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SUSTAINABLE CONSTRUCTION STUDY IN MAURITIUS

LOT 1 : MAURITIUS CONSTRUCTION COST DATA REPORT

TECHNICAL ASSISTANCE FOR THE IMPLEMENTATION OF SUNREF III PROGRAMME - MAURITIUS

Aets opave | ARTELIA | ecosis smart sustainable solutions for the 21st century | EARTHONOMIC ENGINEERS

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Ecosis (Mtius) Ltd

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Mauritius construction cost data Report

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Executive summary

Need of a cost observatory in the construction sector

The aim of a construction cost observatory is to inter alia, i) enable better national costs comparisons, ii) feasibility studies and development appraisals, iii) cost planning and control, iv) procurement and the analysis of tenders, v) audit and dispute resolution and vi) the validation of assets and liabilities. In the context of SUNREF program, it will allow AFD and the technical assistance team to better understand the additional cost related to mitigation and/or adaptation measures in the building sector.

It shall further enable the linkage of financial instruments to the construction sector, be it in terms of the creation of specific financial products or the eligibility of green building projects.

Snapshot of construction cost data locally and internationally.

To achieve this goal, building categories, building elements and norms/standards of costs were considered. Through desktop research the latter were identified and later adapted to the local context. A focus group with major stakeholders of the construction industry in Mauritius was created. The objectives are to define the building categories and the building elements, and to explore the idea of a National Construction Cost Observatory.

Following recommendations from participants, the building categories considered for the study were narrowed down to apartment (residential), villa (residential), and office (commercial). The elements were inspired from several frameworks. The elements are:

	Elements
A.	**Preliminaries**
1	*Preliminaries*
B.	**Substructure**
2	*Piling*
3	*Foundations and substructure*
4	*Basement*
C.	**Superstructure**
5	*Ground Floor Construction*
6	*Structural frame*
7	*External Envelope*
8	*Roof*
9	*Upper floors (load bearing structures only)*
10	*Internal Division*
D.	**Internal Finishes**
11	*Floor finishes*
12	*Internal Wall finishes*
13	*Ceilings*

	Elements
E.	**Fittings**
14	*Fittings*
F.	**Services**
15	*Electrical Installation, incl. Luminaires*
16	*Plumbing Installation*
17	*Fire Protection*
18	*Lifts and Escalators*
19	Air conditioning and Ventilation
20	*Special services and equipment (ICT)*
21	*Swimming Pool Equipment*
G.	**External Works**
22	*Soil Drainage*
23	*Stormwater Drainage*
24	*External Works*
25	*Alterations*
H.	**Contingencies**
26	*Contingencies*
27	*Fluctuation Provisions*

The desktop research conducted, returned general construction cost data both locally and internationally. Locally, a breakdown of cost per specific building components from the Central Statistics Office (CSO), and a schedule of rate dated 2019 from the Construction Industry Development Board (CIDB) were the two main documents consulted. Internationally, various information was obtained from schedule of rates, to cost comparisons.

A survey was created and floated to councils and associations. However, the response was limited. Further engagement is required, and the creation of a steering committee for the setting up of the National Construction Cost Observatory is recommended.

A table with the average cost per square metre, and the breakdown of cost per elements for the three construction types was created from the data collected. Same can serve as a basis for further updates.

Based on existing literature, the additional cost of green buildings compared to conventional buildings varies widely. The additional cost also depends on the level of "green" of a building, and the type of building construction. In South Africa, a study found the additional cost is 8.55%. Another study noted an average additional cost of 10.77%. In Reunion Island, the perception from industry players is around 10%.

Recommendations for further actions

Based on the situational analysis carried out and the following recommendations are proposed:

- Establishing a construction cost data observatory is an important step to support policymaking and construction industry processes in Mauritius. This institutional mechanism will support the development and monitoring of construction cost data at national level.
- Gaps have been identified and the information is limited and asymmetric. The study is limited due to these gaps. It is therefore recommended that an observatory is set up to collect rigorously the data.
- With a formal observatory, data collection will potentially be more efficient.
- This public knowledge resource will be of use not only for decision-makers, but also for investors, industry stakeholders, local authorities, and researchers to allow for, and underpin, decision-making, and for long-term strategic support. Better access to data will contribute to the improvement of the way the building sector is considered in economic modelling of energy efficiency policy options. Access to reliable information will also support effective decision-making in the financial sector, which is crucial specifically for buildings construction and renovation.
- It is recommended that the various stakeholders work (a steering committee) in setting up the observatory. The identified stakeholders shall be made up of industry associations and councils.
- The observatory shall allow for a central repository of information on the construction industry in Mauritius. It can start with the construction cost data.

A multi-stakeholder steering committee can decide on different approaches to tackle data collection. Further to the establishment of construction cost data observatory, the multi-stakeholder steering platform, will enable the creation of stronger ties between stakeholders.

1. Introduction

Through its green finance label SUNREF (Sustainable Use of Natural Resources and Energy Finance), Agence Française de Développement (AFD) supports the energy and environmental transition in nearly 30 developing countries by helping private sector actors seize opportunities linked to green growth and implement their projects, while encouraging local partner banks to finance them.

In the framework of SUNREF Mauritius, the technical assistance and the AFD commissioned a study on green and sustainable building to better inform project developers and banks on the criteria adopted in the fields of mitigation and adaptation to climate change, and to facilitate and promote bankable projects. This will allow easier evaluation of the applications, and the eligibility of the expenses using appropriate frameworks and methodologies. They will be able to apply the methods for evaluating eligible expenses to their projects, in conjunction with the SUNREF partner banks. For the study, one of the key deliverables is to have a benchmark of construction costs by construction sub-sectors in Mauritius. Therefore, with the cost reference in hand, it will be used as a basis to determine the costs in relation to the residential, commercial, and office sub-sectors.

The work to be carried out will take the form of a reference system of new construction costs by sector in the form of a cost observatory that will use the available data (ministries, professional organizations, Statistics Mauritius), emphasizing the notion of a prefiguration of an observatory; the aim is not to set up an observatory, but rather of drawing inspiration from this objective to establish the deliverable.

This report consists of an introduction, the description of the methodology for the study, a findings section where all findings are illustrated and a conclusion.

Construction costs observatory

The lack of construction cost data leads to the following problems:

- Poor decision-making
- Increase in risk and waste
- Hardship for government to audit big projects
- Inability to fully exploit technologies like BIM and big data
- Causes a serious break on development and investment
- Difficulty to link financial instruments to projects

A construction cost observatory will enable better national costs comparisons, feasibility studies and development appraisals, cost planning and control, procurement and the analysis of tenders, audit and dispute resolution and the validation of assets and liabilities.

It shall further enable the linkage of financial instruments to the construction sector.

2. Scope

There are several components to be considered when considering construction cost, namely:

1. Building categories
2. Building elements
3. Cost norms/standards

2.1 Building categories

Buildings are usually classified on the basis of different criteria depending on their usage, design and height, safety standards and other features as follows:

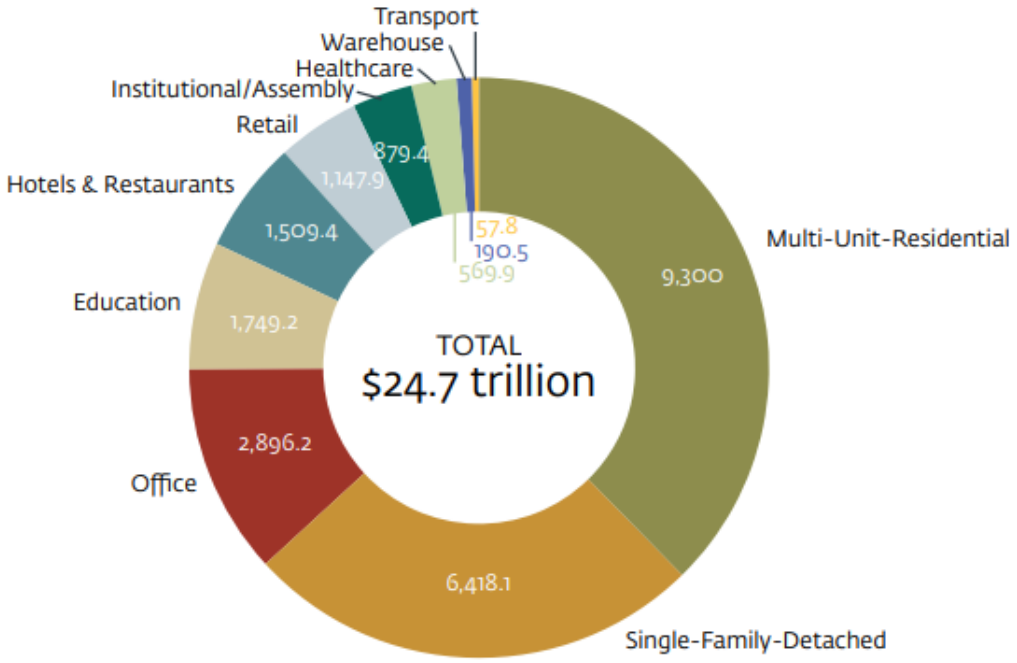
Table 1 Building catergories (RICS, 2013a)

Building Category	Examples
Car parking	Car parking
Administrative facilities	Offices
Commercial facilities	Shops Department Stores Shopping Centres Retail warehouses
Industrial Facilities	Factories Warehouses/Stores Livestock Buildings
Residential facilities	Houses Bungalows Apartments/Flats Hotels/Motels Hotel Furniture, fittings, and equipment Student accommodation Youth Hostels
Religious facilities	Churches, temples, mosques, etc..
Education, scientific, information facilities	Schools Universities, colleges etc Conference Centres
Health and Welfare facilities	Hospitals Nursing Homes Doctors' surgeries Dentists' surgeries
Protective Facilities	Fire stations Ambulance Stations Law Courts Prisons
Recreational Facilities	Theatres Cinemas Concert halls Restaurants Squash courts, tennis courts etc Football stadia

Examples of more building types are found in Appendix 1.

The three project types were selected since firstly, in emerging markets, residential buildings account for most of the investment potential until 2030 - $15.7 trillion across all regions. In comparison, the estimated investment opportunity in commercial buildings is $9 trillion, or about 36% of the total investment opportunity in emerging markets.

Figure 1 Total opportunity by building type (USD billions)



(IFC, 2019).

For the purpose of the study, three types of buildings have been chosen by the share of building project in the market locally and internationally.

They are:

1) Residential – House
2) Residential – Apartments/flats
3) Administrative facilities - Offices

2.2 Cost norms and cost Standards

General construction cost data based on cost per area will provide only a narrow view of a construction project. To be able to have richer and diversified insights a construction project can be broken down in smaller components. These categories of smaller components are known as elements.

There are several classifications. The main ones are provided below.

2.2.1 New Rules of Measurement (NRM)

The development of the Royal Institute of Chartered Surveyors (RICS) new rules of measurement was facilitated by the RICS Quantity Surveying and Construction Professional Group. The rules have been written to provide a standard set of measurement rules that are understandable by anyone involved in a construction project. The rules provide essential guidance to all those involved in, as well as those who wish to be better informed about, the cost management of construction projects. Although the RICS new rules of measurement are principally based on UK practice, the requirements for a coordinated set of rules and underlying philosophy behind each volume have worldwide application(RICS, 2013b). The NRM suite comprises the following three volumes:

- NRM 1: Order of cost estimating and cost planning for capital building works.
- NRM 2: Detailed measurement for building works.
- NRM 3: Order of cost estimating and cost planning for building maintenance works.

A template for the elemental cost plan according to NRM is given in Appendix 2.

2.2.2 International Cost Management Standard (ICMS)

The International Cost Management Standard Coalition (ICMSC) is a group of 49 professional and not-for-profit organisations from around the world, working together to develop and implement international standards(RICS, 2022).

The ICMSC Standards Setting Committee which comprises 25 independent experts from 15 countries, were appointed by the Coalition to draft, consult and produce the new International Cost Management Standard (ICMS), third edition(RICS, 2022). The new ICMS provides a high-level structure and format for classifying, defining, measuring, recording, analysing, and presenting life cycle costs and carbon emissions associated with construction projects and constructed assets(ICMS Coalition, 2021).

It covers buildings and civil engineering works, but not, presently, the process industries. It also covers the life cycle costs and carbon emissions arising throughout the life of a construction project, from inception to end of life, but not Whole Life Costs and Whole Life Carbon Emissions. Thus, it does not cover:

- the costs or carbon emissions associated with change of use prior to acquisition
- what is referred to in BS 15686-5 as 'externalities' such as sequestration
- carbon credits such as energy exported during operation which are considered to sit outside the boundaries of the project.

2.2.3 Guide to Elemental Cost Estimating & Analysis for Building Works – ASAQS/AAQS

In 1998 the Association of South African Quantity Surveyors (ASAQS) published the second edition of the "Guide to Elemental Cost Estimating & Analysis for Building Works. An amended version was issued by the Africa Association of Quantity Surveyors in 2003(AAQS, 2016).

The primary objective of this guide is to present a system which sets out principles and a model format for estimating which may be understood by all those involved in construction projects thereby aiding communication between the design team and the employer. It provides a structured basis for measuring building work and advances a consistent approach for dealing with other key cost components associated with a building project. It should also assist the quantity surveyor in providing effective and reliable cost advice(AAQS, 2016).

A list of sections, construction elements, and components based on the guide is given in Appendix 3.

2.2.4 Code of Measurement for Cost Planning

The Code of Measurement for Cost Planning was created by the Conseil European des Economistes de la Construction/The European Council of Construction Economists (CEEC). Many of the member organisations forming the council have standards for analysing project costs into elements so that they can be used for benchmarking and structuring robust order of cost estimates for future projects.

The Code of Measurement for Cost Planning creates a co-ordinated overall framework, enabling exchange of data at high level, while still permitting differing national approaches and new innovative local developments. The Code provides a standard basis for the sub-division of costs and for measurement of basic quantities of buildings for pan-European budgeting, comparison, and analysis at management level (CEEC, 2021).

The construction cost groups as per the code of measurement for cost planning is given in Appendix 4.

3. Methodology

3.1 Desktop research

Desktop research is the research technique that is mainly acquired by sitting at a desk. Desk research is involved in collecting data from existing resources. It is very effective and can be conducted in starting phase of research as it is quite quick and cheap and most of the basic information could be easily fetched which can be used as benchmark in the research process(MSG, 2022).

Qualitative and quantitative research were both employed for this report. Qualitative research is the collection and analysis of non-numerical data such as texts, with which the researcher deeply understands concepts, perspectives, and participants' experiences. On the contrary, quantitative research is the collection and analysis of numerical data such as the frequency of participants doing things, or the extent to which an activity occurs, or the relationship between variables. The results can be presented in percentages in pie charts, line graphs, or numerical tables (IGI, 2022).

An in-depth literature review was done to have an overview of the national and international construction cost landscape. Cost norms and standards were also investigated, as well as costs of green buildings, particularly compared to the cost of conventional buildings.

3.2 Development of a construction cost observatory

3.2.1 Interviews

Interview was used for obtaining information on the construction cost for Reunion Island (See section 4.3.4.).

3.2.2 Focus group (Stakeholder's meeting)

The consultant carefully selected participants for the study to represent the larger population they're attempting to target.

For this study, the following associations and councils were invited to participate in the focus group:

Professional organisations

i. Building and Civil Engineering Contractors Association (BACECA)
ii. Green Building Council Mauritius (GBCM)
iii. Professional Quantity Surveyor's Council (PQSC)
iv. Professional Architect Council (PAC)
v. Construction Industry Development Board (CIDB)
vi. Association of Consulting Engineers, Mauritius (ACE)
vii. The Mauritius Association of Quantity Surveyors (MAQS)
viii. Institute of Electrical and Electronics Engineers (IEEE Mauritius)
ix. Mauritian Association of Architects (MAA)
x. Royal Institute of Chartered Surveyors (RICS Mauritius)

Quantity surveying firms

xi. Etwaroo & Associates Ltd
xii. Hoolooman & Associates Ltd

xiii. Ong Seng Goburdhun & partners Ltd
xiv. V. D'Unienville & Associates Co Ltd
xv. Milestone Construction Consultant Ltd
xvi. Chuttur & Partners Ltd
xvii. Geerish Sonah Consultant Ltd
xviii. NP Jeetun Chartered Valuation Surveyors
xix. J Nundalalee & Associates Co Ltd
xx. Kims Consulting Engineers
xxi. Jeetah Consulting Ltd
xxii. Contractor
xxiii. Gamma Construction Ltd

Two focus groups were organised. The objectives of the first focus groups were to explore the potential for the development of a National Construction Cost Data observatory, and to define a standard framework to collect construction cost data. The second focus group was a follow up on the focus group for the development of the National Construction Cost Data observatory.

The stakeholders which participated are:

1) Building and Civil Engineering Contractors Association (BACECA)
2) Green Building Council Mauritius (GBCM)
3) Professional Quantity Surveyor's Council (PQSC)
4) Construction Industry Development Board (CIDB)
5) Association of Consulting Engineers, Mauritius (ACE)
6) Royal Institute of Chartered Surveyors (RICS Mauritius)
7) Etwaroo & Associates Ltd
8) Hoolooman & Associates Ltd

More details about the invited stakeholders can be found in Appendix 5.

3.2.2 Surveys/Questionnaires

A survey is a method of gathering information using relevant questions from a sample of people to understand populations as a whole. Surveys provide a critical source of data and insights for everyone engaged in the information economy (Qualtrics, 2022).

A questionnaire was developed after consultation with the different parties during the focus group meeting which was then circulated to the members of councils and organisations mentioned earlier. The questionnaire circulated is found in Appendix 6.

. The objective of the survey was to collect construction costs data for three types of projects namely:

1) Office
2) Villa (residential)
3) Apartment (residential)

3.3 Building elements

The building elements used have been chosen after the meeting with the focus group. They are based on the ASAQS Guide to elemental costing and analysis (Appendix 3)

Table 2 Building elements

	Elements
A	**Preliminaries**
1	*Preliminaries*
B	**Substructure**
2	*Piling*
3	*Foundations and substructure*
4	*Basement*
C	**Superstructure**
5	*Ground Floor Construction*
6	*Structural frame*
7	*External Envelope*
8	*Roof*
9	*Upper floors (load bearing structures only)*
10	*Internal Division*
D.	**Internal Finishes**
11	*Floor finishes*
12	*Internal Wall finishes*
13	*Ceilings*
E.	**Fittings**
14	*Fittings*
F.	**Services**
15	*Electrical Installation, incl. Luminaires*
16	*Plumbing Installation*
17	*Fire Protection*
18	*Lifts and Escalators*
19	Air conditioning and Ventilation
20	*Special services and equipment (ICT)*
	Swimming Pool Equipment
G.	**External Works**
21	*Soil Drainage*
22	*Stormwater Drainage*
23	*External Works*
24	*Alterations*

H.	Contingencies
25	*Contingencies*
26	*Fluctuation Provisions*

These elements shall be used in the breaking down of the construction cost.

3.4 Gap analysis

For this report, a gap analysis was also performed to identify the challenges in setting up a construction cost observatory. The gap analysis is an analytical tool designed to measure the difference between the actual state or performance of an organisation at a given moment in time and its desired or potential state or performance in the future. The gap analysis framework serves as a tool to calculate what is needed to reach the desired outcome and help devise actions and strategies aimed at reaching this objective. Gap analysis involves several steps, including the creation of a list of factors reflecting the actual state of an organisation, and a strategy that includes the steps needed to reach this outcome (Mercadal, 2020).

4. Findings

4.1 Local context

4.1.1 Construction cost data (Mauritius)

Currently the construction cost weightage for Mauritius as per the Central Statistics Office for a 150m2 house is provided as follows:

Table 3 Construction cost weightage (CSO, 2022)

Type of work	Weightage % in MRU
1. Grey Building	58.3
1.1 Earthworks	4.5
1.2 Concrete works	19.3
1.3 Reinforcements	7.9
1.4 Formwork	6.5
1.5 Blockwork	6.8
1.6 Plastering to ceilings and walls	9.3
1.7 Screeding to floors and roofs	4
2. External openings	12.2
3. Internal openings and joinery works	2.7
4. Tiling	3.8
5. Painting	1.9
6. Parquet	2.5
7. Kitchen fit-out	2.2
8. Bathroom fit-out	1.7
9. Electrical works	2.2
10. Plumbing and drainage	6.7
11. Site overhead costs	5.8

The above has been re-worked and analysed to fit in the elements table designed for the study. It has also been compared to the information received through the surveys. Please refer to Table 13

4.1.2 Indicative rates for construction works in Mauritius

In Table 3 below are found the indicative rates for construction works; the rates are for work items for a typical house construction (CIDB, Indicative Rates for Construction Works (June 2021), 2021). The rates for Work Items (except for specialist works in which case all-in prices have been obtained) have been worked out from first principles from the prices of the basic resources (viz. labour, materials and plant/equipment), output of labour, and plant/equipment with respect to various tasks and various industry variables (e.g. transportation, wastage, and sundry allowables) collected from the various stakeholders through Survey Questionnaires and/or face-to-face meetings. The data have been processed using Candy Software produced by Construction Computer Software (CCS) of South Africa(CIDB, 2021).

