



BTC

**BELGIAN
DEVELOPMENT AGENCY**



BUILDING CONSTRUCTION MANUAL

Drafted by

the INFRASTRUCTURE unit of the Sectoral & Thematic Expertise Department

BTC

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ABBREVIATIONS

CEI	Call for Expression of Interest
CT	Call for Tenders
DPD	Detailed Project Draft
SPD	Summary Project Draft
TA/ITA	Technical Assistant - International Technical Assistant
TIA	Technical Inspection Agency
BL	Belgian Legislation
WB	World Bank
UPS	Schedule of Unit Prices
SQ	Bill of Quantities (BoQ)
QF	Lump sum bill of Quantities
QP	Provisional Bill of Quantities
SCEB	Stabilised Compressed Earth Block
SSAS	Schedule of Special Administrative Specifications
SSTS	Schedule of Special Technical Specifications (=TCTS)
TCTS	Technical specifications
GTS	General Terms and Conditions
	These contain the general contractual terms and conditions, which in legal matters determine the nature, scope and extent of mutual commitments by the Project Owner and the tenderer for the performance of public-sector contracts. It constitutes, along with the Tender Specifications, the reference document for the performance of public-sector contracts.
GSAS	General contract conditions (GCC)
TS	Tender Specifications (CSC - Cahier Spécifique des Charges)
	A document containing all the contractual terms and conditions applicable to a specific contract, whether the terms are administrative or technical. It complements the General Terms and Conditions (BL) and may derogate from them to a certain degree. It also includes provisions relating to the awarding of the contract.
BTC	Belgian development agency
TD	Tender documents (equivalent to CSC under BL)
TDS	Tender Data Sheet
TFF	Technical and Financial File
EMIS	Education Management Information System
RE	Renewable Energy
EST	Sectoral and Thematic Expertise Department
EI	Employment Intensive
IT	Instructions to Tenderers
NGO	Non-Governmental Organisation
ICP	Indicative Cooperation Programme
UP	Unit Prices
PV	Photovoltaic Panels
GIS	Geographical Information System
ToR	Terms of Reference
EU	European Union



INTRODUCTION

Objective: The aim of this document is to present the general strategy of the Belgian development agency for the construction of public buildings and to set out the various ways in which this will be implemented. It also aims to guide project managers who are not specialised in this area to implement construction activities.

Structure **Part 1** presents BTC's **general policy** and the approach to apply during the various phases of any project involving construction activities, from formulation to delivery.

Part 2 offers practical tools for the implementation of building construction projects. It includes a technical **methodology for building** construction and maintenance, based on lessons learned. This section includes:

- the necessary support measures for a construction project;
- the process for recruiting an architecture firm (or a design office associated with an architect);
- the procedures for selecting a company able to carry out the works in accordance with best practices and the construction standards as set out in the Tender Specifications;
- the use of sustainable and healthy materials, which are environmentally friendly both in terms of how they are produced and in how they are used;
- the taking into account of environmental criteria (energy efficiency, use of renewable energy, management of solid and liquid waste, suitable technologies, etc.);
- building design, which takes account of the specific needs of women, persons of reduced mobility and cultures;
- the measures, which aim to achieve a greater durability of works and optimization of their use.

The **Annexes** include examples from the Tender Specifications or from Terms of Reference. As these are to suit specific contexts, especially legal contexts, they cannot be accepted indiscriminately.

Targets: **Part 1** is primarily intended for those involved in the formulation of a project that includes an infrastructure component as well as for Representations charged with project monitoring.

Part 2 is aimed at project managers for any sector whose project includes an infrastructure component and who do not have access to technical construction assistance.



PART 1

BTC building construction strategy

1. THE FUNDAMENTALS OF THE STRATEGY

In many developing countries, social infrastructure is one of the few resources to be given to the people. It is the physical expression of the presence of the public authority in the community which they serve. It must at once satisfy the minimum construction standards and embody the authority of a State that is keen to ensure the wellbeing of its people.

All social infrastructure - schools, health centres, market halls and so on - has the prime objective of ensuring the protection and safety of the occupants. It must also satisfy the needs of the function for which it was designed. This is about optimizing working conditions by ensuring the movement of goods and people, whilst taking the climatic, economic, technical and material context into account. A construction should provide its users with optimal conditions of comfort: temperature, light, air renewal, access to water and energy, not forgetting the treatment of any waste produced - liquid, solid and sometimes gaseous. But this does not mean that a purely functional approach should be adopted; cultural and aesthetic points of reference are equally important in providing a quality frame of reference and ensuring the durability of works. Indeed, such aspects contribute to the people's sense of ownership over a building, and therefore to its durability. As such, if a public building is to be built, it must be able to relate to the specific modernity, history and culture of the place in which it is to be built, and all this whilst respecting its natural environment and the various elements of the community which it will serve. This also includes a gender dimension.

1.1. A holistic approach

No BTC building construction project may be limited to purely technical aspects. Quite the opposite, an in-depth and holistic analysis must be undertaken as early on as possible, building on the requirement for a quality construction whilst taking into account any local specifics (site, climate, culture, economy, technical abilities of the local workforce, etc.) along with the various requests of stakeholders - different levels of authority, technical staff, civil society and the related population - via a participatory process. It is the designer's role to translate the at times contradictory interests expressed into one coherent and forward-looking project that adheres to the guidelines of sustainable development with respect of social, economic and environmental dimensions.

1.2. Quantity versus quality

Do BTC works aim to satisfy the most urgent needs of the majority, even if that means a reduction in quality, or to deliver sustainable works regardless of price? This has been a huge topic of debate at BTC for many years now. However, it is clear that there is no absolute answer to this, and so the most important thing is to first satisfy the needs of the area. As such, in a country such as Burundi, where the needs are urgent, we can expect to want to produce a high number of facilities, whereas in a region such as the occupied Palestinian territories, where school construction is less urgent and technical ability greater, we can expect to focus more on the quality of works.

A few unfortunate experiences urge caution. Although all constructions should be designed to last at least 30 years, it has been noted that certain works have been in a deplorable condition only a few years after their acceptance. Such quality of work is unacceptable. Although the cost/quality ratio must be adapted to context, there will be a minimum quality threshold, which must be respected. This shall entail a certain rigour and professionalism throughout the process of design and delivery, but also the management and maintenance of the works.

These standards of quality are the reason for this document. Its aim is to set out the various support measures for the delivery of a social infrastructure worthy of that name.

1.3. Estimating the right price

The estimated budget for a building, whatever its type, sometimes proves to be undervalued as much in the identification as the formulation stages, or even in the Detailed preliminary design (DPD). Defining an appropriate budget for an investment, taking into account site accessibility, geological and climatic context, needs, techniques and materials to be used, etc., is nonetheless essential, since budget overruns are difficult to control within cooperation project budgets, which are rarely flexible.

Often, this underestimation at the identification stage may be explained by the fact that the overall budget for the future project/programme has already been determined due to policy constraints, although the technical information necessary for a proper budget estimation is not yet known. Added to this is the fact that the support measures - the costs of studies and monitoring and inspection assignments – have been underestimated, or even forgotten.

It is in the formulation stage that the scope of the results to be achieved is adapted to the total budget available by providing for a reserve that can cover any unforeseen charges. At this stage, it is important to have as realistic as possible an estimate of the construction costs relating to the works location in question, and which clearly identifies and prioritizes requests and includes all peripheral costs (architectural and technical studies, monitoring, inspections, inflation, etc.).

There may be many reasons for an underestimation of costs at this formulation stage. Once the project concerns a clearly identified infrastructure, for example a dam or hydroelectric power station, a feasibility study becomes necessary. While in the case of difficult geological zones, soil studies become necessary so that the costs of foundations and earthworks may be estimated, which are potentially expensive types of work.

Estimations at the DPD stage must be rigorous and comprehensive, and therefore as realistic as possible, with a tolerance margin of 10%. Their reliability is dependent on the level of detail of architectural studies and the accuracy of market surveys on construction costs. Inspection by an independent body may prove necessary in countries where local expertise is lacking.

1.4. Roles and responsibilities

Confusion has sometimes been noted over the use of certain terms such as Project Owner, Project Owner Delegate and Project Supervisor¹. More fundamentally, certain works confuse roles and responsibilities amongst the various parties involved in the infrastructure delivery: public authorities from the partner country, project management units, design office in charge of the design plans, monitoring bodies - where this falls outside the remit of the design office - and inspection agencies, where the latter exist.

It is the responsibility of the independent design office, as Project supervisor, to design the plans and sometimes to monitor the worksite. Devolving both of these tasks to the same office – so that it becomes a complete assignment – may help to guarantee a technical and legal continuity between the design and construction phase. In certain situations, technical monitoring should be carried out by a different office, either more experienced than the former or with the necessary human resources in the works location. The choice for a complete or partial assignment should therefore be carried out on a case-by-case basis.

It is therefore not the responsibility of the project management unit or any of its members, whether a local engineer or an international technical assistant, to take on these tasks directly as the legal risk is

¹ See the definition of these terms in Appendix 1 of this document

too great. It is, however, the project management unit's responsibility, as the Project Owner (when the project is state-managed) or the Project Owner's representative (when jointly managed), to ensure, on behalf of the Ministry it supports, the service quality of all service providers and building contractors, to advise and guide them, and even bring forward innovative ideas - energy efficiency, passive architecture, treatment systems, etc. - but not to take on any of their legal responsibilities. And so although it may be BTC's responsibility to ensure the successful execution of cooperation projects and provide technical added value, it is not BTC's responsibility to take on legal responsibility for the various infrastructure delivery phases.

In certain situations - particularly in the context of a very large construction programme in terms of size, complexity or number of works to be built - it may be useful to procure the services of an inspection agency. Such an agency will be responsible for verifying, on behalf of the Project Owner, that the work of the design office(s) and company or companies has been carried out in accordance with best industry practices and construction reference standards, including worksite safety standards. An external professional review by an internationally recognised Quality control office would be particularly useful for certain key phases (DPD approval, foundation construction, finalisation of structural works, provisional acceptance, etc.) all the more so if the cooperation project team does not itself have access to international expertise, or the technical ability of the local design offices is limited.

1.5. The stages; from design to construction

1.5.1. Planning and impact studies

Although the construction of a school or health centre may be technically simple, the pertinence of the choice of its location is often underestimated. It is not just a question of building it wherever land is available, but in the most appropriate place for it to meet the needs of the local population without competing with already existing resources. It is therefore important to consider and plan this type of investment to be coherent on a regional or even national scale – using, as the case may be, a school or medical map - and based on an objective needs analysis. This exercise requires the collection and analysis of information by means of a database (EMIS format for education), linked or not to a Geographical Information System (GIS). Such a system is complex to set up and needs to be regularly updated. It requires the presence of a qualified expert as well as resources for the collection and processing of data.² As such it is imperative that this be adopted by the lead ministry. Beyond these constraints, it remains the best guarantor not only for rigorous planning but also for the objective selection of works locations, meaning that any form of pressure, including political pressure, may be avoided. It is also the responsibility of cooperation agencies, such as BTC, to incorporate their investments into this type of planning, and to ensure, where necessary, that it is strengthened, regardless of its level of sophistication.

