFE CYCLE COST APPROACH

COST ELEMENT (ACTIVITY) OWNERSHIP

Maintenance :

i. Repair and Replacement Cost
ii. Preventive Maintenance cost
iii. Service cost
iv. Facilities Management Cost
v. Other related cost

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- COST ELEMENT (ACTIVITY) OWNERSHIP

Building Condition Assessment (BCA):

i. BCA Team Cost
ii. Inspection of electrical engineer cost
iii. Other related cost

LIFE CYCLE COST APPROACH

COST ELEMENT (ACTIVITY) OWNERSHIP

Restoration/Recovery, Renovation and Upgrading:

i. Replacement Cost
ii. Recovery / renovation and upgrading cost
iii. Other related cost

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- COST ELEMENT (ACTIVITY) OWNERSHIP

Disposal:

i. Disposal Cost
ii. Waste management cost
iii. Other related cost

LIFE CYCLE COST APPROACH

ROOF FINISHES

Contoh 11: Kemasan Bangunan

Pengiraan KKH bagi alternatif kemasan lantai dengan penggunaan selama 30 tahun pada kadar diskaun 4% setahun. Kos dikira bagi unit satu kaki persegi.

Jawapan: Menggunakan Kaedah Proses 2 dalam Carta JKR.KKH.3 dan Borang Pengiraan NPV di Lampiran JKR.KKH.6.

Pilihan 1: Jubin Kuari HB: 30 tahun Kadar diskaun, i = 4% Jadual = 3

Aktiviti	Kos (RM)	Masa(Tahun)	Faktor P/F	Faktor P/A	*Present Value*(RM)
Pemasangan	6.83	0	-	-	6.83
O & P	0.32	30	-	17.2920	5.53
				NPV	12.36

LIFE CYCLE COST APPROACH

ROOF FINISHES

Jadual 3

Kadar Diskaun = 4.00%

n	(P/F)	(P/A)	(F/P)	(F/A)	(A/P)	(A/F)
1	0.9615	0.9615	1.0400	1.0000	1.0400	1.0000
2	0.9246	1.8861	1.0816	2.0400	0.5302	0.4902
3	0.8890	2.7751	1.1249	3.1216	0.3603	0.3203
4	0.8548	3.6299	1.1699	4.2465	0.2755	0.2355
5	0.8219	4.4518	1.2167	5.4163	0.2246	0.1846
6	0.7903	5.2421	1.2653	6.6330	0.1908	0.1508
7	0.7599	6.0021	1.3159	7.8983	0.1666	0.1266
8	0.7307	6.7327	1.3686	9.2142	0.1485	0.1085
9	0.7026	7.4353	1.4233	10.5828	0.1345	0.0945
10	0.6756	8.1109	1.4802	12.0061	0.1233	0.0833
11	0.6496	8.7605	1.5395	13.4864	0.1141	0.0741
12	0.6246	9.3851	1.6010	15.0258	0.1066	0.0666
13	0.6006	9.9856	1.6651	16.6268	0.1001	0.0601
14	0.5775	10.5631	1.7317	18.2919	0.0947	0.0547
15	0.5553	11.1184	1.8009	20.0236	0.0899	0.0499
16	0.5339	11.6523	1.8730	21.8245	0.0858	0.0458
17	0.5134	12.1657	1.9479	23.6975	0.0822	0.0422
18	0.4936	12.6593	2.0258	25.6454	0.0790	0.0390
19	0.4746	13.1339	2.1068	27.6712	0.0761	0.0361
20	0.4564	13.5903	2.1911	29.7781	0.0736	0.0336
21	0.4388	14.0292	2.2788	31.9692	0.0713	0.0313
22	0.4220	14.4511	2.3699	34.2480	0.0692	0.0292
23	0.4057	14.8568	2.4647	36.6179	0.0673	0.0273
24	0.3901	15.2470	2.5633	39.0826	0.0656	0.0256
25	0.3751	15.6221	2.6658	41.6459	0.0640	0.0240
26	0.3607	15.9828	2.7725	44.3117	0.0626	0.0226
27	0.3468	16.3296	2.8834	47.0842	0.0612	0.0212
28	0.3335	16.6631	2.9987	49.9676	0.0600	0.0200
29	0.3207	16.9837	3.1187	52.9663	0.0589	0.0189
30	0.3083	17.2920	3.2434	56.0849	0.0578	0.0178
31	0.2965	17.5885	3.3731	59.3283	0.0569	0.0169
32	0.2851	17.8736	3.5081	62.7015	0.0559	0.0159
33	0.2741	18.1476	3.6484	66.2095	0.0551	0.0151
34	0.2636	18.4112	3.7943	69.8579	0.0543	0.0143
35	0.2534	18.6646	3.9461	73.6522	0.0536	0.0136