However, these rates cannot be used as they are not up to date.

Table 4 Indicative rates for construction works (CIDB, 2021)

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
A	Site Clearance and Earthworks			
1	Clear site of vegetation and dispose off-site	m²	50	55
2	Prepare and apply approved weedkillers prior to excavation	m²	65	70
3	Cut down trees (girth over 500mm) and cart away from site	no.	7,300	33,900
4	Excavate topsoil (150mm or 200mm deep) and deposit in temporary spoil heaps	m²	30	40
5	Excavate in bulk starting from stripped level and deposit in temporary spoil heaps	m³	320	670
6	Temporary support to face(s) of excavation (for depth up to 6000mm)	m²	270	390

The full table is given in Appendix 7.

Similar schedule of rates was obtained for India and can be found in Appendix 8.

4.1.3 Construction cost price trend

The data from the Central Statistics office provide the general price trend through the Construction Price Index, which is based on the construction prices of for a single storey detached house

Table 5 Monthly sub-indices by work category, April 2021 to March 2022

Work Categories	Weight	2021									2022		
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1. Grey building	58.3	112.7	113.9	114.8	116.9	118.0	119.2	119.6	120.6	120.7	121.7	123.5	126.2
1.1. Earthworks	*4.5*	*106.3*	*106.3*	*106.3*	*106.6*	*106.6*	*106.6*	*107.2*	*109.0*	*109.0*	*109.9*	*109.9*	*111.0*
1.2. Concrete works	*19.3*	*113.2*	*113.2*	*113.5*	*114.2*	*114.3*	*114.9*	*116.0*	*116.4*	*116.4*	*116.5*	*120.2*	*121.3*
1.3. Reinforcement	*7.9*	*121.4*	*128.2*	*133.1*	*139.8*	*143.5*	*149.3*	*148.9*	*149.5*	*150.5*	*152.4*	*153.1*	*166.3*
1.4. Formwork (coffrage)	*6.5*	*105.5*	*107.4*	*107.5*	*112.3*	*116.3*	*116.5*	*117.5*	*119.5*	*119.6*	*121.4*	*121.4*	*124.5*
1.5. Blockwork	*6.8*	*120.7*	*120.8*	*120.9*	*121.4*	*121.4*	*121.7*	*121.7*	*124.5*	*124.5*	*125.6*	*126.4*	*126.4*
1.6. Plastering to ceilings and walls	*9.3*	*106.5*	*106.7*	*107.1*	*109.5*	*109.7*	*109.8*	*109.8*	*109.8*	*109.8*	*111.0*	*111.3*	*112.4*
1.7. Screeding to floors and roofs	*4.0*	*112.1*	*112.3*	*113.2*	*113.9*	*114.0*	*115.8*	*115.8*	*116.4*	*116.4*	*117.4*	*122.5*	*122.6*
2. External openings	12.2	100.0	100.0	115.2	115.2	115.2	118.8	123.0	123.0	123.0	133.4	133.4	142.8
3. Internal openings and joinery works	2.7	110.4	111.0	111.3	112.9	114.1	115.2	116.1	117.8	117.6	136.7	137.2	137.9
4. Tiling	3.8	105.2	107.3	107.3	113.3	113.9	115.9	124.0	131.4	133.0	133.7	136.0	136.7
5. Painting	1.9	106.3	106.4	106.4	109.3	109.6	109.8	110.0	109.9	109.9	111.9	113.1	114.5
6. Parquet	2.5	106.7	108.3	108.3	116.0	117.6	118.1	121.3	126.6	131.6	131.7	132.5	142.5
7. Kitchen fit-out	2.2	102.9	103.2	103.4	103.7	106.3	106.3	111.0	112.0	112.0	128.6	129.3	131.1
8. Bathroom fit-out	1.7	101.6	101.8	111.5	112.9	113.6	118.1	119.9	120.9	121.5	128.7	130.6	125.0
9. Electrical works	2.2	106.5	106.5	107.0	111.7	112.8	115.4	118.6	119.8	121.8	122.7	122.7	124.6
10. Plumbing and Drainage	6.7	102.9	103.0	105.5	107.5	107.7	111.5	113.6	115.2	115.9	116.9	117.1	118.1
11. Site overhead costs	5.8	103.9	103.9	104.0	104.5	104.6	104.6	106.8	106.9	106.9	108.5	108.6	108.6
Total	**100.0**	**108.8**	**109.6**	**112.4**	**114.5**	**115.3**	**117.0**	**118.6**	**119.8**	**120.2**	**123.3**	**124.5**	**127.7**

However, there has been further increases due to the current world situation. Current reports from various sources depicts the current construction cost price increase.

A newspaper notes that it costed between Rs3.45 million and Rs3.75 million to build a 1500 square foot house in 2021, as compared to a budget between Rs2.7 million and Rs 3million in 2020. This makes a 20-22% increase, mostly due to an increase in construction cost of materials.

The average area of a typical Mauritian house is of 1500 square feet. On that surface, one can have two bedrooms, two bathrooms and toilets, a kitchen, a living room, a dining room, and a terrace. According to the vie-president of the Association of small contractors, in 2021 it took Rs2500 per square foot to construct a house. The cost of construction is said to depend on the materials used and the grade of work done. The following table shows the cost of building a house in 2021, as compared to 2020.

Table 6 Construction cost of a house

	2020	2021
Construction of a house (construction work, laying ceramic tiles, painting, plumbing, electrical work, aluminum work, labor and installation of kitchen furniture)	Between Rs 1,800 and Rs 2,000 per square foot	Between Rs 2,300 and Rs 2,500 per square foot
Budget for a 1,500 square foot home	Between Rs 2.7 million and Rs 3 million	Rs 3.45 million and Rs 3.75 million

Table 7 Labour cost

	Salary in 2020 (per day)	Salary in 2021 (per day)
Builder	Rs 1,200	Rs 1,500
'Manev' mason	Rs800	Rs 1,000

(Defimedia, 2022).

It is to be noted that the price of construction materials has seen a significant increase in Mauritius since the last few months as it can be seen in the next table(Soopaya Moorghen, 2022):

Table 8 Percentage increase in construction materials

Material	Percentage increase
Rock sand 04	61 %
Rock sand 02	57 %
Cement	46 %
Aluminium bar 1009	100 %
Single Core Electrical Cable 1.5 MM	216 %

4.2 International context

With a limited amount of construction cost data for Mauritius, international construction cost information is provided below. Whilst the absolute figures will differ geographically, insights can be obtained from the data.

4.2.1 Regional construction cost performance (Africa)

Table 9 shows information obtained on average cost per m^2 for two African cities for different construction types (Turner & Townsend, 2022).

The percentage variation has been noted for two baselines:

1) Townhouse – medium standard
2) CBD offices – medium (A Grade)

Table 9 Regional construction performance (Turner & Townsend, 2022)

	US$	US$	% diff - townhouse	% diff - townhouse	% diff - Office (medium)	% diff - Office (medium)
International Building costs per m2 of internal area in 2021	Johannesburg	Nairobi	Johannesburg	Nairobi	Johannesburg	Nairobi
Commercial						
CBD Offices-high-rise prestige	1,159.00	910.7	183%	154%	125%	133%
CBD offices- up to 20 floors medium (A-Grade)	925.9	683	146%	115%	**100%**	**100%**
Office fit-out (30,000sq ft) low specification	1298.9	510	205%	86%	140%	75%
Office fit-out (30,000sq ft) medium specification	1432.1	605.6	226%	102%	155%	89%

Office fit-out (30,000sq ft) high specification	1965	910.7	311%	154%	212%	133%
Hotels						
3-Star travelers	1149	1183.9	182%	200%	124%	173%
5-Star luxury	1805.1	1366	285%	231%	195%	200%
Resort Style	1742.8	1092.8	275%	185%	188%	160%
Industrial						
High-tech factory/laboratory	944.2	1001.7	149%	169%	102%	147%
Large warehouse distribution centre	393	500.9	62%	85%	42%	73%
Retail						
Large shopping centre including mail	1019.1	637.5	161%	108%	110%	93%
Neighbourhood incl supermarket	757.3	550.9	120%	93%	82%	81%
Prestige car showroom	845.9	660.2	134%	112%	91%	97%
Residential						
Apartments high-rise	939.2	637.5	148%	108%	101%	93%
Townhouses medium standard	632.8	591.9	**100%**	**100%**	68%	87%

Construction data for Africa, Asia, Australia and New Zealand, Continental Europe, Middle East, North America, South America and UK can be found in Appendix 9.

4.2.2 Construction costs by building elements (US)

In the US, the cost and weightage of the total cost for each type of building works is given in the next table below:

Table 10 Price by type of work (*HomeGuide, 2017)*

Type of work	Weightage %	Total cost per sq ft (USD/Sq ft)
Excavation	1.20	1.5
Foundation, Slab & Piers	3.7	4.63
Flatwork (Drive & Walk)	2.4	3
Brick Hearth & Veneer	0.7	0.88
Rough Hardware	0.6	0.75
Finish Hardware	0.2	0.25
Rough Lumber	6.4	8
Finish Lumber	0.5	0.63
Rough Carpentry Labor	8.9	11.13
Finish Carpentry Labor	1.7	2.13
Countertops	1.5	1.88
Cabinets	3.7	4.63
Insulation (R19 ceiling)	2.3	2.88
Roofing	5.5	6.88
Painting	3.6	4.5
Shower & Tub Enclosure	0.5	0.63
Prefabricated Fireplace	0.9	1.13
Bath Accessories	0.7	0.88
Built-in Appliances	1.6	2
Heating and Ducting	2.9	3.63
Plumbing & Sewer Connections	7.3	9.13
Doors	1.9	2.38
Garage Door	0.4	0.5
Aluminium Windows & Sliding Doors	1.2	1.5
Exterior Stucco	6.4	8
Gypsum Wallboard	4.7	5.88
Resilient Flooring	2	2.5
Carpeting	2.4	3
Wiring	3.2	4
Lighting Fixtures	1.2	1.5
Insurance & Payroll Tax	4.8	6
Plans & Specifications	0.4	0.5
Permits & Utilities	1.7	2.11
Final Cleanup	0.4	0.5
Overhead & Profit	12.5	15.63

4.2.3 International costs comparisons (US, UK,SA)

Table 11 Construction cost by building category

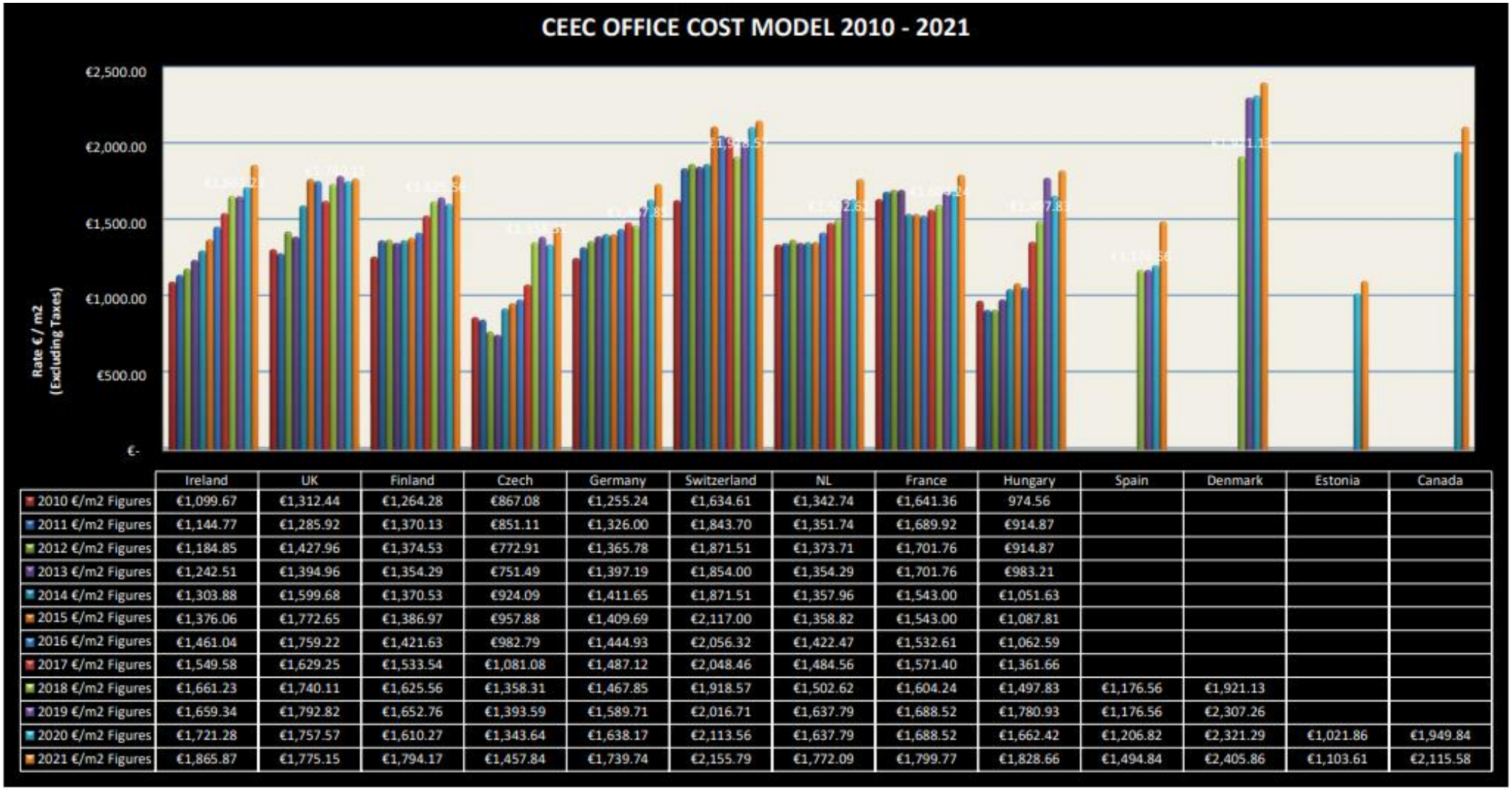
Type of Building	US Cost (MUR/m^2) (Cumming Insights, 2021)	US Cost (MUR/m^2) (Gerardi, 2021)	UK Cost (MUR/m^2) (Costmodelling Limited, 2022)	South Africa Cost (MUR/ m^2) (AECOM, 2020)
Residential				
Single Family Detached – Medium Quality	32,103 – 195,580	142,734-215,829	84,817 – 94,604	9000 – 23,700
Apartment/condominium-mid rise	65,687 – 424,251		97,866 – 108,740	21,000 – 30,300
Commercial/Office				
Single storey	66,675 – 221,262		114,177 – 127,226	24000– 29,400
Mid-Rise	106,680– 440,549	162,983-429,683	116,896 – 129,944	30,900 – 45,900
High-Rise	170,392 – 506,730	212,372-494,383	131,032 – 145,168	34,500 – 57,600
Retail				
Neighbourhood strip centre	74,083 – 227,683		115,808 – 128,857	25,500 – 32,700
Regional Mall	175,331 – 339,302		299,579 – 331,113	32,700 – 39,600
Hospitality/Lodging				
Three-Star Hotel	156,563– 369,923		111,459 – 123,420	2,760,000 – 4,140,000 (rate per key)
Five-Star Hotel	207,433 – 547,229		214,762 – 237,597	5,796,000 – 8,280,000 (rate per key)
Warehouse/Manufacturing				
Warehouse – Regional Distribution	70,626 – 159,526		52,195 – 58,719	
Warehouse – Light Industrial	78,528 – 177,306		61,982 – 69,594	
Manufacturing – Tech Laboratory	229,164– 442,031		73,400 – 82,099	
Healthcare				
Acute Care Facility	260,773 – 725,029		185,945 – 205,519	
Medical Office Building	168,416 – 371,898	222,744-502,779	133,207 – 147,343	
Specialty Building	204,470 – 464,749		86,992 – 212043	
Primary & Secondary Education				
Elementary School	94,333 – 229,164		107,653 – 119,614	
Middle School	105,692 – 250,896		115,808 – 128,857	19,500 – 22,500
High School	115,076 – 275,590		107,109 – 119,070	23,400 – 28,200
Higher Education				
Academic/Classroom	201,507 – 432,647		109,284 – 121,245	
Laboratory	273,121 – 538,339		159,848 – 177,246	
Administration	203,482 – 446,969			

Dormitory	108,162 – 238,548		101,672 – 112,546	
Public/community Facilities				
Government Administrative Building	210,397 – 424,744	210,397-416,842	115,808 – 128,857	22,200 – 28,200
Museum/Performing Arts	319,546 – 644,031	321,028-628,227	128,313 – 142,449	
Recreation/Gymnasium	142,734 – 276,084		75,031 – 83,730	
Police Stations	207,927 – 402,026	171,379-337,326	112,546 – 124,507	
Parking Structures				
Below Grade – Multi Level	42,474 – 104,211		43,496 – 61,329(Estimation QS, 2018)	12,600 – 21,000
Above Grade – Multi-Level	23,213 – 58,773		31,100 – 39,744(Estimation QS, 2018)	1500 – 12,600

4.2.4 Construction cost data around Europe

The construction cost data for the building of offices around Europe from the years 2010 to 2021 is given in Figure 3. The construction costs by building element are given in Table 12.

Figure 2 Construction cost around Europe(CEEC, 2021)



	Ireland	UK	Finland	Czech	Germany	Switzerland	NL	France	Hungary	Spain	Denmark	Estonia	Canada
2010 €/m2 Figures	€1,099.67	€1,312.44	€1,264.28	€867.08	€1,255.24	€1,634.61	€1,342.74	€1,641.36	974.56				
2011 €/m2 Figures	€1,144.77	€1,285.92	€1,370.13	€851.11	€1,326.00	€1,843.70	€1,351.74	€1,689.92	€914.87				
2012 €/m2 Figures	€1,184.85	€1,427.96	€1,374.53	€772.91	€1,365.78	€1,871.51	€1,373.71	€1,701.76	€914.87				
2013 €/m2 Figures	€1,242.51	€1,394.96	€1,354.29	€751.49	€1,397.19	€1,854.00	€1,354.29	€1,701.76	€983.21				
2014 €/m2 Figures	€1,303.88	€1,599.68	€1,370.53	€924.09	€1,411.65	€1,871.51	€1,357.96	€1,543.00	€1,051.63				
2015 €/m2 Figures	€1,376.06	€1,772.65	€1,386.97	€957.88	€1,409.69	€2,117.00	€1,358.82	€1,543.00	€1,087.81				
2016 €/m2 Figures	€1,461.04	€1,759.22	€1,421.63	€982.79	€1,444.93	€2,056.32	€1,422.47	€1,532.61	€1,062.59				
2017 €/m2 Figures	€1,549.58	€1,629.25	€1,533.54	€1,081.08	€1,487.12	€2,048.46	€1,484.56	€1,571.40	€1,361.66				
2018 €/m2 Figures	€1,661.23	€1,740.11	€1,625.56	€1,358.31	€1,467.85	€1,918.57	€1,502.62	€1,604.24	€1,497.83	€1,176.56	€1,921.13		
2019 €/m2 Figures	€1,659.34	€1,792.82	€1,652.76	€1,393.59	€1,589.71	€2,016.71	€1,637.79	€1,688.52	€1,780.93	€1,176.56	€2,307.26		
2020 €/m2 Figures	€1,721.28	€1,757.57	€1,610.27	€1,343.64	€1,638.17	€2,113.56	€1,637.79	€1,688.52	€1,662.42	€1,206.82	€2,321.29	€1,021.86	€1,949.84
2021 €/m2 Figures	€1,865.87	€1,775.15	€1,794.17	€1,457.84	€1,739.74	€2,155.79	€1,772.09	€1,799.77	€1,828.66	€1,494.84	€2,405.86	€1,103.61	€2,115.58

Table 12 European construction costs (CEEC, 2021)

		Ireland	UK	Finland	Czech	Germany	Switzerland	NL	France	Hungary	Spain	Denmark	Estonia	Canada
			€1=£0.85653		€1=25.83CZK		€ 1=1.0969			€1=351.76 HUF		€1= 7.4360Kr		€1= 1.49 CAD $
	Cost Groups	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5	€/m2 # 5
	CONSTRUCTION COSTS 2021													
A	Preliminaries	206.08	224.73	208.13	126.95	72.75	204.00	359.61	63.94	68.20	250.18	150.75	66.96	283.30
B	Substructures	40.83	36.12	52.34	34.18	53.67	99.00	46.73	84.87	67.10	37.92	68.96	17.71	63.54
C	External superstructure/envelope	561.33	649.24	470.52	467.64	675.19	630.00	404.35	709.17	685.30	388.70	761.81	66.85	478.58
D	Internal superstructure	169.82	120.39	126.15	131.29	193.16	242.00	192.63	244.14	137.50	84.89	210.76	227.66	208.66
E	Internal finishings	172.74	121.63	352.84	151.90	224.64	234.00	276.74	255.77	129.80	345.69	222.59	147.31	180.84
F	Services Installations	506.48	439.41	458.33	334.18	326.36	509.00	334.90	254.61	543.40	250.54	676.85	409.10	695.98
G	Special equipment	27.41	28.25	10.92	26.04	-	33.00	24.95	16.28	4.40	17.22	79.88	31.75	34.48
H	Furniture and fittings	55.55	43.48	10.01	60.76	54.22	35.00	33.06	34.88	55.00	38.47	55.18	38.34	26.60
I	Site and external works	71.28	60.20	52.67	82.46	89.08	107.00	47.50	83.70	84.70	37.69	109.00	65.77	81.97
J	Construction contingencies	54.35	51.70	52.26	42.46	50.67	62.79	51.61	52.42	53.26	43.53	70.07	32.14	61.62
K	Taxes on construction	-	-	-	-	-								
	TOTAL CONSTRUCTION COSTS 2021	€ 1,865.87	€ 1,775.15	€ 1,794.17	€ 1,457.84	€ 1,739.74	€ 2,155.79	€ 1,772.09	€ 1,799.77	€ 1,828.66	€ 1,494.84	€ 2,405.86	€ 1,103.61	€ 2,115.58
		100%	95%	96%	78%	93%	116%	95%	96%	98%	80%	129%	59%	113%

The above Table 12 has been used for comparison and validation or % breakdown of elements. Please refer to Table13.