The planning of larger works – for example referral hospitals or technical schools – suits this type of network. Due to their low numbers nationwide, choosing a location is much easier. They must, however, keep in mind the needs of the people in the location in question as well as the transport facilities. Their reputation will also affect the number of patients/students they attract.

Lastly, it should be noted that for the construction of other types of infrastructure –engineered landfills, dams, deep wells – an environmental and social impact study will be necessary. This must identify any potential risks relating to the construction and use of such equipment on the environment – soil pollution, including the groundwater table, air pollution and surface water pollution, the impact on biodiversity, etc. – but also on the surrounding population and define any mitigation or even

² Today, technical surveys may be carried out using Smartphones without the need for a GPS or sophisticated GIS. For more information, contact the Infrastructure unit.

compensation measures. It is important that this type of study be carried out by an independent agency, which is competent in environmental and socio-economic matters, and that the results are then communicated to a broad public.

1.5.2. Programming

For the design of any building, the partner and future beneficiary should first of all get together and make a list of all the different functions the building must provide, their needs in terms of space and any facilities to be provided, as well as the relationships between them – proximity, exchange of flows of goods and people, external relations, etc. From the spatial relationship of these various constraints should emerge a function organisation chart on the basis of which an architectural design may be developed. For the building to respond to changing needs over time, this exercise must include a forecast of at least 30 years.

It is at the end of this exercise that it will be possible to determine the total area required, taking into account the core functions requested, circulation zones and required services. The latter are often underestimated in the original programming carried out by the beneficiary. This process should enable an overall budget to be drawn up on a cost per square metre basis, based on the expected level of finishes in accordance with the type of function and the number of floors anticipated (see below).

For complex layouts such as referral hospitals, technical schools or administrative offices of a ministry, this exercise will be part of the process for drafting a master plan, a compulsory stage prior to the development of a Detailed Project Draft.

1.5.3. Choice of site

The choice of site is the responsibility of the Project Owner and the future beneficiary. On the other hand, it is the project management unit's responsibility to verify the appropriateness of this choice by ensuring that the land meets a set of criteria: accessibility, ease of connection to water, electricity and sewers, geology (Bearing capacity of the ground) and topology (slope and flood risk), it being understood that the potential of the site should be valued by the project planning and design, but that an attempt should also be made to ensure that the financial impact of its constraints are limited while simultaneously agreeing in advance on the allocation of costs with partners. Once the choice has been made, the legality of the property deeds should be verified and any expropriations supported financially (charges to be borne by the partner) as well as socially.

1.5.4. Integration at site

Once the exact size of the required surface area is known, the construction of the future building on the site identified may be determined. Depending on the buildable surface area available, the typology of nearby buildings and any other urban constraints, the number of required floors will be established on the basis of the anticipated square meterage. This will quite clearly have significant budgetary implications, given that the average construction per square metre of a one-storey building is less expensive and less complicated than a multi-storey building, especially if the area in question is seismic. This may be explained by the larger sizing of its foundations and structure as well as by the additional surface area for circulation required, even if lifts do not need to be provided for³.

It may be useful to revisit the notion of buildable surface area. It is indeed rare to allocate an entire plot for construction, even in the city. The standards and ratios in force should be respected, taking

³ In some cases, the partner may express the wish to design a building that allows for vertical extensions with the construction of additional floors at a later stage. An admissible option, but one which will have a definite impact on the initial investment with no guarantee that this additional investment will be amortised one day.

account of any traffic requirements and necessary car parking spaces, storage and waste treatment areas and the buffer spaces they produce, as well as the necessary spaces for rainwater collection and drainage, without forgetting recreational and relaxation areas, including the green areas necessary for the preservation of biodiversity and groundwater levels and for the well-being of occupants. Here, it will be important to avoid constructing the building in the middle of the plot, and to optimise its spatial organisation for different uses whilst providing for possible future extensions.

1.5.5. Design

The design of any building requires that account be taken of a series of both technical and human elements, which will be detailed in the second part of this document. Remember, at this stage an architectural construction should be designed to meet its intended function, the needs of users, gender issues and environmental conservation, all whilst reflecting the culture it forms a part of and its relationship to modernity. In certain countries, an inclination towards presumptuousness may be observed in the sheer number of colonnades and pediments or in overhangs. Although it may not be down to us to judge the aesthetics of the final result, it should nonetheless be recalled that restraint does not necessarily indicate ugliness, but the economy of means. It is, however, the project's responsibility to draw attention to its relationship with time and the durability of the works. Both the designer and the beneficiary should therefore, as early on as possible, take into account the care and maintenance of the future building. Focus could also be drawn to the use of simple forms and durable materials, which would reduce the impact of future climate and user damage and, therefore, limit maintenance.

Also to be considered at this stage is the issue of energy, water cycles and natural resource preservation in general. Energy efficiency, water consumption and the development of renewable energies (RE) do indeed affect building design, and are better included from the outset.

It is the responsibility of the design office to integrate these different aspects into one coherent project, to be submitted to all stakeholders in order to receive their feedback. At the SPD submission stage, a seminar should be organised for this purpose so that everyone may understand the proposed plans (very few people can read an architectural plan and understand all its implications without an explanation). It is the responsibility of the designer to incorporate any comments made without distorting the basic architectural concept, and to submit a new version for approval. This type of approach makes the design phase a more participatory process. This exercise should therefore be provided for in the terms of reference for the office via the submission and presentation of 2 to 3 sketches (if possible in 3D) so that a choice may be made from various options.

1.5.6. Construction norms and standards

Many countries have construction standards or are accustomed to referring to specific standards (for example, French standards in West Africa). These standards should be complied with, although there is freedom to improve upon certain aspects, provided that the financial impact is manageable and its technicality corresponds with local ability and the materials available on the market.

Similarly, certain countries have standard plans for the construction of classrooms or clinics. Although the alignment concept may call for compliance with these standards, this alignment should not however be blind; common sense should still prevail. An example to note is square metres per pupil. If these are below the minimum standards to ensure quality education, discussions should be held with the partner to re-examine them.

This critical alignment may lead to a fundamental review of the standard plans, provided that an objective analysis is able to demonstrate the interest of such an overhaul. A pilot construction stage may prove necessary to convince the ministry concerned before new plans are formally approved and

become the new standard. Such approaches clearly have a significant impact on the timing, but they definitively are an added value for the ministry concerned.

1.5.7. Public contracts

The choice of design office to be responsible for the design is important. Although there are offices of this type in the majority of BTC partner countries, few have real competence in the fields of health, education or justice. Similarly, while it may be possible to find qualified local engineers, it is rare to find architects worthy of this name. A selection phase based on the actual experience of the office and the proposed team is therefore crucial.

For more complex projects, it may be interesting to develop a project contest enabling the Project Owner to obtain a project proposal on the basis of a choice made by a jury. This type of procedure requires a screening phase, the establishment of an independent jury and, depending on the case, the presentation of awards to the 3 best proposals, something which requires time and money, but which may, ultimately, prove fruitful.

Technical and architectural support during the design phase often proves necessary, especially since these offices rarely deal with matters relating to energy efficiency and passive architecture in tropical, semi-tropical and arid areas. This may be ensured through international technical assistance within the project, or through a recognised consultancy.

As for the procedures for awarding public works contracts, an automatic award procedure is often the mode employed. In this case, the price is therefore the only decisive selection criterion. Sadly, a plethora of examples will demonstrate that in selecting the lowest tender, quality is rarely what it should be. The public contract procedures do however allow for a selection based on experience and quality.

A few points to note (see also “GL fundamental procurement principles”):

- **Applicable legislation:**

The applicable legislation is defined in the Specific Agreement or the TFF.

- **Optimal planning for public contracts:**

The application of legislation in matters of public contracts aims to maximize the quality/price relationship of the works. As the legislation imposes that certain time limits be adhered to (particularly when using competitive procedures), it is therefore necessary that the Project Management Team ensures optimal planning of its purchases by taking contract award deadlines into account so that its activities will not be delayed.

- **Interconnection between several contracts:**

For works contracts, it is not uncommon that these precede a supply and equipment installation contract (e.g. a hospital or a seed laboratory) and a training services contract.

- **Determining the contract value:**

Public contracts are contracts concluded for pecuniary interest. Determining the price is very important, both for the buyer, who must pay an amount guaranteeing the correct performance of the contract under the conditions outlined within, but also for the holder. As such, the value of a contract shall be determined by taking a series of elements into account.

The base price and the final price will often differ depending on the uncertainties inherent to the construction phase (except in the case of a single lump sum and non-revisable price) and on the determination of unit prices (if the Project Owner does not know the quantities that will be required in advance, e.g. m³ of concrete) and contract pricing (the works for which quantities can be defined precisely). When the construction work contract covers several months, the use of a price revision clause will be mandatory or optional (variation of prices of raw materials and labour). Where they exist, indicative price lists will be used (or, with caution, the price breakdown of similar contracts in a given period). (See “GL Procurement prospecting”).

- **Constitution of lots in works contracts:**

Dividing the contract into lots must take into account the size and the actual capacity of potential tenderers and the nature of the work required compared to the structure of the contract tender. We must also consider the limitation of the number of lots that can be attributed to a same tenderer. If required, it will be necessary to define a criterion for limiting the maximum number. The establishment of this limitation is related to the ability of tenderers to run a greater or lesser number of lots.

- **Assessment of the qualifying criteria:**

It is very important to establish qualifying standards for determining if the tenderers that submit tenders have the technical capabilities and adequate finances to carry out the contract. In this case, only tenders by qualifying tenderers will be allowed. The same will apply to the technical tender's evaluating criteria when the price is not the sole criterion for awarding the contract. (see “GL Procurement technical specifications”).

- **Companies' access to public contracts:**

Some service providers require specific authorisation to provide the service concerned in their country (architects, engineers, etc.), or contractors must provide proof of registration on an official list (approval of contractors, professional register...)

1.5.8. Worksite monitoring

Professional technical monitoring of the worksites is an important guarantor for the quality of the works. Regular visits are required (at least weekly). At certain key points, they are also imperative, for example, when verifying the iron structure before pouring a concrete slab.