LIFE CYCLE COST APPROACH

Pilihan 2: Batu Marmar HB: 30 tahun Kadar diskaun, i = 4% Jadual = 3

Aktiviti	Kos (RM)	Masa(Tahun)	Faktor P/F	Faktor P/A	*Present Value*(RM)
Pemasangan	21.00	0	-	-	21.00
O & P	0.61	30	-	17.2920	10.55
				NPV	31.55

LIFE CYCLE COST APPROACH

Pilihan 3 : Permaidani HB: 5 tahun Kadar diskaun, i = 4% Jadual = 3

Aktiviti	Kos (RM)	Masa(Tahun)	Faktor P/F	Faktor P/A	*Present Value*(RM)
Pemasangan	3.22	0	-	-	3.22
O & P	1.08	30	-	17.2920	18.68
Penggantian 1	3.22	5	0.8219	-	2.65
Penggantian 2	3.22	10	0.6756	-	2.18
Penggantian 3	3.22	15	0.5553	-	1.79
Penggantian 4	3.22	20	0.4564	-	1.47
Penggantian 5	3.22	25	0.3751	-	1.21
				NPV	31.20

Keputusan: Kemasan jubin kuari dipilih kerana mempunyai KKH yang terendah.
Jawapan di atas dapat dirumuskan dengan menggunakan format dalam LAMPIRAN JKR.KKH.8 seperti berikut :

LIFE CYCLE COST APPROACH

LCC CALCULATION SAMPLING

ID DPA : .....
Projek / Komponen : Kemasan bangunan
Kitaran Hayat Projek, N = 30 Tahun
Kadar Diskaun, i = 4 %

				Jubin kuari		Jubin marmar		Permaidani	
Kos Awalan				Anggaran	PW	Anggaran	PW	Anggaran	PW
1.	Kos pemasangan				6.83		21.00		3.22
Jumlah Kos Awalan : (Sub 1)					6.83		21.00		3.22
Kos Gantian/PUN/Lupus		Tahun,N	Faktor P/F						
1.	Penggantian 1	5	0.8219	0.00	0.00	0.00	0.00	3.22	2.65
2.	Penggantian 2	10	0.6756	0.00	0.00	0.00	0.00	3.22	2.18
3.	Penggantian 3	15	0.5553	0.00	0.00	0.00	0.00	3.22	1.79
4.	Penggantian 4	20	0.4564	0.00	0.00	0.00	0.00	3.22	1.47
5.	Penggantian 5	25	0.3751	0.00	0.00	0.00	0.00	3.22	1.21
Jumlah Kos Gantian / PUN / Lupus : (Sub 2)					0.00		0.00		9.3
Kos O & P Tahunan		Tahun, N	Faktor P/A						
1.	Penyenggaraan	30	17.2920	0.32	5.53	0.61	10.55	1.08	18.68
Jumlah Kos O & P Tahunan : (Sub 3)					5.53		10.55		18.68
JUMLAH BESAR = Sub 1 + Sub 2 + Sub 3					12.36		31.55		31.20
Pemilihan KKH (LCC) yang terendah adalah :				Pilihan : Jubin kuari		Berjumlah : RM 12.36			

LIFE CYCLE COST APPROACH

Mechanical Component

Pengiraan KKH bagi dua pilihan pam yang akan digunakan selama 15 tahun dengan kadar diskaun sebanyak 6% setahun. Nilai sisa bagi setiap pam dijangka 50% daripada harga kos asal. Cari alternatif KKH yang terendah untuk pam tersebut.

Jawapan: Menggunakan Kaedah Proses 2 dalam Carta JKR.KKH.3 dan Borang Pengiraan NPV di Lampiran JKR.KKH.6.