Table 13 shows the findings of the data collection. Data was obtained for 5 Residential-villa, 2 Residential-apartment and 2 Office building.

An average was taken to calculate for the 3 types of buildings.

Information was equally taken from Table 12 and Table 13 for comparison.

Table 13 Construction cost data comparison

Construction cost data - Cost per m2 - % cost											
Construction cost data			Cost per m2 Mauritius - apartment	% total cost Mauritius - apartment	Cost per m2 Mauritius - Villa	% total cost Mauritius - Villa	Cost per m2 Mauritius - Office	% total cost Mauritius - Office	Cost per m2 Europe (avg)	% total cost Europe (avg)	% total cost CSO
	Elements	**Unit**	**MUR per m2**	**Cost %**	**MUR per m2**	**Cost %**	**MUR per m2**	**Cost %**	**EUR per m2**	**Cost %**	**Cost %**
A	**Preliminaries**		**2,078.25**	**5.60%**	**4,734.82**	**8.85%**	**2,500.00**	**6.01%**	**9,772.31**	**11.21%**	**5.80%**
1	*Preliminaries*	Sum	2,078.25	5.60%	4,734.82	8.85%	2,500.00	6.01%	9,772.31	11.21%	5.80%
B	**Substructure**		**2,981.89**	**8.04%**	**3,521.55**	**6.59%**	**3,312.38**	**7.96%**	**1,936.16**	**2.22%**	**14.50 %**
2	*Piling*										
3	*Foundations*	m²	1,022.02	2.75%	3,521.55	6.59%	3,312.38	7.96%	1,936.16	2.22%	14.50 %
4	*Basement*	m²	1,959.87	5.28%	-						
C	**Superstructure**		**4,631.47**	**12.48%**	**9,915.52**	**18.54%**	**13,761.13**	**33.08%**	**34,671.13**	**39.77%**	**49.55 %**
5	*Ground Floor Construction*										

6	*Structural frame*	m²	3,982.33	10.73%	5,824.45	10.89%	7,379.04	17.74%	26,618.27	30.53%	30.00 %
7	*External Envelope*	m²	152.05	0.41%	985.81	1.84%	5,836.16	14.03%	Incl above		12.20 %
8	*Roof*	m²	287.40	0.77%	2,678.95	5.01%	545.93	1.31%			
9	*Upper floors (load bearing structures only)*						Incl in 6				
10	*Internal Division*	m²	209.69	0.57%	426.31	0.80%	Incl in 6		8,052.86	9.24%	7.35%
D.	**Internal Finishes**		**2,817.89**	**7.59%**	**4,629.33**	**8.66%**	**-**	**0.00%**	**8,191.33**	**9.40%**	**16.85 %**
11	*Floor finishes*	m²	754.25	2.03%	983.03	1.84%					10.30 %
12	*Internal Wall finishes*	m²	1,655.85	4.46%	3,414.51	6.39%					6.55%
13	*Ceilings*	m²	407.80	1.10%	231.79	0.43%					
E.	**Fittings**		**15,034.08**	**40.52%**	**13,974.47**	**26.13%**	**3,897.95**	**9.37%**	**2,634.18**	**3.02%**	**2.20%**
14	*Fittings*		15,034.08	40.52%	13,974.47	26.13%	3,897.95	9.37%	2,634.18	3.02%	2.20%
F.	**Services**		**6,755.29**	**18.21%**	**6,023.78**	**11.27%**	**11,191.09**	**26.90%**	**24,017.28**	**27.55%**	**11.10 %**
15	*Electrical Installation*	m²	3,099.60	8.35%	2,372.45	4.44%	4,674.50	11.24%			2.20%
16	*Plumbing Installation*	m²	1,632.54	4.40%	2,091.84	3.91%	Incl above				8.90%
17	*Fire Protection*	m²	35.14	0.09%	-						
18	*Lifts and Escalators*	m²	495.54	1.34%	-		730.67	1.76%			
19	Air conditioning and Ventilation	m²	440.69	1.19%	841.84	1.57%	Incl in 15				
20	*Special services and equipment*	m²	1,051.78	2.83%	717.65	1.34%	5,785.92	13.91%			

G.	**External Works**		**1,179.67**	**3.18%**	**7,175.08**	**13.42%**	**4,748.43**	**11.42%**	**3,380.10**	**3.88%**	
21	*Soil Drainage*	m²	111.08	0.30%	816.33	1.53%	178.13	0.43%			
22	*Stormwater Drainage*	m²	19.66	0.05%	280.61	0.52%	1,049.48	2.52%			
23	*External Works*	m²	1,048.93	2.83%	6,078.14	11.37%	3,520.83	8.46%			
24	*Alterations*										
H.	**Contingencies**		**1,624.38**	**4.38%**	**3,498.22**	**6.54%**	**2,184.00**	**5.25%**	**2,577.28**	**2.96%**	
25	*Contingencies*	Sum	1,624.38	4.38%	3,498.22	6.54%	2,184.00	5.25%	2,577.38	2.96%	
26	*Fluctuation Provisions*										
I.	**Total**		**37,102.93**	**100.00%**	**53,472.76**	**100.00 %**	**41,595**	**100.00%**	**87,179.77**	**100.00%**	**100.00 %**

4.3 Green buildings

The construction sector represents a very polluting sector: between the construction of houses and tertiary buildings and their occupation and use (for heating, lighting, water…), they represent a considerable consumption of resources and energy. In this aspect, it is important to put in place strategies to reduce the ecological impact of buildings and make them more eco-friendly. “Green” or “sustainable” buildings use key resources like energy, water, materials, and land more efficiently than buildings that are just built to code. With more natural light and better air quality, green buildings typically contribute to improved employee and student health, comfort, and productivity(Kats, 2003).

It is estimated that conventional buildings use about 40% of global energy, 40% of other resources, 25% of global water, and emit approximately 1/3rd of Green House Gas (GHG) emissions while green buildings have 19% lower aggregate operational costs, 25% of less energy, and 36% of fewer CO_2 emissions(Ramachandra et al., 2018).

The green buildings seem unattractive to developers who prioritise fast investment returns, due to costs attributed to implementing sustainable features, and consequently, only 19% of existing buildings are certified for green, globally(Achini Shanika Weerasinghe & Ramachandra, 2020).

Green buildings are said to cost higher than conventional ones during the construction phase(Construction Industry Institute Hong Kong, 2005; Goncalves, 2019). Development costs of green buildings ranges between 18% below to 9% above the costs of conventional affordable housing projects(GSB, 2019).

However, it is to be noted that for an initial construction cost increase of $3 to $5 per square foot, savings could be as much as $6 on resource savings and almost $8.50 on maintenance and repairs. In total, after 20 years, the savings will probably have amortized 2 to 3 times the initial investment(Goncalves, 2019). Depending on how green the building is; the savings will be between 25 and 40% of operational costs after the initial years(GSB, 2019).

A year-long study was undertaken in Singapore recently and it makes a strong case for the value of green buildings. The buildings were analysed from a lifecycle cost perspective and compared. All had achieved the various Green Mark ratings of Gold, GoldPLUS and Platinum.

It was found that owners of Green Mark buildings reap greater energy and water savings throughout its lifecycle, and these savings outweigh the early investment cost. In fact, the greener the buildings, the higher the cost savings. However, greener buildings also needed a longer period to recoup the initial construction costs, with the highest tier Platinum-rated buildings taking close to six years to do so.

Table 14Findings for green mark non-residential buildings (NRB)

GM Certification	Green Cost Premium	Simple Pay Back (yrs)	NPV Savings per GFA (median $/m^2)
Gold	0.12%-1.89%	0.81-2.45	48
Gold^{PLUS}	0.70%-1.87%	1.89-3.56	117
Platinum	1.00%-4.40%	2.30-5.80	225

Table 15 Findings for greenmark residential buildings (NRB)

GM Certification	Green Cost Premium	Simple Pay Back (yrs)	NPV Savings per GFA (median $/m^2)
Gold	0.23%-1.71%	Payback not applicable for residential projects as most of the savings are enjoyed by the household	39
Gold^{PLUS}	0.64%-3.76%		54
Platinum	0.79%-4.15%		140

(BCA, 2020).

4.3.1 Benefits of Green Building over Conventional Buildings

Green buildings are a global solution for cities, communities, and neighbourhoods. The tangible benefits may not be easily recognizable to tenants or visitors, but through sustainable design, construction and operations green buildings are reducing carbon emissions, energy and waste; conserving water; prioritizing safer materials; and lowering our exposure to toxins.

Green buildings positively affect public health. Improving indoor air quality can reduce absenteeism and work hours affected by asthma, respiratory allergies, depression and stress and self-reported improvements in productivity.

Green buildings promote resilience-enhancing designs, technologies, materials and methods. To support these efforts, green buildings promote the use of durable materials, thoughtful site selection, rainwater collection, demand response, grid islanding, energy efficiency, onsite renewable generation and more.

At building level, the benefits observed are as follows:

- Green buildings achieving the **Green Star certification in Australia** have been shown to produce 62% fewer greenhouse gas emissions than average Australian buildings, and 51% less potable water than if they had been built to meet minimum industry requirements.
- Green buildings certified by the **Indian Green Building Council (IGBC)** results in energy savings of 40 - 50% and water savings of 20 - 30% compared to conventional buildings in India.
- Green buildings achieving the **Green Star certification in South Africa** have been shown to save on average between 30 - 40% energy and carbon emissions every year, and between 20 - 30% potable water every year, when compared to the industry norm.
- Green buildings achieving the **LEED certification** in the US and other countries have been shown to consume 25 per cent less energy and 11 per cent less water, than non-green buildings(Prasad, 2021).

The savings brought about by a green building are exemplified in the following table:

Table 16 Cost and savings analysis of LEED and traditional features

LEED Features	LEED Features Cost	Traditional Features Cost	Savings Per Year
Lighting	$400.00	$702.00	$1,000
Indoor rainwater use	$12,000		$1,200
Windows	$19,872	$3,150	0
Contamination Control & Nontoxic Pest Control	$17,832		$2,500
Heating/Cooling/Ventilation	14,600		$3,500
Garage Pollutant Protection	$5,689		
Indoor Water Use	$3,610	$2,130	$38
Appliances and Interior	$11,232	$5,900	$255
Solar Roof	$77,796.00	$12,157	$1,000
Construction waste management	$6,200.00		0

(A et al., 2019).

Furthermore, the benefits of green buildings can be grouped within three categories: environmental, economic and social(Nikunj.j, 2014).

Environmental benefits of green building:

- Enhance and protect biodiversity and ecosystems
- Improve air and water quality
- Reduce waste streams – by reusing and recycling
- Conserve, preserve and restore natural habitats as well as resources

Economic benefits of green building:

- Reduce operating costs
- Improve occupant productivity & reduced absenteeism
- Enhance asset value and profits
- Optimize life-cycle economic performance

Social benefits of green building:

- Enhance occupant health and comfort
- Improved indoor air quality
- Minimize strain on local utility infrastructure
- Improve overall quality of life

4.3.2 Construction cost difference between green and conventional buildings

The construction cost comparison for conventional and green buildings for South Africa is given in Table 17.

Table 17 Construction cost comparison between conventional and green buildings(Windapo & Machaka, 2018)

Construction cost			
Respondent			Percentage difference
1			9.31%
2			14%
3			10%
4			8%
5			5%
6			5%
Average			8.55%

Another study on the construction cost difference between green building certified residences and general residences in Taiwan demonstrated that internationally, there is an extra increase in construction costs of green building certified buildings, as shown in Table 21 below:

Table 18 Extra increase in construction costs of green building certifiifed buildings (Sun et al., 2019)

Country	Building Type	Extra Construction Costs
UK	housing, commercial, industrial	5%–15% or less than 1%
China	hotel, residential building, office	hotel 8.5%, residential building 10.3%, office 13.9% (Average 10.9%)
USA	residential housing	10.77%
USA	office, school	0.66%–6.5%
USA	library, laboratory, academic classroom	0%
USA	bank	2%–3%
New Zealand	office	0%
Israel	office	4.33–11.6%

The outcome from the first case study points out that in general, the average percentage difference between the construction cost per m^2 of a conventional building as compared to a green building is 8.55% (Windapo & Machaka, 2018).

More specifically, there is an average of 10.3% extra construction cost for residential buildings and 13.9% extra construction cost for an office building for the UK and China, with an overall average of 10.9% (Sun et al., 2019).

4.3.3. Cost comparisons conducted between green buildings and similar natured conventional buildings

Weerasinghe et al. (2018), summarised 25 previous studies providing cost comparisons conducted between green buildings and similar natured conventional buildings. The type of the building, the methodology adopted, and the outcome were considered. The cost premium of the green buildings is based on different green certification levels in BREEM, Green Star, and LEED rating systems. The cost premiums increase with the certification level.

Table 19 Summary of previous studies on green cost premium

Type of building	Outcome	Methodology adopted	Source
	Silver: 2.11% Gold: 1.82% Platinum: 6.5%		
Academic	No statistically significant cost difference	Unpaired *t*-test – actual costs of 22 green building against non-green buildings	Matthiessen and Morris (2007)
Academic	−15%	Single case study – cost comparative analysis	Fullbrook *et al.* (2005)
Academic	LEED Certified: 1.65% Silver: 1.8% Gold: 1.93% Platinum: 2.53%	Participants' perception	Kats *et al.* (2010)
Academic, Laboratory and Library	No statistically significant cost difference Majority: no additional cost	Unpaired *t*-test – actual cost of 45 LEED seeking buildings against 93 non-LEED seeking buildings	Matthiessen and Morris (2004)
Library	4.90%	Single case study – cost comparative analysis	Fullbrook *et al.* (2005)
Higher education	3 to 5%	Participants' perception	Building Design and Construction (2007)
School	11 to 15%	Participants' perception	Building Design and Construction (2007)
Schools	LEED Certified: 0.35% Silver: 1% Gold: 1.3% Platinum: 9.6%	Participants' perception	Kats *et al.* (2010)
School	Average: 1.7%	Cost comparative analysis – 30 green buildings against conventional	Kats (2010)
School	46%, Mean construction cost per square foot is significantly higher	Cost comparative analysis – 30 green buildings against 30 conventional	Shrestha and Pushpala (2012)
School	5.70%	Single case study – cost comparative analysis	Fullbrook *et al.* (2005)
House	LEED Silver: 17%	Single case study: itemised cost impact analysis	NAHB Research Centre (2009)
Residential	Cost per square foot – no statistically significant cost difference	Cost comparative analysis – 15 green projects against 22 conventional	USGBC (2009)
Residential	10.77%	Single case study: cost comparative analysis	Kim *et al.* (2014)
Residential	6 to 10%	Participants' perception	Building Design and Construction (2007)
Healthcare	0% to 5%	Cost comparative analysis – cost of 13 green and buildings against conventional	Houghton *et al.* (2009)
Healthcare	1.50%	Single case study – cost comparative analysis	Fullbrook *et al.* (2005)
Healthcare	3 to 5%	Participants' perception	Building Design and Construction (2007)
Hotel and Restaurant	3 to 5%	Participants' perception	Building Design and Construction (2007)
Bank	No statistically significant cost difference	Cost comparative analysis – 02 green and conventional	Mapp *et al.* (2011)
Commercial	Cost per square foot – no statistically significant cost difference	Cost comparative analysis – 12 green commercial interior projects and 13 conventional	USGBC (2009)
General	−5 to 10%	Participants' perception	Ahn and Pearce (2007)
General	0 to 18%	Participants' perception	Building Design and Construction (2007), Park *et al.* (2008), Kats (2010)

Focusing on residential buildings, the cost of a green building lies between 6 to 10.77% higher than a similar-natured conventional building.

4.3.4. Construction cost data by sub-sector in Reunion Island

Conventional buildings:
The average cost of conventional buildings (office buildings, residential buildings) in Reunion Island is in between 71,000-95,000 MUR/m^2 of net floor area.

Bioclimatic buildings:
An average extra cost of bioclimatic/low carbon buildings is approximately 10% in Reunion Island. The cost is between 85,000-105,000 MUR/m^2/y.

Comparison between conventional buildings and bioclimatic buildings

Annual consumption:
For bioclimatic buildings without air conditioning, the annual consumption is five time less than a conventional office building (20 kWh/m^2/y vs 100 kWh/m^2/y)

For bioclimatic buildings with air conditioning coupled with ceiling fans, the annual consumption is reduced by 30% (70 kWh/m2/y vs 100 kWh/m2/y). The period of air conditioning is reduced to 5 months (December-April). The chillers are smaller and undersized compared to a conventional building. The use of ceiling fans coupled with air-conditioning allows to get a higher set temperature (at least 28°C) with a temperature felt by the user 4°C below the air temperature. It is also possible to use the ceiling fans only in winter and during the intermediate season.

Table 20 Comparison of end-users between a conventional academic building and ENERPOS (bioclimatic building)

Index kWh/m²nfa.y	Indoor lighting	Outdoor lighting	Ceiling fans	AC	Plug loads	Lift	Total
ENERPOS	2	1	2	4	8	1	18
Standard building	14	8	0	80.0	35.0	3	140.0

Maintenance costs:
The maintenance costs due to AC in Reunion Island is on average 950 MUR/m^2/yr. The maintenance cost does not include the replacement of the chiller. Usually, the lifespan of a chiller is approximatively 17 years.

Other advantages:
Natural light: The use more efficient of natural cross ventilation implies that the buildings are thinner and are more efficient in terms of daylighting. The annual consumption due to artificial lighting is reduced by 7.

Thermal comfort and health:
Using natural ventilation implies that the indoor air quality is much better than an air-conditioned building. Those buildings are healthier with less people sick.

Some other strategies used are:
- Larger openings to encourage natural cross ventilation
- Solar shadings
- Ceiling fans in addition to air conditioning
- Vegetation (trees) around the building to reduce the heat island effect. The impact of vegetation/trees is important. It allows to reduce the outside air temperature by 5^{0}C around the building.

Table 21 Comparison between conventional and bioclimatic building

	Conventional office building	Energy efficient/bioclimatic building Without air conditioning	Energy efficient/bioclimatic building With AC and ceiling fans
Investment (MUR.m^2)	95,000 MUR	105,000 MUR/m^2	105,000 MUR/m2
Energy consumption	100 kWh/m^2/y	20 kWh/m^2/y	70 kWh/m^2/ y
Cost of energy	950 MUR/m^2/y	95 MUR/m^2/y	660 MUR/m^2/y
Maintenance costs	950 MUR/m^2/y	0	710 MUR/m^2/y
Annuel cost	1900 MUR/m^2/y	95 MUR/m^2/y	1370 MUR/m^2/y
Savings	0	1805 MUR/m^2/y	530 MUR/m^2/y
Pay back time	**0**	**5 years**	**18 ears**

5. Gap analysis

5.1 Objectives

The objectives of the study were to:

- find construction cost data in terms of building categories.
- find construction cost data in terms of building elements.
- Analysis of the construction cost data, including variances
- provide recommendations for the creation of a construction cost data observatory

5.2 Identification of the desired state

The goal is to identify recommendations to set up an institutional mechanism that is a construction cost data observatory and to crowdsource construction cost data.