A more detailed inspection will also be required for verifying the quality and quantity of materials used. Indeed, a daily inspection is useful in verifying that the engineer's daily instructions have been properly adhered to. Unfortunately, it is not always possible to ensure that a technician (known as a “worksite representative” in certain countries) is permanently available at the worksite to perform this task. One viable option may be to use an on-site representative of the future beneficiaries, such as a teacher in the case of a school expansion. This has the advantage of involving the ultimate beneficiary from the beginning and ensuring that they are aware of any problems encountered at the worksite, which could be useful for subsequent maintenance operations. Such an approach requires suitable support: formal preliminary training of future supervisors, close collaboration and well established communication channels with the engineer in charge of the weekly monitoring, clear and accurate instructions provided at the various stages of the construction and a reminder that it is not the responsibility of the daily supervisor to issue injunctions to the company, as only the Project Owner's representatives and the Project Owner are authorised to do so.

Two further levels may be added to these 2 levels of monitoring: that of the management unit and that of the ministry representative. Monitoring should be coordinated to prevent contradictory recommendations from being submitted to the company. This may be achieved specifically through the organisation of monthly worksite meetings at which disputed issues are decided on, the decisions being documented in meeting reports.

Other than the correct use of materials, as described in the Tender Specifications, in terms of quality and quantity, their storage conditions, their use according to best industry practices, compliance with the plans, the worksite presence of qualified and non-qualified staff as well as the facilities provided for in the tender, visits should also ensure that minimum safety standards have been complied with. This aspect is all too often neglected in the majority of partner countries by the companies and monitoring agencies, as well as by the technical ministries. The wearing of helmets and safety shoes are safety measures, which are rarely adhered to, as is the instalment of fencing around the perimeter of worksites to avoid persons not related to the works, including children, from being able to access them. It is the responsibility of a cooperation agency to stress the importance of these measures and ensure that they are complied with.

Finally, it should be noted that it is the responsibility of the design office in charge of the monitoring to draft the as-built plans. This is a revision of the original plans, which incorporates all changes made during construction. This type of plan is particularly useful for the maintenance of large buildings.

1.5.9. *The institutional aspect*

A development cooperation project is rarely limited to a single contribution. A component to help strengthen the lead ministry's abilities often proves necessary to help the latter better manage the stages relating to the planning, design, or monitoring, as well as the management and maintenance of the works, this last aspect being all too often neglected.

The Sectoral Days organised by the Governance and Infrastructure units at BTC's headquarters in 2014 will approach maintenance issues by addressing both the institutional aspect (liability, accountability, provision of funds, etc.) along with any technical issues (checklist and manual for problem analysis procedures and repair methods).

1.5.10. *Required expertise*

A strategy concerned with the quality of works as advocated in this report requires a holistic approach, necessitating suitable expertise at several levels: the institutional partner, the project management unit, the local design offices and companies. It will be important to evaluate skill levels, absorption capacities, and from there, define the required support in terms of resources and the training of these various stakeholders. This aspect is one of the major stumbling blocks regularly met by the institutional partners during the formulation stage. It must be dealt with clearly so that it may be refined during the project start-up phase with a more focused study of training requirements.

2. *IMPLEMENTING THE STRATEGY*

2.1. *At the formulation stage*

The aim of a formulation is to establish the feasibility of anticipated project results in accordance with pre-established budgetary limits, to define the necessary resources to achieve this, the modalities of participation, project duration, the level of mainstreaming cross-cutting themes and any risks and possible mitigation measures.

2.1.1. Budget estimations

The challenge here is to collect the information needed in order to refine the estimate to make it more realistic during the project identification, and this within an acceptable timeframe.

When it comes to the construction or renovation of a large number of similar infrastructures - schools or health centres - it would be wise not to embark on the project with a set number of infrastructures to build/renovate for a prescribed overall budget. Although it may be possible to establish a realistic estimate of a new construction, unexpected events are inevitable (foundations, backfills, additional costs due to the remoteness or inaccessibility of some of the sites, inflation, difficulty in finding reliable companies, etc.), and all the more so if it concerns renovation works, where estimates are much more uncertain. The intervention zone should therefore be circumscribed and a range should be given for the expected deliverables rather than a precise number.

In the case of renovation/extension of sites comprising a group of buildings, such as district hospitals or technical schools, it will probably be required during the formulation to cite the eligible sites by name. The first step will be to draw up a comprehensive inventory of the existing buildings and determine the extent of the renovations/extensions to be delivered (this may be carried out alongside the formulation mission by a team of local consultants). In collaboration with the various levels of the lead ministry, an order of priority should be established, either between the different sites (which is rarely accepted), or between the needs identified for each site, by establishing the priority functions to renovate, fit out or expand.

Flexibility should thus be the key word in order not to inhibit the scope of works to be undertaken. This approach runs, without doubt, counter to the aspiration to measure the anticipated results of the works using exact figures, but it will mean that the project will be able to deal with any contingencies in a pragmatic way.

This approach is not so practical for a project where the objective is clearly defined, or a project, such as a dam or an engineered landfill, where the size has been accurately specified and where every element is necessary in ensuring that it functions properly. In this instance, achieving the anticipated results is not possible without first building the entire building and all its related facilities. Faced with this type of project, the only solution is to require an in-depth and therefore lengthy feasibility study in the formulation stage. This should enable the drafting of a rigorous budget for works to be delivered. An environmental and social impact study should follow so that any mitigation and/or compensation activities are included in the works and identified risks dealt with.

2.1.2. Duration

The construction of a building, or group of buildings, requires a series of actions in sequence, from the identification of needs and planning, to their execution, and all the various studies along the way. To do this, various calls for tender will be needed, pursuant to the terms of delivery outlined in the TFF (those of the partner country in most cases). At each stage, delays are possible for a multitude of reasons - incomplete tenders or unsuccessful procedure, delays in delivery, etc., not to mention delays of approval nationally as well as from BTC itself. It will be important, during the formulation, to establish the sequencing of these different stages - their interrelationships and theoretical duration⁴

⁴The traditional assumption is that the first construction-related activity will start six months after the project managers have started. The duration of studies may range from 3 months (simple project) to 6 months for a more complex project. Construction duration may vary (outside of seasonal risks such as rainy season) from between 6 months for a one-storey, 6-class school to a minimum of 12 months for a more complex build; a further 1 year must also be added to this for final acceptance. To this may be added the various timeframes necessary for public contracts, which depending on the country, may vary from between 3 and 9 months per case,

along with delays of approval, and identifying the risks of delay, the calculation of which should be included in the duration of the works. Unfortunately, the partners sometimes have a tendency to underestimate the time required for each stage as well as the risk of delay, not wishing to openly criticize the administrative system in which they operate. Consultation should also be made with other players, including other cooperation agencies, on the average duration of similar projects, and a further safety margin added to this. For projects delivering a substantial number of infrastructures, it will sometimes be necessary to negotiate certain adjustments with the partner, in accordance with the legislation, so that any risks of delay are limited. Such agreements are a possibility provided that they are clearly described in the TFF.

2.1.3. *Appropriate human resources*

The commitment to deliver quality buildings both in terms of design and construction requires access to quality expertise. During the formulation, this should be assessed at three levels:

- technical skills and availability within the ministry concerned;
- design and worksite monitoring skills of locally available consultants and their workload;
- skills and availability of construction companies.

To this may be added an analysis of the organisation of the ministry itself, its logistic facilities and responsiveness.

Although the skill level of national engineers may be satisfactory in many countries, with the quality of local real estate as proof, this does not, however, always mean that innovative solutions will be provided, and this applies in both architectural and technological matters alike, including the use of appropriate materials, energy efficiency, environmental conservation, gender issues, the promotion of renewable energies, etc. Furthermore, expertise should not, strictly speaking, be limited to purely technical aspects. Institutional capacity development in a variety of areas (planning, design, monitoring and inspection, participation of the local communities both in decision-making and implementation, facilities management and maintenance, etc.) is often necessary.

The use of international expertise can indeed prove to be useful in helping BTC to provide real added value to the process. This may take various forms: periodic consultancy services, technical assistance shared between several projects or on an ongoing basis. Its primary goal is to support and facilitate the works. It may also be useful for strengthening the skills of the various players, specifically in their ability to critically assess current practices and encourage innovation. It may also contribute specific expertise in certain fields, although certainly not all. As such, it is not a substitute for the ad-hoc support of national or international specialised consultants.

The usefulness of international expertise in the field of architecture and engineering is, however, today contested in many countries, as national competencies are often judged sufficient by the partners and are also less expensive for the monitoring of said projects. However, poor quality, which is still all too often observed in numerous works of this type, prompts us to remain cautious.

International assistance is certainly not a panacea, and all the more so as it is becoming increasingly difficult to find adequate expertise. However, the contribution of an independent external view, in light of international best practices, may make a difference in many cases, even if this is to be shared across several works to reduce costs and avoid the risk of the project management becoming too involved.

This calls for a more comprehensive understanding of the infrastructure portfolio at the level of the

various BTC partner countries. It will then be up to the person responsible for the formulation to budget for this periodic technical assistance to be shared across other projects. Coordination will therefore be the responsibility of headquarters and the Representation. This point will be discussed in more detail in the following chapter.

2.1.4. Agreement on execution or financing

The Project Owner's representative may provide an interesting alternative to the provision of technical expertise during project identification at the formulation stage. It is indeed conceivable to delegate all the construction management anticipated for a project to an existing public or semi-public executing agency via an agreement on execution or financing (Project Owner Delegate). The latter must have the experience and necessary human resources to take on this role. It may be a cooperation agency or a public works execution agency such as AGETIP in Senegal or ABUTIP in Burundi. Such management units have generally been created by the World Bank, with the aim of managing extensive infrastructure programmes on behalf of technical ministries. The prerequisite for the use of this type of arrangement is that it must be provided for in the TFF by naming the selected agency and justifying the choice. For more information, refer to the guide on execution and financing agreements.

2.1.5. Cross-cutting themes

The Belgian development agency is concerned with the integration of cross-cutting themes into its works. Environmental protection has been implicitly highlighted in various parts of this document: the limitation of negative impacts on the environment in the design and construction stages as well as the use of the buildings themselves has been described in great detail. It is also thought that measures relating to the management of climatic changes, should also be provided for during the formulation. To do this, the incorporation of adaptation measures (such as, for example, taking account of increased precipitation risks in the sizing of drainage and sewage systems, the development of aquifer recharge zones, or measures limiting the risks of rising temperatures in urban areas, etc.) and mitigation measures (measures aiming to achieve a low carbon society, more specifically through the development of energy efficiency and promotion of renewable energies) should be ensured.

Focus should also be put on the importance of ensuring accessibility of public spaces by those with reduced mobility, and a consideration of how they will be used by women in accordance with local culture. Good examples include the privacy of toilets or consultation rooms in health centres.

Attention should also be drawn to respecting children's rights: for example, it should be ensured that the employment of minors at worksites is strictly prohibited. The same goes for attention for HIV/AIDS awareness campaigns for staff at the worksites may be useful, as it is a known vector of propagation.

2.1.6. Risk management

Risks related to budget overruns, delays both in the research and construction phase or the availability of expertise are recurrent in infrastructure projects. Corruption is another frequently cited issue. The latter needs special attention, although it has not been discussed further in this manual. Studies and documentation are available from BTC's anti-corruption unit in Brussels, as well as the Anti-Corruption Resource Centre, a U4 organisation (www.U4.no).