Pilihan 1: Pam konvensional Kadar diskaun, i = 6% Jadual = 5

Aktiviti	Kos (RM)	Masa(Tahun)	Faktor P/F	Faktor P/A	*Present Value*(RM)
Pembelian	262,500	0	-	-	262,500.00
O & P	260,067	15	-	9.7122	2,525,822.72
Lupus	131,250	15	0.4173	-	(54,770.63)
				NPV	2,733,552.09

Pilihan 2: Pam *submersible* Kadar diskaun, i = 6% Jadual = 5

Aktiviti	Kos (RM)	Masa(Tahun)	Faktor P/F	Faktor P/A	*Present Value*(RM)
Pembelian	300,000	0	-	-	300,000
O & P	120,067	15	-	9.7122	1,166,114.72
Lupus	150,000	15	0.4173	-	(62,595.00)
				NPV	1,403,519.72

Keputusan: Pam *submersible* dipilih kerana mempunyai KKH yang terendah.

LIFE CYCLE COST APPROACH

Jadual 5

Kadar Diskaun = 6.00%

n	(P/F)	(P/A)	(F/P)	(F/A)	(A/P)	(A/F)
1	0.9434	0.9434	1.0600	1.0000	1.0600	1.0000
2	0.8900	1.8334	1.1236	2.0600	0.5454	0.4854
3	0.8396	2.6730	1.1910	3.1836	0.3741	0.3141
4	0.7921	3.4651	1.2625	4.3746	0.2886	0.2286
5	0.7473	4.2124	1.3382	5.6371	0.2374	0.1774
6	0.7050	4.9173	1.4185	6.9753	0.2034	0.1434
7	0.6651	5.5824	1.5036	8.3938	0.1791	0.1191
8	0.6274	6.2098	1.5938	9.8975	0.1610	0.1010
9	0.5919	6.8017	1.6895	11.4913	0.1470	0.0870
10	0.5584	7.3601	1.7908	13.1808	0.1359	0.0759
11	0.5268	7.8869	1.8983	14.9716	0.1268	0.0668
12	0.4970	8.3838	2.0122	16.8699	0.1193	0.0593
13	0.4688	8.8527	2.1329	18.8821	0.1130	0.0530
14	0.4423	9.2950	2.2609	21.0151	0.1076	0.0476
15	0.4173	9.7122	2.3966	23.2760	0.1030	0.0430
16	0.3936	10.1059	2.5404	25.6725	0.0990	0.0390
17	0.3714	10.4773	2.6928	28.2129	0.0954	0.0354
18	0.3503	10.8276	2.8543	30.9057	0.0924	0.0324
19	0.3305	11.1581	3.0256	33.7600	0.0896	0.0296
20	0.3118	11.4699	3.2071	36.7856	0.0872	0.0272
21	0.2942	11.7641	3.3996	39.9927	0.0850	0.0250
22	0.2775	12.0416	3.6035	43.3923	0.0830	0.0230
23	0.2618	12.3034	3.8197	46.9958	0.0813	0.0213
24	0.2470	12.5504	4.0489	50.8156	0.0797	0.0197
25	0.2330	12.7834	4.2919	54.8645	0.0782	0.0182
26	0.2198	13.0032	4.5494	59.1564	0.0769	0.0169
27	0.2074	13.2105	4.8223	63.7058	0.0757	0.0157
28	0.1956	13.4062	5.1117	68.5281	0.0746	0.0146
29	0.1846	13.5907	5.4184	73.6398	0.0736	0.0136
30	0.1741	13.7648	5.7435	79.0582	0.0726	0.0126
31	0.1643	13.9291	6.0881	84.8017	0.0718	0.0118
32	0.1550	14.0840	6.4534	90.8898	0.0710	0.0110