5.3 Identification of gaps and determination of action steps

Table 22 Gap analysis

Implementation Process		What we have	What we need	Gaps
Key Activities	**Sub- Activities**			
Desktop research	Research on the construction costs internationally	- Construction cost per elements (US) - Cost of materials (India) - Construction Cost Data Around Europe - International construction cost comparison (US, UK, EU, SA)	- Construction cost per building elements - Construction cost per building categories	
	Research on cost management standard	- New Rules of Measurement (NRM) - International Cost Management Standard (ICMS) - Guide to Elemental Cost Estimating & Analysis for Building Works – ASAQS/AAQS - Code of Measurement for Cost Planning	- To find information on cost management standards across the world which can be replicated in Mauritius	
	Research on the local context	- Construction cost index - CIDB – Indicative rates for construction works in Mauritius - CIDB – percentage of elemental cost - Major stakeholders constituting the construction industry in Mauritius	- Construction cost per building elements - Construction cost per building categories - Identification of stakeholders to create a focus group - Updated schedule of rates	**- No detailed information available on construction costs in terms of building categories (villa, apartment, office)** **- Limited data sets** **- Limited construction costs per element were available.**

				- Data not according to the selected elements categorisation based on the "Guide to Elemental Cost Estimating & Analysis for Building Works – ASAQS/AAQS"
	Research on cost of green buildings	-Construction cost difference between green and conventional buildings -Cost comparisons conducted between green buildings and similar natured conventional buildings -Cost analysis of a green versus conventional building (per green feature)	- Difference in construction costs and general costs of a green building as compared to a traditional building, taking into consideration extra costs for green building features	**- No local information is available** **- International construction cost data is available. However it is not possible to generalise as the variations in cost fluctuates.**
Data collection (Suvey)	Construction cost data collection for three types of buildings Residential – Villa Residential – Apartment Office	- Questionnaire has been developed to gather local construction cost data	- Construction cost data from contacted stakeholders in the local construction industry	- **Low participation from stakeholders** - **Lack of responses to survey** - **Incomplete response to surveys**
Determing recommendations for the development of a construction cost observatory	Focus group	- Identification of major stakeholders in the Mauritian construction industry - First contact inititated with the different stakeholders in the Mauritian construction industry	- Setting of an institutional mechanism - Construction cost observatory. It was decided to first set up a steering committee to define the objectives for the construction cost observatory - Crowdsourcing of local construction cost data	- **Low participation from stakeholders contacted for focus group** - **Stakeholders from diferent professions do not collaborate often.** - **Overlap of responsibilites between the potential committee to be set up for the development of a construction cost observatory and the CIDB**

6 Recommendations

Establishing a construction cost data observatory is an important step to support policymaking and construction industry processes in Mauritius. The institutional mechanism will support the development and monitoring of construction cost data at national level.

Gaps have been identified and the information is limited and asymmetric. The study is limited due to these gaps. It is therefore recommended that an observatory is set up to collect rigorously the data.

With a formal observatory, data collection will potentially be more efficient.

This public knowledge resource will be of use not only for decision-makers, but also for investors, industry stakeholders, local authorities, and researchers to allow for, and underpin, decision-making, and for long-term strategic support. Better access to data will contribute to the improvement of the way the building sector is considered in economic modelling of energy efficiency policy options. Access to reliable information will also support effective decision-making in the financial sector, which is crucial specifically for buildings construction and renovation.

It is recommended that the various stakeholders work (a steering committee) in setting up the observatory. The identified stakeholders are made up of industry associations and councils.

The observatory shall allow for a central repository of information on the construction industry in Mauritius. It can start with the construction cost data.

Through this study the initial three construction types have been identified, including the breakdown of elements for a proposed taxonomy.

The observatory can gradually add new data sets, which can be collected or estimated.

The observatory shall provide a harmonised structure for data collection and reporting. This structure shall consider existing approaches for data collection at national level (such as: type of information collected, taxonomy). In addition, the consortium can decide on different approaches to tackle data collection.

Further to the construction cost data observatory, the multi-stakeholder platform is also a good start for creating stronger ties between the stakeholders.

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Appendix 1

Building types

Residential	
Single-family detached	Bungalow Central -passage House Chattel House Cottage Courtyard house Konak Log house Mansion Housebarn Split level home Upper Lusation House
Single-family attached	Duplex, semi detached/double decker Triplex/ triple decker Quadplex/quadruple Townhouse/Terraced house
Large multi-family	Apartments Flats Condos Dormitory Retirement Home Nursing home
Public	Official residence Palace
Commercial	
Office	Low-rise Mid-rise High-rise
Retail	Super-regional shopping centre Regional shopping center Community shopping center Neighborhood shopping center Strip or convenience shopping center Lifestyle center Retail outlet Pop-up retail
Hotels	Full service hotels Travelers' hotels Motel Choultry Caravanserai Extended stay hotels Boutique hotels Resort 3-Star 5-Star
Special purpose	Self-storage Car washes Theme or amusement parks Bowling alleys Marinas

	Theaters Funeral Homes
Industrial	
Manufacturing	Light manufacturing Heavy manufacturing
Warehouses/distribution	Warehouses Bulk Cold/cool/refrigerator/freezer storage High-cube Warehouse store Distribution/fulfillment centers Container terminals Truck
Flex Space	Office building Laboratory Data center Call center Showroom
Infrastructure	
Plants	Composting Desalination plant Waste transfer Power generation Power plant Thermal power plant Fossil-fuel power station Nuclear power plant Geothermal power Biomass power plant Renewable energy power station Power distribution Substation Converter hall Rotary converter plant Transmitter building Dams Pump house
Agricultural	
Agricultural	Abattoir Barn Chicken coop or chickenhouse Cow-shed Farmhouse Granary, Hórreo Greenhouse Hayloft Pigpen or sty Root cellar Shed Silo Slaughterhouse Stable Storm cellar Well house Crib Windmill Workshop
Institutional	
Medical	Hospital Nursing homes

	Mental hospital Sanatorium
Educational	Archive College Elementary schools Orphanage Secondary School School University Nursery school
Civic	Arena Library Mudhif: a traditional reed house made by the Madan people of Iraq Museum Observatory Community hall
Religious	Church Basilica Cathedral Duomo Chapel Oratory Martyrium Imambargah Monastery Mithraeum Shrine Synagogue Temple Pagoda Gurdwara Hindu temple Mosque
Government	City hall Consulate Courthouse Embassy Fire station Meeting house Moot hall Parliament house Police station Post office Assembly
Military	Arsenal Barracks Bunker Blockhouse Citadel Missile launch facility
Transport	Airport Bus station Metro (subway, underground) station Taxi station Railway station (or, primarily in US, Railroad station) Signal box Lighthouse Shipyard

	Spaceport Hovercraft Passenger terminal Boathouse Parking garage Hangar
Other	Aul Bathhouse Film studio Folly Gym Shelter

Definition of some Building categories as given by Economic Times (India)

Building category	Definition/Usage
Residential Buildings	These are buildings which are used for normal residential purposes and should facilitate activities such as sleeping, living and cooking. The building must include one or more family residencies, apartments, flats and private garages
Educational Buildings	These are buildings housing educational institutions such as schools or colleges which are affiliated and recognized by an appropriate board, university, or any similar affiliation authority. The building should promote the aggregation of instructional, educational, and recreational activities pertaining to educational purposes.
Institutional Buildings	These types of buildings consist of buildings that are constructed by the government, semi-government organizations or registered trusts for specific purposes.
Assembly Buildings	These are defined as buildings or parts of them which houses public gatherings congregated with the intent of amusement, recreation, social, religious, patriotic, civil, travel or other similar purposes.
Business Buildings	If a building or a part of it is primarily used for keeping records of business transactions, maintaining accounts, bookkeeping purposes or managing other types of records then it can be classified as a business building. Buildings under this category include offices, banks, courthouses and other professional establishments serving the aforementioned purposes.
Mercantile Buildings	In these types of buildings, either the entire building or a part of it is used for housing shops, stores or showrooms where display and sale of wholesale goods, retail goods or merchandise is carried out. Such buildings should also accommodate office, storage and service facilities essential for the business which should be located in the same building.
Industrial Buildings	Buildings used to manufacture, assemble or process products or materials are termed as industrial buildings. They include manufacturing units, assembly plants, factories, mills, power

	plants, oil refineries, gas plants, dairy plants, laboratories, etc.
Storage Buildings	If a building or a part of it is used for the storage of commodities, goods, merchandise, etc. then it is categorised as a storage building. They comprise buildings such as warehouses, cold storages, grain storage units, barns, stables, freight depot, transit shed, hangars, truck terminals, public garages, etc.
Wholesale Establishment	Buildings under this category include establishments being fully or partially utilized for wholesale trade and manufacture, wholesale shops having required storage facilities or warehouses and establishments providing truck transportation services and/or truck transportation booking services.
Mixed Land Use Buildings	These are buildings which are used for both residential purposes as well as for carrying out non-residential activities.
Detached Buildings	A building comprising roofs and walls which is detached from any other building and has open spaces within its boundaries is termed as a detached building.
Semi Detached Buildings	These are buildings which are detached from any other building on three sides and have open spaces on all those sides. (Open spaces have been defined as integral parts of the site which are left open to the sky.)
Multi storey or High rise Buildings	All buildings comprising more than 4 stories and/or buildings with height more than 15 meters (without stilt) or 17.5 meters (with stilt) above the average level of the front road have been categorized as high rise buildings.
Special Buildings	This is an all-encompassing category which includes assembly buildings, industrial buildings, wholesale establishments, hazardous buildings, hotels, hostels and buildings with central air conditioning which are more than 15 meters in height and have a built-up area of more than 600 square meters.
Multi Level Car Parking	These are buildings which are either partially below ground level and have two or more basements or above ground level with two or more floors that are principally used for parking cars, bikes, scooters and other light motorised vehicles.

Appendix 2

Template for elemental cost plan based on New Rules of Measuremet – Royal Institute of Chartered Surveyors

Cost centre	Group Element/ Element	Cost/m^2 of GIFA	Total Cost of element (Target Cost)
BUILDING WORKS			
1	**Substructure**		
1.1	Foundations		
1.2	Basement excavation		
1.3	Basement retaining walls		
1.4	Ground floor construction		
2	**Superstructure**		
2.1	Frame		
2.2	Upper floors		
2.3	Roof		
2.4	Stairs and ramps		
2.5	External walls		
2.6	Windows and external doors		
2.7	Internal walls and partitions		
2.8	Internal doors		
3	**Internal finishes**		
3.1	Wall finishes		
3.2	Floor finishes		
3.3	Ceiling finishes		
4	**Fittings, furnishings and equipment**		
4.1	General fittings, furnishings and equipment		
4.2	Special fittings, furnishings and equipment		
4.3	Internal planting		
4.4	Bird and vermin control		
5	**Services**		
5.1	Sanitary appliances		
5.2	Services equipment		
5.3	Disposal installations		
5.4	Water installations		
5.5	Heat source		
5.6	Space heating and air conditioning		
5.7	Ventilation systems		
5.8	Electrical installations		
5.9	Gas and other fuel installations		
5.10	Lift and conveyor installations		
5.11	Fire and lightning protection		
5.12	Communication, security and control systems		
5.13	Specialist installations		
5.14	Builders' work in connection with services		
6	**Complete buildings and building units**		
6.1	Prefabricated buildings		
7	**Work to existing buildings**		
7.1	Minor demolition works and alteration works		
7.2	Repairs to existing services		
7.3	Damp-proof courses/fungus and beetle eradication		

7.4	Façade retention		
7.5	Cleaning existing surfaces		
7.6	Renovation works		
8	**External works**		
8.1	Site preparation works		
8.2	Roads, paths and pavings		
8.3	Planting		
8.4	Fencing, railings and walls		
8.5	Site/street furniture and equipment		
8.6	External drainage		
8.7	External services		
8.8	Minor building works and ancillary buildings		
9	**Facilitating works**		
9.1	Toxic/hazardous material removal		
9.2	Major demolition works		
9.3	Specialist groundworks		
9.4	Temporary diversion works		
9.5	Extraordinary site investigation works		
SUB-TOTAL: BUILDING WORKS			
10	**Main contractor's preliminaries**		
10.1	Employer's requirements		
10.2	Main contractor's cost items		
SUB-TOTAL: BUILDING WORKS (including main contractor's preliminaries)			
11	**Main contractor's overheads and profit**		
11.1	Main contractor's overheads		
11.2	Main contractor's profit		
TOTAL: BUILDING WORKS ESTIMATE (A)			
PROJECT/DESIGN TEAM FEES AND OTHER DEVELOPMENT/PROJECT			
12	**Project/design team fees**		
12.1	Consultants' fees		
12.2	Main contractor's pre-construction fees		
12.3	Main contractor's design fees		
13	**Other development/project costs**		
TOTAL: PROJECT/DESIGN TEAM FEES AND OTHER DEVELOPMENT/PROJECT COSTS ESTIMATE (B)			
BASE COST ESTIMATE (C) [C=A+B]			
14	**Risks**		
14.1	Design development risks		
14.2	Construction risks		
14.3	Employer change risks		
14.4	Employer other risks		
TOTAL: RISK ALLOWANCE ESTIMATE (D)			
COST LIMIT (excluding inflation) (E)[E=C+D]			
15	**Inflation**		
15.1	Tender inflation		
15.2	Construction inflation		
TOTAL: INFLATION ALLOWANCE (F)			
COST LIMIT (excluding VAT assessment) (G) [G=E+F]			
16	VAT ASSESSMENT		

Appendix 3

Guide to elemental cost estimating & analysis for building works 2016 - list of sections, elements, and components (Association of South African Quantity Surveyors)

SECTION	ELEMENTS	COMPONENTS
Primary elements	Substructure	Un-reinforced strip footings Reinforced strip footings Ground beams Column bases and pile caps Lift shaft bases Columns Brick and block walls Concrete walls Plinth finishes Rock, etc excavation Sundries
	Ground floor	Solid floors Insulation Suspended floors Steps Ramps Service ducts, trenches, etc Pits and bases Sub-surface drains Catch pits, sumps, etc Pumps
	Structural frame	Slabs Precast / composite decking systems Ramps Staircases and fire escapes Columns Beams Portal frames Space frames Steel frames Timber frames
	External facade	Brick and block walls Concrete walls Pre-fabricated composite walls Waterproofing, drainage, etc Cladding Finishes Curtain walls Shop fronts and similar glazed screens Windows Sun control Grilles, screens, louvres, etc Doors Special doors
	Roofs	Construction Coverings

		Glazed roofs Roof, lantern, skylights and openings Dormers, hatches, etc Waterproofing Insulation Trafficable surfaces Eaves Verges Rain water drainage Ventilators and cowls Chimneys
	Internal divisions	Brick and block walls Concrete walls Shop fronts and similar glazed screens Borrowed lights Hatches and access doors Screens, etc Doors Special doors
	Partitions	Office partitions Toilet partitions Doors
	Floor finishes	Applied floor finishes Suspended floor finishes Raised access floors Stair and ramp floor finishes Skirtings, etc
	Internal wall finishes	Finishes Rails, corner protectors, etc
	Ceiling finishes	Slab soffit finishes Nailed-up ceilings Suspended ceilings Bulkheads Cornices, etc Access panels, trapdoors, grilles, etc.
	Fittings	Built-in cupboards Cupboards fixed to walls Pigeon hole fittings, mail boxes, etc Room dividers White, chalk, etc boards Pinning, bulletin, etc boards Building directories Raised platforms Counters Kitchen floor and wall cupboards Worktops, benches, vanities, etc Shelving Seating benches Lockers Telephone enclosures Tables Lecterns, etc Miscellaneous
	Electrical installation	Main switchboard, etc Circuit wiring Luminaires Emergency lighting Special light fittings Builder’s work Profit and attendance

	Plumbing	Sanitary fittings Pods Sanitary fitting sundries Plumbing Duct covers Cold water supplies Hot water supplies Steam and condensate distribution Geysers Boilers Solar heating Heat pumps Water storage tanks Booster pumps Grey water systems Builder's work Profit and attendance
	Fire protection	Fire stop Fire resistant paint, etc Extinguishers Hose reels Hydrants, pedestals, etc. Water supply Water storage tanks Booster pumps Builder's work Profit and attendance
	Balustrading, handrails, etc	Balustrade walls Parapet walls Steel handrails Timber handrails Steel balustrading Timber balustrading Glazed balustrading
	Miscellaneous items	Catwalks, ladders, etc Bollards Other
Specialist installations	Special foundations	Sheet piling Driven piles Cast in-situ piles Augured piles Vibro-compacted columns Establishment, etc Pile testing, etc Caissons Raft foundations Underpinning, etc Shoring Dewatering Builder's work Profit and attendance
	Special fire protection systems	Sprinklers Fire detection and alarm Building evacuation Foam generating Fire suppression Smoke ventilation / control Builder's work Profit and attendance
	Conveyance systems	Passenger lifts

		Freight lifts Car lifts Wheel chair lifts Hoists Dumbwaiters Pneumatic tubes Chutes Turntables Transportation systems Funiculars Escalators Travelators Conveyors Builder's work Profit and attendance
	Air conditioning	Energy supply Heat generating systems Chillers Cooling towers, etc Piping and fittings, etc Supply and return air systems Ventilation and exhaust systems Steam, hot water, etc distribution Heat recovery equipment Air conditioning units Reverse-cycle, etc terminal heat pumps Self-contained air conditioners, etc Testing and balancing Other systems and equipment Builder's work Profit and attendance
	Ventilation	Ventilation Builder's work Profit and attendance
	Heating and cooling	Heat generating systems Cooling generating systems Builder's work Profit and attendance
	Special electrical systems	Uninterrupted power supply Clean power supply Power factor correction Lightning and grounding protection Power generating Other special electrical systems Builder's work Profit and attendance
	Electronic systems	Building management Voice data Television Other electronic systems Builder's work Profit and attendance
	Other services	Gas installation Other services Builder's work Profit and attendance
	Communications and security	Public address and music systems Inter-communication and paging systems Telephone systems Call systems Closed circuit television systems

		Local area network systems Clock and programme systems Fire alarm systems Security and detection systems Turnstiles Builder's work Profit and attendance
	Signage	Building signage Signage pylons, towers, etc Directional, identification, safety, etc Flagpoles Builder's work Profit and attendance
	Artwork, furnishings, etc	Artwork Cabinetry, etc TV arms, brackets, etc. Window treatment Hospital curtain tracks, drip rails, etc Floor mats, etc Multiple seating Interior landscaping Interior seating benches, rubbish bins,etc Builder's work Profit and attendance
	Miscellaneous items	Fireplaces, etc Saunas Jacuzzis Other Builder's work Profit and attendance
Equipment	Commercial	Security and vault Teller and service Registration Checkroom Trading Commercial laundry and dry cleaning Vending Office Builder's work Profit and attendance
	Institutional	Ecclesiastical Library Theatre and stage Instrumental Audio-visual Detention Research Medical Mortuary Builder's work Profit and attendance
	Vehicular	Vehicular service Parking control Loading dock Builder's work Profit and attendance
	Other	Maintenance Façade cleaning Solid waste handling Food storage service

		Domestic appliances Security Commercial kitchen Cold rooms Darkroom, etc Athletic, recreational, playground and Therapeutic Planetarium Observatory Agricultural Builder's work Profit and attendance
Tenant installations	Tenant installations	Tenant installations allowances
Alterations	Alterations	Temporary barriers, screens, etc Removal of existing work Cutting through floors and ceilings Building up openings Preparatory work to existing surfaces Making good of finishes, etc Openings through existing walls, etc Cleaning existing surfaces Protective coatings to existing surfaces
External works and services	Demolitions	Buildings Relocation of buildings and utilities Breaking up and removing Taking down and removing Toxic / hazardous building materials and components
	Site clearance	Site clearing and grubbing Contaminated land Trees Hedges, fences, etc
	Earthworks	Grading and excavation Rock, etc excavation Filling Soil stabilization Basement excavation Lateral support Dewatering Sundries
	Soil drainage	Soil drains Laboratory and industrial liquid waste drainage Manholes, inspection chambers, etc Pump stations Waste water treatment plants Septic tanks, etc
	Sub-surface water drainage	Sub-surface drains Catch pits, inspection chambers, sumps, etc Pumps, etc
	Storm water drainage	Surface water channelling Piping Ditches and culverts Rain water harvesting Retention ponds Manholes, catch pits, inspection, chambers, sumps, etc Pumps
	Water supply	Potable incoming main Potable site reticulation

		Non-potable site reticulation Chilled water reticulation Steam and condensate distribution Storage tanks Well systems, boreholes, etc
	Fire service	Incoming main Site reticulation Twin booster connections Hydrants, pedestals, etc
	Electrical installation	Electrification Incoming main Site reticulation Site communications and security Substations and transformers Emergency power generating Photovoltaic / wind generation Fuel tanks Street, bollard, etc lighting Floodlighting Builder's work Profit and attendance
	Gas and fuel	Storage and distribution
	Connection fees, etc	Soil drainage Storm water drainage Water supply Fire service Electrical installation Gas and fuel
	Boundary, screen, retaining walls, etc	Boundary walls Screen walls Retaining walls Terrace and perimeter walls Doors Gates
	Fences and railings	Fences Railings Gates
	Roads, paving, etc	Roads Parking areas Paving Steps and ramps Bridges Kerbs and gutters Bollards Rails and barriers Painted lines, markings and signage
	Covered parking, walkways, etc	Covered parking Covered walkways
	Decks, etc.	Timber Steel
	Pergolas, canopies, etc	Pergolas Canopies
	Minor construction work	Minor construction work
	Pools, etc	Swimming pools, etc Decorative fountains and water courses Change rooms, etc
	Sports facilities	Playing fields Spectator seating, stands, etc Change rooms, etc

	Garden works	Landscaping Irrigation systems
	Miscellaneous items	Site / street furniture and equipment Other
Preliminaries	Preliminaries	Preliminaries
Contingency allowances	Price and detail development contingency Construction contingency	Price and detail development contingency Construction contingency
Escalation	Pre-tender Contract	Pre-tender Contract
Tax	Value added tax Sales tax	Value added tax Sales tax

Appendix 4

Construction cost groups as per the Code of measurement for cost planning – European Council of Construction Economists (CEEC)

Category	Groups	Definition
Construction costs and fees	1. Substructure	All building work up to the structural upper surface of the lowest floor slab including basement excavation and filling, pumping, supports to sides of excavation, foundations, walls below lowest floor slab, excluding drainage (see cost groups 05 and 09). Note: Where the cost of the basement walls cannot be separated from the substructure they should be included here. Note Where cost of drainage under the building cannot be separated from the substructure it should be included here)
	2. External superstructure/envelope	The building envelope above the substructure including roofs (together with associated beams, balustrades and the like), external walls (together with associated columns and beams), external windows (with external sun protection), external doors and external finishes but excluding internal finishes. Solar/rain screening and facade access/cleaning systems. Note: Where the costs of suspended or cantilevered balconies, or framed members (columns and beams) to external structures cannot be identified separately they should be included in group 03. Note: Where the cost of the basement walls cannot be separated from the substructure they should be included in group 01.
	3. Internal superstructure	All remaining superstructure including suspended floors and balconies (together with any associated columns and beams, topping concrete and the like), stairs, internal walls and partitions, internal columns and beams, internal windows and doors, internal screens, balustrades and handrails but excluding internal finishes. Note: On refurbishment contracts include general stripping out of partitions, ceilings, finishes, fittings. etc. where these cannot be allocated to separate elements. Note: Where the costs of suspended or cantilevered balconies, or framed members to external structures cannot be identified separately they should be included here. Note: Where the cost of internal partitions cannot be separated from the finishes they should be included in group 04.