2.2. At the operational level, by country

2.2.1. Evaluation of the volume of construction activities for projects in countries without Technical Assistance Infrastructure.

The setting up of a directory, highlighting the short and medium-term financial volume for each of the partner countries, as implemented by the Representation (with a copy at headquarters) will make it possible to assess the size of the portfolio of construction projects without access to internal technical expertise. This directory should also include a breakdown of the number of construction projects (worksites) to be implemented.

Analysis using the directory may be conducted on several levels for each project:

1. total expenditure and number of worksites for the current year;
2. number of contracts entered into and an overview of planned spending up to the end of these contracts;
3. number of worksites and budgets provided for in the TFF of forthcoming but not yet signed projects, and commitment forecasts;
4. number of worksites and budgets in the TFF for finalised formulations, but whose projects have not yet started. (See worksite timeline, which goes from needs assessment to final acceptance in Appendix No. 11);
5. estimation of infrastructure budgets based on ICP forecasts for currently unplanned projects.

On the basis of this information, it will be possible to determine expertise requirements in accordance with the budget levels listed below. As specified below, an analysis of context should be incorporated into the definition of these needs, that is to say the skills of the partner institution(s), design offices and companies, as well as the programmatic complexity and techniques to be implemented.

2.2.2. Categorisation of human resource requirements based on construction activity volume

1. Less than €1,500,000/year and less than five construction projects

This level does not require internal technical assistance, as this would be too expensive given the level of investment. It should therefore be thought of in terms of exchanging available expertise in a country or neighbouring country. A Technical Assistant Infrastructure may thus provide punctual and regular advice on projects in which they may not be directly involved during the fundamental phases (architectural planning, design in the SPD and DPD phases, revision of technical terms in TD in the worksite phase).

This type of exchange requires that the project benefitting from the expertise bear the costs relating to such input, or even the expert's salary.

2. Between €1,500,000 and €5,000,000/year and between five and ten construction projects

For such a volume, it is up to the Representation to hire a Technical Assistant Infrastructure, where the costs would be shared between several cooperation projects. Depending on the opportunities available in that country and the complexity of construction activities, this assistant may be found

nationally or internationally. An analysis of the institutional context will help to refine this choice by assessing to what extent this technical assistance will be useful in the sectoral political dialogue.

This TA would have technical responsibility for the constructions and would work in all of BTC's concentration sectors for the country in question.

The Technical Assistant Infrastructure would oversee the following tasks:

- organising construction activities in consultation with the project managers;
- ensuring the prevention of any forms of corruption;
- contributing added value in terms of capitalisation, networking, innovation, energy efficiency and renewable energy concepts;
- capacity development at the ministry level to support the development of construction strategies: defining a methodology for the development of health/education/legal maps, implementation of a policy for day-to-day management, effective maintenance and the budgeting of this;
- developing the abilities of the various partners;
- reducing the workload for technicians in specialised fields (pedagogy, medicine, law, sociology, agronomy, etc.), who may then devote more time to their respective disciplines;
- ensuring quality monitoring and an inspection process for construction designs and works;
- prospecting the local market to identify quality architecture firms, design offices (engineering) and companies. Establishing a directory of companies and local design offices;
- providing support for the Representation in the formulation of projects, which include a construction aspect;
- helping the project management check if the budgets included in the TFF are up to date. And if not, reviewing priorities with the project management;
- defining with the project management the architectural construction programme to be undertaken;
- drawing up the ToR in order to contract an architecture firm or design office for each construction project;
- analysing (technical parts) tenders from the architecture firms or design offices in collaboration with the project management;
- monitoring the design studies with the architecture firms or design offices and attending SPD feedback meetings;
- revising the technical parts of the TD for the works;
- participating in the administrative, technical, quantity and price analysis of tenders from companies and signing the award report;
- ensuring worksite monitoring either personally or via assignment of the inspection and

attending all worksite meetings at least twice monthly.

- attending the provisional and final acceptances of worksites.
- In collaboration with the Brussels EST department, the Representation will evaluate its needs and hire an infrastructure expert.

The project management remains responsible for procedures in general, but are relieved of the technical element; they must ensure:

- that the administrative parts of the TD/TS have been drawn up;
- the architectural programming with an International Technical Assistant Infrastructure;
- that the TD have been finalised and the CTs have been launched in the area newspapers and on the BTC and EU sites (if necessary);
- the organisation of the opening committees and analysis committees for tenders from architecture firms, as head of tender analysis;
- the organisation of the SPD feedback meetings, to be attended by the International Technical Infrastructure Assistant;
- that the administrative parts of the TD for the companies have been checked and the CT launched;
- the organisation of the opening committees and analysis committees for tenders from companies, also as head of tender analysis;
- that they attend the worksite meetings;
- that they are involved in provisional and final acceptances and, as often as possible, the worksite meetings.

3. More than €5,000,000 and more than ten construction projects

Following the same principle, a Technical Assistant Infrastructure should be hired (depending on the context, from a high level nationally or internationally) to join the Representation. A national team of engineers, the number of which will depend on the remoteness and scale of the worksite, will support him.

The main task (ToR) of the national engineers will be to monitor the worksite, but the TA him/herself will refine this remit.

Should the budget be closer to ten million, taking local specificities into account, a second Technical Assistant Infrastructure should be hired to the Representation. In this case, it will be important to clearly divide activities (there will be no shared responsibilities) either by region or thematic sector, depending on the volume of construction activities.

2.2.3. Financing the technical assistance

The cost for an international TA is between 3 and 10% of an annual financial volume of infrastructure of 1.5 to 5 million euro.

The financing of this technical assistance should be charged against the 'infrastructure' budget of each project by applying the rule of proportional representation, a more realistic option than own financing given BTC's budgetary situation. This budget should be provided for during the formulation. It should therefore go beyond the simple project framework and establish links between the various works in accordance with directives from headquarters and the Representation (see above).

An agreement between project management units, in conjunction with the partners, should define the allocation of the TA's working time and possibly also their financing, if this has not been provided for in the formulation stage.

2.3. At project level

2.3.1. In the absence of technical support at the level of the Representation

When the project management locally hires a construction engineer (if hired under a BTC employment contract, they may be designated as executive officer; if a service contract is used, their mandate must be specified in the Tender Specifications), it will be important to identify and clearly define their mandate in the contract documents (studies and works). Following a risk analysis and on a case-by-case basis, the following steps may be taken:

- verification of whether the budgets in the TFF are up to date and informing project managers of the situation;
- drawing up the ToR and the TD in order to contract an architecture firm or design office;
- organising and preparing the documents for the opening committees and analysis committees for tenders from architecture firms;
- drawing up the opening and analysis report for tenders from architecture firms;
- revising the technical parts of the works TD;
- organising and preparing the documents for the opening committees and analysis committees for tenders from companies;
- drawing up, in collaboration with the architecture firm, the opening and analysis report for tenders from companies;
- ensuring the contract monitoring of the architecture firm service contracts and the company works contract;
- being responsible for worksite monitoring on behalf of the project management and attending worksite meetings every week;
- checking progress reports in accordance with the original schedule, related invoices, and producing a monthly progress report;

- suggesting adequate technical solutions for problems encountered in the field;
- being responsible for the provisional and final acceptances of worksites on behalf of project management.

2.3.2. In case of support at the level of the Representation

As detailed above, the Technical Assistant Infrastructure of the Representation will deal with the technical part of construction procedures. They may, if needed, request support from the EST department and LEA unit for critical project phases such as the SPD and DPD.

The project management remains responsible for all administrative and financial elements of the process, specifically: the architectural programme, the launching of the call for tenders, tender analysis, verification of the plans and TD documents, attending of worksite meetings.

2.4. At the headquarters level in Brussels

Depending on needs and its availability, the headquarters Infrastructure unit will strive to provide support during the different phases of the construction process at the request of the project management, the Representation or headquarters itself. This support primarily aims to guide the project management in the execution of its tasks and to verify the quality of input submitted by the design offices and the companies. It will unfortunately be difficult for its members to substitute the project management and assume specific tasks on their behalf, such as the delivery of a master plan or the drafting of a call for tenders, but they can contribute to the writing of technical components.

For countries where the Representation has no construction expertise, the unit should be more present at certain stages, such as the development of architectural programmes, SPD and DPD feedback, and on an ad hoc basis, during worksite monitoring, including provisional acceptances.



PART 2

Starting construction activities

1. STUDY OF NEEDS AND FEASIBILITY

1.1. Project start-up phase

During the start-up phase, the newly formed project team will endeavour to visit the identified site or sites and analyse the budget in respect of the programme planned as well as the construction standards set. In addition, it will check that the data in the TFF is still up to date; if necessary the construction activities planned must be adapted to the partner's new aspirations or a change of context.

A prospective study with a few architecture firms, local companies and materials suppliers will also be useful for collecting various information such as: work capacity, skill levels through analysis of the parties' references, the costs of services (studies and works) and materials in order to determine an estimate of the cost per square metre for a major renovation or new construction in accordance with project standards. On the basis of this information and those from other sources (other BTC, EU, WB, NGO projects, etc.), the project management will verify the price per m² for new constructions and the renovations proposed in the TFF. This study will also assess the interest of the private sector for the implementation of future project works.

During such an exercise, the project management will ensure that the principles of competition, transparency and equal treatment of tenderers are respected, by avoiding supporting one or another party through the disclosure of certain information or the subsequent distortion of a contract by introducing characteristics specific to a potential tenderer into the Tender Specifications.

1.2. Influencing factors in the architectural design

1.2.1. Programming

Programming requires a synergy between the organisation of a building and the philosophy that will come along with its usage. Thus, for example, the design of a school must be in keeping with the type of teaching that will be practiced.

At this stage, the following points should be noted:

- the relationship between the spaces and their future functions and the different types of circulation (people - internal and external - and goods);
- the comfort of users - room temperature, humidity levels, noise, natural and artificial lighting, etc. - taking into account not only codes of good practice and the local culture, but also the impact of the chosen materials on these aspects (some materials being able to alleviate or worsen temperature, humidity or dust production problems);
- safety-related aspects: risks of fire (width of doors and corridors depending on number of users, emergency exits, etc.), theft or natural hazards (floods, earthquakes, tornadoes, etc.);
- topographical constraints (taking into account the slope of the land) and climatic constraints (position in relation to the sun and prevailing winds, solar protection, rain and wind, humidity, dust exposure, differences in temperature according to seasons and between day and night, etc.) will influence the situation of the building, its form, its insulation, its passive facilities (blinds, solar chimneys, natural ventilation systems, etc.) and its active facilities (air conditioning, heating, artificial lighting, etc.);

- an inclusive consideration of the gender dimension. This will include, for example, an inclusive consideration of persons with reduced mobility or the role of women in society (see various standards and documents on this subject);
- typological adaptation to the local cultural context and taking account of cultural practices in the use of spaces;
- constraints relating to management and maintenance (raising awareness of problems, technical availability and resources);
- environmental issues both during the construction and final use of a building:
 - waste management, risks of erosion and dust production from construction;
 - orientation of the building and its exposure, accessibility, water management including used water, the materials used (priority to local or recycled materials wherever possible), waste management, pollution prevention;
 - The impact on fauna and flora, conservation of the local ecosystem, including any notable trees on the site;
 - aspects relating to climate change should also be taken into account at this stage (change of hydrological rhythms, heat islands, etc.);
 - energy sources used, energy efficiency of building and use of renewable energies. (For more in-depth information on these last two points, read “Development, a matter of energy. Promoting renewable solutions”, BTC (2012), available on www.btctb.org, only in English).