LIFE CYCLE COST APPROACH

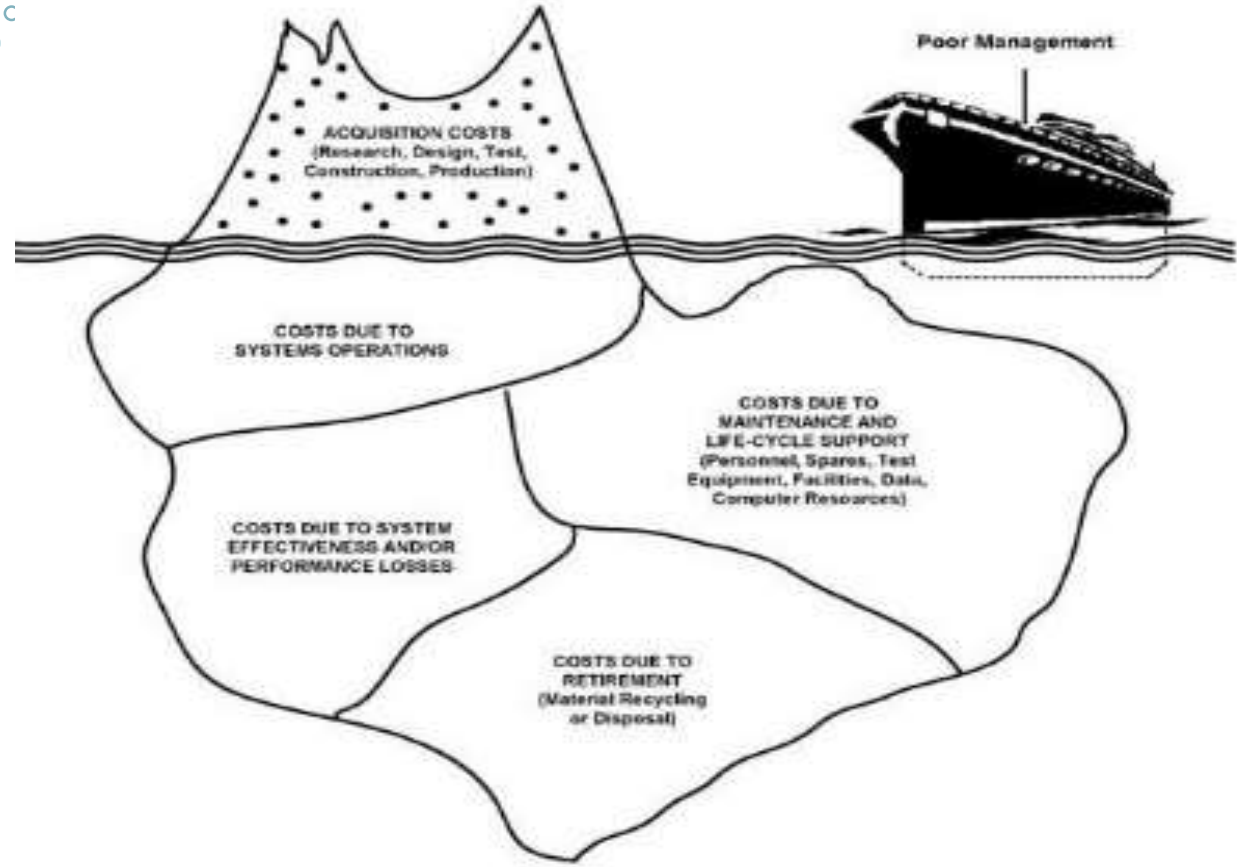

Figure 1: Total Cost Visibility

LIFE CYCLE COST APPROACH

LCC Improve:

- The competitiveness of the construction industry
- The industry's awareness of the influence of environmental goals on LCC
- The performance of the supply chain, the value offered to clients, and clients'
- confidence to invest through a robust and appropriate LCC approach
- Long-term cost optimisation and forecast certainties

LIFE CYCLE COST APPROACH

LCC Improve:

- The reliability of project information, predictive methods, risk assessment and
- Inovation in decision-making for procurement involving the whole supply chain
- Generate comparable information without creating national barriers and also considering the most applicable international developments

LIFE CYCLE COST APPROACH

Conclusion:

- Transparency of future operational costs
- Ability to plan for future expenditure (e.g. through the establishment of sinking funds).
- Improved awareness of total costs
- Ability to manipulate and optimise future costs at the design stages

LIFE CYCLE COST APPROACH

Conclusion:

- Achieving and demonstrating better value for money in projects

- Evaluation of competing options, either for entire assets or parts thereof

- Performance trade-offs against cost (e.g. environmental performance).

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