Category	Groups	Definition
	4. Internal finishings	Internal floor, wall and ceiling finishes including screeds, raised floors, internal panelling and cladding, suspended ceilings, decoration and finishes to balconies. Note: Where the cost of internal partitions cannot be separated from the finishes they should be included here.
	5. Services installations	Mechanical, electrical and public health installations including heating, cooling, ventilation and sanitary installations, lift and conveyor, power, lighting, energy production systems, telecommunication data and IT installations, fire and security systems, building management systems and the appropriate control systems and commissioning.
	6. Special equipment and installations	Special mechanical and electrical installations in relation to the use of the building including fixed and mobile equipment, production installations, professional kitchen equipment, cold stores and refrigeration, and the appropriate commissioning.
	7. Furniture and fittings	Fixed and mobile furniture and fittings including cupboards, gymnasium equipment, signage, curtains, loose carpets, consumable stores and artwork.
	8. Prefabricated buildings, building units and pods	Prefabricated volumetric and flat pack buildings, units and rooms, the cost of which cannot be allocated to groups 01 to 07. Includes complete buildings, building units (e.g. boiler rooms, hotel rooms, medical theatre suites) and rooms (e.g. bathroom pods).
	9. Site and external works	Work to site outside of buildings including, external services and service connections, drainage, external lighting, paving, soft landscaping and planting, walls and fencing and minor buildings and civil engineering works.
	10. Site preparation	Work to provide a clear site for construction works including demolition, decontamination, temporary support to adjacent structures. General site dewatering, soil stabilisation, gas venting etc. Archaeological investigation, biodiversity measures. Site clearance and preparatory groundworks to form new contours.
	11. Construction site overheads and management (Preliminaries)	General site installations and temporary works which are not incorporated in the appropriate Cost Groups including cranes, temporary Site accommodation, scaffolding, setting out, drying out, cleaning work, site security, health and safety measures, temporary enclosures, temporary works, contractors' on-site management and contractors' risk, insurance bonds and guarantees. Note: Include contractor's general overheads and

Category	Groups	Definition
		profit where these are shown separately. Note: Where site management is commissioned separately from construction it should be included in group 12.
	12. Design and project team fees	Fees for design and project delivery including those for architect, structural, mechanical and electrical engineers, other designers, (including contractors design fees), construction economists, quantity surveyors, project managers, town and country planners, employers agent, surveyors, project health and safety advisors, environmental impact advisors and specialist planners, but excluding legal fees. includes the cost of client's Building Information Model. Note: Where site management is commissioned separately from construction it should be included here, where it is part of the contractor's construction cost it should be included in group 11.
	13. Taxes on construction costs and Fees	Value added tax and any other taxes on construction costs and Fees.
Incidental costs	14. Ancillary costs and charges	General incidental costs to the client including the costs of physical models, documentation, copies and drawings, laying of foundation stone, topping out, inauguration, competitions, permits, planning, connections for utilities, insurances, third party compensation, client's involvement, legal fees in association with construction, compensation payments due to statuary requirements, defects insurance, marketing costs, etc.
	15. Project budget risk allowances (contingencies)	Contingency allowances included in the budget for risk items such as design development risk, construction risk, employer's change risk and inflation (excluding contractors inflation risk),
	16. Taxes on incidental costs	Value added tax and any other taxes on incidental costs
Costs in use	17. Maintenance	Costs in use for major replacements, minor replacements, repairs, maintenance, servicing of mechanical and electrical services and redecoration
	18. Operation	Cost in use for cleaning, water, energy, waste disposal, insurance, inspection, administration, property management and caretaking.
	19. End of life	Cost of sale or other disposal of property, including decommissioning, disposal inspections, reinstatement to meet contractual requirements, demolition.
	20. Taxes on cost in use	Value added tax and any other taxes on costs in use.
Site acquisition	21. Site acquisition costs	Cost of site including all cost associated with the acquisition, purchase or lease of the site and legal fees.

Category	Groups	Definition
	22. Taxes on site acquisition	All taxes in association with site acquisition
Project funding	23. Finance	The cost to the client of finance including interest on loans, bank charges and mortgage costs.
	24. Grants and subsidies	Any financial grants and contributions payable to the project.
	25. Taxes on project funding	All taxes in association with project funding and finance

Appendix 5

Major stakeholders constituting the construction industry in Mauritius

Through the situational analysis, it was determined that the list of stakeholders in section 3.2. constitute the construction industry in Mauritius. More details about each organisation/council can be found below. The list is non-exhaustive.

Professional Associations

i. Building and Civil Engineering Contractors Association (BACECA)

The BACECA is a Trade Union of contractors officially registered in 1996. Its main objective is to promote, protect and defend the interests of its members. As of January 2018, the association consisted of 12 members. All of its members are registered with the Construction Industry Development Board (CIDB): 8 Grade A, 3 Grade B, and 1 Grade (Mauritius Finance, 2018).

ii. Green Building Council Mauritius (GBCM)

GBCM forms part of the World Green Building Council and a part of the rapidly growing African network of Green Building Councils. GBCM is uniting the Mauritius building using sustainability as a catalyst to positively transform the places people work, live, play, and learn. Some of the objectives of GBCM are listed below:

- Promote the construction and use of buildings and other infrastructure that are environmentally responsible, sustainable, profitable, and healthy places to live and work
- Foster and a closer association between people in the building industry and other sectors who are involved in the construction, use, and promotion of environmentally responsible buildings
- To be Mauritius's principal coalition of leaders from the building industry involved in promoting environmentally responsible buildings (GBCM, 2017)

iii. Professional Quantity Surveyor's Council (PQSC)

PQSC was established as an objective of the Professional Quantity Surveyors' Bill (the act was proclaimed on 16th September 2013). Objectives of the council include to:

- Register professional quantity surveyors and publish an annual list of thereof
- Ensure that a firm of quantity surveyors (local or foreign) complies with the Act
- Exercise and maintain discipline in the profession of quantity surveyors, with the assistance and support of such Professional Conduct Committee as may be set up
- Be responsible for the updating of professional knowledge and skills in the field of quantity surveying by means of continuous professional development programmes
- Be responsible for advancement in the field of quantity surveying (PQSC, nd)

iv. Professional Architect Council (PAC)

The council is responsible for informing, educating, regulating, and developing the state of Architecture in Mauritius (Professional Architects Council Mauritius, nd).

v. Construction Industry Development Board (CIDB)

CIDB is a statutory body established under the CIDB Act of 2008. Its overriding objective is to promote the development and improvement of the construction industry. CIDB operates under the aegis of the Ministry of National Infrastructure and Community Development. It is governed by a council comprising 12 members including the chairperson.

One of the core activities of CIDB is the registration of consultants and contractors. The vision of the board is to be a global reference in construction. Its mission includes regulating and facilitating an efficient and effective construction industry (CIBD, nd).

vi. Association of Consulting Engineers, Mauritius (ACE)

The association was founded in 2013. Consulting engineers are essential professionals in the construction industry. They ensure that all projects meet all standards, both local and international (Investor's mag, 2019).

vii. The Mauritius Association of Quantity Surveyors (MAQS)

MAQS was created in 1998 to meet a long-felt need for a distinctive grouping representing one key profession in the construction industry. As a dynamic player in the industry, the MAQS interacts with other professional bodies and is involved in government policy decisions through representation in various government bodies. MAQS is also strongly attached to interaction with organisations related to the profession at regional and international level (MAQS, nd).

viii. Institute of Electrical and Electronics Engineers (IEEE Mauritius)

IEEE is one of the leading global organisations in developing technology standards and publishing almost 1/3rd of global technology journals supporting many industries and professions. IEEE is considered as the trusted "voice" for engineering, computing, and technology information around the globe.

The Mauritius section has over 85 members hailing from academia and industry. Since 2011, the set and ambitious programme to improve the well-being of the Mauritian society through the application of technology, science, and engineering knowledge (IEEE Mauritius Section, 2022).

ix. Mauritian Association of Architects (MAA)

MAA is an association in Mauritius which gathers and represents local architects, trainee architects and architectural students (Mauritian Association of Architects, nd).

x. Royal Institute of Chartered Surveyors (RICS Mauritius)

RICS Mauritius forms part of the globally recognised professional body RICS. Through their global standards, leading professional progression and data and insight, RICS promotes and enforces professional standards in the development and management of land, real estate, construction and infrastructure (RICS, 2022).

PROFESSIONAL QUANTITY SURVEYORS

xi. Etwaro & Associates Ltd
xii. Hoolooman & Associates Ltd
xiii. Ong Seng Goburdhun & Partners Ltd
xiv. V. D'Unienville & Associates Co Ltd
xv. Milestone Construction Consultant Ltd
xvi. Chuttur & Partners Ltd
xvii. Geerish Sonah Consultant Ltd
xviii. NP Jeetun Chartered Valuation Surveyors
xix. J Nundalalee & Associates Co Ltd
xx. Kims Consulting Engineers
xxi. Jeetah Consulting Ltd

CONTRACTOR

xxii. Gamma Construction Ltd

Gamma Construction Ltd ("GCON") is a wholly-owned subsidiary of Gamma-Civic Ltd. GCON is broadly segregated into a buildings division, a civils division, an asphalt division, and a plant division. The company has sound knowledge and experience of the industry and strong local partnerships. Its main operating activities in Mauritius are:

- Construction of residential, commercial, and industrial buildings
- Construction of new roads, drains and rehabilitation of existing road networks including civil works, hiring of plant and equipment, mainly for own contracts
- Production and sales of asphalt, principally for utilisation of GCON's own projects (Gamma, nd)

Appendix 6

Questionnaire for construction cost observatory

Response from the questionnaires were obtained from the following firms

Gamma Construction Ltd
Etwaro and associates
Hoolooman and associates
GLM Cost Surveying Ltd

Project Brief

Dear colleagues,

Through the green finance label SUNREF (Sustainable Use of Natural Resources and Energy Finance), the "Agence Française de Développement" supports the energy and environmental transition in nearly 30 developing countries. The scheme helps private actors seize the opportunities linked to green growth and make their projects a reality while encouraging local partner banks to finance them. Business Mauritius is responsible for the SUNREF technical assistance.

AFD has commissioned a study to generate data to have better references in analysing construction costs. The project further consists of the setting up of a National Construction Cost Observatory.

In turn, the study results and the setting up of a National Construction Cost Observatory will allow AFD to better evaluate projects and channel green finance to the construction industry. As climate finance and sustainability finance increase, the availability of information to link these financial instruments to a construction project is critical.

We count on you to anonymously contribute in enriching the datasets on construction costs. The report will be public after completion. We will consult you on how best to set up the observatory shortly.

We are currently collecting only for three types of projects, as discussed with various stakeholders at our meeting on 17 May 2022. They are:

1. Office
2. Villa (residential)
3. Apartment (residential)

Please use additional sheets for additional projects. You can add information by any level of details you have. It can be total amounts or detailed amounts. The more detailed, the richer will be the datasets.

Once you complete the survey, please send the document back to the following email addresses: saheel@ecosisltd.org and huguette@ecosisltd.com.

We would appreciate getting the filled questionnaire back by **Thursday 26th May 2022**. Please feel free to ask questions regarding the survey – Saheel or Huguette on +230 4640455/4660055, or at one of the email addresses mentioned above.

Thank you for your valuable time. We look forward to your contribution.

Sincerely,
Saheel Sewtohul
Ecosis (Mtius) Ltd

Questionnaire- Construction Cost Observatory

Building Category (residential or office)	
Site Area	
Gross floor area (based on SAPOA)	
Year built	

Green building features (if any)

	Elements	Element QTY	Element Unit	Element total cost	Cost/per qty
A	**Preliminaries**				
1	*Preliminaries*				
B	**Substructure**				
2	*Piling*				
3	*Foundations*				
4	*Basement*				
C	**Superstructure**				
5	*Ground Floor Construction*				
6	*Structural frame*				
7	*External Envelope*				
8	*Roof*				
9	*Upper floors (load bearing structures only)*				
10	*Internal Division*				

D.	**Internal Finishes**				
11	*Floor finishes*				
12	*Internal Wall finishes*				
13	*Ceilings*				
E.	**Fittings**				
14	*Fittings*				
F.	**Services**				
15	*Electrical Installation*				
16	*Plumbing Installation*				
17	*Fire Protection*				
18	*Lifts and Escalators*				
19	Air conditioning and Ventilation				
20	*Special services and equipment*				
G.	**External Works**				
21	*Soil Drainage*				
22	*Stormwater Drainage*				
23	*External Works*				
24	*Alterations*				
H.	**Contingencies**				
25	*Contingencies*				
26	*Fluctuation Provisions*				
I.	**Total**				

Appendix 7

Indicative rates for construction works

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
A	Site Clearance and Earthworks			
1	Clear site of vegetation and dispose off-site	m²	50	55
2	Prepare and apply approved weedkillers prior to excavation	m²	65	70
3	Cut down trees (girth over 500mm) and cart away from site	no.	7,300	33,900
4	Excavate topsoil (150mm or 200mm deep) and deposit in temporary spoil heaps	m²	30	40
5	Excavate in bulk starting from stripped level and deposit in temporary spoil heaps	m³	320	670
6	Temporary support to face(s) of excavation (for depth up to 6000mm)	m²	270	390
7	Allow for removal and disposal of ground water by pumping, bailing or other means (24-hour operation)	day	4,450	4,650
8	Disposal of excavated material off site	m³	N/A	265
9	Backfilling with selected fill obtained from spoil heaps	m³	200	235
10	Imported soil fill	m³	700	765
11	Imported hardcore/Crushed stone filling	m³	950	2,350
12	Anti-termite treatment	m²	N/A	30

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
13	UV resistant plastic sheeting 250 microns with dual function as damp proof membrane and anti-termite physico-chemical barrier	m²	N/A	175
14	Non-woven geotextile membrane laid in trenches/pits	m²	90	110
15	Allow for temporary support to existing structures not exceeding 2000mm high	m	550	645
16	Excavate preliminary trench starting from stripped level and deposit in temporary spoil heaps	m³	290	730
B	Concrete Works and Blockwalling			
1	Site-mixed plain concrete			
	Grade 15 (blinding layer 50mm or 75mm thick)	m³	5,250	5,770
	Grade 20	m³	4,600	5,250
2	Pre-mixed plain concrete			
	Grade 15 (blinding layer 50mm or 75mm thick)	m³	6,000	6,100
	Grade 20	m³	5,270	5,450
3	Site-mixed reinforced concrete			
	Grade 25	m³	4,740	5,450
	Grade 30	m³	4,900	5,620
4	Pre-mixed reinforced concrete			
	Grade 25	m³	5,200	5,500
	Grade 30	m³	5,400	5,630
	Grade 35	m³	5,600	5,820
5	Formwork for in-situ concrete			
	Class 3 finish	m²	500	645
	Class 2 finish	m²	635	1,190
	Class 1 finish	m²	680	1,330
6	Mild steel reinforcement of diameter 6mm for in-situ concrete, generally cut and bent to shapes and profiles. Rate includes for tying wire, steel chairs, spacer, waste, etc.	kg	55	80

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
7	High tensile reinforcement (diameter ranging from 8mm to 32 mm) for in-situ concrete, generally cut and bent to shapes and profiles. Rate includes for tying wire, steel chairs, spacer, waste, etc.	kg	50	70
8	Mesh reinforcement for in-situ concrete, including all necessary chairs, waste cutting, overlapping and tying with stout gauge mild steel tying wire.			
	ref. A98 (1.54kg/m²)	m²	160	190
	ref. A142 (2.22kg/m²)	m²	195	225
	ref. A193 (3.02kg/m²)	m²	250	310
	ref. A252 (3.95kg/m²)	m²	300	350
	ref. A393 (6.16kg/m²)	m²	445	515
9	Polystyrene 25mm thick as expansion joint filler in in-situ concrete	m²	270	280
10	Polystyrene 12.5mm thick as isolation joint filler in in-situ concrete	m²	220	230
11	Deep saw cut joints 8mm x 40mm in floor slab and filling with polysulphide sealant	m	420	425
12	Supply and fix water bar	m	N/A	420
13	Allow for dowelling of new reinforcement bar to existing concrete element.	no.	90	190
14	Hollow concrete blockwalling laid with cement and sand mortar			
	Walls; 100mm thick	m²	610	735
	Walls; 150mm thick	m²	655	800
	Walls; 200mm thick	m²	740	900
15	Infilled hollow concrete blockwalling laid with cement and sand mortar with voids filled with concrete Grade 20N/mm²			
	Walls; 150mm thick	m²	990	1,175
	Walls; 200mm thick	m²	1,250	1,460

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
16	Infilled reinforced hollow concrete blockwalling laid with cement and sand mortar with high tensile reinforcement bar fixed vertically and filled with concrete Grade 20N/mm²			
	Walls; 150mm thick	m²	1,135	1,380
	Walls; 200mm thick	m²	1,400	1,680
C	Plastering			
1	Cement and sand (1:4) render mixed with an approved plasticiser laid on concrete or blockwall surfaces.			
	12mm thick to walls internally with sponge finish	m²	315	395
	12mm thick to reveals of openings with sponge finish	m²	350	445
	12mm thick to walls finished to receive tiles	m²	290	365
	20mm thick to walls externally in two coats with sponge finish	m²	500	620
	12mm render to soffit of suspended slab	m²	440	590
D	Waterproofing Works			
1	Bituminous waterproofing membrane with pebble finish	m²	N/A	525
2	Cold applied liquid waterproofing for roof coatings.	m²	N/A	705
E	Openings			
1	Powder coated aluminium windows			
	Window overall size 600 x 600mm	no.	N/A	4,000
	Window overall size 1200 x 1200mm	no.	N/A	10,000
	Window overall size 1500 x 1500mm	no.	N/A	13,500
2	Powder coated aluminium doors			
	Single leaf glazed door overall size 900 x 2100mm	no.	N/A	13,000
	Double leaf glazed door overall size 1800 x 2100mm	no.	N/A	24,500
3	Solid timber doors			
	Single leaf door overall size 900 x 2100mm	no.	N/A	31,500
	Double leaf door overall size 1800 x 2100mm	no.	N/A	50,500
4	Semi-solid timber doors			
	Single leaf door overall size 900 x 2100mm	no.	N/A	11,000

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
	Double leaf door overall size 1800 x 2100mm	no.	N/A	18,000
F	Flooring and Tiling Works			
1	Screed (ranging from 25mm to 45mm thick) laid on concrete floor and with smooth trowelled finish	m²	400	485
2	Screed (ranging from 20mm to 40mm thick) laid on concrete floor and finished to receive ceramic tiles	m²	375	465
3	Supply and lay ceramic tiles (assumed supply rate of Rs 500/m²) with adhesive.	m²	1,115	1,225
G	Painting Works			
1	Prepare and apply one undercoat and two finishing coats of paint on walls, beams, and the like	m²	N/A	130
H	Plumbing and Sanitary Appliances			
1	Supply and fix the following sanitary appliances complete with pipes, fittings, etc.			
	W.C. suite (supply rate Rs 5,000/set)	no.	7,500	7,700
	Wash hand basin (supply rate Rs 7,500/set)	no.	9,550	10,000
	Urinal (supply rate Rs 4,000/set)	no.	5,340	5,600
	Stainless steel sink (Rs 4,500/set)	no.	5,360	7,000
	Shower tray (Rs 6,000/set)	no.	8,000	8,500
	Bath tub (Rs 20,000/set)	no.	25,000	35,000
	Shower screen	no.	13,000	25,000
2	Supply and fix sanitary accessories such as floor drain, toilet paper holder, soap holder, soap dispenser, towel rail, hand dryer and mirror.	sum	15,000	N/A
I	Drainage Works			
1	Rocksand 0-6mm (laid and compacted in layers) in bed and surround to pipe, septic tank and grease trap	m³	2,250	2,350