Both the programming (number of rooms, surface, functions to provide for, etc.) and the selection of the required equipment type must be made in consultation with the future recipient, while ensuring a notified external, professional inspection, in order to avoid excessive or useless requests, over/under sizing or oversights. It would be interesting to ask the service users about their ideas for the best architectural function of their services, as they are sometimes better informed than their superiors.

It would be useful to check the existence of standard building plans (primary school, health centre, district hospital) at ministry level and see if they correspond to the request, taking account of the required standards such as thermal comfort and energy efficiency. Note here that if it is a matter of alignment with national policy and its standards, this alignment will be critical.

The architectural programme will allow tendering design offices to assess the scope of the work to be undertaken and as such the resources that they will have to make available to perform the contract. It is easier to over-estimate the work to be completed, even if it means lowering the volume at the SPD stage, than to be subsequently restricted in responding to new requests if the budget falls short.

The programme must include:

- the list of necessary services: offices, operating theatres, classes, courts, dormitories, meeting rooms, archiving rooms, secretary's office, etc.;
- the number of people, beds, pupils or spectators that each area accommodates. On this basis calculate the necessary toilet facilities;
- identification of the premises to include specific equipment (such as for example radiology or

multimedia rooms), the required electric power and the dimensions of the machinery, the number of electrical outlets needed, necessary water points...;

- the number of m² for the desired construction, for example: 9 m² for a secretary's office; 16 m² for a director's office; 1.5 m² per pupil for classrooms; 4 m² per hospital bed (to which clearance spaces to exit and enter the room with the bed must be added); 1 m² per person for a courtroom... Ministries sometimes have specific standards. Otherwise, it is possible to refer to "NEUFERT" (aROOTS edition);
- the operation of the building and interactions between the various services such as, for example:
 - for a hospital, the surgery ward must be close to the operating theatres, in which the plan must separate the movement of room equipment, or provide an outpatient consultation service at the hospital entrance;
 - for a courthouse, the plan should define the areas accessible to the public and those limited to judicial activity. As such, the detention area for the prisoners will be secure and located near the courtroom. Access should not cross the public flow;
 - in a school, the toilets should not be far away from the playground or the classrooms, while still being discreetly located away from the prevailing wind direction. A point to be aware of will be girls' access to toilet facilities;
 - for agricultural infrastructure, the foodstuff drying area must be near the storage building...
- internal circulation in the building, which is a minimum of 20% of the usable floor space;
- related services: incinerator, kitchen, covered walkway between buildings, access for people with reduced mobility, parking, access layout etc.

1.2.2. *Implant site*

Various elements specific to the ground must be checked with the local government, the neighbourhood, partners or other organisations working in the area. They will directly affect the design of the project. It is a matter of:

- on the one hand, the physical accessibility of the ground (roads, paths, trains etc.) and its proximity to the target audience and the higher referral instance on the other (e.g. district hospital, secondary school etc.);
- the area's ecosystem (presence of notable species), geology, (geotechnical constraints such as bearing capacity and stability) and topography (presence of erosion or flooding risk) and the risk of additional costs related to the nature of the terrain and the sub-soil. Consider wadis as an example in desert areas: these riverbeds are dry during the majority of the year and yet may prove dangerous during the rainy season;
- restrictions may affect building sites, such as sunlight and exposure to strong winds - including possible occulting (shading, or the bottleneck effect of nearby buildings or vegetation) - and possible nuisance through odours and noise from the neighbourhood. Here it will be a question of considering the potential nuisance that may occur, but also the nuisance that will be caused by the building;

- access to running water, electricity, telephony (including internet) and to the sewer (especially in the case of hospitals). In the absence of one or other, it will be necessary to take account of the additional cost to remedy this unavailability, or even to consider another location.

The property's deeds will also need to be checked. When the administration chooses to use land owned by an individual, they should check that the partner properly applies expropriation steps so that the owner is not unfairly treated. The World Bank standards are in this respect a good basis of reference that should be mentioned in the TFF. Lastly, it would be appropriate in urban areas to check sector and land-use plans where they exist, to ensure their conformity with the functionality of the proposed building and its typology.

1.2.3. *Choice of construction techniques and standards*

The definition of standards and construction technique options will be prior to or during discussions with the architecture firm and partner during the design phase. They relate to a series of points listed non-exhaustively here.

1. The effect of the ground on the structure of the building

The type of soil will have a significant impact on the budget and the choice of the foundation type, or even the construction technique:

- **ground known as “normal - bearing capacity of 1 kg/cm²”**: the building structure will be light, only having to support the building-specific effects (weight, wind etc.);
- **ground known as “expansive clay”** (soil usually cracked in dry season): the structure must, in addition to the building-specific effects, support the effects of the ground on the building (swelling and shrinkage). You will need to dig deep into good soil to lay foundations;
- **ground known as “marshy” (waterlogged)**: the structure will be designed on stilts in order to find soil sufficiently resistant to lay the foundations. This construction method is complicated and more expensive, not to mention the health risks arising from the possible presence of pests such as mosquitoes;
- **seismic zone**: the structure must, in addition to the building-specific effects, support the effects of the ground (tremors, multidirectional pushes) on the building. The foundations and the structure must be designed to withstand strong pushes and thus be oversized; the risk of damage to the building is never zero in the case of medium and high amplitude earthquakes⁵.

⁵Reminder of some basic construction principles in seismic areas (French standard PS 92)

1 The building construction should avoid mounds, a movable surface layer and the proximity of an active fault or a landslide corridor.

2 Building materials must be of good mechanical resistance. Take particular care with the quality of bricks and concrete.

3 Post/beam framework with brick filling should be avoided, as this is more vulnerable.

4 Choose forms that are as simple, symmetrical and regular as possible. Split complex shapes using earthquake-resistant joints. Large openings and overhangs should be avoided.

5 Ensure good horizontal and vertical mechanical continuity of concrete reinforcements. Use double wall-ties and wind bracing in order to ensure solidity between all the elements of the structure.

6 Shallow foundations must be interconnected.

2. The structure of the building

The selection of the structure type is made in collaboration with the partner. Distinguish between:

- traditional foundations laid with bearing walls and (wooden, metal or concrete) lintels for each door or window space;
- traditional isolated foundations with a concrete framework and non-load-bearing masonry filling. This type of structure is very often used and normally well known to local architecture or engineering offices.

Multi-storey buildings: they have the advantage of only having a roof limited to the number of useful m² covered and requiring a reduced land surface area, but the foundations and the structure will be more significant (actual weight, wind power etc.) than for a single-storey building.

It may be that the partner asks to design a building that can accommodate the addition of new floors in the future. This type of design raises questions, because it requires an important reinforcement of the foundations and structure of the building without the certainty that the upper floors will be built. The money invested in the foundations is no longer available for other immediate activities, such as site development or a better finish.

Construction on stilts: this type of construction allows good, natural ventilation, limits the risk of flooding and the need for building water and electricity pipes under flagstones, which facilitates maintenance. In addition, during the dry season, it allows covered outdoor activities. The major drawback is its cost.

3. The composition of walls

Walls can be made from various materials: fired clay brick, breeze block (concrete block), wood, compressed stabilised earth brick (CSEB) or adobe (soil formed and simply dried). In addition to resistance and maintenance, the environmental factor is important in the choice of material. Fired clay brick very often requires wood for the firing process (a furnace often with a poor yield requiring a lot of wood). Breeze blocks require a lot of cement. CSEBs require a press (manual or hydraulic). Hand-pressed mud bricks (whether or not self-locking) are the most natural, but require a specific design and construction (increased protection from moisture with an overhanging roof and base). Before using these types of materials, you should enquire into the existence of local know-how. BTC has some positive experience with CSEBs, in DR Congo, Burundi and Rwanda. Additional information is available from the Infrastructure unit at the Brussels head office.

4. Type of roof

Flat roofs in reinforced concrete require a bituminous 'roofing' type seal which is expensive but has a good lifespan (estimated at 40 years), provided that the material is good quality, correctly laid and well protected from UV and high winds (for example, placing a layer of gravel as ballast). This type of roofing offers good acoustic comfort and acceptable thermal comfort.

The sloping steel roof is less expensive than the flat one, but has the disadvantage of noise when it rains and overheating (think in this case of placing well ventilated false ceilings). Aluminum-zinc corrugated sheets are preferable to galvanised sheets (as they have a longer lifespan). Roofs with more than two slopes should be avoided, as they are difficult to lay, fragile at the joints and thus require more maintenance.

⁷ Bays and openings must be fitted with a (reinforced concrete, wood or metal) frame.

Frames may be made of wood or metal. The metal option is generally preferred for its durability; wood is not always well dried. But be careful to ensure the correct and uniform application of rustproof paint (at least 2 layers) on all of the sections.

The use of translucent sheets can prevent the invasion of bats due to the light that they allow into the attic. Ensure that galvanised sheets are placed on top of the translucent sheets and not the other way round (if not, the translucent sheets over the joints blacken in the heat of the sun). Natural ventilation of the roof is also advised, making sure to limit the access to pests (rodents and insects).

In hot and rainy countries, a large overhanging roof is recommended, as this ensures better protection for the walls and windows against rain and sun. This solution is mandatory when the wall is constructed using CSEB; raw earth is not capable of withstanding long term exposure to rain. In all cases, generous ventilation of the roof will ensure a more pleasant temperature in the building.

The use of gutters can prevent erosion at the base of the walls and can be used to collect water in tanks in the rainy season. Concrete tanks are preferable to plastic ones, as they make it possible to reduce the acidity of rain water (make sure they are closed tightly to avoid mosquito larvae).