SN	Description of Work Items	Unit	Work Items (Range of Rates) (MUR)	
			From	To
2	Aggregate 31.5-50mm (laid and compacted in layers) in trenches	m^3	1,430	1,475
3	Hardcore/crushed stone filling laid and compacted in layers to make levels in leaching field/soakaway			
	Hardstones not exceeding 100mm size	m^3	1,000	1,100
	Crusher run size 0-32mm	m^3	2,200	2,245
4	Supply and fix heavy-duty cast-iron manhole cover and frame			
	600 x 600mm cover to manhole	No.	8,100	8,200
	450 x 450mm cover to catchpit	No.	4,500	4,625
5	Supply and fix metal grating and frame - 300 x 500mm cover to catchpit	No.	3,820	3,950

Appendix 8

Construction, material, and MEP cost details

PLINTH AREA RATES AS ON 01.04.2019				ANNEXURE – 1
Sl. No.	**Description**	**Non-Residential Buildings**		**Residential Buildings**
		Office/School /College	**Hospital**	**Hostels/Quarters (Type- I to Type-VI Qtrs.) & Bunglows (Type-VII & VIII)**
		(Rates in Rupees (MUR) Per Sqm.)		
1.0	**BUILDING COST (Specifications as per Annexure-II)**			
1.1	**RCC FRAMED STRUCTURE (Upto Six Storeys)**			
1.1.1	Floor ht. 3.60 m.	14535	15276	-
1.1.2	Floor ht. 2.90 m.	-	-	11115
1.2	**LOAD BEARING STRUCTURE (Upto Four Storeys)**			
1.2.1	Floor ht. 3.60 m.	12369	12996	
1.2.2	Floor ht. 2.90 m.	-	-	9462
1.3	**EXTRA FOR**			
1.3.1	Extra for every additional storey over six storeys upto twelve storeys (For RCC Framed Structure only)	331		
1.3.2	Every 0.3 m. additional/lesser height of floor above	191		
1.3.3	Every 0.3 m. higher plinth over normal plinth height of 0.45 m. (on G.F. area only)	191		
1.3.4	Every 0.30 m. deeper foundations over normal depth of 1.20 m. (on G.F. area only)	91		
1.3.5	Making stronger foundations to take load of one additional floor at a later date (on area of additional floor only)	838 (For RCC framed structures only)		314 (For load bearing structures only)
1.3.6	Resisting Earthquake forces	684 (For RCC framed structures only)		456 (For load bearing structures only)
1.3.7	R.C.C. Raft foundations (Ground floor only)	2936		
1.3.8	Pile foundation (On ground floor area only)	9462		
1.3.9	Stronger structural members to take heavy load above 500 Kgs./sqm. upto 1000 Kgs./Sqm.	946		
1.4	**BASEMENT FLOOR**			
1.4.1	Floor ht. upto 3.35 m. with Kota Stones/HDPE membrance i/c integral crystalline water proofing.	17100		
1.4.2	Add or deduct for every 0.30 m. height against normal height of 3.35 m.	513		
1.5	**FIRE FIGHTING**			
1.5.1	With wet riser system	456		
1.5.2	With wet riser and sprinkler system	684		
Sl. No.	**Description**	**Non-Residential Buildings**		**Residential Buildings**

		Office/School /College	Hospital	Hostels/Quarters (Type- I to Type-VI Qtrs.) & Bunglows (Type-VII & VIII)
		(Rates in Rupees (MUR) Per Sqm.)		
1.6	**FIRE ALARM SYSTEM**			
1.6.1	Manual Fire Alarm System	143		
1.6.2	Automatic Fire Alarm System	342		
1.7	Pressurized mechanical ventilation system in the basements with Supply duct of exhaust blowers (on basement area only)	599 (For RCC frame structures only)		
1.8	**STILT PORTION**			
1.8.1	Stilt Portion of Multistorey RCC framed structure (up to ht. of 3.60m) Applicable area only	4560		
1.8.2	Every 0.30 m. additional height (above 3.60 m.)	114		

Note :- 1) The rates for items are applicable on entire plinth area except items no. 1.3.3, 1.3.4, 1.3.5, 1.3.7, 1.3.8, 1.5.1, 1.5.2, 1.6.1, 1.6.2, 1.7, 1.8.1, 1.8.2.

2) The rates mentioned above are inclusive of all taxes, but excluding statutory provisions.

		Non-Residential Buildings			Residential Buildings	
Sl. No.	**Description**	**Office & College**	**Hospitals**	**Schools**	**Hostels**	**(Type- I to Type-VIII Qtrs.)**
2.0	**SERVICES**					
2.1	Internal Water Supply & Sanitary Installations	4%	10%	5%	12% with attached toilets, 8% with common toilets.	9%
2.2	External Service connections					
2.2.1	Electrical External Service Connections	3.75%	3.75%	3.75%	3.75%	3.75%
2.2.2	Civil External Service Connections	1.25%	1.25%	1.25%	1.25%	1.25%
2.3	Internal electric installations	12.5%	12.5%	12.5%	12.5%	12.5%
2.6	**EXTRA FOR**					
2.6.1	Power wiring and plugs	4%	4%	4%	4%	4%
2.6.2	Central Call bell system	0.5%	0.5%	0.5%	0.5%	-
2.6.3	Lightning conductors	0.25%	0.25%	0.25%	0.25%	-
2.6.4	Telephone conduits	0.25%	0.25%	0.25%	0.25%	-
2.6.5	Centralized Intercom system	-	-	-	-	1%
2.6.6	Third Party Quality Assurance	1%	1%	1%	1%	1%

Note:-
1. Third Party Quality Assurance charge of 1% shall be taken in estimate only when client department request for TPI.
2. For modular furniture to be provided in offices etc. extra provision for raceways, conducting and LAN shall be made as per requirement.
3. LED fitting/fixtures are inclusive in Internal Electrical Installation rates. No separate provision shall be made.
4. Percentage mentioned above means the percentage of building cost as per item 1.1/1.2.

Sl. No.	Type of lift	Capacity/ Persons	Weight	Speed in M/Sec.	Travel	Doors	Control	Price (MUR)	Addl. Price for each additional floor (MUR)
1	2	3	4	5	6	7	8	9	10
3.0	**LIFTS**								
3.1	**Passenger lifts**								
3.1.1	Passenger lift	8	544 Kg.	1.0	G+4	Power operated	ACV VVF	1600000	51,300
3.1.2	Passenger lift	8	544 Kg.	1.5	G+5	Power operated	ACV VVF	1800000	51,300
3.1.3	Passenger lift	13	884 Kg.	1.0	G+4	Power operated	ACV VVF	1800000	51,300
3.1.4	Passenger lift	13	884 Kg.	1.5	G+5	Power operated	ACV VVF	2000000	51,300
3.1.5	Passenger lift	16	1088 Kg.	1.0	G+4	Power operated	ACV VVF	2400000	62,700
3.1.6	Passenger lift	16	1088 Kg.	1.5	G+5	Power operated	ACV VVF	2600000	62,700
3.1.7	Passenger lift	16	1088 Kg.	2.5	G+12	Power operated	ACV VVF	700000	62,700
3.1.8	Passenger lift (Bed lift)	20	1360 Kg.	0.75	G+4	Power operated	ACV VVF	2400000	62,700
3.1.9	Passenger lift	20	1360 Kg.	1.5	G+5	Power operated	ACV VVF	2700000	62,700
3.1.10	Passenger lift	20	1360 Kg.	2.5	G+12	Power operated	ACV VVF	7500000	62,700
3.2	Goods lifts (2 speed)								
3.2.1		1 Ton	-	0.5	G+4			2600000	48,450
3.2.2		2 Ton	-	0.5	G+4			3300000	48,450
3.2.3		3 Ton	-	0.25	G+4			4100000	57,000

Note:- 1. ACV VVF=AC variable voltage variable frequency.
2. Provision for lift may also be taken for the buildings having floor less than G+4.

Sl. No.	Description	Rates in Rupees
4	**WATER TANK (RCC ONLY)**	
4.1	Overhead tank without independent staging	10 / Litre.
4.2	Overhead tank upto staging height 20 metres	17/ Litre.
4.3	Overhead tank with staging height between 20 metres and upto 30 metres	20/ Litre.
4.4	Overhead tank with staging height between 30 metres and 40 metres	23/ Litre.
4.5	Underground sump	10 / Litre

Sl. No.	Description	Rates in MUR
5	**DEVELOPMENT OF SITE**	
5.1	Levellling	91/ sqm.
5.2	**Internal roads & paths**	
5.2.1	Internal road with WBM and Bituminous top	100/sqm
5.2.2	Internal road with WMM and Bituminous top	108/sqm
5.2.3	Cement Concrete pavement with vaccum dewatered concrete	48/sqm
5.2.4	Footpath with kerb stone	48/sqm
5.3	Sewer	94/sqm
5.4	Filter Water Supply	
5.4.1	Distribution lines100 mm dia and below	57/sqm
5.4.2	Peripheral grid 150 mm to 300 mm dia pipes	57/sqm
5.4.3	Unfiltered water supply distribution lines	37/sqm
5.5	Storm water drains	74/ sqm.
5.6	Rain Water Harvesting (RWH)	51/sqm
5.7	Trenchs for services	333/meter
5.8	Boundary wall with 1.5 metre. normal height from GL & 0.60 meter high MS grill, and required no. of steel gates/wicket gates etc.	
5.8.1	With load bearing brick wall and plastering on either side and with/without intermediate columns and plinth beams.	5130/metre
5.8.2	With precast RCC columns & 1.80/2.40 metre long, 200/250mm wide and 80 to 100mm thick precast RCC horizontal panels having required foundation footings.	4275/metre
5.9	**Horticulture Works**	
5.9.1	Horticulture Operations including 30 cm earth filling , grassing, tree plantations/shrubs and potted plants etc.	143/sqm.
5.9.2	Vertical plantations	23/sqm

Note :-

1. The rates are per sqm. and are to be applied on the entire area of the plinth/plot to be developed.
2. These rates will apply to normal conditions and normal layout plans. If any extras are required due to nature of layout involving filling, cutting or bringing services, from large distances, then additional provision should be made.
3. Cost of bulk services water supply, sewage disposal e.g.

(a) Tube wells, pumps, open wells, treatment plant, extension of lines from source of local bodies, head works at water source etc.

(b) Sewage pumps, sewage treatment plants, septic tanks, extension of cut-fall sewer up to point of disposal etc. are not included in these rates. Extra provision depending upon site conditions may be made for these.

4. None of the specialize E&M services are included in the above rates and necessary provisions as may be required as per design requirements must be considered and rates as per items provided in Annexure-V of this PAR may be referred.
5. The green measures considered for Civil & Electrical works.

(a) Over deck insulation and Application of high SRI reflective paint on the roof.

(b) Masonry work in super structure with Autoclave Aerated Concrete (AAC) blocks/ fly ash bricks.

(c) Window with reflective glass coating / High performance double glazed unit.

(d) Paints with low VOC options.

(e) Rain water harvesting.

(f) Replacement of conventional pillar cock with pillar cock having infrared sensor and foam flow technology (in offices and Hospitals).

(g) AC plant with VVVF drives and ECBC compliant chillers, high efficiency motors, plant optimizers etc. (cost of plant not included.)

(h) Automated lighting controls with day light sensors and PIRs etc.

(i) Dual plumbing system.

PROFORMA FOR CALCULATION OF BUILDING COST INDEX

ANNEXURE –IV

Sl. No	Description	Unit	%age	Rates as on 01.04.2019	Proportio-nate value	Weightage rates	Weight-age of Compo-nent	Rates at the time of revision of cost index	Cost Index
1	Bricks (Fly Ash)	1000 Nos.	100%	2508.00	2508.00	2508.00	8.00	-	-
2	Cement (OPC)	Qtl.	100%	342.00	302.00	302.00	14.50	-	-
3	**TMT Steel**								
a.	8 & 10 mm dia	Qtl.	50%	2451.00	1226.00	2451.00	19.50	-	-
b.	12 & 16 mm dia		50%	2451.00	1226.00			-	-
4	Aggregates 20 mm a) Natural sources	Cum	75%	798.00	599.00	748.00	6.50	-	-
	b) Aggregates 20mm (RCA)		25%	599.00	150.00			-	-
5 (a)	Sand (Coarse Sand) Natural Sources	Cum	75%	798.00	599.00	1225.00	3.00	-	-
(b)	Sand (Coarse Sand) RA		25%	399.00	100.00			-	-
6	**Flooring Items**								
a.	Vitrified tiles	Sqm	50%	376.00	188.00	439.00	5.00	-	-
b.	Ceramic Tiles		20%	148.00	30.00			-	-
c.	Kota Stone		10%	160.00	16.00			-	-
d.	Granite Stone		20%	1026.00	205.00			-	-
7	**Paints**								
a.	Synthetic Enamel Paint	Litre	33.33%	91.00	30.00	143.33	3.00	-	-
b.	Acrylic Washable distemper		33.33%	29.00	10.00			-	-
c.	Premium acrylic paint		33.33%	125.00	42.00			-	-
8	**Door/Windows-Wooden/ uPVC/Aluminium/Steel**								
a.	35mm thick flush door shutters both side commercial veneering	Sqm	30.00%	542.00	162.00	1978.60	7.00	-	-
b.	Factory made, standard Z-section steel windows		15.00%	976.00	147.00				
c.	uPVC windows		20.00%	1878.00	376.00			-	-
d.	Aluminium Window		35.00%	1264.00	442.00			-	-
9	**Pipes**								
a.	15 mm GI Pipe	Metre	10.00%	48.00	5.00	167.00	2.50		
b.	100 mm CI Pipes		40.00%	359.00	144.00				
c.	20 mm Black Conduits		20.00%	25.00	5.00				
d.	20mm CPVC pipes		30.00%	44.00	13.00				
11	**Lamps & Fans**								
a.	Ceiling Fans 1200 mm	Each	50%	855.00	428.00	751.00	4.50		
b.	1200 mm LED tube lights with fittings		40%	798.00	319.00				
c.	LED bulbs		10%	46.00	5.00				
12	Electrical Machinery, Motor 7.5 HP (Pump set) 1500 RPM (Kirloskar)	Each	100%	15675.00	15675.00	15675.00	2.50		

13	**Wires & Cables**								
a.	Copper Wire 1.5 Sq. mm	100 Metre	70%	513.00	359.00	735.00	4.00		
b.	Copper Wire 4.0 Sq. mm		30%	1254.00	376.00				
14	**Labour**								
a.	Skilled	Each	50%	405.00	202.00	369.00	20.00		
b.	Unskilled		50%	333.00	166.00				
						Total	**100.00**		

PLINTH AREA RATES FOR SPECIALISED E&M WORKS

Annexure-V

Sl. No.	**Description of Item**	**Unit**	**Rate (MUR)**
1	SUB-STATION EQUIPMENTS		
	Supplying, installation, testing and commissioning of 33kV/0.433kV or 11kV/0.433 kV substation equipments comprising HT Panel, Dry type Transformers, HT cable, Bus trunking from Transformer to LT Panel, LT Panel, Automatic Power factor correction panel, Active Harmonic Filters, TVSS (Transient Voltage suppression system),SPD (Surge protection system), Essential panel, Earthing, required inter-connections,substation safety equipments including LT cabling from sub station to the buildings fed by the sub station.	per KVA	5130
2	DIESEL GENERATING SETS		
	Supplying, installation, testing and commissioning of Silent Type DG Sets,AMF Panel, Bus Ducting/ Cables from DG Sets to Essential Panel, Synchronizing Panel where required, DG Set enclosure room sound insulation/ventilation/smoke exhaust as required, Earthing of DG Set system, control cabling, Fuel tank/piping, DG set Exhaust piping/ Exhaust Chimney as per CPCB norms, Civil works connected with DG Sets including Foundation as required.	per KVA	6270
3	33 KV RECEIVING SUBSTAION AND 33KV/11KV HT CABLING		
	(i) Supplying, installation, testing and commissioning of 33 kV Substation comprising 33 kV HT Panel, transformers 33kV/11 kV, 11 kV HT Panel, inter connections, 11kV HT UG cabling to the distribution substations on Ring main system, Substation earthing, substation safety equipments.	per KVA	3420
	(ii) Supplying, Installation, testing & Commissioning of 33 kV Switch room comprising of 33 kV HT panel, inter connections, 33 kV HT UG cabling to the distribution substations, on ring main system, earthing, safety equipments.	per KVA	3420
4	UNINTERRUPTED POWER SUPPLY		
	Supplying, installation, testing and commissioning of online 3 phase UPS System with 30 minutes back up including batteries, interconnecting cables, battery racks etc.	per KVA	11400
4.1	Add for every additional 30 minutes backup	per KVA	5130

	Note: For assessment of kVA estimation of a building, Para 4.4 and other relevant Paras of "Guidelines for Substation & Power Distribution Systems of Buildings- 2019" which is available on CPWD Website may be referred.		
5	CENTRAL AC PLANT		
	Supplying, installation, testing and commissioning of energy efficient central AC Plant including low side works	per TR	48450
	Extra for stand by chilling units High side	per TR	21660
6	VRV/ VRF AC System		
	Supplying, installation, testing and commissioning of VRV/VRF System including indoor /outdoor units, piping, electrical power distribution/wiring, electrical panel, treated fresh air system etc.	per HP	31350
7	PRECISION AIRCONDITIONING SYSTEM		
	Supplying, installation, testing and commissioning of PRECISION Air Conditioning System including piping, electrical cabling, controller etc. required for the system	per TR	62700

Sl. No.	Description of Item	Unit	Rate (MUR)
8	SOLAR PHOTO VOLTAIC POWER GENERATION SYSTEM		
	Supplying, installation, testing and commissioning of Grid interactive roof top solar photo voltaic power generation system including space frame	per KWp	37050
9	SOLAR WATER HEATING SYSTEM		
	Supplying, installation, testing and commissioning of solar water heating system with heat exchanger type including electrical heater backup , make up water tank but without piping	100 liters per day	12825
	Note: For higher capacity, multiply the rate		
10	CCTV SYSTEM		
	Supplying, installation, testing and commissioning of IP Based CCTV system for building security comprising of PTZ Fixed camera, cabling, recording, display system and hard ware software support	per sqm.(for Indoor)	114
		per sqm.(for external surveillance of plot area)	114
	Note: Rate includes peripheral IP Based PTZ camera besides indoor camera at reception, corridors, lift lobby etc., wiring upto CCTV room and setting up monitoring unit/ units, as required.		
11	ACCESS CONTROL SYSTEM		
	Supplying, installation, testing and commissioning of Access control system for building security comprising of controller, E&M Locks, Reader, Smart Cards, cabling, recording, display system, hardware and software support as required	per sqm.	114
12	IBMS: INTEGRATED BUILDING MANAGEMENT SYSTEM		
	Supplying, installation, testing and commissioning of Integrated Building Management System for Digital/electronic display and monitoring of all E&M systems like substation, DG sets, Ups, Solar power, Lifts, AC Plants, Ventilation systems, Fire protection systems, Pumps etc. to include cabling, monitors, recording, display system, hardware, software support(upto 10,000 sq.m)	upto 10,000 sqm.	228
12.1	Add extra for built up area above 10, 0000 sq mtr.	per sqm.	71
13	HYDROPNEUMATIC WATER SUPPLY SYSTEM		
	Supplying, installation, testing and commissioning of Hydropneumatic water supply system consisting of pumps, pneumatic tank, Microprocessor based control panel, VFD, inter connecting pipes, valves, cabling, switchgear etc. as required	per LPM	855