5. Finishes

- Joinery is usually metal or wood, depending on the availability of the raw material and the local workforce skills. To avoid dust in specific luxury or technical services (operating theatre blocks, laboratories etc.) consider using aluminium or PVC frames which are more expensive but more airtight.
- The more door or window locks are of high quality and of recognised brands (be careful not to mention the brand in the Tender Specifications), the more expensive they are, but the risk of repairs being needed is less. Consider using padlocks for services that require them (classrooms, hospital rooms, storage, workshops) or simple and solid locks for toilets, shower doors and windows. For sensitive premises, provide safety grids.
- Floor coverings may be of various materials: cement, epoxy paint on screed, filled screeds, granolithic concrete (small pieces of stone embedded in the mortar that is sanded on-site), tiles, parquet wood, linoleum, marble etc. Prices obviously vary depending on the quality of the selected flooring.
- Wall coverings are often paint coats (provide an oil-based paint up to the height of the doorframe, and water-based for the upper part). This approach requires regular maintenance (repainting every 3 to 5 years). You can consider brickwork (provided that it is high quality and the maintenance will be regular) or a sprayed cement coating requiring no maintenance. For technical departments (laboratories, operating theatre blocks, kitchens etc.), earthenware tiles are generally used.
- Floor and wall coverings in operating theatre blocks require optimal hygiene. Bacteria have very little grip on earthenware tiles, but cling more easily to the grout between tiles. You should therefore ensure that the largest tiles possible are used. You can also consider using 'epoxy' paint that microbes can rarely settle on. This paint is quite expensive and should be replaced every 6 to 10 years, depending on use.
- False ceilings can be in wood, aluminium-zinc or plasterboard. Alu-zinc ceilings require no maintenance. In general, they're used in administrative services, services that cannot house dust or luxury buildings. Provide an inspection port in the frames and restrict animal access through the false ceiling by blocking all access points (for example by using grating) while maintaining good ventilation.

- To prevent termite invasion, use metal fittings or a very hard wood (red standard, Azobe, Ekky, Afzelia source SKAT). Be sure to verify the origin of these species, emphasising the use of certified wood. In all cases, be sure to paint the wooden parts of the building (doors, windows, frames, etc.) with an anti-termite or anti-vermin protection product, paying attention to the toxicity of these products both during construction works and during use. For toilet block doors, use metal frames and wooden doors, but allow a space of at least 15cm between the floor and the door (to avoid direct access of termites).

6. Toilet facilities

Toilet facilities must combine comfort, local customs, hygiene and maintenance. As such, consider squat toilets in a bush hospital rather than English toilets that you would use in the design of a ministry, for example. Check with the user if the water quantity and pressure are sufficient for the needs of the building. In all cases, robust equipment should be provided, of well-known brands within the market (although be careful not to mention any brands in the Tender Specifications) and that have spare parts that can be sourced locally.

The sanitary block doors (showers and toilets) are subject to high levels of humidity; they should be protected with a 'tar'-based paint at least on the bottom of the door.

In the case of a toilet block, a system that is simple to use and easy to maintain in case of misuse would be preferred. It should include, for example, a duct (gutter) under the bank of toilets with access points on each side of the building. The construction of dry latrines as well as water toilets must be at least 30m away from a drinking water point. Dry latrines have the advantage of being green if they are correctly used. If they are not "modern", they are often best suited to the habits and customs of remote areas.

To look further into this subject: Sustainable Sanitation Alliance (www.susana.org).

7. Electric installations

The safety aspect plays a crucial role here. A low voltage master board for the whole of the building will be required. This master board makes it possible to receive the electrical current from the supplier and dispatch it in the building. It includes, amongst others, the differential circuit breakers and fuses for each circuit in the building, the earthing for each circuit and if necessary a transformer. For each building, a distribution box should be used to house the differential circuit breakers and fuses from where the supply circuits leave. It is advisable to have a separate supply circuit for the lamps and the outlets (maximum six elements per circuit), and separate circuits for any rooms using water.

In the building, the supply circuits may be open or built-in. Built-in circuits make it possible to hide electric wires and protect them from the building users. Open circuits make it possible to see the wires and intervene easily in the event of failure. A study of the building's electric circuit must be carried out by a professional.

Attention should be paid to outdoor lighting, considering both the comfort of the users, vandalism risks and security risks.

8. Solid and liquid waste management

Solid waste management is an aspect often overlooked in the design of a building. Some recommendations can be made at this stage:

- conduct a global site review of waste management, recycling and waste processing, including, if necessary, a special construction to aid this such as a tank, composting area, or

even an incinerator. So, for example, hard bins (concrete, metal or other) should be used in public spaces (to avoid vandalism). Future users must be made aware of the issue and be assisted in the management of the future equipment provided;

- develop an excrement management system considering treatment, and even ecological purification and use of dry latrines (agricultural fertiliser) or biomethane. This point should be considered very carefully in hospitals, considering the treatment of germ-carrying urine and faeces;
- the biogas system can be used for buildings such as boarding schools, large capacity hospitals, agricultural projects or neighbourhood (housing) development projects. The experiments run by GIZ in Rwanda are particularly good sources of inspiration for this. The principle is to produce methane gas from the fermentation of excrement or organic waste. This approach means that the establishment no longer has to buy fuel (wood) to prepare the meals, for example. This system requires major maintenance. Before taking on this type of technology, you must be sure that there are sufficient skills in the country or sub-region;
- current technologies offer a wide range of wastewater treatment systems. You should make your choice depending on the level of pollution, available skills and resources but also according to usable surfaces and climatic conditions. The outgoing water from the system is never drinking water, but can be used for irrigation or cleaning. With a pump and tank system, they can also be reused to flush toilets in arid places (in hospitals, chlorination is essential).

9. Energy production

Solar thermal energy production (hot water production) is increasingly used. The equipment is cheap, it increases the well-being of the building's occupants and results in lower management fees.

The use of solar photovoltaic panels (PV) is a good alternative for the local electricity production in countries where the sun is strong and electricity expensive. Such a system is initially to be considered in areas not connected to the power grid, or if it is defective and irregular. It consists of PVs, a power converter and batteries (if the system is not connected to the network). In this case, you should choose low maintenance batteries that have a lifespan of approximately 7 years. Funding for battery replacement and their recycling at the end of their lifespan should be accounted for from the outset. The sizing of the panels and batteries is calculated by totalling the power consumed by all the electrical equipment of the building (or service). This system remains an expensive investment and it is rare to be able to connect all the equipment of a building to the batteries. The positioning of the panels must be carefully considered to ensure maximum sun exposure, easy cleaning and guaranteed security (theft risks). The system works very well for VHF radio installation in isolated health centres that are not powered by electricity, for the powering of a well or borehole water pump, supplying a multimedia room, or lighting a building etc. It does not work as well for technical school workshops with heavy equipment such as lathes and milling machines, or for a hospital's operating room... The research and installation of these systems must be carried out by professionals.

When it is connected to the network (the latter being used as storage), this type of system is to be promoted in countries with a "feed-in tariffs" policy.⁶.

If use of a generator is required, look to locate it in a place where the noise will be the least disruptive, or put up a soundproof wall.

⁶ For more information, see the 'Development, a matter of energy, promoting renewable solutions' brochure, BTC, 2012.

10. Other elements to consider

Outdoor facilities

- When the construction site is large, landscaping of gardens and internal paths creates a more pleasant working environment, although they require maintenance. It is obvious that in a harmonious setting, staff will be more inclined to work, a patient will heal faster, a student will learn more and users will be more inclined to respect the site. Planting trees will have a positive effect on several levels: shade, biodiversity, visual aspect, regulating the local climate etc.
- Walkways between buildings (services) create a more pleasant space, provide protection from climate constraints, and give users a greater quality of professional life.

Furniture

- In the school refectories, tables and benches are often wooden. However, they require much maintenance and are difficult to clean. It is possible to use masonry and concrete, which is less aesthetically pleasing and offers less flexibility in use, but is indestructible and easily maintained. If the room must be multi-functional, you could consider furniture with powder-coated metal arms and hardwood panels (MDF).
- In boarding school dormitories look to create "cubicles" for a maximum of 4 to 6 children, offering greater privacy and general comfort than large dormitories.

Hospital facilities

- Hospital performance depends largely on its equipment. This may entail many constraints that must be integrated in the design of the building. Hospitals therefore require specialist expertise that should be integrated at the design stage.
- You should protect the walls of hospital corridors against damage from passing hospital beds by adding wooden or metal slats up to the height of the beds and reinforcing corners of the walls with L-shaped corner pieces.
- Hospital Radiology departments require lead protection (minimum 2 mm thick) in the walls, doors, windows and even the ceiling if there are floors above the Radiology block.
- In hospitals, ensure that opening windows will not knock against beds. To do this, use windows with a sufficient height, that open outwards or slat windows.

1.2.4. *Budgetary impact*

When programming, with strategic directions and construction standards determined, it will be possible to refine the cost of the building. Construction standards may be reduced to a cost per square meter, which can be multiplied by the different functions depending on their level of finish. It will be then possible to limit the total budget from the design stage, even if it means reconsidering certain strategic choices with the partner if the total budget is exceeded.

2. ROLE OF THE ARCHITECTURE FIRM

2.1. Depending on the type of works

2.1.1. Small community works

Small-scale (less than €15,000 per building) and low standard constructions, such as drying areas, agricultural storage, latrines, agricultural greenhouses, stables etc. do not require input from an architecture firm. The ministry must be able to provide the necessary plans. It will then be possible for these works to be carried out by a small local company, or even for the ultimate recipients to carry out the work with the support of the project.

The project manager can then buy materials according to local legislation and carry out the project following the EI (employment-intensive) method. The project manager is then responsible for monitoring the work and quality compliance. Depending on the case, it is advisable to specifically hire a technician to closely monitor the work. They can bring their expertise during the design phase, when it is also incumbent upon the beneficiary population. It may also be possible to hire qualified personnel (subcontractors) to complete certain tasks.

2.1.2. Public buildings

For the construction or renovation of large public buildings (schools, hospitals, courts, ministries, laboratories, police stations, water towers, dams etc.) it is essential to work with an architecture firm.

Some projects must have identical facilities on several sites (primary schools, dispensaries, common rooms, community offices, etc.). A detailed preliminary study of the standard plans coupled with an analysis of the features of each site will reduce costs while optimizing quality.

2.2. Types of services expected

The benefit of a design office is first to call upon their expertise both in the design and follow-up of a building site in order to increase the overall quality level, and next for it to take on the legal responsibility for both of these tasks.

2.2.1. Know-how

Local architecture firms generally know the situation of the country or the area well. They should therefore be able to choose the type of architecture and materials to use depending on the climate, the nature of the soil, customs, local availability of materials etc. Of course, the project also contributes to the architectural choices in relation to the functionality of the buildings, their layout on the site, the respect for the environment or gender issues. It will also be useful to introduce certain innovative aspects, both in terms of design (such as passive architecture) and construction techniques (such as the use of appropriate technologies such as SCEB).

In the case of small and medium scale buildings, such as health clinics, rural hospitals or primary schools etc., the capacity of local architectural offices are generally sufficient. It is advisable to draw their attention to particular aspects, such as the promotion of passive technologies for better thermal comfort of users without use of electricity. The BTC guide to promoting these aspects (see the 'Development, a matter of energy' guide) will be initially useful media to give them. But complementary supports will probably be needed to assist them in this way.

In the case of buildings in high-risk areas (seismic, unstable ground etc.) or buildings on a large scale

(referral hospital or Supreme Court of National Justice etc.) the local architecture firms will not necessarily have the required skills. It will be advisable to evaluate their capacities, as designing this type of building requires special expertise. You could consider different types of support depending on the level of help required: support of the head office Infrastructure unit, support from a regional or international design office for key construction phases (architectural design, tendering, SPD, TD and supervision), or the permanent presence of international expertise.

2.2.2. Responsibility

The contract with an architecture firm will include all of the studies that must lead to the correct execution of the work: soil survey, land survey, implementation, general and detailed architectural design of the buildings, calculations of stability, sanitary and electric design, special techniques. Studies relating to special equipment (laboratory, medical equipment, etc.) should be the subject of separate studies. The terms of reference of the firm will also include the drafting of TD/TS, call for Tender documents and the assessment report for the choice of company. In the case of a complete mission, the site monitoring and acceptance phase will be included, including the secretariat's follow-up (writing the minutes of site meetings, follow-up mail both to the company and to the Project Owner). The office will then assume overall responsibility for the construction in place of the Project Owner, which facilitates the discussion in case of dispute.

2.2.3. Monitoring the contract

Those in charge of the project must ensure that the architecture firm respects the contractual rules. They also have the responsibility of taking the architecture firm's opinions into account as regards the progress of the work. If opinions seem disproportionate, the best solution is to contact the Infrastructure unit at head office for verification.

2.2.4. Quality of the architecture firm

Due to its responsibility throughout the process, the firm is a fundamental hinge in the construction project. This document recommends that the TD/Tender Specifications set aside a percentage of the cost of the work to be completed for the architecture firm's fees. The choice of firm is based on the analysis of the technical part of the tenders. This makes it possible to judge the quality of services offered by the tenderer and to choose the firm that offers the most benefits.

An example of the architectural offices fee schedule is shown in annex 5.

This method is not accepted by all legislations. When the analysis is based on both the technical and financial elements (the tenderer's tender), keep in mind that the lowest tender will probably result in a less successful delivery, with a major risk to the ultimate quality of the work. The technical assessment of the tender should therefore be decisive.

2.3. Service contract award procedures

The terms of reference will be drafted in compliance with legislation and the procedures in force and applicable for the project. Opportunities may differ largely from one country to another.

Appendix 3 of this document accurately describes the elements to be integrated in the ToR of a design office. In general, they include the items listed below.

2.3.1. Call for candidates or Call for Expression of Interest (CEI)

More and more, national laws of service contracting require a stage of demonstration of interest or call

to candidates, before a call is launched based on the TD/TS. Apart from the case of a design contest, this stage adds nothing to the recruitment of an architecture firm, but it lengthens the period of the procedure.

2.3.2. Architectural design contest

This process is reserved for luxury or large buildings (Supreme Court of Justice, museums, cinemas, national referral hospitals etc.) and is rarely used in BTC projects. It has the advantage of making it possible to judge the quality of firms on the basis of a preliminary design sketch specific to the planning and the project site. This procedure is longer and more expensive, but offers the advantage of requiring firms to present the best of their work in order to be selected. This type of procedure involves:

- a call for applications and the establishment of a short list of firms (on the basis of selection criteria);
- the establishment of a panel of at least 5 people, including one independent (outside of the project and the lead ministry);
- a prize for the top 3 nominees, at least covering expenses related to the contest.

2.3.3. Public service contracts for an architecture firm

The services dossier consists of several sections explained in the annexes. It allows, on the one hand, the contracting entity (project manager) to outline the tasks that will be required from the tenderer winning the contract (see the example of Terms of Reference in annexe) and, on the other hand, tenderers to take note of the information required for compiling their tender.

2.3.4. Drafting the Terms of Reference

The Terms of Reference will be as complete as possible, and explicitly clarify all the tasks expected (for example a topographical survey or a specific number of soil surveys) as well as the expected quality level (both in the firm's work and the construction). One visit will be required among other things. The document will also detail potential collaborations expected if external, or even international, consultancies are planned as well as the inclusion of an independent inspection firm.

After approval of the ToR by the inspection body specified in the TFF, the project will be able to launch the contract by publishing it in the official newspapers (this is obligatory), the local newspapers with a large readership and finally in professional or technical newspapers, as well as on the BTC and OECD websites according to the public contracts thresholds in force as set out in the table attached (see also "GL Procurement Publicity").

Table T1: Level of publication according to the contract threshold

Thresholds in euros	Level of publication	Minimum period
More than 22,000	BTC website	7 days
More than 67,000	National publication	Open procedure: 36 days Restricted procedure: 15 days for the receipt of candidate application forms and 15 days for the receipt of tenders
More than 150,000	OECD/DAC publication	60 days or 90 days (if the contract is more than €60 million)
More than €200,000 (or €5,000,000 for public works contracts)	European Advertising OJEU	Open procedure: 52 days Restricted procedure: 37 days for the receipt of candidate application forms and 15 days for the receipt of tenders

A tenderer can always request clarification; a deadline date for requests should be provided (for example ten days before the opening of tenders). Any further information should be accessible via the same channels as the initial file, or communicated to all of the firms that have expressed interest.

2.3.5. Opening and analysis of tenders

It is important to consult the relevant legislation. Legislation can be detailed with regard to the conduct of the tender-opening session.

When tenders are received, it is advisable to number them (directly on the envelopes) as well as drawing up a list of receipt (signed by the secretary) containing the number, the date and the time each tender was received.

If the selected procedure requires it, proceed with a public opening of tenders allowing everyone to know the number and name of the tenderers (transparency), without forgetting to circulate an attendance list.

The analysis is carried out on the basis of what is requested in the TD/Tender Specifications (see the annexes). This is to verify the administrative section, i.e. not only the presence of the requested documents, but also the content. It can be useful to physically check certain elements of the tender and sometimes check directly with previous contracting authorities (project managers), for example buildings completed (references) or available equipment (ICT, theodolite etc.)

Depending on the legislation in force, the analysis (or its conclusions) may have to be published in local newspapers.

Once the technical analysis is complete and weighting established, financial tenders from service providers who meet the acceptance criteria (minimum assessment) are opened. After checking quantities and unit prices, the contract is awarded to the tenderer with the lowest bid according to the pre-established proportion between financial and technical aspects (according to the procedure and following the legislation in place).

2.3.6. Summary Project Draft (SPD)

Establishing a SPD is a key stage in the construction process. The architecture firm prepares the general plans, the definitions, the cuts and facades on the basis of the architectural programme and the requirements requested by the Project Owner (project manager) in the TD/TS (service contracts - intellectual services - for an architecture firm).

This stage makes it possible to verify if the budget is sufficient and if priorities need to be adjusted or not. In case of an adjustment, it is always better to change the volume of activity rather than the quality or aesthetics. The SPD must be subject to a feedback meeting with all the beneficiaries and parties involved in the project (with meeting minutes signed by all).

2 or 3 proposals should be provided in the TD/TS of the design office based on the reactions of the partners involved in the project. To ensure a proper understanding of the proposals (reading plans is not easy for some), the architect may be asked to make an oral presentation and make the proposed plans available in perspective, or even provide a model (all this must be set out in the ToR of the TD/TS).

2.3.7. Public works contract for a building contractor

Following the acceptance of the SPD, the architecture firm will draw up a DPD. After approval of this by the Project Owner, the TD/TS for the public works contract is finalised, the content of which is outlined in the annexes. This dossier contains written documents including the technical specifications (example in annexe 7), the quantitative specifications (see example in annexes 8, 9 & 10) and graphics that will make it possible for the company to deliver its tender, and then complete the constructions. This document also explains how tenders will be evaluated.

To avoid any misunderstanding, ask tenderers to sign a document stating that they have acknowledged the plans, bill of quantities, the location in situ (site visit - avoid organising one day of joint visits by all tenderers to prevent discussions between them) and that they have no special remarks.

The company's tender includes various sections, including an administrative section, a technical section (including a schedule of work) and a financial section.

The amount of work to be performed can be calculated as lump sum(QF) or in provisional quantities (QP). In the first case, the quantity is fixed and the Project Owner knows the final cost of the tasks at the beginning of construction, unless there is a clause for revision of prices in the contract. In

the second case, the quantities of work are assumed and remeasured either at each stage for an interim payment, or upon provisional acceptance. The payment to the firm is based on the quantity actually carried out. The quantity for each task can be higher or lower than the quantity initially set out in the TD. In this second case, the Project Owner only knows the exact cost of work at the end of construction.

In general, the Project Owner prefers QF to avoid budget overruns.

In both cases, you should verify if the applicable legislation allows for the increase or the reduction in the amount of contracted construction works (expressed as a %) and by how much. If it is authorized, include a clause in the TD/TS allowing an extension or reduction of the works.

3. PUBLIC WORKS CONTRACT

3.1. Procedures

In general, the TD/TS is sold to allow the recovery of the dossier cost (reproduction of plans, CD-ROM, written sections). The project manager can sell this at a fixed price (mentioned in the invitation letter or contract notice) by mutual agreement with the partner and in accordance with the applicable law.

The project contract is launched by publishing it in the official newspapers (this is obligatory) and the local newspapers (possibly professional or technical newspapers), as well as on the BTC website and the OECD site (see Table 1).

A tenderer can always request clarification; a deadline date for these requests should be provided (for example ten days before opening the tenders). The project seeks information from the architecture firm and responds to this tenderer and all other contractors who bought the file (the procedure of responding to tenderers must be outlined in the TD/TS). The Project Owner can also gather all the questions and answers and publish them on the BTC website.

3.2. Opening and analysis of tenders from companies

According to the applicable public contract law and the contract award procedure, (in general, they are public invitations to tender), a tender analysis committee should be established as well as, if necessary, another committee for opening the tenders.

The two committees (mainly the analysis committee) may be made up of those in charge of the project and a representative of the partner, but also of the recipient and people interested in construction.

Be sure to consult the application legislation as part of the construction contract. This can detail the conduct of the tender opening session. When tenders are received, it is advisable to number them (directly on the envelopes) and draw up a list of receipt (signed by the secretary) containing the number, the date and the time each tender was received.

The opening is done in a public meeting, depending on the chosen procedure and what is outlined in the TD/TS. The committee reads the tender amount and summarily checks for the requested administrative documents. The opening committee writes opening minutes which are signed by all the members of the committee and preferably also by the tenderers present.

According to what has been requested in the TD/TS, the analysis committee checks:

Eligibility of the tenderer (possible causes of exclusion). If they are not eligible, their tender is rejected.