	LIGHTING AUTOMATION INCLUDING OCCUPANCY SENSORS		
14	Supplying, installation, testing and commissioning of lighting automation including occupancy sensors	per sqm.	114
15	BASIC HOME SECURITY FOR RESIDENTIAL COLONY		
	Supplying, installation, testing and commissioning of basic security system in the residential colony to include control room at the gate and intercom connection to each dwelling unit, and basic CCTV system to be installed at the entry and exit points, Parking areas, entry point of each dwelling unit and other common areas as required including CCTV control room, required UG cabling, recording system and monitor/ monitors in the control room		
15.1	Intercom system	per sqm. of residential Area	171
15.2	CCTV system	per sqm. of plot Area	171
	LAN SYSTEM		
16	Supplying, installation, testing and commissioning of LAN System comprising of Core switches & L2 switches with 10 G, 10 Giga SFP modules, WIFI Access points, WIFI controller, Network Management Software, Racks, CAT 6A cable, Patch Panels, OFC etc.	per sqm. of covered area	285
17	IP BASED EPABX SYSTEM		
	Supplying, installation, testing and commissioning of IP based EPABX System comprising of Core switches & L2 switches with 10 G, 10 Giga SFP modules, Industry Standard Appliance Server, Cloud- based, enterprise-grade UC Solution, MID/ENTRY Level IP/SIP Phone with, Dual 1 Gig Ports, Racks, CAT 6A cable, Patch Panels, OFC etc.	per sqm. of covered area	513
	NOTE: It will be economical to use common infrastructure of switches, OFC, CAT 6A cable for both voice and Networking		
18	Conference Hall: Supplying, installation, testing and commissioning of Audio Visual/Conference System	per sqm.	7125
19	Auditorium: Supplying, installation, testing and commissioning of Sound reinforcement, Stage Lighting, Stage curtains	per sqm.	7125
	STREET LIGHTING WITH LED		
20	Supplying, installation, testing and commissioning of LED Street/ Compound/ High mast/ Pathway/ Landscape Lighting for the entire Campus	per sqm. (Plot Area)	86
	Note: This is applicable for plot sizes more then 1 acre. For smaller plot sizes actual requirements may be worked out		
	Note : - Cost for General Façade lighting, if required, with IP 66/67 LED fixtures (RGB/Tunable/Mono) along with controls (hardware and software) and cabling may be assessed on case to case basis		
	STP/ETP PLANT		
21	Supplying, installation, testing and commissioning of STP/ETP of appropriate technology including Civil Works (except plant room), Tertiary Treatment etc. for the Building/ campus		
21.1	Per Day for Plant size upto 50,000 LPD	per thousand Ltr.	42750
21.2	Per Day for Plant size above 50,000 upto 1,00,000 LPD	per thousand Ltr.	34200

21.3	Per Day for Plant size above 1,00,000 LPD	per thousand Ltr.	28500
22	DRIVER FACE AND AUTOMATIC NUMBER PLATE RECORDING SYSTEM/RECOGNITION SYSTEM		
22.1	Supplying, installation, testing and commissioning of Driver face and automatic number plate recording system / recognition system Including High resolution camera and software set for the driver face capture and automatic number plate recording	per set	413250
23	BAGGAGE SCANNERS		
23.1	Baggage scanner small: computer based multi energy X-Ray Baggage Inspection System mounted on castor wheels capable of passing through bags of dimensions 540 mm (W) X 350 mm (H), belt height 750 mm to 850 mm, 22"/24 LCD Monitor, Input / Output rollers with frames	per unit	1211250
23.2	Baggage scanner Big: computer based multi energy X-Ray Baggage Inspection System capable of passing through bags/parcels of dimension 940mm (W) x 640mm (H) with Belt Height – 750mm –850mm with 22"/24" LCD Monitor, Input/ Output rollers with frames	per unit	1995000
24	DOOR FRAME METEL DETECTOR		
	20 zone or above Door frame Metal detector nominal Size: 760 mm (W) x 2050 mm (H) x 700 mm (D) loaded with necessary software	per set	199500
25	MEDICAL GAS PIPELINE SYSTEM		
	Medical Gas pipeline system (as per international standards) comprising of oxygen, carbon dioxide, nitrous oxide, AGSS, Air-4, Air-7, Vacuum outlets, manifolds, pressure alarms, fully automatic gas control system, Bed head panels, copper piping, cylinder banks, plant equipment such as compressors, Vacuum pumps etc.	per bed	34200
	MODULAR OPERATION THEATER		
26	MOT comprising of walls & ceiling system for operating area, steel framework, static dissipative flooring, laminar flow, double dome OT light, touch screen surgeon's control panel, scrub station, X ray viewing screen, hatch box, automatic sliding doors, anesthesia pendent, surgeon pendent etc.		
26.1	With stainless steel technology	per OT	4845000
26.2	With SMS technology	per OT	7125000
	Note: The above rates are based on minimum OT size of 550 sq ft.		
27	NURSING CALL SYSTEM		
27.1	Nursing call system comprising of VDE 0834/UL approved Nursing call system, System Switch for de-centralized communications, Nurse Station Terminal, Patient Handset, Event Data base Software, Nurse Call Server along with its Integration with LAN and FRRAY cabling etc	per Bed	23940
27.2	Nursing call system (INDIAN) comprising of System Switch for de-centralized communications, Nurse Station Terminal, Patient Handset, Event Database Software, Nurse Call Server, Cabling etc.	per Bed	12255
28	BOOM BARRIER		
28.1	Boom Barrier for car: Electromechanical parking barrier with all accessories upto 6 meter length		71250
29	CAR PARKING SYSTEM		
29.1	Sensor based car parking system with controller, display etc. as required. (Cost based on minimum car quantity of 250 cars)	per car	5700
30	EMERGENCY LIGHT & ILLUMINATED SIGNAGES		
30.1	Illuminated signages	per sqm. of covered Area	11
31	MOTORIZED STEEL GATES	per gate upto 5.00 m. Width	285000

Appendix 9

Regional construction data

1. Africa

Construction market metrics

	Cape Town	Durban	Gaborone	Harare	Johannesburg	Kampala	Kigali	Lagos	Nairobi
Tendering:	Lukewarm	Lukewarm	Cold	Cold	Lukewarm	Lukewarm	Lukewarm	Lukewarm	Cold
Market:	Staying the same	Staying the same	Cooler	Cooler	Staying the same	Warmer	Warmer	Warmer	Cooler
Inflation 2020:	6.0%	5.0%	5.0%	10.0%	6.0%	-3.1%	6.0%	5.0%	5.0%
Inflation 2021:	5.0%	5.0%	10.0%	5.0%	5.0%	9.7%	10.0%	12.0%	10.0%
Inflation 2022:	4.0%	5.0%	5.0%	5.0%	4.0%	4.0%	8.0%	9.0%	8.0%
Inflation 2023:	4.0%	5.0%	3.5%	5.0%	4.0%	6.0%	7.0%	8.0%	-5.0%
Contractor's margin:	5.0%	5.0%	6.0%	12.5%	5.0%	8.0%	25.0%	27.5%	15.0%
Preliminaries:	10.0%	10.0%	10.0%	10.0%	8.5%	7.0%	10.0%	12.0%	4.0%
Location index (London = 100):	25.8	26.3	32.1	40.7	23.2	25.4	29.6	56.0	18.8

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Johannesburg	Nairobi
Commercial		
CBD Offices – high-rise prestige	1,159.0	910.7
CBD Offices – up to 20 floors medium (A-Grade)	925.9	683.0
Office fit-out (30,000sq ft) low specification	1,298.9	510.0
Office fit-out (30,000sq ft) medium specification	1,432.1	605.6
Office fit-out (30,000sq ft) high specification	1,965.0	910.7
Hotels		
3-Star travellers	1,149.0	1,183.9
5-Star luxury	1,805.1	1,366.0
Resort style	1,742.8	1,092.8
Industrial		
High-tech factory/laboratory	944.2	1,001.7
Large warehouse distribution centre	393.0	500.9
Retail		
Large shopping centre including mall	1,019.1	637.5
Neighbourhood incl supermarket	757.3	550.9
Prestige car showroom	845.9	660.2
Residential		
Apartments high-rise	939.2	637.5
Townhouses medium standard	632.8	591.9

Labour, material and plant costs	Johannesburg	Nairobi
Labour costs		
Group 1 Tradesman e.g. plumber, electrician	6.0	13.7
Group 2 Tradesman e.g. carpenter, bricklayer	4.7	13.7
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	4.7	13.7
Group 4 Green collar installation operative e.g. insulation/solar/heat pump	6.0	13.7
General labourer	3.3	6.4
Site foreman	14.0	22.8
Material costs		
13 mm plasterboard (m²)	10.0	13.8
Concrete 30 MPa (m³) (1500m³ job)	105.2	116.2
Concrete block (400x200) per 1000 (>10,000 block job)	349.7	910.7
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	2.8	3.3
Copper pipe 15 mm (metre) (1,000m + job)	7.3	13.7
Emulsion paint (litre)	10.0	5.0
Glass pane 10mm tempered (m²)	183.2	45.5
Reinforcement bar 16mm (tonne) (120 tonne job)	915.9	983.5
Softwood timber for framing 100mm X 50mm (m)	5.5	9.1
Standard brick per 1000	105.9	500.9
Structural steel beams (tonne) (100 tonne+ job)	1,189.0	2,003.5
Plant costs		
Hire 50t mobile crane + operator (day)	832.6	1,092.8

2. Asia

Construction market metrics

	Bangalore	Beijing	Chennai	Delhi	Guangzhou	Hanoi	Ho Chi Minh City	Hong Kong	Jakarta	Kuala Lumpur
Tendering:	Lukewarm	Warm	Cold	Warm	Warm	Warm	Warm	Warm	Lukewarm	Lukewarm
Market:	Warmer	Warmer	Staying the same	Warmer	Warmer	Warmer	Warmer	Staying the same	Warmer	Warmer
Inflation 2020:	4.5%	2.5%	4.5%	4.5%	3.0%	2.0%	2.0%	-3.0%	-4.0%	1.0%
Inflation 2021:	3.5%	3.0%	3.5%	3.5%	3.0%	2.0%	2.0%	1.0%	4.0%	3.0%
Inflation 2022:	3.5%	4.0%	3.5%	3.5%	3.0%	2.0%	2.0%	1.0%	2.0%	1.5%
Inflation 2023:	2.3%	3.0%	2.3%	2.5%	3.0%	3.0%	3.0%	2.0%	2.0%	3.0%
Contractor's margin:	15.0%	4.0%	15.0%	15.0%	3.0%	6.0%	6.0%	5.0%	9.0%	10.0%
Preliminaries:	9.5%	8.0%	9.5%	9.5%	6.0%	10.0%	10.0%	15.0%	10.0%	8.5%
Location index (London = 100):	15.6	25.2	15.3	15.8	25.3	21.5	21.5	121.6	23.0	28.4

	Macau	Manila	Mumbai	Seoul	Shanghai	Shenzhen	Singapore	Taipei	Tianjin	Tokyo
Tendering:	Lukewarm	Warm	Warm	Lukewarm	Warm	Warm	Cold	Warm	Warm	Warm
Market:	Cooler	Warmer	Warmer	Staying the same	Warmer	Warmer	Warmer	Staying the same	Warmer	Staying the same
Inflation 2020:	-5.0%	5.0%	5.0%	3.8%	4.2%	3.0%	5.0%	5.0%	2.5%	2.0%
Inflation 2021:	3.0%	5.0%	4.0%	6.5%	3.0%	3.0%	10.0%	5.0%	3.0%	1.0%
Inflation 2022:	5.0%	5.0%	4.0%	5.2%	3.0%	3.0%	8.0%	3.0%	4.0%	2.0%
Inflation 2023:	5.0%	5.0%	3.0%	5.2%	3.0%	3.0%	5.0%	3.0%	3.0%	1.0%
Contractor's margin:	20.0%	15.0%	15.0%	3.5%	3.0%	3.0%	5.0%	5.0%	4.0%	12.0%
Preliminaries:	15.0%	8.0%	9.5%	15.0%	5.0%	6.0%	13.5%	8.0%	8.0%	15.0%
Location index (London = 100):	97.6	26.6	15.8	49.8	25.4	25.3	64.9	26.4	25.2	124.9

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Hong Kong	Jakarta	Mumbai	Shanghai	Singapore	Tokyo
Commercial						
CBD Offices – high-rise prestige	4,119.1	1,102.3	713.8	1,367.8	2,451.0	5,030.5
CBD Offices – up to 20 floors medium (A-Grade)	3,539.8	832.0	686.9	1,169.1	2,228.2	4,573.1
Office fit-out (30,000sq ft) low specification	1,029.8	305.1	497.9	557.8	817.0	1,554.9
Office fit-out (30,000sq ft) medium specification	1,930.8	499.2	795.1	883.4	1,188.4	2,972.5
Office fit-out (30,000sq ft) high specification	3,089.3	651.7	1,203.8	1,123.3	2,005.4	3,658.5
Hotels						
3-Star travellers	4,119.1	936.0	1,546.4	970.5	2,822.4	5,716.4
5-Star luxury	5,148.9	1,549.5	1,684.5	1,803.4	3,639.4	8,003.0
Resort style	5,535.0	1,906.6	1,456.5	1,138.6	4,307.9	6,173.7
Industrial						
High-tech factory/laboratory	4,634.0	1,102.3	624.2	993.4	2,302.5	4,801.8
Large warehouse distribution centre	3,025.0	797.3	381.8	512.0	1,411.2	3,201.2
Retail						
Large shopping centre including mall	4,505.3	728.0	515.7	894.0	2,525.3	4,115.8
Neighbourhood incl supermarket	3,539.8	589.3	427.5	611.3	2,133.7	3,786.6
Prestige car showroom	4,312.2	1,143.9	549.9	649.5	2,673.8	5,259.1
Residential						
Apartments high-rise	3,861.6	963.7	662.7	680.1	2,005.4	5,259.1
Townhouses medium standard	4,505.3	589.3	445.3	680.1	2,153.9	4,115.8

Labour, material and plant costs	Hong Kong	Jakarta	Mumbai	Shanghai	Singapore	Tokyo
Labour costs						
Group 1 Tradesman e.g. plumber, electrician	20.6	1.5	1.3	7.2	23.0	34.2
Group 2 Tradesman e.g. carpenter, bricklayer	32.2	1.5	1.5	6.9	16.3	32.7
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	21.9	1.5	1.4	6.9	23.0	32.2
Group 4 Green collar installation operative e.g. insulation/solar/heat pump	20.6	1.7	2.6	7.6	23.0	42.8
General labourer	15.4	1.2	1.1	4.6	17.1	26.2
Site foreman	25.7	1.9	2.2	9.5	29.7	45.3
Material costs						
13 mm plasterboard (m²)	12.9	6.6	4.4	3.8	6.3	5.5
Concrete 30 MPa (m³) (1500m³ job)	92.7	64.1	79.7	85.0	85.4	146.3
Concrete block (400x200) per 1000 (>10,000 block job)	1,802.1	776.5	645.1	703.0	551.9	1,143.3
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	2.4	1.9	1.5	2.0	2.2	2.3
Copper pipe 15 mm (metre) (1,000m + job)	5.0	8.0	5.2	7.3	13.4	7.8
Emulsion paint (litre)	9.0	6.2	3.0	5.8	14.1	5.5
Glass pane 10mm tempered (m²)	231.7	41.6	22.9	22.9	94.3	146.3
Reinforcement bar 16mm (tonne) (120 tonne job)	810.9	734.9	681.4	645.7	714.5	686.0
Softwood timber for framing 100mm X 50mm (m)	11.6	4.6	2.9	4.7	9.7	13.7
Standard brick per 1000	579.2	50.3	87.0	91.7	275.6	1,436.0
Structural steel beams (tonne) (100 tonne+ job)	1,609.0	1,081.6	689.0	764.1	1,782.6	2,515.2
Plant costs						
Hire 50t mobile crane + operator (day)	1,415.9	741.8	497.1	427.9	1,576.1	5,487.8

3. Australia and New Zealand

Construction market metrics

	Adelaide	Auckland	Brisbane	Christchurch	Melbourne	Perth	Sydney
Tendering:	Warm	Warm	Warm	Warm	Warm	Warm	Warm
Market:	Warmer	Warmer	Warmer	Staying the same	Warmer	Warmer	Warmer
Inflation 2020:	-3.0%	3.0%	0.5%	2.0%	2.0%	0.5%	-1.5%
Inflation 2021:	3.0%	4.0%	4.0%	3.5%	3.0%	4.0%	4.0%
Inflation 2022:	2.5%	3.5%	3.5%	3.0%	2.5%	4.0%	3.5%
Inflation 2023:	2.0%	2.5%	2.5%	2.0%	2.0%	3.0%	3.0%
Contractor's margin:	4.0%	6.0%	3.0%	6.0%	4.0%	4.5%	4.0%
Preliminaries:	13.0%	12.0%	13.0%	13.0%	15.0%	15.0%	12.0%
Location index (London = 100):	47.3	64.6	56.0	62.5	58.9	49.0	60.4

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Auckland	Melbourne	Sydney
Commercial			
CBD Offices – high-rise prestige	3,210.3	3,506.6	3,811.5
CBD Offices – up to 20 floors medium (A-Grade)	2,547.3	2,591.8	2,782.4
Office fit-out (30,000sq ft) low specification	837.5	1,143.4	1,105.3
Office fit-out (30,000sq ft) medium specification	1,256.2	1,753.3	1,677.1
Office fit-out (30,000sq ft) high specification	2,442.6	3,125.4	3,049.2
Hotels			
3-Star travellers	2,442.6	2,058.2	2,363.1
5-Star luxury	3,978.0	4,268.9	4,568.4
Resort style	3,489.5	2,973.0	3,171.2
Industrial			
High-tech factory/laboratory	3,234.7	3,201.6	3,582.8
Large warehouse distribution centre	1,054.5	914.8	914.8
Retail			
Large shopping centre including mall	2,791.6	2,439.4	2,325.0
Neighbourhood incl supermarket	1,570.3	1,638.9	1,776.2
Prestige car showroom	1,940.8	2,286.9	2,286.9
Residential			
Apartments high-rise	2,652.0	2,439.4	2,439.4
Townhouses medium standard	1,884.3	1,600.8	1,715.2

Labour, material and plant costs	Auckland	Melbourne	Sydney
Labour costs			
Group 1 Tradesman e.g. plumber, electrician	59.3	91.5	82.3
Group 2 Tradesman e.g. carpenter, bricklayer	45.4	72.4	72.4
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	45.4	72.4	70.9
Group 4 Green collar installation operative e.g. insulation/solar/heat pump	52.3	68.6	67.1
General labourer	38.4	57.2	56.4
Site foreman	66.3	91.5	91.5
Material costs			
13 mm plasterboard (m²)	8.7	8.4	8.4
Concrete 30 MPa (m³) (1500m³ job)	279.2	190.6	183.7
Concrete block (400x200) per 1000 (>10,000 block job)	3,559.3	2,820.5	2,744.3
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	2.8	2.3	2.3
Copper pipe 15 mm (metre) (1,000m + job)	12.6	8.4	7.6
Emulsion paint (litre)	20.9	11.4	11.4
Glass pane 10mm tempered (m²)	206.6	266.8	218.0
Reinforcement bar 16mm (tonne) (120 tonne job)	2,442.6	1,372.1	1,321.1
Softwood timber for framing 100mm X 50mm (m)	5.6	3.8	3.8
Standard brick per 1000	1,046.8	609.8	715.8
Structural steel beams (tonne) (100 tonne+ job)	1,524.9	2,058.2	2,303.7
Plant costs			
Hire 50t mobile crane + operator (day)	2,442.6	2,286.9	2,906.6

4. Continental Europe

Construction market metrics

	Amsterdam	Berlin	Brussels	Dublin	Frankfurt	Geneva	Hamburg	Madrid
Tendering:	Lukewarm	Hot	Warm	Warm	Hot	Hot	Hot	Lukewarm
Market:	Warmer	Staying the same	Warmer	Warmer	Staying the same	Warmer	Staying the same	Staying the same
Inflation 2020:	0.9%	1.0%	2.0%	2.0%	1.0%	0.0%	1.0%	0.0%
Inflation 2021:	1.8%	3.0%	2.0%	7.5%	2.0%	0.5%	3.6%	2.0%
Inflation 2022:	0.0%	3.0%	2.0%	4.0%	3.0%	0.5%	3.6%	0.5%
Inflation 2023:	-1.0%	3.0%	2.0%	4.0%	2.0%	0.5%	3.7%	0.5%
Contractor's margin:	4.0%	5.0%	5.0%	3.0%	5.0%	6.0%	5.0%	8.0%
Preliminaries:	13.0%	12.0%	10.0%	13.0%	14.0%	10.0%	12.0%	12.0%
Location index (London = 100):	75.0	72.7	73.6	88.3	76.4	108.6	73.9	63.8

	Milan	Moscow	Munich	Paris	Stockholm	Vienna	Warsaw	Zurich
Tendering:	Hot	Lukewarm	Hot	Hot	Warm	Warm	Warm	Hot
Market:	Warmer	Staying the same	Warmer	Warmer	Warmer	Staying the same	Warmer	Staying the same
Inflation 2020:	1.0%	8.0%	1.0%	1.6%	0.0%	0.9%	5.0%	0.5%
Inflation 2021:	3.0%	10.0%	2.0%	2.7%	2.5%	2.0%	8.0%	0.5%
Inflation 2022:	3.0%	5.0%	3.0%	3.0%	2.0%	2.1%	5.0%	0.5%
Inflation 2023:	3.0%	5.0%	3.0%	3.2%	2.0%	2.0%	5.0%	0.0%
Contractor's margin:	7.0%	6.0%	4.0%	8.0%	12.0%	8.0%	6.0%	5.5%
Preliminaries:	10.0%	7.0%	13.0%	9.3%	15.0%	11.0%	8.0%	11.0%
Location index (London = 100):	67.5	28.6	74.2	69.4	82.6	76.0	32.8	105.7