If they are eligible:

The tenderer's capacity must at least fulfil the requirements set out in the TD/TS. The CVs of the staff provided for the construction (site foreman and others) will be seriously analysed, as they will carry out the work. It is sometimes useful to physically check and perhaps go directly to an old client to verify certain elements of the tender, for example completed constructions (reference) or the equipment available (trucks, generators, concrete mixers etc.). If it does not meet the requirements, the tender is rejected.

If it meets the requirements:

The financial section, unit prices in figures should match those written in letters (in case of discrepancy, the amount in letters is taken in faith), the multiplication (quantity * UP) and the total amount.

In order to compare tenders, tenderers may not, under any circumstances, modify the quantities of work of the base tender document. If they find anomalies in the TD/TS, they can report it in a document separate from the tender.

This work can be greatly reduced by using the Excel file described in the annexes.

For all the award criteria included in the TD/TS, justification must be included in the awarding minutes or evaluation report.

The tenderer responding favourably to the selection criteria and with the lowest financial tender or the most economically advantageous tender (depending on the chosen procedure) wins the contract. Refer to the applicable legislation to know exactly how to award the contract: this can be done, inter alia, by sending a simple notification to the winning tenderer or by signing the contract.

Depending on the legislation in force, the analysis (or its conclusions) may have to be published in the local newspapers.

4. WORKSITE SUPERVISION

The necessary worksite supervision documents are:

- Construction site logbook,
- weekly construction site meeting logbook
- the work plan set out by the building contractor;
- materials testing;
- TD including graphics;
- monthly report from the architecture firm;
- progress reports;
- provisional acceptance;
- final acceptance;

- plans as built, the works once completed.

All these documents must be constantly available on site and, if necessary, have several copies (plans, specifications, planning).

It is very important that the project manager is completely involved in the building site supervision to ensure a level of quality both by the architecture firm and by the building contractor.

The architecture firm in charge of supervision must provide a permanent supervisor on site (staff who are required in the TD/TS and ToR of the architecture firm); the building contractor also provides its team for the completion of the work.

4.1. Construction site logbook

It is made available and completed daily by the building contractor. This logbook includes one A4 sheet per day and contains the following information: name of the site, dates, weather conditions, staff present that day, supplies that day, work in progress and any comments from the architecture firm, the project, the beneficiary or the building contractor itself.

The site foreman and permanent supervisor of the architecture firm sign each sheet. At each visit by the architecture firm, project manager, partner or beneficiary, the visitor should note in the logbook entries concerning his/her visit and sign the log.

4.2. Weekly construction site meeting logbook

The architecture firm organises a weekly site meeting attended by the engineer and the permanent supervisor from the architecture firm, the recipient, the project manager (the director, joint director and/or the project engineer), the building contractor's site manager and its site leaders. At least once a month, the architect (project leader), the director of the project and the director of the building contractor must attend the meeting. At the end of each meeting, an in situ status report is prepared and signed by all parties, with a copy for the recipient, one for the building site, one for the building contractor, one for the architecture firm and the original for the project manager.

The status report includes at least the following sections: name of the building site, date, status report number, those present, the work completed during the previous week, respect of the forecasts of the previous week, approvals of the samples (materials, frames, equipment etc.), planned work for the upcoming week, comments and advice, the signature of all the meeting participants.

This meeting makes it possible, on the one hand, to see the progress and the quality of work and to discuss the building contractor's shortcomings and imperfections and, on the other hand, to plan site activities with the recipient and the building contractor.

All materials and equipment must be presented at the meeting before their placement/installation. In the case of discussion or disagreement on tasks to be completed or equipment to be used, the parties shall refer to the specifications and plans of the site.

Sometimes, it appears that certain tasks are not recorded in the TD (not foreseeable at the beginning of the project). In this case, additional work is granted to the firm. The cost of this work must be calculated on the unit price basis that the company provided in its initial tender (an additional work clause must be included in the contract). The agreement for modifications to work giving rise to additional work must be the subject of a document signed by those in charge of the project, the architecture firm and the building contractor, before works begin. It must be taken into account that, according to the legislation in force and the rules laid down by the donor, the total amount of

amendments may not exceed a certain ratio of the original amount (between 10 and 20%), unless a particular clause was introduced in the call for tenders document in accordance with the legislation in force.

4.3. *Materials testing*

At the beginning of construction, the building contractor analyses materials to determine the composition of concrete, mortar etc. During construction, the permanent supervisor of the architecture firm and the Project Owner may ask to carry out tests on the concrete or any other material used on site (for example, steel or corrosion-proof earthenware tiles for laboratories). The building contractor must ensure that there are sufficient test specimens on site to carry out these tests. If test results are below the requirements set out in the TD/TS, the building contractor must redo the work that has been carried out using low quality material. The architect and his team of engineers inform the project manager of the reliability of public works laboratories and, where appropriate, the need to find an alternative to check materials. You may need to use a lab in a neighbouring country, or even in Belgium, or buy the necessary equipment and ask the architecture firm to carry out the tests themselves (calibration is then required). In both cases, the rates must be set out in the TD/TS.

All the materials or equipment used on site are subject to prior approval by the architecture firm and the Project Owner.

4.4. *Monthly report from the architecture firm*

At the end of each month, the architecture firm delivers a work progress report to the Project Owner. This must be outlined in the architecture firm's ToR.

This report includes: an administrative section (the name of the construction contractor, start and end date, amount, contractual period etc.), a summary table per week indicating support personnel and the number of workers on the construction site, a table of the work performed during the month, a comment on the progress and quality of work carried out in the month, including proposals to catch up on possible delays, and photos or other items considered necessary.

4.5. *Progress reports*

In general, at month-end, the building contractor creates its invoice on the basis of a progress report of the work, which is checked and countersigned by the project leader (architect) of the architecture firm (this may differ according to what is set out in the TD/TS). The project carries out their own audit and proceeds with payment or presents their non-objection to the competent authority to make the payment. This is a crucial stage in the supervision of the worksite, as it is now that you have the most influence on the building contractor. At site meetings, outline the building contractor's shortcomings and imperfections. If the building contractor does not modify work that was not well done, remove these parts from the progress report and the building contractor will not be paid for this work.

4.6. *Provisional acceptance*

The architecture firm (upon request by the building contractor) organises the provisional acceptance, which is held at the construction site when the work is completed and the building site is correctly cleaned. At the end of the acceptance meeting, an in situ status report is drawn up and signed by all parties. Each party receives a copy and the project manager retains the original. This acceptance also makes it possible to highlight the building contractor's shortcomings and imperfections, and officially hand over the building(s) to the beneficiary for use. The last payment is made to the building contractor when all the comments noted on the provisional acceptance status report have been addressed. The

lifting of the comments is sanctioned by a letter from the recipient stating that the building contractor has addressed them. The architecture firm will receive its last payment after the lifting of the remarks and when they submit the final construction site report and the project specification plans of the building site (as built plans i.e. work actually completed).

A guarantee of 5 to 10% of the contract total (depending on the applicable legislation) is retained for one year after the final acceptance of the project. This guarantee is distinct from the performance guarantee, explained in the next section.

4.7. Final acceptance

The architecture firm organises (at the request of the building contractor) the final acceptance (which takes place one year after the provisional acceptance). This acceptance makes it possible to note the condition of the buildings after one year of operation. A status report of the final acceptance is drawn up, indicating to the building contractor the possible defects that have arisen due to the poor implementation or poor quality of materials used (cracks in walls or floors, gutters twisted due to the effect of the sun etc.). The building contractor has no responsibility for damage caused due to use of the building such as dirtiness, broken windows, broken taps and lamps, damaged frames etc.

The status report is signed by all the parties who each receive a copy; the project manager retains the original.

The performance bonds of 5 to 10% of the contract total are released when the remarks reported during the final acceptance visit are lifted (which is also sanctioned by a letter from the beneficiary).

4.8. Ten-year guarantee

The architecture firm and the contractor remain responsible for the structure of the building for a period of ten years. This guarantee is not often applicable in the countries where BTC intervenes, but is normally outlined in the legislation.

5. TECHNICAL INSPECTION AGENCY

The objective of a technical inspection is to prevent the technical hazards likely to cause losses and verify compliance with the construction code of practice. It can be a contract related to a specific project or a multi-year open contract covering all BTC construction projects in a country, which must allow the successful tenderer to meet the various demands of different cooperation projects.

The successful tenderer will be responsible, as Technical Inspection Agency (TIA), for carrying out all necessary checks and doing so independently from the project management (the architecture and design firm) and the building contractor, and in coordination with the head of each inspected deliverable.

The TIA will provide the Project Owner with an impartial inspection service to guarantee the quality and conformity of the work. This task generally covers two types of inspection:

- type L (legal): inspection of the solidity of structures, sustainability, foundations, framing, enclosed and covered areas, equipment that is included in the building;
- type S (safety of people): safety inspection of completed constructions, including earthquake risks.

A traditional inspection covers the following tasks: i) the revision of plans and architecture and engineering design documents, including verification of calculation notes; ii) analysis of the tender records; iii) analysis of the documents drawn up by the building contractor in the design and site preparation phase; (iv) construction inspection during certain critical construction phases and of the construction equipment; v) future users safety inspection; vi) report of each of the stages, and a final technical inspection report.

To achieve this, the inspection must include all useful activities to ensure type L and type S inspections, well in advance (as much as possible) of the construction project phases. This includes but is not limited to, the following services:

- analysis of all written sections of the dossier;
- examination of the plans and execution documents, works and the conditions under which the work will be / has been carried out;
- the record of samples on site and their analysis by certified laboratories;
- advice on the technical provisions of the project and on the conditions under which stakeholders in the dossier carry out the technical checks assigned to them;
- following a specific request, assistance with the acceptance of the works, participation in coordination meetings, contribution to the resolution of the problems etc.

APPENDICES

A 1	Definition of terms
A 2	Recommendations for launching a public services contract with an architecture firm
A 3	Example of ToR for the evaluation of proposals from an architectural design contest
A 4	Scale of architect fees of the Belgian Architects' Association
A 5	Example of ToR for an architecture firm (without a call for expressions of interest or contest)
A 6	Example of technical specifications for a construction specifications
A 7	Example of a Schedule of Unit Prices
A 8	Example of a Lump sum bill of quantities
A 9	Schedule of Unit Prices and Bill of Quantities in Excel to be given to companies
A 10	Example of a schedule for the stages of a construction project

IMPORTANT NOTE:

The documents presented in the annexes are purely informative. They can in no case be considered as reference documents applicable to all BTC constructions. They are documents resulting from a specific context, in this case Burundi. It is up to each project manager to write his/her invitations to tender, including the TS, according to the legislation in force, standards and construction standards applicable in the country in which he operates, as well as technologies and materials chosen to achieve the work and best industry practices specific to their implementation.

Mind, the procurement unit (LEA) is working towards building a standard public contracts database and country-specific Tender Specifications models.

BUILDING A FAIR WORLD

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