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Amsterdam	Dublin	Munich	Paris
Commercial				
CBD Offices – high-rise prestige	4,602.8	4,597.2	4,535.1	4,100.0
CBD Offices – up to 20 floors medium (A-Grade)	3,265.5	3,536.3	3,441.7	3,150.0
Office fit-out (30,000sq ft) low specification	1,223.6	1,066.8	1,321.0	1,254.2
Office fit-out (30,000sq ft) medium specification	1,825.9	1,597.2	1,922.0	1,758.4
Office fit-out (30,000sq ft) high specification	2,484.8	2,257.3	2,964.6	2,781.5
Hotels				
3-Star travellers	2,739.6	3,241.6	2,601.0	2,513.8
5-Star luxury	4,838.5	4,597.2	5,055.7	4,551.3
Resort style	3,605.3	3,772.0	3,348.5	3,352.2
Industrial				
High-tech factory/laboratory	2,595.6	3,064.8	3,112.4	2,341.0
Large warehouse distribution centre	1,331.5	1,827.1	1,368.7	1,144.5
Retail				
Large shopping centre including mall	3,225.7	3,536.3	2,937.9	2,958.4
Neighbourhood incl supermarket	2,895.0	3,418.4	2,902.4	2,478.7
Prestige car showroom	3,372.3	3,772.0	3,165.9	3,215.7
Residential				
Apartments high-rise	2,784.8	3,182.7	2,528.5	2,560.0
Townhouses medium standard	1,786.2	2,416.5	1,853.6	1,633.2

Labour, material and plant costs	Amsterdam	Dublin	Munich	Paris
Labour costs				
Group 1 Tradesman e.g. plumber, electrician	66.8	51.9	76.6	65.8
Group 2 Tradesman e.g. carpenter, bricklayer	54.5	49.5	64.2	54.9
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	51.8	44.8	64.2	48.5
Group 4 Green collar installation operative e.g. insulation/solar/heat pump	66.8	49.5	91.9	70.8
General labourer	43.3	38.9	45.4	38.7
Site foreman	74.9	58.9	70.1	54.7
Material costs				
13 mm plasterboard (m²)	6.9	9.4	5.3	6.4
Concrete 30 MPa (m³) (1500m³ job)	127.2	106.1	156.7	170.8
Concrete block (400x200) per 1000 (>10,000 block job)	4,905.7	825.1	4,257.6	3,333.0
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	3.4	4.7	6.6	5.1
Copper pipe 15 mm (metre) (1,000m + job)	8.4	11.8	12.0	10.2
Emulsion paint (litre)	12.7	13.0	8.0	8.9
Glass pane 10mm tempered (m²)	186.3	176.8	147.1	206.9
Reinforcement bar 16mm (tonne) (120 tonne job)	1,014.3	884.1	1,238.9	1,317.9
Softwood timber for framing 100mm X 50mm (m)	2.6	8.8	5.5	4.1
Standard brick per 1000	592.9	766.2	976.1	881.1
Structural steel beams (tonne) (100 tonne+ job)	1,840.3	2,593.3	2,684.4	2,292.2
Plant costs				
Hire 50t mobile crane + operator (day)	1,381.5	1,178.8	1,554.3	1,552.8

5. Middle East

Construction market metrics

	Abu Dhabi	Doha	Dubai	Muscat	Riyadh
Tendering:	Lukewarm	Warm	Warm	Cold	Overheating
Market:	Staying the same	Staying the same	Staying the same	Staying the same	Warmer
Inflation 2020:	-2.0%	-0.5%	0.0%	-2.0%	5.0%
Inflation 2021:	2.0%	2.5%	0.0%	0.0%	10.0%
Inflation 2022:	2.0%	4.0%	1.5%	1.0%	5.0%
Inflation 2023:	0.0%	-3.0%	1.5%	2.0%	5.0%
Contractor's margin:	7.5%	7.0%	6.0%	5.0%	10.0%
Preliminaries:	12.0%	12.0%	10.0%	9.0%	12.0%
Location index (London = 100):	40.8	56.9	39.1	33.7	40.6

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Dubai	Riyadh
Commercial		
CBD Offices – high-rise prestige	1,715.5	1,733.3
CBD Offices – up to 20 floors medium (A-Grade)	1,388.7	1,400.0
Office fit-out (30,000sq ft) low specification	1,497.6	1,386.7
Office fit-out (30,000sq ft) medium specification	2,178.4	2,000.0
Office fit-out (30,000sq ft) high specification	2,722.9	2,533.3
Hotels		
3-Star travellers	1,497.6	1,560.0
5-Star luxury	2,450.6	2,613.3
Resort style	3,131.4	3,333.3
Industrial		
High-tech factory/laboratory	1,497.6	1,333.3
Large warehouse distribution centre	953.0	933.3
Retail		
Large shopping centre including mall	1,443.2	1,600.0
Neighbourhood incl supermarket	1,470.4	1,280.0
Prestige car showroom	2,450.6	2,080.0
Residential		
Apartments high-rise	1,225.3	1,466.7
Townhouses medium standard	1,225.3	1,266.7

Labour, material and plant costs	Dubai	Riyadh
Labour costs		
Group 1 Tradesman e.g. plumber, electrician	7.1	7.5
Group 2 Tradesman e.g. carpenter, bricklayer	6.8	7.5
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	6.8	7.5
Group 4 Green collar installation operative e.g. insulation/solar/heat pump		
General labourer	4.9	5.3
Site foreman	15.0	9.3
Material costs		
13 mm plasterboard (m²)	4.1	3.7
Concrete 30 MPa (m³) (1500m³ job)	73.5	53.3
Concrete block (400x200) per 1000 (>10,000 block job)	953.0	453.3
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	3.3	3.2
Copper pipe 15 mm (metre) (1,000m + job)		7.5
Emulsion paint (litre)	2.7	9.3
Glass pane 10mm tempered (m²)	185.2	189.3
Reinforcement bar 16mm (tonne) (120 tonne job)	751.5	693.3
Softwood timber for framing 100mm X 50mm (m)	3.8	4.8
Standard brick per 1000		586.7
Structural steel beams (tonne) (100 tonne+ job)	2,287.3	2,000.0
Plant costs		
Hire 50t mobile crane + operator (day)	735.2	880.0

6. North America

Construction markets metrics

	Atlanta	Austin	Boston	Calgary	Chicago	Edmonton	Houston	Los Angeles	Mexico City
Tendering:	Warm	Lukewarm	Warm	Lukewarm	Warm	Lukewarm	Lukewarm	Warm	Lukewarm
Market:	Warmer	Warmer	Warmer	Staying the same	Staying the same	Staying the same	Staying the same	Warmer	Cooler
Inflation 2020:	1.0%	2.0%	0.2%	2.5%	5.0%	3.0%	2.0%	2.5%	3.8%
Inflation 2021:	3.9%	2.0%	4.0%	3.5%	4.0%	3.0%	2.0%	3.5%	4.5%
Inflation 2022:	3.0%	3.0%	2.0%	4.0%	5.0%	2.5%	3.0%	4.5%	4.5%
Inflation 2023:	2.5%	3.0%	2.0%	2.5%	5.0%	3.0%	3.0%	4.5%	4.5%
Contractor's margin:	4.0%	3.5%	8.0%	2.0%	9.0%	2.0%	3.5%	4.0%	6.0%
Preliminaries:	10.0%	8.0%	10.0%	10.0%	15.0%	10.0%	8.0%	11.3%	2.0%
Location index (London = 100):	69.7	72.4	105.4	57.9	91.6	56.7	62.6	99.5	29.7

	Montreal	Nashville	New York City	Ottawa	San Francisco	Seattle	Tampa	Toronto	Vancouver
Tendering:	Warm	Lukewarm	Lukewarm	Hot	Warm	Warm	Lukewarm	Warm	Warm
Market:	Warmer	Staying the same	Warmer	Warmer	Warmer	Warmer	Warmer	Warmer	Warmer
Inflation 2020:	5.0%	5.0%	4.0%	5.0%	3.5%	3.0%	3.0%	3.0%	3.0%
Inflation 2021:	5.0%	3.0%	2.0%	6.0%	4.5%	5.0%	5.0%	5.0%	4.0%
Inflation 2022:	5.0%	3.0%	4.0%	5.0%	5.0%	6.0%	5.0%	5.0%	4.0%
Inflation 2023:	3.0%	3.0%	3.0%	5.0%	5.0%	6.0%	5.0%	5.0%	4.0%
Contractor's margin:	4.0%	2.4%	5.0%	6.0%	7.0%	5.0%	3.5%	4.0%	3.0%
Preliminaries:	12.0%	5.3%	13.0%	15.0%	10.0%	11.0%	10.0%	12.0%	10.0%
Location index (London = 100):	60.1	71.8	109.6	64.8	116.1	86.5	79.0	67.7	66.1

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Chicago	Houston	Los Angeles	Mexico City	New York City	San Francisco	Toronto	Vancouver
Commercial								
CBD Offices – high-rise prestige	5,576.0	3,764.0	5,793.0	1,581.2	6,752.0	7,070.0	3,473.2	3,418.3
CBD Offices – up to 20 floors medium (A-Grade)	4,359.0	2,769.0	4,965.0	1,206.9	5,833.0	5,840.0	2,814.1	2,571.1
Office fit-out (30,000sq ft) low specification	1,461.7	1,058.9	1,367.6	919.1	1,617.2	1,588.3	1,319.6	1,192.4
Office fit-out (30,000sq ft) medium specification	2,195.2	1,590.2	2,053.9	1,134.9	2,428.8	2,385.4	2,019.2	1,907.9
Office fit-out (30,000sq ft) high specification	3,280.5	2,376.4	3,069.3	1,914.4	3,629.6	3,564.6	3,239.5	3,179.8
Hotels								
3-Star travellers	3,123.0	1,824.0	3,200.0	1,020.2	3,234.0	3,590.0	1,987.4	2,543.9
5-Star luxury	6,212.0	4,034.0	6,217.0	1,961.3	5,977.0	6,830.0	3,696.6	3,974.8
Resort style	3,913.0	2,473.0	3,972.0	2,357.7	4,096.0	4,280.0	2,782.4	3,974.8
Industrial								
High-tech factory/laboratory	6,117.0	5,125.0	5,407.0	2,897.8	5,955.0	6,020.0	4,769.8	4,598.9
Large warehouse distribution centre	2,109.0	1,184.0	1,600.0	716.1	1,880.0	1,840.0	1,325.9	1,482.0
Retail								
Large shopping centre including mall	3,512.0	2,959.0	3,862.0	1,202.3	4,083.0	4,330.0	2,804.6	2,420.1
Neighbourhood incl supermarket	1,806.1	1,318.7	3,098.0	848.0	2,207.0	2,200.0	2,173.7	1,655.5
Prestige car showroom	3,244.0	3,222.0	3,350.0	1,433.4	3,659.0	3,670.0	2,543.9	2,305.4
Residential								
Apartments high-rise	2,780.0	2,055.0	3,641.0	947.4	3,993.0	4,220.0	2,265.6	3,020.9
Townhouses medium standard	1,760.0	1,106.0	2,317.0	685.8	2,248.0	2,870.0	1,723.4	1,994.8

Labour, material and plant costs	Chicago	Houston	Los Angeles	Mexico City	New York City	San Francisco	Toronto	Vancouver
Labour costs								
Group 1 Tradesman e.g. plumber, electrician	85.0	71.5	97.0	6.7	140.0	138.0	60.8	58.8
Group 2 Tradesman e.g. carpenter, bricklayer	79.0	62.0	83.0	6.4	108.0	107.0	53.8	54.9
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	79.0	51.0	80.0	6.7	100.0	90.0	50.3	50.9
Group 4 Green collar installation operative	87.0	68.0	97.0	12.5	140.0	138.0	63.6	63.6
General labourer	55.0	45.0	69.0	3.9	88.0	81.0	46.7	47.7
Site foreman	120.0	101.0	112.0	8.8	150.0	155.0	72.3	71.5
Material costs								
13 mm plasterboard (m^2)	11.0	11.3	12.0	6.2	12.0	16.0	10.4	10.3
Concrete 30 MPa (m^3) (1500m^3 job)	160.0	165.0	179.0	130.3	165.0	190.0	163.8	147.1
Concrete block (400x200) per 1000 (>10,000 block job)	1,040.0	1,580.0	1,350.0	460.1	1,425.0	2,150.0	1,470.7	1,544.6
Copper cable (m) (3C + E, 2.5mm PVC) (100,000m+ job)	8.0	8.2	12.0	1.8	9.0	7.5	7.5	7.9
Copper pipe 15 mm (metre) (1,000m + job)	17.0	16.3	20.0	6.2	17.0	15.0	10.4	10.3
Emulsion paint (litre)	9.0	7.8	7.0	4.5	8.0	8.0	10.4	10.3
Glass pane 10mm tempered (m^2)	320.0	303.0	286.0	119.9	285.0	310.0	318.0	327.5
Reinforcement bar 16mm (tonne) (120 tonne job)	1,202.0	1,193.0	1,500.0	843.4	1,232.0	1,650.0	1,709.2	2,106.7
Softwood timber for framing 100mm X 50mm (m)	8.0	2.9	14.0	3.6	6.0	7.0	6.4	6.4
Standard brick per 1000	510.0	639.6	575.0	143.8	610.0	700.0	941.6	965.9
Structural steel beams (tonne) (100 tonne+ job)	2,488.0	2,500.0	3,200.0	2,179.5	2,995.0	4,250.0	2,861.9	2,430.2
Plant costs								
Hire 50t mobile crane + operator (day)	3,600.0	2,260.2	3,200.0	904.5	3,675.0	3,600.0	1,788.7	1,944.5

7. South America

Construction markets metrics

	Bogota	Buenos Aires	Lima	Rio de Janeiro	Santiago	São Paulo
Tendering:	Warm	Lukewarm	Warm	Warm	Warm	Warm
Market:	Warmer	Warmer	Warmer	Warmer	Warmer	Warmer
Inflation 2020:	4.0%	-5.0%	2.2%	-5.0%	3.0%	-5.0%
Inflation 2021:	6.0%	10.0%	3.7%	10.0%	5.0%	10.0%
Inflation 2022:	5.0%	5.0%	4.5%	5.0%	5.0%	5.0%
Inflation 2023:	4.0%	5.0%	3.5%	5.0%	5.0%	5.0%
Contractor's margin:	10.0%	11.0%	9.0%	9.0%	9.0%	7.0%
Preliminaries:	13.0%	10.0%	10.0%	10.0%	3.0%	10.0%
Location index (London = 100):	29.8	30.5	42.9	20.1	36.8	16.9

Region construction cost performance

International building costs per m² of internal area, in 2021	US$ São Paulo
Commercial	
CBD Offices – high-rise prestige	727.4
CBD Offices – up to 20 floors medium (A-Grade)	616.7
Office fit-out (30,000sq ft) low specification	684.5
Office fit-out (30,000sq ft) medium specification	744.3
Office fit-out (30,000sq ft) high specification	1,169.7
Hotels	
3-Star travellers	1,321.0
5-Star luxury	2,174.1
Resort style	2,001.6
Industrial	
High-tech factory/laboratory	1,276.8
Large warehouse distribution centre	523.0
Retail	
Large shopping centre including mall	535.3
Neighbourhood incl supermarket	710.0
Prestige car showroom	826.9
Residential	
Apartments high-rise	576.0
Townhouses medium standard	488.2

Labour, material and plant costs	São Paulo
Labour costs	
Group 1 Tradesman e.g. plumber, electrician	8.9
Group 2 Tradesman e.g. carpenter, bricklayer	8.0
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	8.0
Group 4 Green collar installation operative e.g. insulation/solar/heat pump	8.5
General labourer	6.1
Site foreman	21.2
Material costs	
13 mm plasterboard (m²)	5.5
Concrete 30 MPa (m³) (1500m³ job)	91.0
Concrete block (400x200) per 1000 (>10,000 block job)	585.0
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	3.5
Copper pipe 15 mm (metre) (1,000m + job)	4.7
Emulsion paint (litre)	2.5
Glass pane 10mm tempered (m²)	61.3
Reinforcement bar 16mm (tonne) (120 tonne job)	1,025.1
Softwood timber for framing 100mm X 50mm (m)	1.2
Standard brick per 1000	167.3
Structural steel beams (tonne) (100 tonne+ job)	2,599.0
Plant costs	
Hire 50t mobile crane + operator (day)	1,135.6

8. UK

Construction market metrics

	Belfast	Birmingham	Bristol	Edinburgh	Glasgow	Leeds	London	Manchester	Newcastle
Tendering:	Lukewarm	Warm	Lukewarm	Lukewarm	Lukewarm	Warm	Warm	Lukewarm	Warm
Market:	Staying the same	Warmer	Staying the same	Staying the same	Staying the same	Warmer	Warmer	Warmer	Warmer
Inflation 2020:	-2.0%	0.0%	-1.0%	0.0%	0.0%	-0.5%	-2.5%	-1.0%	-1.0%
Inflation 2021:	1.0%	1.5%	1.3%	2.3%	2.3%	1.3%	2.0%	2.0%	1.0%
Inflation 2022:	2.5%	4.0%	2.5%	4.0%	4.0%	2.5%	3.0%	2.5%	2.3%
Inflation 2023:	3.5%	5.0%	3.5%	5.0%	5.0%	3.0%	4.0%	3.5%	3.5%
Contractor's margin:	3.0%	3.0%	3.0%	5.0%	5.0%	4.5%	2.5%	4.5%	4.5%
Preliminaries:	11.0%	14.0%	12.5%	14.0%	14.0%	14.0%	15.0%	14.5%	13.0%
Location index (London = 100):	58.0	76.0	78.3	71.7	72.0	71.3	100.0	73.0	72.1

Region construction cost performance

US$

International building costs per m² of internal area, in 2021	Birmingham	Glasgow	Leeds	London	Manchester
Commercial					
CBD Offices – high-rise prestige	3,580.4	3,683.7	3,167.3	5,164.0	3,002.0
CBD Offices – up to 20 floors medium (A-Grade)	3,511.5	2,891.8	3,029.6	4,062.4	3,167.3
Office fit-out (30,000sq ft) low specification	1,473.5	1,377.1	1,445.9	1,704.0	1,480.4
Office fit-out (30,000sq ft) medium specification	2,065.6	2,065.6	2,065.6	2,518.9	2,203.3
Office fit-out (30,000sq ft) high specification	3,029.6	2,891.8	2,960.7	3,556.1	3,029.6
Hotels					
3-Star travellers	2,606.8	2,478.7	2,513.2	3,993.5	2,526.9
5-Star luxury	4,092.7	3,855.8	3,792.5	6,334.5	3,546.0
Resort style	3,373.8	3,580.4	3,428.9	4,475.5	3,959.1
Industrial					
High-tech factory/laboratory	1,389.5	2,616.4	2,685.3	3,090.1	2,616.4
Large warehouse distribution centre	1,239.4	1,308.2	1,211.8	1,543.6	1,239.4
Retail					
Large shopping centre including mall	2,712.8	2,685.3	2,685.3	3,006.0	2,699.1
Neighbourhood incl supermarket	1,834.4	1,730.7	1,790.2	2,075.2	1,844.2
Prestige car showroom	2,350.7	2,409.9	2,203.3	2,540.7	2,196.4
Residential					
Apartments high-rise	3,198.9	3,167.3	3,353.2	5,095.2	3,408.3
Townhouses medium standard	2,273.5	2,341.0	2,203.3	4,200.1	2,251.5

Labour, material and plant costs	Birmingham	Glasgow	Leeds	London	Manchester
Labour costs					
Group 1 Tradesman e.g. plumber, electrician	53.7	53.7	48.2	68.9	47.8
Group 2 Tradesman e.g. carpenter, bricklayer	48.2	44.1	48.2	55.1	47.8
Group 3 Tradesman e.g. carpet layer, tiler, plasterer	45.4	39.9	48.2	48.2	47.8
Group 4 Green collar installation operative e.g. insulation/solar/heat pump	55.1	53.7	55.1	68.9	57.1
General labourer	32.4	32.4	32.4	33.0	33.0
Site foreman	49.6	53.7	55.1	63.3	54.5
Material costs					
13 mm plasterboard (m^2)	6.9	8.3	6.9	12.4	6.3
Concrete 30 MPa (m^3) (1500m^3 job)	146.0	172.1	165.2	192.8	141.8
Concrete block (400x200) per 1000 (>10,000 block job)	1,198.1	1,198.1	1,198.1	1,652.5	1,204.9
Copper cable (metre) (3C + E, 2.5mm PVC) (100,000m+ job)	4.8	5.2	4.1	5.5	4.1
Copper pipe 15 mm (metre) (1,000m + job)	6.9	8.3	6.2	9.6	6.2
Emulsion paint (litre)	6.9	10.3	5.5	9.0	6.2
Glass pane 10mm tempered (m^2)	154.2	151.5	151.5	172.1	151.5
Reinforcement bar 16mm (tonne) (120 tonne job)	1,528.5	1,528.5	1,514.8	1,583.6	1,514.8
Softwood timber for framing 100mm X 50mm (m)	5.9	8.0	5.8	9.0	5.8
Standard brick per 1000	663.7	895.1	688.5	757.4	709.2
Structural steel beams (tonne) (100 tonne+ job)	3,029.6	3,029.6	2,754.1	3,442.7	2,754.1
Plant costs					
Hire 50t mobile crane + operator (day)	1,177.4	1,363.3	1,514.8	1,748.9	1,377.1